

Air Force Reserve Command
**F-35A Operational
Beddown**



DRAFT

F-35A OPERATIONAL BEDDOWN - AIR FORCE RESERVE COMMAND ENVIRONMENTAL IMPACT STATEMENT



Prepared for:
United States Air Force
United States Department of the Navy

VOLUME I

February 2020

Privacy Advisory

This Draft Environmental Impact Statement (EIS) is provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality (CEQ) NEPA Regulations (40 *Code of Federal Regulations [CFR]* §§1500-1508), and 32 *CFR* §989, Environmental Impact Analysis Process (EIAP).

The EIAP provides an opportunity for public input on U.S. Air Force (USAF) decision-making, allows the public to offer inputs on alternative ways for the USAF to accomplish what it is proposing, and solicits comments on the USAF's analysis of environmental effects.

Public commenting allows the USAF to make better, informed decisions. Letters or other written or oral comments provided may be published in the EIS. As required by law, comments provided will be addressed in the EIS and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EIS or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of the EIS. However, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the Final EIS.

COVER SHEET

DRAFT

AIR FORCE RESERVE COMMAND (AFRC) F-35A OPERATIONAL BEDDOWN ENVIRONMENTAL IMPACT STATEMENT

- a. Responsible and Cooperating Agencies:** United States Air Force (USAF), AFRC, United States Department of Navy (DoN), Pima County, and City of Tucson.
- b. Report Designation:** Draft Environmental Impact Statement (EIS)
- c. Comments and Inquiries:** Mr. Hamid Kamalpour, AFCEC/CZN, HQAFCR.F-35.EIS@us.af.mil
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- d. Proposed Action:** Beddown and operation of 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft with 2 Backup Aircraft Inventory (BAI) in one squadron at one base in the continental United States (CONUS) where the AFRC leads a global precision attack mission. These F-35A aircraft would replace the existing AFRC F-16 fighter or A-10 ground-attack aircraft at the selected alternative.
- e. Alternatives:** The Strategic Basing Process resulted in the identification of the following four reasonable alternatives for the AFRC F-35A Operational Beddown:
- Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Fort Worth, Texas (preferred alternative),
 - Davis-Monthan Air Force Base (AFB), Tucson, Arizona,
 - Homestead Air Reserve Base (ARB), Homestead, Florida, and
 - Whiteman AFB, Knob Noster, Missouri.
- Note: All four alternatives are evaluated equally along with the no action alternative.
- f. Abstract:** This EIS has been prepared in compliance with the National Environmental Policy Act (NEPA) (42 *United States Code [USC]* 4331 et seq.); the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 *Code of Federal Regulations [CFR]* 1500-1508); and the USAF Environmental Impact Analysis Process (EIAP) as promulgated at 32 *CFR* 989, *Environmental Impact Analysis Process*. The DoN implements NEPA through 32 *CFR* 775, *Procedures for Implementing the National Environmental Policy Act*. This EIS will serve the NEPA requirements of both the USAF and the DoN. The USAF has prepared this EIS to assess the potential environmental consequences that could result from the beddown and operation of the AFRC F-35A operational mission. The USAF identified alternatives using operational analysis, the results of site surveys, and military judgment factors. Resources addressed in the EIS include airspace management and use, noise, air quality, safety, soil and water resources, biological resources, cultural resources, land use and recreation, socioeconomic, environmental justice and the protection of children, infrastructure, hazardous materials and waste, and cumulative effects and irreversible and irretrievable commitment of resources.
- g. Comments:** The Draft EIS 45-day comment period begins with the publication of the Notice of Availability (NOA) in the *Federal Register*. It is recommended that all comments be submitted during this 45-day comment period to allow sufficient time for full consideration during the development of the Final EIS.

How to Use This Document

Our goal is to provide a reader-friendly document that provides an in-depth, accurate analysis of the proposed action, the alternative basing locations, the No Action Alternative, and the potential environmental consequences for each base. The organization of this Environmental Impact Statement (EIS) is shown below.

EXECUTIVE SUMMARY

- Synopsis of Purpose and Need and Proposed Action and Alternatives
- Comparison of Impacts

VOLUME I OVERALL SUMMARY

CHAPTER 1

- Purpose and Need for the Air Force Reserve Command (AFRC) F-35A Operational Beddown

CHAPTER 2

- Description of the Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of the Proposed Action and Alternatives

CHAPTER 3

- Resource Definition and Methodology

CHAPTER 4

- Base Alternatives and the No Action Alternative

VOLUME I BASE-SPECIFIC INFORMATION

	Davis-Monthan AFB	Homestead ARB	NAS Fort Worth JRB	Whiteman AFB	No Action Alternative
Section DM1.0 Proposed Action Overview	Section HS1.0 Proposed Action Overview	Section FW1.0 Proposed Action Overview	Section WH1.0 Proposed Action Overview	This section describes the effects of not implementing the AFRC F-35A mission at any of the four bases.	
Section DM2.0 Base-Specific Project Details	Section HS2.0 Base-Specific Project Details	Section FW2.0 Base-Specific Project Details	Section WH2.0 Base-Specific Project Details		
Section DM3.0 Affected Environment and Environmental Consequences	Section HS3.0 Affected Environment and Environmental Consequences	Section FW3.0 Affected Environment and Environmental Consequences	Section WH3.0 Affected Environment and Environmental Consequences		
Section DM4.0 Cumulative Effects, Irreversible and Irrecoverable Commitment of Resources	Section HS4.0 Cumulative Effects, Irreversible and Irrecoverable Commitment of Resources	Section FW4.0 Cumulative Effects, Irreversible and Irrecoverable Commitment of Resources	Section WH4.0 Cumulative Effects, Irreversible and Irrecoverable Commitment of Resources		

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- List of Preparers

- List of Repositories

- Glossary

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- Appendix A – Correspondence
- Appendix B – Noise Modeling, Methodology, and Effects
- Appendix C – Air Quality

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ACRONYMS AND ABBREVIATIONS

$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
$^{\circ}\text{F}$	degrees Fahrenheit
1-135 ARB	1-135th Attack Reconnaissance Battalion
20 RS	20th Reconnaissance Squadron
47 FS	47th Fighter Squadron
55 ECG	55th Electronic Combat Group
56 FW	56th Fighter Wing
72 TES	72nd Test and Evaluation Squadron
93 FS	93rd Fighter Squadron
125 FW	125th Fighter Wing
131 BW	131st Bomb Wing
136 AW	136th Airlift Wing
162 FW	162nd Fighter Wing
214 RG	214th Reconnaissance Group
301 FW	301st Fighter Wing
325 WPS	325th Weapons Squadron
355 FW	355th Fighter Wing
442 FW	442nd Fighter Wing
482 FW	482nd Fighter Wing
509 BW	509th Bomb Wing
563 RQG	563rd Rescue Group
924 FG	924th Fighter Group
943 RQG	943rd Rescue Group
2013 CGP	Construction General Permit
AATC	Air National Guard Air Force Reserve Command Test Center
ACAM	Air Conformity Applicability Model
ACC	Air Combat Command
ACM	asbestos-containing material
ACS	American Community Survey
ADC	approach-departure corridor
ADEQ	Arizona Department of Environmental Quality
AEZ	Airport Environs Zone
AFB	Air Force Base
AFH	Air Force Handbook
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOOSH	Air Force Occupational Safety and Health
AFPAM	Air Force Pamphlet
AFPD	Air Force Policy Directive
AFRC	Air Force Reserve Command
AGE	Aerospace Ground Equipment
AGL	above ground level
AHAS	Avian Hazard Advisory System
AICUZ	Air Installations Compatible Use Zones
AIM	Air Intercept Missile
AIRFA	American Indian Religious Freedom Act
AMARG	Aerospace Maintenance and Regeneration Group

ACRONYMS AND ABBREVIATIONS (Continued)

ANG	Air National Guard
ANGB	Air National Guard Base
APAFR	Avon Park Air Force Range
APE	Area of Potential Effects
APZ	Accident Potential Zone
ARB	Air Reserve Base
ARTCC	Air Route Traffic Control Center
ASRAAM	Advanced Short Range Air-to-Air Missile
AST	aboveground storage tank
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZPDES	Arizona Pollutant Discharge Elimination System
BAI	Backup Aircraft Inventory
BASH	Bird/Wildlife-Aircraft Strike Hazard
BG	Block Group
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
BMP	Best Management Practice
BO	Biological Opinion
BOS	Base Operating Support
BRAC	Base Realignment and Closure
BSA	Basic Surface Attack
BWC	Bird Watch Conditions
BX	Base Exchange
C&D	construction and demolition
CAA	Clean Air Act
CAF	Combat Air Forces
CAS	Close Air Support
CBP	U.S. Customs and Border Protection
CDMP	Comprehensive Development Master Plan
CDNL	C-weighted day-night average sound level
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERP	Comprehensive Everglades Restoration Plan
<i>CFR</i>	<i>Code of Federal Regulations</i>
CH ₄	methane
CHRIMP	Consolidated Hazardous Material Reutilization and Inventory Management Program
CO	carbon monoxide
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalent
COC	community of comparison
CONUS	continental United States
CSAF	Chief of Staff of the Air Force

ACRONYMS AND ABBREVIATIONS (Continued)

CSR	<i>Code of State Regulations</i>
CT	Census Tract
CTOL	Conventional Take-Off and Landing
CWA	Clean Water Act
CZ	Clear Zone
dB	decibel(s)
dBA	A-weighted decibel(s)
DDESB	Department of Defense Explosives Safety Board
DM	Davis-Monthan Air Force Base
DNL	day-night average sound level
DoD	U.S. Department of Defense
DoDI	Department of Defense Instruction
DoN	U.S. Department of the Navy
EA	Environmental Assessment
ECP	Entry Control Point
EESOH-MIS	Enterprise Environmental, Safety, and Occupational Health Management Information System
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EISA	Emergency Independence and Security Act
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ESQD	explosive safety quantity-distance
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FANG	Florida Air National Guard
FDEP	Florida Department of Environmental Protection
FEAD	Facilities Engineering and Acquisition Division
FEMA	Federal Emergency Management Agency
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
FIRM	Flood Insurance Rate Map
FL	Flight Level
FLARNG	Florida Army National Guard
FONPA	Finding of No Practicable Alternative
FPL	Florida Power and Light Company
FRP	Facility Response Plan
FW	Naval Air Station Fort Worth Joint Reserve Base
FWC	Florida Fish and Wildlife Commission
FWNC&R	Fort Worth Nature Center & Refuge
GCR	General Conformity Rule
GHG	greenhouse gas
GIS	geographic information system
GPD	gallons per day
GPS	global positioning system

ACRONYMS AND ABBREVIATIONS (Continued)

GWP	global warming potential
HAP	hazardous air pollutant
HAZMART	Hazardous Materials Pharmacy
HDMS	Heritage Data Management System
HQ	Headquarters
HS	Homestead Air Reserve Base
HUD	U.S. Department of Housing and Urban Development
HWMP	Hazardous Waste Management Plan
HYENA	Hypertension and Exposure to Noise near Airports
Hz	hertz
I-	Interstate
ICP	Integrated Contingency Plan
ICRMP	Integrated Cultural Resources Management Plan
IDP	Installation Development Plan
IEMP	Installation Emergency Management Plan
IFR	instrument flight rules
ILS	Instrument Landing System
IMPLAN	Impact Analysis for Planning
INRMP	Integrated Natural Resources Management Plan
IPaC	Information for Planning and Consultation
IPMP	Integrated Pest Management Plan
IR	Instrument Route
IRP	Installation Restoration Program
ISR	Intelligence, Surveillance, and Reconnaissance
ISWMP	Integrated Solid Waste Management Plan
JASSM	Joint Air-to-Surface Standoff Missile
JDAM	Joint Direct Attack Munition
JLUS	Joint Land Use Study
JRB	Joint Reserve Base
kV	kilovolt(s)
kWh	kilowatt hour(s)
LBP	lead-based paint
L_{dnmr}	onset rate-adjusted day-night average sound level
LEED	Leadership in Energy and Environmental Design
L_{eq}	equivalent noise level
L_{eq16}	16-hour equivalent noise level
L_{eq24}	24-hour equivalent noise level
$L_{eq(SD)}$	school day equivalent noise level
LID	Low Impact Development
L_{max}	maximum noise level
L_{night}	nighttime equivalent noise level
LOA	Letter of Agreement
MAD	Managed Areas Database
MAG-41	Marine Aircraft Group 41
MAJCOM	Major Command
MAP	Management Action Plan
MBTA	Migratory Bird Treaty Act

ACRONYMS AND ABBREVIATIONS (Continued)

MCAS	Marine Corps Air Station
MCF	million cubic feet
MDC	Missouri Department of Conservation
M-DCPS	Miami-Dade Public School
MDFR	Miami-Dade Fire Rescue
MDNR	Missouri Department of Natural Resources
MDT	Miami-Dade Transit
MGD	million gallons per day
MIA	Miami International Airport
MILCON	Military Construction
MJU	Mobile Jettison Unit
mm	millimeter
MMBTU	million British thermal units
mmHg	millimeters of mercury
MMPA	Marine Mammal Protection Act
MO ANG	Missouri Air National Guard
MOA	Military Operations Area
MS4	Municipal Separate Stormwater Sewer System
MSA	Munitions Storage Area
MSGP	Multi-Sector General Permit
MSGP-2010	2010 Multi-Sector General Permit
MSL	mean sea level
MTR	Military Training Route
MVA	megavolt ampere(s)
MW	megawatt(s)
MWh	megawatt hour(s)
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	Naval Air Station
NCD	Noise Control District
NCTCOG	North Central Texas Council of Governments
NDI	Noise Depreciation Indices
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGVD	National Geodetic Vertical Datum
NHO	Native Hawaiian Organization
NHPA	National Historic Preservation Act
NIA	Natural Infrastructure Assessment
NIOSH	National Institute for Occupational Safety and Health
NIPTS	Noise-Induced Permanent Threshold Shift
NM	nautical mile(s)
NO ₂	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NOT	Notice of Termination
NO _x	nitrogen oxides

ACRONYMS AND ABBREVIATIONS (Continued)

NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
O&M	operation and maintenance
O ₃	ozone
OPNAVINST	Chief of Naval Operations Instruction
OR	odds ratio
OSHA	Occupational Safety and Health Administration
OSI	Office of Special Investigations
OWS	oil/water separator
PAA	Primary Aerospace Vehicles Authorized
PBA	Programmatic Biological Assessment
PCB	polychlorinated biphenyl
PCL	Pilot Controlled Lighting
PDEQ	Pima County Department of Environmental Quality
PEP	Project Evaluation Program
PHL	Potential for Hearing Loss
PM _{2.5}	particulate matter less than or equal to 2.5 micrometers in diameter
PM ₁₀	particulate matter less than or equal to 10 micrometers in diameter
ppm	parts per million
PR	personnel recovery
PSD	Prevention of Significant Deterioration
PTSD	post-traumatic stress disorder
RA	Restricted Area
RAICUZ	Range Air Installations Compatible Use Zone
RAP	Ready Aircrew Program
RAPCON	Radar Approach Control
RCRA	Resource Conservation and Recovery Act
RCZ	Range Compatibility Zone
RNAV	Radio Navigation
ROD	Record of Decision
ROI	Region of Influence
RV	recreational vehicle
SARA	Superfund Amendments and Reauthorization Act
SAT	Surface Attack Tactics
SECAF	Secretary of the Air Force
SEL	sound exposure level
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO ₂	sulfur dioxide
SO _x	sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasures
SRI	Statistical Research, Inc.
STAR	Standard Terminal Arrival Route
SUA	Special Use Airspace
SULMA	Special Use Land Management Area

ACRONYMS AND ABBREVIATIONS (Continued)

SWPPP	Stormwater Pollution Prevention Plan
SWPPT	Stormwater Pollution Prevention Team
TAA	Tucson Airport Authority
TACAN	Tactical Air Navigation
TAF	Taiwan Air Force
TANG	Texas Air National Guard
TCE	trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TDSHS	Texas Department of State Health Services
TIM	Time In Mode
TO	Technical Order
TPDES	Texas Pollutant Discharge Elimination System
TPWD	Texas Parks and Wildlife Department
TRACON	Terminal Radar Approach Control
TSCA	Toxic Substances Control Act
TUS	Tucson International Airport
UDB	Urban Development Boundary
UEA	Urban Expansion Area
UFC	Unified Facilities Criteria
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
<i>USC</i>	<i>United States Code</i>
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEIA	U.S. Energy Information Administration
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGRP	U.S. Global Change Research program
USMC	U.S. Marine Corps
UST	underground storage tank
UTA	Unit Training Assembly
UTBNI	up to but not including
VFR	visual flight rules
VOC	volatile organic compound
WADS	Western Air Defense Sector
WDZ	Weapons Danger Zone
WH	Whiteman Air Force Base
WHMP	Wildlife Hazard Management Plan
WMWA	Wichita Mountains Wilderness Area
WMWR	Wichita Mountains Wildlife Refuge
WWTP	Wastewater Treatment Plant

CHAPTER 1

PURPOSE AND NEED FOR THE AIR FORCE RESERVE COMMAND F-35A OPERATIONAL BEDDOWN



How to Use This Document

Our goal is to provide a reader-friendly document that provides an in-depth, accurate analysis of the proposed action, the alternative basing locations, the No Action Alternative, and the potential environmental consequences for each base. The organization of this Environmental Impact Statement (EIS) is shown below.

EXECUTIVE SUMMARY

- Synopsis of Purpose and Need and Proposed Action and Alternatives
- Comparison of Impacts

VOLUME I OVERALL SUMMARY

CHAPTER 1

- Purpose and Need for the Air Force Reserve Command (AFRC) F-35A Operational Beddown

CHAPTER 2

- Description of the Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of the Proposed Action and Alternatives

CHAPTER 3

- Resource Definition and Methodology

CHAPTER 4

- Base Alternatives and the No Action Alternative

VOLUME I BASE-SPECIFIC INFORMATION

Davis-Monthan AFB	Homestead ARB	NAS Fort Worth JRB	Whiteman AFB	No Action Alternative
Section DM1.0 Proposed Action Overview	Section HS1.0 Proposed Action Overview	Section FW1.0 Proposed Action Overview	Section WH1.0 Proposed Action Overview	This section describes the effects of not implementing the AFRC F-35A mission at any of the four bases.
Section DM2.0 Base-Specific Project Details	Section HS2.0 Base-Specific Project Details	Section FW2.0 Base-Specific Project Details	Section WH2.0 Base-Specific Project Details	
Section DM3.0 Affected Environment and Environmental Consequences	Section HS3.0 Affected Environment and Environmental Consequences	Section FW3.0 Affected Environment and Environmental Consequences	Section WH3.0 Affected Environment and Environmental Consequences	
Section DM4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section HS4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section FW4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section WH4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	

VOLUMES I AND II SUPPORTING INFORMATION

CHAPTER 5

- References

- List of Preparers

- List of Repositories

- Glossary

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APPENDICES: VOLUME II

- Appendix A – Correspondence
- Appendix B – Noise Modeling, Methodology, and Effects
- Appendix C – Air Quality

1.0 PURPOSE AND NEED FOR THE AIR FORCE RESERVE COMMAND F-35A OPERATIONAL BEDDOWN

1.1 INTRODUCTION

The F-35A Lightning II is the next-generation, multi-role, fighter aircraft for the U.S. Air Force (USAF) and will replace the USAF's F-16 fighter and A-10 ground-attack aircraft. The F-16 and A-10 aircraft that would be replaced by this action would be retired or reassigned. Should the aircraft be reassigned, a separate basing process supported by a National Environmental Policy Act (NEPA) analysis would be completed as an independent action from this Environmental Impact Statement (EIS).

The proposed action evaluated in this EIS addresses the beddown and operation of 24 Primary Aerospace Vehicles Authorized (PAA)¹ F-35A aircraft with 2 Backup Aircraft Inventory (BAI) in one squadron at one base in the continental United States (CONUS) where the Air Force Reserve Command (AFRC) leads a global precision attack mission. Air Combat Command (ACC) is the primary provider of combat airpower to the United States' warfighting commands. To support global implementation of national security strategy, ACC operates fighter, bomber, reconnaissance, battle-management, and electronic-combat aircraft. It also provides command, control, communications, and intelligence systems, and conducts global information operations. In this role, ACC organizes trains, equips, and maintains combat-ready forces for rapid deployment and employment while ensuring strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense. AFRC supports ACC in fulfilling these roles, although on a lesser scale. The proposed action considers the beddown of F-35A aircraft and replacement of existing fighter or ground-attack aircraft at one of the following alternative bases: Davis-Monthan Air Force Base (AFB), Arizona; Homestead Air Reserve Base (ARB), Florida; Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas; and Whiteman AFB, Missouri (Figure 1-1). NAS Fort Worth JRB has been identified as the preferred alternative, and the other three bases are reasonable alternatives.

This EIS has been prepared in compliance with the NEPA (42 *United States Code [USC]* 4331 et seq.); the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 *Code of Federal Regulations [CFR]* 1500-1508); and the USAF Environmental Impact Analysis Process (EIAP) as promulgated at 32 *CFR* 989, *Environmental Impact Analysis Process*. The U.S. Department of the Navy (DoN) and Pima County and the City of Tucson in Arizona are serving as Cooperating Agencies through this EIS process (see Section 1.6). The DoN implements NEPA through 32 *CFR* 775, *Procedures for Implementing the National Environmental Policy Act*. This EIS will serve the NEPA requirements of both the USAF and the DoN.

¹ PAA is the number of aircraft authorized to a unit in order to perform its operational mission, while BAI is the aircraft that would be used only if one of the PAA aircraft is out of commission.

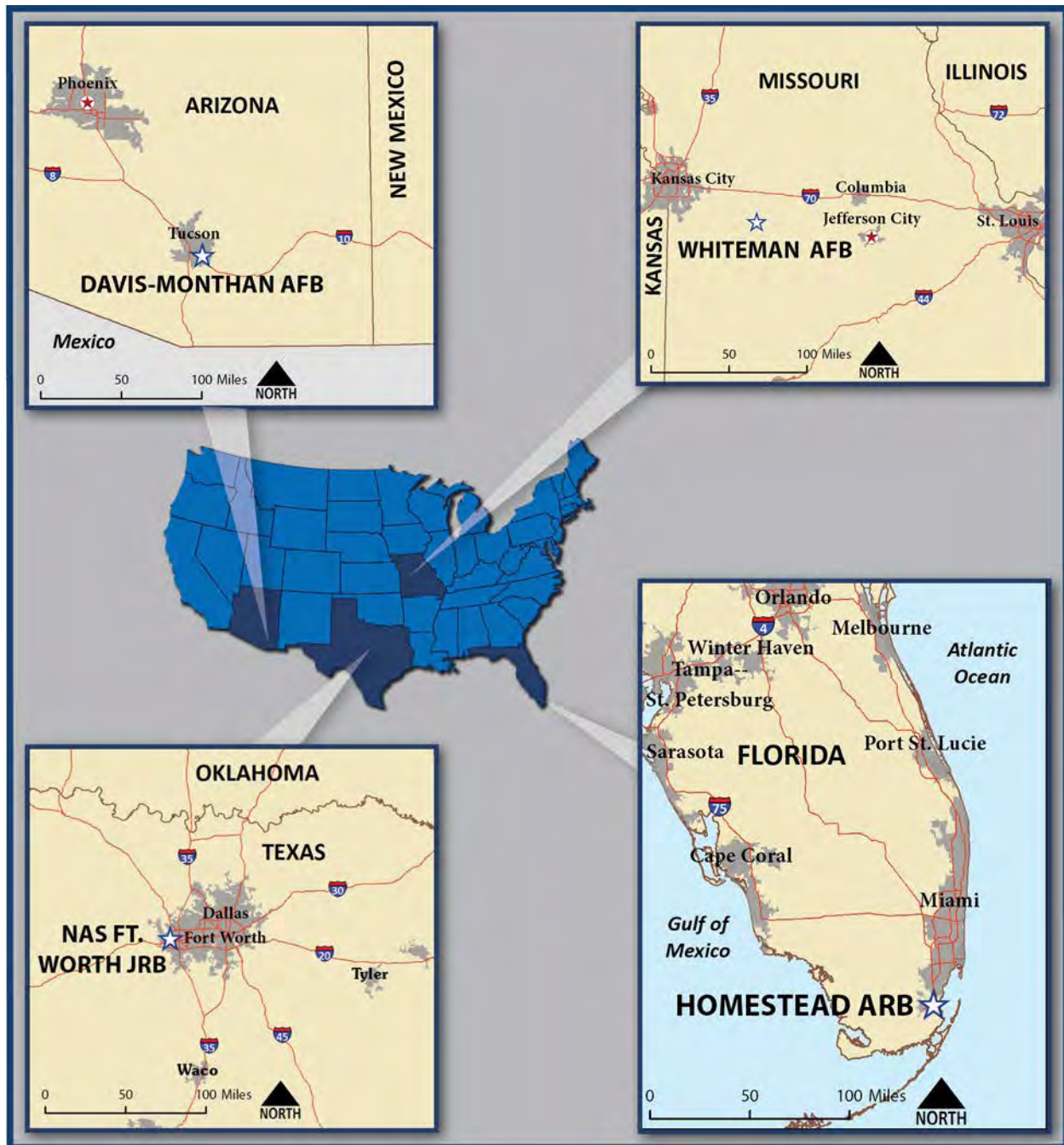


Figure 1-1. Location of Alternative Bases Proposed for the AFRC F-35A Operational Beddown

The National Guard Bureau is preparing a separate EIS that will support an independent decision to beddown F-35A aircraft at two Air National Guard (ANG) installations, to be operated by the ANG. The alternative installations being considered include Dannelly Field Air Guard Station (AGS), Montgomery, Alabama; Gowen Field AGS, Boise, Idaho; Jacksonville AGS, Jacksonville, Florida; Selfridge Air National Guard Base (ANGB), Detroit, Michigan; and Truax AGS, Madison, Wisconsin. This action is separate and independent from the AFRC F-35A decision that will result from this EIS.

1.2 BACKGROUND

The USAF strategy to modernize the aging aircraft inventory with a near all-stealth fighter force by 2025 began with the F-22A Raptor in the early 1990s. In 1994, the U.S. Congress and U.S. Department of Defense (DoD) determined that the F-35 would be developed to replace USAF F-16 and A-10 aircraft (Congressional Research Service 2006).

Development and deployment of the F-35 Lightning II represents one of the priority defense programs for the United States. This multi-decade program was initiated in the early 1990s to provide the premier strike fighter aircraft to the USAF, U.S. Marine Corps (USMC), and DoN, as well as international partners, for the next several decades. The DoD established and is implementing the F-35 program for several branches of the Armed Services. The information in this section is for background purposes only. This EIS covers only the proposed AFRC F-35A beddown.

1.2.1 Aircraft Characteristics of the F-35A

The USAF has designated the F-35A to replace existing but aging fighter or ground-attack aircraft at one base in the CONUS where AFRC leads a global precision attack mission. These new aircraft would fulfill the wide range of roles and missions currently conducted by legacy fighter and ground-attack aircraft, including Attack Operations/Air Interdiction, Offensive Counter Air, Close Air Support (CAS), Strategic Attack, Suppression of Enemy Air Defenses, Destruction of Enemy Air Defenses, and Defensive Counter Air. Additional F-35A missions would include Armed Reconnaissance, Forward Air Controller (airborne), and Combat Search and Rescue. The USAF variant (i.e., Conventional Takeoff and Landing [CTOL]) of the F-35 therefore embodies critical combat capabilities to fulfill multiple mission roles and epitomizes the characteristics needed for these roles, offering a unique combination of capabilities (USAF 2013). The following are a unique combination of capabilities of the F-35A aircraft.



The F-35A is optimized to be a multi-role fighter, with the ability to perform air-to-air; air-to-ground; and intelligence, surveillance and reconnaissance (ISR) missions.

- **Stealth** – Design features and radar-absorbent composite materials make the F-35A more difficult to detect than conventional aircraft of similar size.
- **Range and Supersonic Speed** – The F-35A offers an equivalent or greater combat radius than current legacy aircraft. The ability to fly at supersonic speeds makes the F-35A more effective in engaging the enemy and less vulnerable to enemy aircraft and ground-based threats.

- **Sensor Integration to Support Precision Munitions** – New F-35A computer systems, improved multi-spectral sensor technology, and networked sharing of information permit USAF pilots to detect enemy threats and deliver precision munitions at substantially greater distances than those supported by current aircraft.
- **Comprehensive Combat Information Systems** – Highly sophisticated avionics systems, including a helmet-mounted display, are integrated throughout the F-35A to provide the pilot information from many sources and produce a clear, easily understood picture of the combat situation.
- **Reduced Maintenance Costs** – Computerized self-tests of all systems, improved maintenance, and other autonomic logistics information system components reduce both maintenance time and costs.

The F-35A, a single-seat, all-weather fighter, receives its power from one F135 Pratt and Whitney jet engine capable of supplying approximately 40,000 pounds of thrust and speeds up to 1,151 miles per hour. The aircraft is capable of employing guided air-to-ground and air-to-air weapons from an internal weapons bay or external weapon stations. It has a four-barrel version of the Gatling-type 25-millimeter (mm) autocannon for close air support missions, effective against lightly-armored and “thin-skinned” vehicles. The aircraft also employs defensive countermeasures such as flares.

The F-35A measures approximately 51 feet long, 35 feet across the wings, and 15 feet tall. Internal fuel capacity is more than 18,000 pounds, providing an unrefueled range of 1,200 miles without external tanks. The aircraft has two internal weapon bays with four stations: two stations that can carry up to 2,000 pounds of air-to-ground bombs and two stations for smaller weapons (including but not limited to air-to-air missiles and/or bombs). The suite of ordnance the F-35A can employ includes, but is not limited to: Air Intercept Missile (AIM)-9X, AIM-120, and AIM-132 Advanced Short Range Air-to-Air Missile (ASRAAM) missiles; Air-to-Ground Missile (AGM)-158 Joint Air-to-Surface Standoff Missiles (JASSMs); Joint Direct Attack Munitions (JDAMs); Small Diameter Bombs; and other guided bombs. When low observability is not required, external pylons can be loaded with ordnance, yielding a weapons payload of more than 18,000 pounds (USAF Fact Sheet, <http://www.af.mil/About-Us/Fact-Sheets/Display/Article/478441/f-35a-lightning-ii-conventional-takeoff-and-landing-variant/>).

The F-35A contains an integrated core processor that combines information from all the aircraft’s sensors into a single, coordinated view of the battlefield. Among these sensors is an active, electronically scanned array radar with a synthetic aperture radar mapping mode to provide pilots with far more precise search and targeting capabilities than those of F-15 and F-16 fighters. The aircraft is also equipped with an infrared search and tracking system for air-to-air combat, while advanced air-to-ground combat features include an electro-optical targeting system with a forward-looking infrared imager, a targeting laser, a laser spot tracker, and a closed circuit digital television camera. With software capable of analyzing the information, these sensors provide the F-35A with an automatic target recognition and classification system to identify specific targets. A speech recognition system that detects a pilot’s spoken commands operates various systems without the need of pressing buttons or flipping switches.

1.3 PURPOSE OF THE AIR FORCE RESERVE COMMAND F-35A OPERATIONAL BEDDOWN

The purpose of the proposed action is to efficiently and effectively maintain combat capability and mission readiness as the USAF faces deployments across a spectrum of conflicts while also providing for homeland defense. Beddown and operation of the F-35A at one of the alternative bases would represent a major step toward this goal. This beddown action would continue to posture the USAF with the ready availability of the most advanced fighter aircraft in the world at an additional strategic location in the CONUS.

1.4 NEED FOR THE AIR FORCE RESERVE COMMAND F-35A OPERATIONAL BEDDOWN

Three factors establish the need for the AFRC beddown and operation of the F-35A. First, existing and anticipated enemy air defense systems have reached levels of effectiveness sufficient to pose a significant threat to current fighter and ground-attack aircraft. In addition, worldwide prevalence of sophisticated air-to-air and surface-to-air missiles continues to grow, increasing the number of threats to which existing USAF fighter and ground-attack aircraft are vulnerable. Implementation of the proposed beddown would provide AFRC with a location to operate the F-35A aircraft.

Second, AFRC needs to efficiently and effectively maintain combat capability and mission readiness. However, it faces increased difficulty in maintaining aging fighter and ground-attack aircraft inventories. These aircraft need to be replaced as a result of attrition, decreasing service life, and the lack of manufacturing of additional aircraft. Therefore, AFRC must replace the aging aircraft and supporting infrastructure to integrate operational F-35A squadrons into the existing USAF structure.

Third, the F-35A must support AFRC core competencies of air and space superiority, global precision attack and agile combat support. In order for AFRC to organize, train, equip and support F-35A pilots to meet a full range of military operations, the USAF needs to beddown the F-35A at existing locations offering compatible base infrastructure and providing ready access to existing airspace and ranges suitable for the F-35A. Beddown and operation of the F-35A at such locations forms a critical priority for the USAF.

1.5 PUBLIC AND AGENCY INVOLVEMENT

CEQ regulations for implementing the NEPA (40 *CFR* §§ 1500-1508), and the USAF's implementing regulations (32 *CFR* § 989), require the USAF to consider potential environmental consequences of its proposed action early and concurrent with the initial project planning stages. An EIS documents the detailed study of the potential environmental consequences of the proposed action, as well as cumulative impacts. When preparing an EIS, the USAF is required to invite review from other federal, state, and local agencies and from the public. In providing the opportunity for comment on the EIS, the USAF requests that comments be substantive in nature. Generally, substantive comments are regarded as those specific comments that challenge the analysis, methodologies, or information in the EIS as being factually inaccurate or analytically inadequate; that identify impacts not analyzed or developed and evaluate reasonable alternatives or feasible mitigations not considered by the USAF; or that offer specific information (e.g., differences in interpretations of significance, scientific, or technical conclusions) that may have a bearing on the decision or cause changes or revisions in the proposal. Non-substantive comments, which do not require a USAF response, are generally considered to be those comments that are

non-specific; that express a conclusion, an opinion, agree or disagree with the proposals; vote for or against the proposal itself, or some aspect of it; that state a position for or against a particular alternative; or that otherwise state a personal preference or opinion.

Stages of the environmental review process are provided below:

- **Notice of Intent (NOI)** – A notice that announced the USAF’s intent to prepare an EIS was published in the *Federal Register* on March 22, 2018. Notices were also published in local newspapers near each of the four alternative bases and under the airspace proposed for use. The NOI formally initiated the public scoping process. The NOI included descriptions of the alternatives and the scoping process, and the dates, times and locations of the scoping meetings. The NOI also invited affected federal, state, and local agencies; affected Indian tribe(s); and interested persons (e.g., public) to participate in the scoping process. After the scoping period closed, the USAF was made aware that the address provided for submittal of courier delivered public scoping comments (e.g., Federal Express or United Parcel Service) was incorrect. Consequently, the USAF provided the correct address, published an amended NOI, and added an additional 10-working days to resubmit scoping comments from the time resubmittal instructions were published in the *Federal Register* on 13 August 2018 and in the local newspapers.
- **Scoping** – The USAF held four public scoping meetings near Homestead ARB, NAS Fort Worth JRB, Davis-Monthan AFB, and Whiteman AFB. The purpose of the public scoping meetings was to gather community-specific concerns to help focus the EIS analysis. The meetings were arranged in a “come and go,” open-house format with no formal presentation or opportunity for public testimony. Meeting attendees were asked to sign in and written comments were accepted. Poster display stations were set up and staffed approximately one-half hour prior to each meeting’s scheduled start time to answer questions concerning the EIS process, the proposed action and alternatives, and base mission-specific questions. Resource specialists were on hand to provide information, answer questions, facilitate the identification of issues, and encourage public involvement. All four of the scoping meetings were well attended and during both comment periods, 711 comments were received regarding all of the resource areas evaluated in this Draft EIS.
- **Draft EIS** – This Draft EIS analyzes the environmental consequences of the proposed action. It includes a description of the proposed action, the purpose and need for the proposed action, alternatives for implementing the proposed action, the existing environmental conditions where the proposed action would take place, and the potential environmental consequences of the proposed action. The Draft EIS is supported by detailed technical studies.
- **Draft EIS Notice of Availability (NOA) and Notice of Public Hearing** – On 14 February 2020, a formal NOA was published in the *Federal Register* by the U.S. Environmental Protection Agency (USEPA) announcing the availability of the Draft EIS at public libraries and on the project website for review by the public and federal, state, and local agencies. The NOA also included the dates, times, and locations of the public hearings near each of the four alternative bases. The NOA was also published in local newspapers.
- **Final EIS** - The Final EIS documents the comments received on the Draft EIS and includes responses to all substantive comments. This version of the document could

include modifying alternatives; supplementing, improving, or modifying the analyses; and correcting factual and typographical corrections.

- **Final EIS NOA** – Again, a formal notice will be published in the *Federal Register* by the USEPA and advertisements will be published in local newspapers to announce that the Final EIS is available. These publications are followed by a 30-day waiting period.
- **Record of Decision (ROD)** – The USAF will prepare a concise public ROD that will address the USAF decision, identify alternatives considered, specify the environmentally preferred alternative, and state whether all practicable means to avoid or minimize environmental harm have been adopted (and if not, why they were not). A notice of the ROD availability will be announced in the *Federal Register*.

1.5.1 Agency Consultation

Agency consultation is integral to developing a comprehensive EIS. Specifically, the NEPA, CEQ regulations, and the EIAP require a process called “scoping” to involve the public early in the assessment process. The scoping process is designed to solicit input from the public and interested agencies on the nature and extent of issues and impacts to be addressed, and the methods by which potential impacts are evaluated.

As part of the EIAP process, the USAF notified the U.S. Fish and Wildlife Service (USFWS) regional offices and the respective State Historic Preservation Officers (SHPOs) of the intent to undertake the EIS and initiate informal consultation (Volume II, Appendix A). Prior to the scoping meetings, the USAF initiated direct contact with potentially interested and affected government agencies, government representatives, elected officials, and parties in the states potentially affected through distribution of Interagency and Intergovernmental Coordination letters (Volume II, Appendix A). The letters announced the beginning of the scoping process and included maps of the proposed beddown locations, a list of scoping meeting dates and locations, and the scoping flier. The USAF published advertisements in local newspapers a week prior to the scoping meetings. Each advertisement provided scoping meeting dates and locations applicable to that area. Summaries of the correspondence received from the USFWS and SHPOs are contained in the following sections: DM2.5.3.2, DM2.5.3.3, FW2.5.3.2, FW2.5.3.3, HS2.5.3.2, HS2.5.3.3, WH2.5.3.2 and WH2.5.3.3. Responses from other government agencies, government representatives, elected officials, and parties in the states are included in Volume II, Appendix A.

Chapter 4 of this EIS is divided into five subsections, one for each alternative base and one for the No Action Alternative. Each alternative subsection is labeled with a unique identifier in front of each of the section and page numbers. DM – Davis-Monthan AFB; HS – Homestead ARB; FW – NAS Forth Worth JRB; WH – Whiteman AFB; and NA – No Action Alternative.

1.5.2 Government-to-Government Consultation

In compliance with the National Historic Preservation Act (NHPA) of 1966, as amended, the USAF has endeavored to identify historic properties, sacred sites, and Traditional Cultural Properties that may be affected by the proposed action. The USAF has consulted Native American tribes with cultural affinity to the proposed beddown sites in keeping with the Presidential Memorandum on Government-to-Government Relations with Native American Tribal Governments; Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*; Air Force Instruction (AFI) 90-2002, *Air Force Interactions with Federally-Recognized Tribes* and AFI 32-7065, *Cultural Resources Management*; and DoD Policy on Native American and Native Alaskan Consultation. The USAF sent letters to federally recognized tribes

with potential interest in the proposed action. The letters requested any concerns or additional information for incorporation into the EIS. Volume II, Appendix A, Section A.2, contains a record of these consultations. Summaries of the correspondence received from the Tribes are contained in the following sections: DM2.5.3.1, FW2.5.3.1, HS2.5.3.1, and WH2.5.3.1.

1.6 LEAD AND COOPERATING AGENCIES

The USAF is the proponent for the proposed AFRC F-35A beddown and is the lead agency for the preparation of the EIS. The DoN has agreed to be a Cooperating Agency due to the fact the Navy has been assigned lead Service for NAS Fort Worth JRB and is also the airspace and range controller for specific aspects of the proposed action and alternatives.

The City of Tucson Arizona and Pima County Arizona are also serving as Cooperating Agencies because they have special expertise with respect to zoning and land use planning codes relative to noise in the Tucson city limits and in Pima County Arizona.

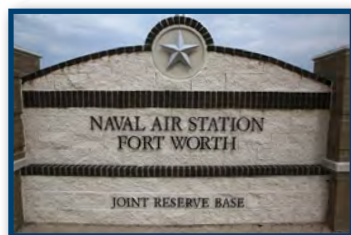
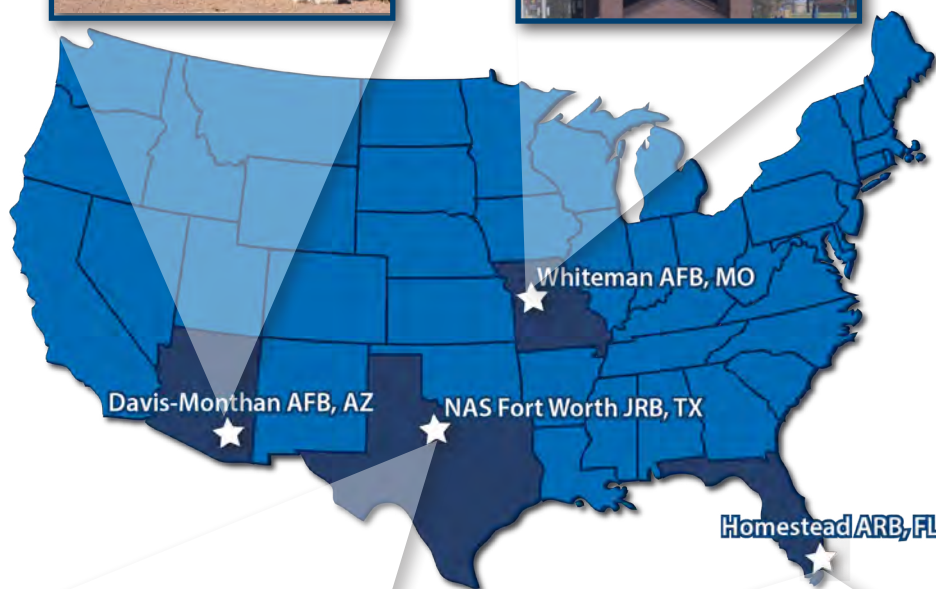
As defined in 40 *CFR* § 1508.5, a Cooperating Agency:

“...means any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposal (or a reasonable alternative) for legislation or other major Federal action significantly affecting the quality of the human environment. The selection and responsibilities of a cooperating agency are described in § 1501.6. A State or local agency of similar qualifications or, when the effects are on a reservation, an Indian Tribe, may by agreement with the lead agency become a cooperating agency.”

Volume II, Appendix A, presents the relevant correspondence exchanged between the USAF and the Cooperating Agencies.

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES



How to Use This Document

Our goal is to provide a reader-friendly document that provides an in-depth, accurate analysis of the proposed action, the alternative basing locations, the No Action Alternative, and the potential environmental consequences for each base. The organization of this Environmental Impact Statement (EIS) is shown below.

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- Synopsis of Purpose and Need and Proposed Action and Alternatives
- Comparison of Impacts

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- Resource Definition and Methodology

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- Base Alternatives and the No Action Alternative

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Proposed Action Overview

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Proposed Action Overview

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 OVERVIEW

This chapter presents a description of the process the U.S. Air Force (USAF) used to identify and select alternatives for the Air Force Reserve Command (AFRC) F-35A mission. This chapter also describes the activities and implementing actions that would be associated with the proposed mission. The proposed AFRC F-35A mission involves the beddown and operation of 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft with 2 Backup Aircraft Inventory (BAI) in one squadron at one base in the continental United States (CONUS) where the AFRC leads a global precision attack mission. The AFRC F-35A mission requires facilities and infrastructure, personnel, airspace to conduct training activities, and airspace to support missions.

Table 2-1 provides an overview of key elements associated with the proposed AFRC F-35A beddown that have the potential to affect environmental resources at the selected base in or under the regional training airspace.

Table 2-1. Overview of the AFRC F-35A Beddown

The proposed AFRC F-35A beddown would involve implementing several related elements at the selected base. The following elements would occur at the selected base and in the associated training airspace.

Elements Affecting the Base

- ✓ The beddown of 24 PAA F-35A aircraft with 2 BAI and either the replacement of 24 existing F-16 or 24 existing A-10 aircraft at one installation in accordance with the aircraft delivery schedule;
- ✓ Renovate, construct, and manage facilities and infrastructure necessary to support the mission;
- ✓ Implement personnel changes (increases or decreases) at the base to conform to F-35A requirements; and
- ✓ Conduct airfield operations for missions and training.

Elements Affecting Airspace

- ✓ Conduct F-35A operations in existing Restricted Areas (RAs), Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace (ATCAA), and offshore Warning Areas, emphasizing fighter and ground-attack aircraft requirements, to include supersonic flight;
- ✓ Employ defensive countermeasures, such as flares, in airspace authorized for their use; and
- ✓ Accomplish limited employment of ordnance at existing ranges approved for such use.

2.2 ALTERNATIVE IDENTIFICATION PROCESS

2.2.1 Alternative Identification Process Methodology

The established USAF strategic basing process (Air Force Instruction [AFI] 10-503, *Strategic Basing*) provides a deliberate, repeatable, standardized, and transparent framework for identifying operations and training locations. As part of the F-35A strategic basing process, the USAF developed basing criteria to assess the four AFRC fighter bases, based on their capability and capacity to support F-35A training and operations. The USAF has used this process for basing selections of operational locations.

Through a process involving collaborative staffing between Air Combat Command (ACC), AFRC, and Headquarters (HQ) functional offices, the need for an AFRC F-35A installation was validated. The seventh operational location, which is the focus of this Environmental Impact Statement (EIS), is a 24 PAA AFRC squadron with 2 BAI, with the first aircraft expected to arrive in 2024.

2.2.2 Identification of Preferred and Reasonable Alternatives

To meet the overall purpose and need, the USAF identified two broad selection standards that a base must meet: 1) the base must be a current AFRC installation with a fighter mission, and; 2) the base must have a runway longer than 8,000 feet. Applying these two broad selection standards, the USAF identified four candidate bases for the first AFRC-led F-35A base. On 12 April 2016, the USAF released the names of these four candidate bases: Davis-Monthan AFB, Arizona; Homestead Air Reserve Base (ARB), Florida; Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas; and Whiteman AFB, Missouri.

ACC and AFRC then conducted detailed, on-the-ground site surveys at each candidate base and assessed each location against four additional specific selection standards. These specific selection standards represent capabilities that each installation must have in order to qualify as a reasonable alternative. The four specific selection standards are:

1. Mission standard: ability to conduct a global precision attack core mission with access to training and range airspace;
2. Capacity standard: operational and logistics facilities, and ramp and parking space;
3. Environmental standard: considerations on air quality, incompatible development, base encroachment, and land use controls; and
4. Cost factor standard: Given budgetary constraints, the USAF considered area construction factors based on Unified Facilities Criteria (UFC) 3-701-01, *DoD Facilities Pricing Guide*, dated March 2011, Change 11, September 2016, area Basic Allowance Housing rates, and area General Schedule locality pay.

The completed site survey results were briefed to the SECAF and Chief of Staff of the Air Force (CSAF) to select preferred and reasonable alternatives for the AFRC F-35A beddown location.

On 6 January 2017 the USAF announced NAS Fort Worth JRB as the preferred alternative and the remaining three bases as reasonable alternatives for the AFRC F-35A mission. Along with the No Action Alternative, all four bases are equally evaluated in this EIS.

2.3 ELEMENTS OF THE PROPOSED ACTION COMMON TO ALL BEDDOWN ALTERNATIVES

The AFRC F-35A mission would replace the existing AFRC mission at one of the four alternative bases. Implementation of the proposed action would occur in two stages: a beddown stage and an operational stage. The beddown stage would involve construction/retrofit of required facilities, infrastructure, and prepared surfaces, which includes renovation, alteration, new construction, and demolition. The beddown stage would also include preparing support facilities for new personnel to support the mission. The operational stage would involve conducting the day-to-day activities (operational missions, etc.) of the squadron at the base, including flight operations and training in the regional airspace.

Section 2.3.5 provides a general description of each of the alternative bases under consideration. The description of each alternative carried forward as a reasonable alternative in Chapter 4 contains specifics about how the beddown and mission would be implemented at each base and within the regional airspace. In accordance with the Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations [CFR]* 1502.14(d)), Section 2.3.6 describes the No Action Alternative, which consists of not bedding down an AFRC F-35A mission at any of the four alternative bases.

Four elements of the proposed action have the potential to affect the base and associated airspace: 1) facility and infrastructure projects necessary or required to support the F-35A beddown; 2) personnel changes necessary to meet F-35A requirements; 3) airfield operations conducted by AFRC F-35A pilots; and 4) airspace and range use by AFRC F-35A pilots. Each element is explained below.

The USAF proposes to beddown 24 PAA F-35A aircraft with 2 BAI in one squadron at one of the four alternative bases. At Davis-Monthan AFB or Whiteman AFB, 24 A-10 aircraft would be replaced with 24 F-35A aircraft. At Homestead ARB or NAS Fort Worth JRB, 24 F-16 aircraft would be replaced with 24 F-35A aircraft. The aircraft replacement process would occur over approximately 2 years as the required F-35A aircraft are manufactured. Delivery of the first F-35A aircraft to the selected base would occur in 2024. At the end of the 2-year period the full complement of 24 PAA F-35A aircraft and 2 BAI would be located at the installation. The F-16 or A-10 aircraft that would be replaced by the F-35A aircraft would be reassigned or removed from the USAF inventory. Construction activities are planned to start in 2021 and be completed in approximately 2 years.

2.3.1 Facilities and Infrastructure

To accommodate the AFRC F-35A beddown, the selected base must provide the facilities and infrastructure necessary to support all aspects of the AFRC F-35A mission. Examples of some basic F-35A facility and infrastructure requirements necessary to support the beddown of F-35A aircraft include:

- Squadron operations/maintenance facilities;
- Hangars;
- Full mission simulator facility;
- Base communications infrastructure;
- Electrical system upgrades; and
- Other base support facilities (e.g., an engine repair shop, lightning-protected sunshades, and aircraft parking aprons), which vary from base to base.

While all four of the bases offer the basic necessary facilities for the operational beddown, none have all of the required infrastructure and facilities. Construction of new facilities and/or modification of existing facilities would be necessary at each of the alternative bases, although the nature and magnitude of these efforts would differ among the four bases. Table 2-2 presents the amount of total acres that would be disturbed at each installation as a result of implementing the AFRC F-35A mission. Details on construction and modification projects are presented in each alternative base-specific section contained in Chapter 4.

Table 2-2. Proposed Construction and Infrastructure Modifications for the AFRC F-35A Mission

Alternative ^a	Ground Disturbance ^b (Acres)
Davis-Monthan AFB	15.2
Homestead ARB	2.3
NAS Fort Worth JRB	7.7
Whiteman AFB	2.9

^a Data in this table were obtained from AFRC in 2017 for each of the four bases (NAS Fort Worth JRB 2017, Davis-Monthan AFB 2017, Homestead ARB 2017, Whiteman AFB 2017).

^b The total disturbed area includes the construction footprint plus an additional 50 feet around the footprint of buildings and an additional 20 feet for road widening.

As suggested by its designation, the construction footprint represents the area covered by the footprint of the proposed facilities and consists of the designed limits of the structure, facility, apron, road, access, and/or parking lot. To account for construction grading and clearing, equipment laydown space, landscaping, modifications to final designs, and associated disturbance, this analysis includes disturbance areas in addition to the construction footprints. These disturbance areas encompass 20 feet adjacent to each linear feature (e.g., roads, utility extensions, etc.) to 50 feet around the construction footprint for all other structures or facilities.

Proposed improvements on the alternative bases would disturb between 2.3 and 15.2 total acres. Overall, construction and modification of facilities and infrastructure would be limited at any one of the four bases. Construction and modifications would precede beddown of the F-35A aircraft and could extend through 2023.

2.3.2 Personnel

Beddown of the F-35A aircraft would also require sufficient and appropriate personnel to operate and maintain the aircraft and to provide necessary support services. Personnel discussed in this EIS include:

- All personnel authorizations in the AFRC units directly related to flying and maintaining the aircraft;
- Associated Base Operating Support (BOS) personnel authorizations (military, civilian, contractor) performing functions such as security or administration at the bases;
- Other AFRC unit personnel authorizations associated with the AFRC units; and
- Total base personnel to provide an overall context for changes resulting from the F-35A beddown.

Depending on the alternative base, the proposed AFRC F-35A mission would require a variety of different full-time and part-time personnel (Table 2-3). At Davis-Monthan AFB, Homestead ARB, and NAS Fort Worth JRB, the AFRC F-35A mission would result in net decreases of 30, 91, and 102 personnel, respectively. At Whiteman AFB, the AFRC F-35A mission would result in a net increase of 11 personnel. The USAF expects that changes in personnel authorizations necessary for the AFRC F-35A mission would occur coincident with the arrival of the F-35A aircraft during the procurement process.

Table 2-3. Summary of Personnel Changes by Alternative Base

Alternative Base	Baseline Personnel			Proposed F-35A Authorized Personnel			Percent Change to Total Personnel at Each Base
	Total Authorized Personnel at Each Base	AFRC Authorized Personnel at Each Base	Percent of Total Authorized Based Personnel	AFRC F-35A	Change to AFRC Unit Personnel Positions	Percent Change to AFRC Unit Personnel	
Davis-Monthan AFB	10,140	1,154	11.38%	1,124	-30	-2.60%	-0.3%
Homestead ARB	3,430	1,735	50.58%	1,644	-91	-5.24%	-2.7%
NAS Fort Worth JRB	9,600	1,751	18.24%	1,649	-102	-5.83%	-1.1%
Whiteman AFB	12,642	1,009	7.98%	1,020	11	1.09%	0.1%

2.3.3 Airfield Operations

To provide the training necessary to ensure combat readiness, F-35A pilots would conduct aircraft operations in two types of areas: 1) an airfield associated with a base and 2) airspace and ranges. The

aircraft operations conducted at the training ranges and airspace would be geographically separate from the aircraft operations conducted at the airfields.

This EIS uses two terms to describe different components of aircraft flying activities: sortie and operation. Each term has a distinct meaning and commonly applies to a specific set of activities in a particular airspace environment or unit. These terms also provide a means to quantify activities for the purposes of analysis. A sortie consists of one single military aircraft from a take-off through a landing and includes a flying mission. For this EIS, the term sortie is commonly used when summarizing the amount of flight activity from a base. A sortie can include more than one operation. The term operation is applied in this EIS to airfield activities. An operation comprises one action (e.g., a landing or take-off). Pilots making multiple practice approaches (i.e., touch and go’s) conduct a landing followed immediately by a take-off; this entire closed pattern circuit is counted as two airfield operations.

In order to meet the AFRC F-35A mission requirements, the USAF anticipates that each AFRC F-35A aircraft would be used to fly 193 sorties per year. Thus, a total of 24 F-35A aircraft would account for an estimated 4,632 sorties per year.

Each of the alternative bases currently supports a considerable number of airfield operations. Using information from previous Air Installations Compatible Use Zones (AICUZ) studies, airfield management logs, recent environmental documentation, and interviews with airfield managers and pilots, the baseline operations provide a benchmark (as of November 2017) against which proposed activities can be assessed. For each alternative base, these data include operations by other based (tenants) or transient military aircraft. Tenant aircraft operations would not change with implementation of the AFRC F-35A mission. The baseline aircraft operations and the proposed AFRC F-35A airfield operations are identified in Table 2-4.

Sortie = a single military aircraft mission, from take-off through landing, that includes a flying mission. A sortie can include more than one *operation*.

Operation = one action (e.g., a landing or take-off). Pilots making multiple practice approaches (i.e., touch and go’s) conduct a landing followed immediately by a take-off; this entire closed pattern circuit is counted as two airfield operations.

Table 2-4. AFRC F-35A Baseline and Proposed Annual Airfield Operations

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
Davis-Monthan AFB^b		
Based A-10 (924 FG only)	11,088	0
Proposed F-35A	0	11,580
Other Aircraft	62,168	62,168
Total Airfield Operations	73,256	73,748
Percent Change		0.7%
Homestead ARB		
Based F-16	10,428	0
Proposed F-35A	0	11,580
Other Aircraft	28,090	28,090
Total Airfield Operations	38,518	39,670
Percent Change		3.0%

Table 2-4. AFRC F-35A Baseline and Proposed Annual Airfield Operations (Continued)

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
NAS Fort Worth JRB		
Based F-16	8,524	0
Proposed F-35A	0	11,580
Other Aircraft	16,768	16,768
Total Airfield Operations	25,292	28,348
Percent Change		12.1%
Whiteman AFB		
Based A-10	5,810	0
Proposed F-35A	0	11,580
Other Aircraft	27,370	27,370
Total Airfield Operations	33,180	38,950
Percent Change		17.4%

^a Total baseline operations is for the last year. Data in this table were collected from the operations staff at each of the four bases in 2017 (NAS Fort Worth JRB 2017, Davis-Monthan AFB 2017, Homestead ARB 2017, Whiteman AFB 2017).

^b Multiple flying units operate A-10 aircraft at Davis-Monthan AFB. Should Davis-Monthan AFB be selected for the AFRC F-35A mission, the A-10 aircraft operated by the 924th Fighter Group (924 FG) would be replaced by F-35A aircraft. However, the 355th Fighter Wing (355 FW) and a detachment of the Air National Guard Air Force Reserve Command Test Center (AATC) would continue to operate A-10 aircraft at Davis-Monthan AFB.

Beddown of the F-35A aircraft would increase total aircraft operations at each of the four alternative bases. Implementation of the AFRC F-35A mission would increase total aircraft operations the most at Whiteman AFB and the least at Davis-Monthan AFB.

Current F-16 and A-10 aircraft operations, which include departures, flying local patterns, and landings, are unique at each of the four bases and reflect the nature of base-specific training requirements, safety considerations, course rules, noise reduction practices, and other factors. AFRC F-35A pilots would adhere to the identified restrictions, avoidance procedures, and existing quiet-hour programs in place at the selected base.

The F-35A Ready Aircrew Program (RAP) Tasking Memorandum, Aviation Schedule 2018, establishes F-35A pilot proficiency requirements. The RAP Tasking Memorandum also establishes the proposed F-35A training activities and annual sortie requirements.

Certain F-35A operational requirements, such as the use of afterburner, are mission- and situation-dependent. Runway length, temperature, atmospheric pressure, wind conditions, and aircraft loads (e.g., avionics, fuel, weapons) are some of the factors that influence pilot decisions to use afterburner power for departures versus standard military power. AFI 11-2F-35A V3, *Flying Operations, F-35 – Aircrew Training*, guidelines state that F-35A pilots should not takeoff with military power if calculations, based on the relevant site conditions, indicate that the aircraft would require more than 50 percent of the available runway for takeoff when using military power. In short, the primary requirement for using afterburner is safety.

AFRC evaluated the requirement for afterburner use during departures, calculated takeoff requirements, and determined that afterburner use would be required on approximately 5 percent of the total departures from each alternative base. However, for this analysis, the USAF evaluated three different scenarios for afterburner use: Scenario A is afterburner use on 5 percent of total takeoffs, Scenario B is afterburner use on 50 percent of total takeoffs, and Scenario C is afterburner use on 95 percent of total takeoffs. Figure 3-1 in Chapter 3 illustrates the difference between a takeoff using afterburner and a takeoff using standard military power.

Combat missions can require flying after dark. Therefore, combat pilots are required to train and fly after dark. F-16 and A-10 pilots stationed at each of the four bases currently fly after dark. F-35A

pilots would also need to train under such conditions. For the purposes of meeting this requirement, 1 hour after sunset is generally considered to be dark. Therefore, the hours of flight activity after dark vary from season to season and by base. As shown in Table 2-5, the aircraft proposed for replacement are only flown 1 to 4 percent of the time during “environmental night” (i.e., after 10:00 P.M. and before 7:00 A.M.).

Table 2-5. Comparison of Baseline and Proposed Night Operations^a

Alternative Base	Percent Operations After 10:00 P.M. and Prior to 7:00 AM		
	Aircraft Proposed for Replacement	Total Operations (all aircraft)	Proposed AFRC F-35A Operations
Davis-Monthan AFB	1%	6%	1%
Homestead ARB	3%	8%	2%
NAS Fort Worth JRB	<1%	2%	<1%
Whiteman AFB	4%	7%	4%

^a Data in this table were obtained from each of the four bases and AFRC in 2017 (NAS Fort Worth JRB 2017, Davis-Monthan AFB 2017, Homestead ARB 2017, Whiteman AFB 2017).

Environmental night receives special consideration for analysis because it represents a period when noise effects are more noticeable. Because of the capabilities and expected tactics of the F-35A aircraft, AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC F-16 and A-10 pilots. AFRC F-35A pilots would fly very little during environmental night, although contingencies such as weather or special combat mission training could result in rare, unplanned operations during this time period. AFRC F-35A units could conduct nearly all required “after dark” operations prior to 10:00 P.M.

Day-Night Average Sound Level (DNL) is a noise metric combining the levels and duration of noise events, and the number of events over an extended time period. It is a cumulative average, computed over a given time period (e.g., a year) to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10-decibel (dB) penalty for noise occurring between 10:00 P.M. and 7:00 A.M.

2.3.4 Airspace and Range Use

2.3.4.1 Airspace Use

Although the exact nature and sequence of training activities for the F-35A remain under development, information available from the RAP indicates that F-35A pilots must conduct multiple role training for five major mission types to replace the missions of F-16 and A-10 aircraft (Table 2-6). Each of these five major missions requires the necessary airspace and range assets to permit realistic training. Due to advanced electronics, the ability to engage targets at higher altitudes, and the speed of the aircraft, F-35A pilots would primarily use Special Use Airspace (SUA), including Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace (ATCAA), Restricted Areas (RAs), and offshore Warning Areas. AFRC F-35A pilots would infrequently use Military Training Routes (MTRs), either to access SUA or conduct training.

Table 2-6. Proposed F-35A Training Activities

Major Mission	Training Activities	Airspace Type
Basic Fighter Maneuvers	G-force awareness, maneuverability, break turns, high angle of attack maneuvering, acceleration maneuvering, gun tracking, offensive and defensive positioning, air refueling, stall recovery.	MOAs, ATCAA, and Warning Areas.
Surface Attack Tactics (SAT)	Single to multiple aircraft attacking a wide range of ground targets using different ingress and egress methods, delivery tactics, ordnance types, angles of attack, and combat scenarios.	MOAs and RAs (over weapons delivery ranges).
Air Combat Maneuvers	Multi-aircraft formations and tactics, systems check, G-force awareness, two-versus-four and four-versus-six aircraft intercepts, combat air patrol, defense of airspace sector from composite force attack, intercept and destroy bomber aircraft, avoid adversary fighters, supersonic engagement.	MOAs, ATCAA, Warning Areas, and RAs (over weapons delivery ranges).
Close Air Support (CAS)	Air support for ground-based offensive and defensive operations, work with Joint Terminal Attack Controllers, use SAT and Basic Surface Attack (BSA) components.	MOAs and RAs (over weapons delivery ranges).
Air Combat Tactics	Multi-aircraft and multi-adversary defense and combat air patrol, defense of airspace sector from composite force attack, intercept and destroy bomber aircraft, avoid adversary fighters, strike-force rendezvous and protection, supersonic engagement.	MOA, ATCAA, and Warning Areas.

Each of the four alternative bases has an AFRC fighter mission that is associated with ACC. The AFRC pilots associated with the fighter missions at each of the four alternative bases would follow an F-35A training syllabus developed by ACC. The F-35A program recognizes that combat pilots will need to conduct the range of training activities in appropriate SUA, as shown in Table 2-6. Figure 2-1 depicts and describes the characteristics of these different types of SUA. While the USAF developed both estimated minimum dimensions and a recommended set of dimensions (USAF 2012), training for the F-35A would adapt to existing airspace structures near each of the alternative bases. Adaptation, where needed, could include the use of SUA in combination or sequencing events within a sortie to fit the airspace. Such adaptation would vary among the bases due to differences in the structure and configuration of the SUA to be used at each of the four alternative bases.

AFRC F-35A pilots would only use existing, Federal Aviation Administration (FAA)-approved and -charted SUA and ranges. By adapting training activities to the airspace associated with the selected base, no F-35A-specific changes to airspace size or structure, or to ranges would be required to accommodate the AFRC F-35A training. Should the USAF decide to make any F-35A-specific airspace or range modifications in the future, these actions would undergo the appropriate level of environmental analysis at that time. In general, AFRC F-35A pilots stationed at each alternative base would operate in MOAs, ATCAA, and RAs above ranges. AFRC F-35A pilots stationed at Homestead ARB would conduct some of their training in offshore Warning Areas.

Table 2-7 identifies SUA associated with each alternative base where AFRC F-35A pilots could operate. The airspace structure for each base represents conditions under the No Action Alternative, where sorties conducted by the based F-16 and A-10 pilots currently occur.

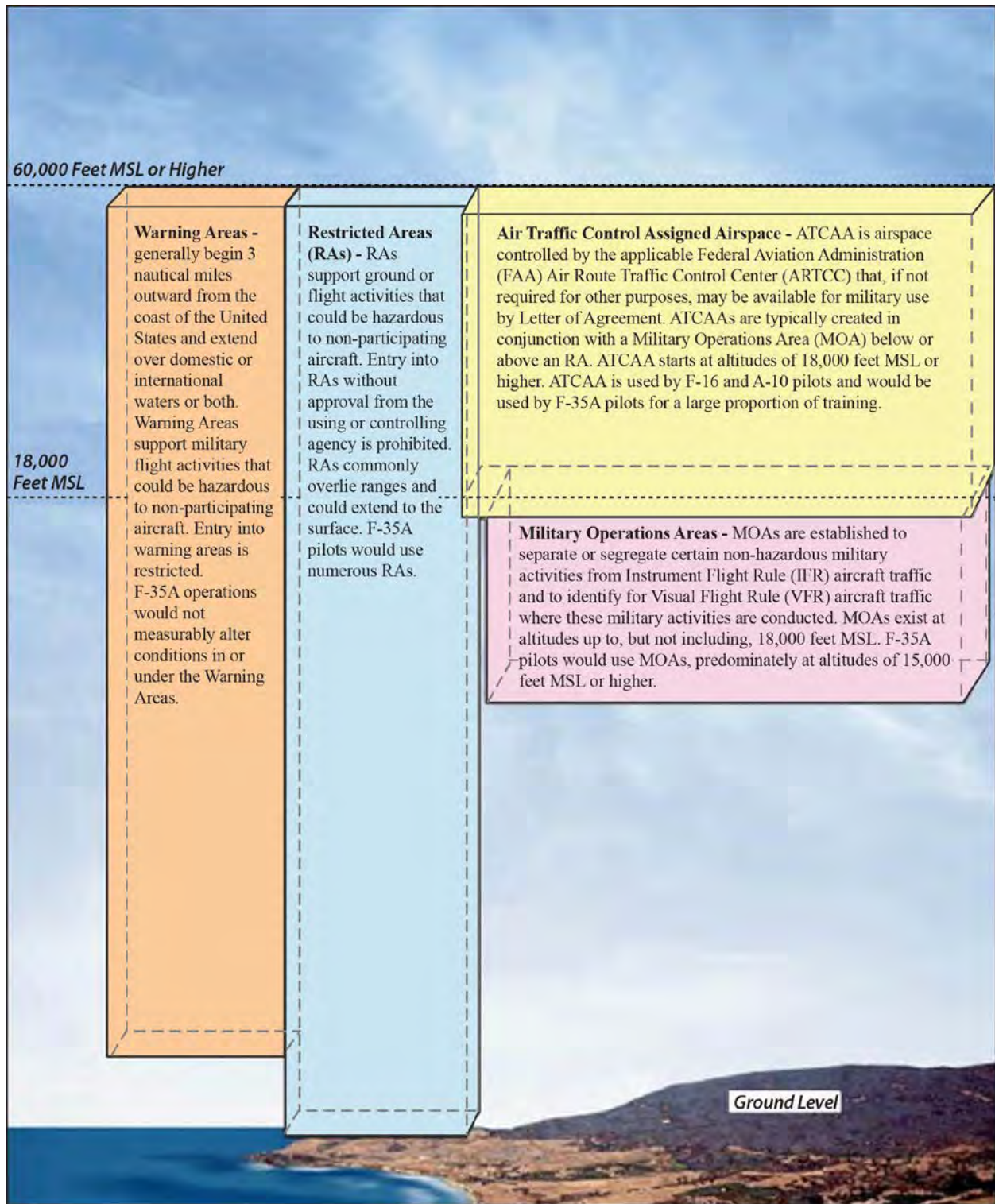


Figure 2-1. Types of Training Airspace

Table 2-7. Summary of Existing Airspace Proposed for Use by AFRC F-35A Pilots

Davis-Monthan AFB	Airspace ^a
Southern Arizona	Fuzzy MOA
	Jackal MOA
	Jackal Low MOA
	Outlaw MOA
	Ruby 1 MOA
	Sells 1 MOA
	Sells Low MOA
	Tombstone A, B & C MOAs
	Barry M. Goldwater Range (BMGR) R-2301E
	BMGR R-2304
	BMGR R-2305
	Fort Huachuca Range R-2303A, B & C
Homestead ARB	Airspace
U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges)	Palatka 1 & 2 MOAs
	R-2907 A, B & C
	R-2910 A, B, C, D & E
	R-2906
Avon Park Air Force Range (APAFR)	Avon East MOA
	Avon East High MOA
	Basinger MOA
	Lake Placid N, E & W MOAs
	Marian MOA
	R-2901 A, B, C, D, E, F, G, H, I, J, K, L, M, N
Warning Areas	W-168
	W-174 A, B, C, E, F & G
	W-465 A, B & D
NAS Fort Worth JRB	Airspace
Southwest Texas	Brady Low and High MOAs
	Brady North MOA
	Brownwood 1 East & West MOAs
	Brownwood 2 East & West MOAs
	Brownwood 3 & 4 MOAs
	Hood MOA
	Hood High MOA
	Lancer MOA
	Gray MOA
	Sheppard 1 MOA
	Rivers MOA
	Washita MOA
	Falcon Range R-5601 A, B, C, D, E, F, G, H, & J; R-5602 A,B
Fort Hood R-6302A, B, C & D	
Central United States	Ada East & West MOAs
	Bison MOA
	Cannon A & B MOAs
	Eureka Low & High MOAs
	Lindbergh A, B & C MOAs
	Lindbergh D and West ATCAAs ^b
	Riley MOA
	Salem MOA
	Shirley A, B, & C MOAs
	Smoky Low and High MOAs
	Truman A, B & C MOAs

Table 2-7. Summary of Existing Airspace Proposed for Use by AFRC F-35A Pilots (Continued)

Whiteman AFB	Airspace
Central United States (Continued)	Cannon Range R-4501 Complex
	Fort Riley Range R-3602A & B
	Smoky Hill Range R-3601A

^a Airspace used by F-35A pilots will include ATCAAs that overly the MOAs included in the table. The ATCAAs will accommodate training above 18,000 feet mean sea level (MSL).

^b Lindbergh ATCAAs are called out in the table and figures for reference because no MOAs are located beneath these areas.

To simplify discussion of the numerous SUAs associated with the alternative bases, many are combined under a single unofficial designation. This approach is used because adjacent SUAs are typically scheduled at the same time due to their proximity to each other and due to the airspace manager that controls the airspace. For example, pilots from Davis-Monthan AFB operate in the Southern Arizona complex, which includes numerous MOAs, ATCAA, and RAs. This EIS therefore uses the combined unofficial designations both analytically and descriptively in lieu of presenting the constituent airspaces. Individual airspace is only identified in those instances in which greater specificity enhances the description or the analysis. Further details on airspace associated with each alternative base are presented in the base-specific sections contained in Chapter 4.

Table 2-8 summarizes the proposed F-35A sorties to training airspace that would be conducted at completion of the AFRC F-35A beddown. These proposed sorties are also compared to the baseline sorties conducted by existing F-16 or A-10 aircraft at each of the four alternative bases. Although differences in numbers of aircraft, training activities, and configuration of airspace preclude direct and precise comparison among alternative bases, these data reflect basic trends of usage. Detailed sortie data for each alternative base are provided in the individual base discussions contained in Chapter 4.

Table 2-8. Summary of Baseline and Proposed Airspace Training Sorties

Alternative Base	Total Baseline Sorties ^a	AFRC F-35A Sorties	Change in Total Sorties	Percent Change in Total Sorties
Davis-Monthan AFB	40,358	4,632	2,004	5.0%
Homestead ARB	45,151	4,632	-108	-0.2%
NAS Fort Worth JRB	77,445	4,632	917	1.2%
Whiteman AFB	15,739	4,632	-931	-5.9%

^a Includes sorties flown in all aircraft types.

AFRC F-35A pilots would share training airspace with many other users. Representative types of other aircraft using the airspace could include other F-35A aircraft operated by Lockheed Martin, the U.S. Marine Corps (USMC), and the USAF; Navy F-18; F-15C, F-15E, F-22A, A-10, F-16, E-3, and C-130 aircraft; and various types of helicopters. These other users would continue operations after beddown of the AFRC F-35A aircraft. Depending on the base, other aircraft would account for varying amounts of total activity in the airspace. At Davis-Monthan AFB and NAS Fort Worth JRB, the number of sorties flown in training airspace would increase. At Homestead ARB and Whiteman AFB, the number of sorties flown in training airspace would decrease.

AFRC F-35A pilots would use the same types of airspace used by F-16 and A-10 pilots. Although F-35A missions would be similar to those of the aircraft they are proposed to replace, F-35A aircraft have distinctive capabilities and would be flown differently. Some of the expected differences in the F-35A operational capabilities relative to the F-16 or A-10 aircraft include:

- More effective in air-to-air engagements;
- More effective in executing missions against fixed and mobile targets;
- More effective in non-traditional intelligence surveillance reconnaissance, suppression of enemy air defense, and destruction of enemy air defense missions;
- Self-sufficient or part of multisystem and multiservice combat operations;
- Able to rapidly transition between air-to-ground and air-to-air missions while still airborne; and
- Reduced detection with low-observable technologies and tactics.

Due to these capabilities and the breadth of the F-35A mission requirements, several changes in the operational use of existing airspace and ranges could occur at any one of the four alternative bases. These changes are detailed below.

2.3.4.1.1 Use of Higher Altitudes

In order to fulfill multi-role requirements, AFRC F-35A pilots would use the full, authorized capabilities of the airspace available for training, operating (where permitted) from 500 feet above ground level (AGL) up to 60,000 feet mean sea level (MSL)¹. However, F-35A pilots would generally conduct training in the airspace at altitudes higher than those used by F-16 pilots, operating at 18,000 feet MSL or higher approximately 71 percent of the time (Table 2-9). Due to the capabilities and expected tactics of the F-35A aircraft, F-35A pilots would rarely (1 percent) fly below 5,000 feet AGL. Actual flight altitudes would depend upon the lower and upper limits of specific airspace. Some SUA might not offer sufficient vertical spans to permit all of the required training activities. Due to such limitations, F-35A pilots would need to use existing airspace in different proportions than those used by F-16 or A-10 pilots.

Table 2-9. Current and Proposed Aircraft Altitude Distribution in the Airspace

Altitude (feet)	Existing Percentage of Use				Proposed Percentage of Use
	Davis-Monthan AFB	Homestead ARB	NAS Fort Worth JRB	Whiteman AFB	All Bases
	A-10	F-16	F-16	A-10	F-35A
100 – 500 AGL	7%	0%	0%	7%	0%
500 – 2,000 AGL	30%	2%	2%	30%	1%
2,000 – 5,000 AGL	26%	4%	4%	26%	0%
5,000 AGL – 10,000 MSL	33%	10%	10%	33%	5%
10,000 – 18,000 MSL	4%	68%	70%	4%	23%
18,000 – 30,000 MSL	0%	11%	12%	0%	60%
+30,000 MSL	0%	5%	2%	0%	11%

In comparison to the F-35A, the F-16 and A-10 aircraft are generally operated at lower altitudes a greater proportion of the time. Altitude distribution varies according to mission type. Overall, F-16 pilots focus operations below 18,000 feet MSL (84-86 percent). A-10 pilots spend approximately

¹ MSL is the elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level. The elevation of a mountain, for example, is marked by its highest point and is typically illustrated as a small circle on a topographic map with the MSL height shown in either feet or meters, or both. Because aircraft fly across vast landscapes, where points above the ground can and do vary, MSL is often used to denote the “plane” on which the floors and ceilings of SUA are established and the altitude at which aircraft must operate within that SUA. AGL is the height as measured from ground level.

56 percent of training flight time between 500 and 5,000 feet AGL and rarely operate above 18,000 feet MSL. While these data represent generalized altitude distributions for F-16 and A-10 aircraft (not specific to a single airspace), they clearly establish the differences in altitude use between the F-35A aircraft and currently based aircraft.

Regardless of the proposed altitude distribution and percent use indicated in Table 2-9, AFRC F-35A pilots would adhere to all FAA-charted floors and ceilings of SUA. For example, if a MOA has a charted floor of 7,000 feet AGL, then AFRC F-35A pilots would remain at or above that altitude. When flying, AFRC F-35A pilots would continue to comply with FAA avoidance regulations (14 *CFR* 91.119) and any base-specific avoidance procedures that current F-16 or A-10 pilots employ. For instance, aircraft must avoid congested areas of a city, town, or settlement or any open-air assembly of people by 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

2.3.4.1.2 Combined Use of Existing Airspace

Due to advanced capabilities, F-35A aircraft require larger expanses of airspace to operate. In order to conduct required training missions, F-35A pilots would use SUA in combination rather than individually. For example, an AFRC F-35A pilot might schedule and use two MOAs and their overlying ATCAA for one training activity. Although F-16 and A-10 pilots also use combined airspace, the F-35A aircraft would require more consistent combined use and incorporation of more existing SUA. Again, the need for sufficient size airspace would require changes in use patterns of existing airspace when compared to those of the F-16 or A-10 aircraft.

2.3.4.1.3 Night Operations

Combat can occur 24 hours per day and, as noted in Section 2.3.3, F-35A pilots would need to train after dark. In many circumstances, these after-dark operations are and would be completed before environmental night (i.e., 10:00 P.M. to 7:00 A.M.). The F-16 and A-10 aircraft proposed for replacement are currently flown between 1 and 4 percent of the time during environmental night (refer to Table 2-5). AFRC F-35A pilots are expected to fly approximately the same percent of operations during environmental night. Contingencies such as weather or special combat mission training could result in rare, unplanned operations during environmental night.

2.3.4.1.4 Supersonic Flight

Use of supersonic speeds enables F-35A pilots to “close on” (fly toward) and set up to fire a missile more rapidly than an adversary aircraft with less supersonic capability. F-35A pilots also use supersonic capability defensively to evade adversary air-to-air and ground-to-air weapons. To train with the full capabilities of the aircraft, AFRC F-35A pilots would employ supersonic flight where permitted. All supersonic flight would occur at altitudes and within airspace already authorized (i.e., approved and charted by the FAA) for such activities. Due to the F-35A mission and the aircraft’s capabilities, the USAF anticipates that AFRC F-35A supersonic flight training would be conducted above 15,000 feet MSL, with 90 percent occurring above 30,000 feet MSL (Table 2-10). AFRC F-35A pilots would fly at supersonic speeds below 15,000 MSL on only an occasional basis. F-16 pilots conduct supersonic training at lower altitudes more frequently, with approximately 8 percent of supersonic operations occurring between 10,000 and 15,000 feet MSL, 12 percent between 15,000 and 30,000 feet MSL, and the remaining 80 percent at altitudes above 30,000 feet MSL. As mentioned previously, F-35A tactics are still evolving. Currently, the estimated percentage of F-35A sorties involving supersonic flight is approximately the same as the percentage flown by 4th generation fighter aircraft such as the F-16. A-10 pilots do not conduct supersonic flights.

Table 2-10. Average Altitude Profiles for Supersonic Flight

Altitude (feet)	F-16 Aircraft	Proposed F-35A
5,000 AGL – 10,000 MSL	0%	0%
10,000 – 15,000 MSL	8%	0%
15,000 – 30,000 MSL	12%	10%
+30,000 MSL	80%	90%

2.3.4.1.5 Mission Duration

Like the F-16 and A-10 pilots, AFRC F-35A pilots would fly, on average, approximately 45 to 115 minute-long missions, including take-off, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, AFRC F-35A pilots (like F-16 and A-10 pilots) would fly approximately 20 to 60 minutes in the training airspace. Occasionally, F-35A pilots could fly up to 90-minute sessions in one or more SUA(s).

2.3.4.2 Range Use

The F-35A has the requirement and capability to perform air-to-ground missions. For the AFRC F-35A aircraft, air-to-ground training would represent about 60 percent of the training program, with the air superiority mission accounting for the remaining 40 percent. Most air-to-ground ordnance delivery training would be simulated (i.e., nothing is released from the aircraft and electronic scoring is used). The F-35A aircraft uses high-fidelity avionics and embedded training systems to simulate ordnance delivery on a target. This type of training could be conducted in any of the SUA meeting the airspace training event requirements for floor, ceiling, and size.

Air-to-ground training would also include occasional ordnance delivery. AFRC F-35A pilots would conduct air to ground ordnance delivery training only while operating in existing RA over the ranges previously approved for ordnance use. No changes to airspace structure or size are proposed to support the AFRC F-35A mission. Additionally, no changes to range target configurations or types are needed to accommodate F-35A training and operations. Should AFRC choose to make any F-35A-specific airspace or range modifications in the future, these actions would undergo an appropriate level of environmental analysis prior to implementation.

Proposed ranges at each of the alternative bases include: the Barry M. Goldwater Range (BMGR) (Davis-Monthan AFB); Pinecastle Range and Avon Park Air Force Range (APAFR) (Homestead ARB); Falcon and Fort Hood Ranges (NAS Fort Worth JRB); and Cannon, Fort Riley and Smoky Hill Ranges (Whiteman AFB). The U.S. Navy Pinecastle Range Complex, to include the Rodman and Lake George Ranges, located in Florida, does not currently include F-35A air-to-ground ordnance training. However, the U.S. Navy Pinecastle Range Complex does support both high-explosive and inert training conducted by AFRC F-16 pilots. AFRC F-35A training proposed to be conducted at the U.S. Navy Pinecastle Range Complex would be conducted at the same training tempo and type as training currently conducted by AFRC F-16 pilots. Prior to the use of F-35A ordnance profiles and training actions, the USAF would coordinate with the Navy to ensure that the proposed F-35A ordnance profiles have been approved for use at the U.S. Navy Pinecastle Range Complex. Should additional analysis or planning be required for range safety actions, they would be completed as applicable.

The F-35A is capable of carrying and employing several types of ordnance. As the USAF currently envisions, the following describes the types of ordnance that could be employed by the F-35A; however, ordnance types change over the years and how they are employed in training evolves as well. AFRC F-35A pilots would only use ordnance that is approved for use at each of the ranges identified in this EIS.

Currently, the F-35A is expected to use the GBU-31 variant of the Joint Direct Attack Munition (JDAM), which is a 2,000-pound, general-purpose Mark-84 bomb, for air-to-ground ordnance delivery. JDAMs are guided to the target by an attached global positioning system (GPS) receiver. These weapons, commonly released between 20,000 and 40,000 feet MSL, require no laser guidance. The USAF expects no changes in the numbers of JDAMs used by F-35A aircraft when compared to those of the F-16 or A-10 aircraft proposed for replacement, and JDAMs would continue to be used on ranges already approved for such use. Optional internal loads include a wide variety of air-to-ground ordnance: small diameter bombs, missiles, dispensers, and guided weapons. In addition, because the F-35A carries an internal, four-barrel cannon, occasional tactical training using the cannon would be conducted. Using the cannon involves firing at a prescribed target for a short burst of time. As is the case for air-to-air and air-to-ground ordnance training, use of the cannon would follow specific safety procedures and be employed only on ranges and targets approved for such use.

2.3.4.2.1 Defensive Countermeasures

Flares are one of the defensive mechanisms dispensed by military aircraft to avoid attack by enemy aircraft and air defense systems. Although the stealth features of the F-35A aircraft significantly reduce its detectability, pilots must train to use defensive countermeasures. Flares dispensed from aircraft provide high-temperature heat sources that mislead heat-sensitive or heat-seeking targeting systems. Flares provide an infrared countermeasure against homing, heat-seeking, surface-to-air and air-to-air missiles. Flares would only be used in airspace approved for flare use and at altitudes designated for the airspace. Flares burn out in approximately 500 feet, so altitude restrictions in SUA are established to ensure flares burn out before reaching the ground or water (ACC Supplement to AFI 11-214).

Flare deployment in authorized airspace associated with the four alternative bases is governed by a series of regulations based on safety and environmental considerations and limitations. These regulations establish procedures governing the use of flares over ranges, other government-owned and -controlled lands, and nongovernment-owned or -controlled areas. All areas used for flare deployment are required to be analyzed through appropriate National Environmental Policy Act (NEPA) documentation. ACC has set standard minimum-release altitudes (ACC Supplement to AFI 11-214, Change 1, 2016) for flares over government-owned and -controlled lands. These standards, which vary from 300 to 900 feet AGL according to aircraft type, are designed to allow the flares to burn out completely at least 100 feet AGL. For F-16 and A-10 aircraft, the minimum release altitude for flares is 700 feet AGL. Minimum release altitudes for the F-35A aircraft would be the same. Over nongovernment-controlled lands, flare release is restricted to a minimum of 2,000 feet AGL and above for all aircraft; this requirement would apply to F-35A aircraft. More restrictive altitude restrictions are followed for specific airspace in response to local considerations, including wildfire threat levels. Flares can also be dispensed in the offshore Warning Areas without altitude restrictions.

Defensive flares are made of magnesium that, when ignited, burns for a short period (less than 5 seconds) at approximately 2,000 degrees Fahrenheit (°F). The burn temperature is hotter than the F-35A exhaust, so the flare attracts and decoys heat-seeking weapons and sensors targeted on the aircraft. Pilots must regularly train with defensive flares under simulated threat conditions to ensure flare deployment in extremely high-stress combat conditions. F-35A pilots would use the Mobile Jettison Unit (MJU)-61A/B type of flare. If the USAF determines that F-35A pilots need to employ flares in training airspace not yet approved for such operations, then appropriate NEPA documentation would be completed prior to use of flares in that airspace (USAF 2013).

The MJU-61A/B flare measures approximately 1 inch by 1 inch by 8 inches in size. This flare has an igniter device that allows the hot gasses propelling the flare from the aluminum cartridge to ignite the flare magnesium pellet as the flare exits the cartridge. As shown in Table 2-11, residual materials are deposited on the ground following deployment of each MJU-61A/B flare (USAF 2013).

Table 2-11. Disposition of Residual Material Following Deployment of One Flare

Material	Disposition	MJU-61A/B
Flare Case	Aluminum, remains in aircraft	1-inch x 1-inch x 8-inch
Flare Insert	Burns when deployed	Magnesium, Teflon
End Cap/Pad	Deposited on the ground	1-inch x 1-inch x 1/8-inch plastic or nylon cap; one same-sized silicone foam pad
Piston	Deposited on the ground	1-inch x 1-inch x 1/2-inch nylon/plastic piston
Flare/Body Wrapping	Deposited on the ground	Up to 2-inch x 17-inch piece of graphite fabric (stiff, duct-tape type material)
Initiator	Deposited on the ground	1-inch x 1-inch x 1/2-inch plastic/spring device

Source: USAF 2012

Different residual flare materials have different rates of descent and different impacts when they reach the ground. All of the MJU-61A/B residual flare materials that fall have surface area-to-weight ratios that do not produce any substantial impact when the residual flare material reaches the ground. The largest item (by surface area-to-weight ratio) that would fall from the MJU-61A/B flare is the 0.975-inch by 0.975-inch by 0.5-inch plastic and spring igniter device, which weighs approximately 0.33 ounce. This igniter device strikes the ground with a momentum of 0.046 pound/second, or approximately the same force as a small hailstone. If an igniter device were to strike an unprotected individual, it would be expected to be noticed, but not cause a bruise (USAF 2012).

Use of these defensive countermeasures varies among the airspace for the four alternative bases, and records defining the amount of use are not complete or comparable. This is due to the fact that F-16 and A-10 pilots do not dispense flares on every sortie, and F-35A pilots can be expected to use fewer flares. Although AFRC F-35A missions and training would retain similarities with F-16 or A-10 missions and training, F-35A tactics and training events are evolving and continue to develop. Flare use by F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. These restrictions would continue to minimize the potential for fires, so the impacts of flare use would not exceed the negligible impacts already occurring. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of F-35A flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires.

2.3.5 Proposed Action and Alternatives

Along with the No Action Alternative, four beddown alternatives that best fulfill AFRC's mission responsibilities as presented in the purpose and need are carried forward for further detailed analysis. To provide a context for the proposed action and beddown alternatives, the following sections present a brief description of each base and its missions.

2.3.5.1 Davis-Monthan AFB, Arizona

Davis-Monthan AFB is located on the southeastern edge of the City of Tucson in Pima County, Arizona. The majority of the base, with the exception of the southeastern portion, is located within

the city limits of Tucson. The base encompasses approximately 10,700 acres, of which approximately 5,700 acres are developed or semi-improved, 4,700 acres are undeveloped, and 300 acres are under easement and maintained by Pima County. Davis-Monthan AFB is surrounded by heavy to light industrial development to the south and west and the City of Tucson to the north. The Aerospace Maintenance and Regeneration Group (AMARG), which serves as the storage facility for retired aircraft, dominates land use to the east, with some residential development to the northeast.

Davis-Monthan AFB is the home of the 355th Fighter Wing (355 FW), which is part of the ACC. The 924 Fighter Group (924 FG) is an “associate unit to the 355 FW and operates 24 A-10 aircraft at Davis-Monthan AFB; these aircraft would be replaced with 24 F-35A aircraft should the installation be selected to receive the AFRC F-35A mission.

2.3.5.2 Homestead ARB, Florida

Homestead ARB is located in southern Miami-Dade County, Florida, approximately 25 miles south of Miami. The base is located approximately 8 miles from the center of the City of Homestead and outside the city limits. The installation encompasses approximately 1,950 acres and is surrounded by agricultural lands and some residential and commercial development.

Homestead ARB is an AFRC installation and is led by the AFRC 482nd Fighter Wing (482 FW). As part of the 482 FW, the 93rd Fighter Squadron (93 FS) “Makos” fly and maintain 24 F-16 aircraft; these aircraft would be replaced with 24 F-35A aircraft should the installation be selected to receive the AFRC F-35A mission.

2.3.5.3 NAS Fort Worth JRB, Texas

NAS Fort Worth JRB is located in the western portion of Fort Worth, directly south of Lake Worth, in Tarrant County, Texas. The installation encompasses approximately 1,805 acres and is bordered to the east by residential development, to the west by the Lockheed Martin assembly plant and residential development, to the north by Lake Worth, and to the south by light industrial and commercial development.

NAS Fort Worth JRB is operated by the U.S. Department of Navy (DoN). The 301st Fighter Wing (301 FW) is the only AFRC fighter unit in the State of Texas and operates 24 F-16 aircraft at NAS Fort Worth JRB; these aircraft would be replaced with 24 F-35A aircraft should the installation be selected to receive the AFRC F-35A mission.

2.3.5.4 Whiteman AFB, Missouri

Whiteman AFB is located in Johnson County, Missouri, approximately 2 miles south of the City of Knob Noster and 70 miles southeast of Kansas City, Missouri. The installation encompasses approximately 5,419 acres and is predominantly surrounded by agricultural land use with some minor residential development to the east.

The 509th Bomb Wing (509 BW) of the USAF Global Strike Command is the host unit at Whiteman AFB. The 442nd Fighter Wing (442 FW) operates 24 A-10 aircraft at Whiteman AFB; these aircraft would be replaced by 24 F-35A aircraft should the installation be selected to receive the AFRC F-35A mission.

2.3.6 No Action Alternative

Analysis of the No Action Alternative (40 *CFR* §1502.14(d)) provides a benchmark, allowing the decision-maker to compare the magnitude of the environmental effects from taking no action to the effects of implementation of the proposed action at any of the four alternative bases. The No Action Alternative for this EIS means that there would be no AFRC F-35A mission. Implementation of the No Action Alternative would mean that the AFRC F-35A aircraft beddown would not occur and there would be no F-35A related personnel or construction changes at any of the four bases. The current environmental situation, which includes on-going, currently planned activities and programs would continue, unchanged at each of the four bases.

2.4 COMPARISON OF ENVIRONMENTAL CONSEQUENCES AMONG ALTERNATIVES

Table 2-12 summarizes the potential environmental consequences from Chapter 4 where the AFRC F-35A mission requirements from Chapter 2 are overlaid on the baseline conditions for each of the four alternative bases. The consequences will be presented for each environmental resource area and will be described for each alternative base.

This summary comparison of environmental consequences provides an overview of the consequences associated with implementation of the AFRC F-35A mission at each base. The following NEPA activities will be completed to ensure that decision makers have a comprehensive understanding of the potential environmental consequences of their decision.

- Documentation of existing environmental conditions for each alternative base. The existing conditions for these resources relied heavily on recent environmental materials and federal and state databases prepared at and near each alternative base.
- Base-specific assessments of environmental consequences of the beddown of the AFRC F-35A mission. Each assessment overlaid the project details upon the existing conditions to estimate potential base-specific environmental consequences.

Table 2-12. Comparative Summary of Environmental Consequences

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Airspace Management and Use	<p>Installation:</p> <ul style="list-style-type: none"> No adverse impacts to airspace management and use in the local air traffic environment. 0.7 percent increase in total annual airfield operations. This increase could be accommodated by the Davis-Monthan AFB airfield and surrounding airspace without adverse effect. <p>Airspace:</p> <ul style="list-style-type: none"> No change to the current configuration of airspace. Approximate 5 percent increase in total sorties. This increase could be accommodated by the region’s airspace. No adverse impacts on airspace management and use. 	<p>Installation:</p> <ul style="list-style-type: none"> No adverse impacts to airspace management and use in the local air traffic environment. 3.0 percent increase in total annual airfield operations. This increase could be accommodated by the air traffic control (ATC) within the Homestead ARB airfield and surrounding airspace without adverse effect. <p>Airspace:</p> <ul style="list-style-type: none"> No change to the current configuration of airspace. Approximate 0.2 percent decrease in total sorties. No adverse impacts on airspace management and use. 	<p>Installation:</p> <ul style="list-style-type: none"> No adverse impacts to airspace management and use in the local air traffic environment. 12.1 percent increase in total annual airfield operations. This increase could be accommodated by the NAS Fort Worth JRB airspace environment without adverse effect. <p>Airspace:</p> <ul style="list-style-type: none"> No change to the current configuration of airspace. Approximate 1.2 percent increase in total sorties. No adverse impacts on airspace management and use. 	<p>Installation:</p> <ul style="list-style-type: none"> No adverse impacts to airspace management and use in the local air traffic environment. 17.4 percent increase in total annual airfield operations. This increase could be accommodated Whiteman AFB airfield and surrounding airspace environment without adverse effect. <p>Airspace:</p> <ul style="list-style-type: none"> No change to the current configuration of airspace. Approximate 5.9 percent decrease in total sorties. No adverse impacts on airspace management and use. 	<p>Under the No Action Alternative at all four alternative bases, the USAF would continue to use and manage airspace as it is today until retirement of the current aircraft. Flying operations and airspace use would continue with no F-35A-related increase or decrease in air traffic.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
<p>Noise</p>	<p>Implementation of the AFRC F-35A mission would result in significant noise impacts at Davis-Monthan AFB. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Section 2.5).</p> <p>Installation:</p> <p>Affected by day-night average sound level (DNL) of 65 decibels (dB) or greater:</p> <p><i>Scenario A</i> Acres – 1,566 Estimated Population – 1,506</p> <p><i>Scenario B</i> Acres – 1,679 Estimated Population – 1,428</p> <p><i>Scenario C</i> Acres – 1,762 Estimated Population – 1,361</p> <p>Other items of note:</p> <ul style="list-style-type: none"> The Griffin Foundation Schools would be the only schools exposed to DNL of 65 dB or greater (all scenarios) Residential areas including parts of the Roberts and Julia Keen neighborhoods would be exposed to DNL of 65 dB (all scenarios) Transient F-35A aircraft operate at Davis-Monthan occasionally under baseline conditions. Operations would become much more frequent under the AFRC F-35A mission. The highest sound exposure level (SEL) experienced at representative locations would remain the same under the AFRC F-35A mission as under baseline conditions except at Freedom Park, the Griffin Foundation Schools, and the University of Arizona where they would increase by 2, 1, and 5 dB, respectively, under Scenario A, B, or C. All the proposed action noise contours (all scenarios) are within the Airport Environs Zone (AEZ). <p>Airspace:</p> <ul style="list-style-type: none"> Onset-rate adjusted day-night average sound level (L_{dnmr}) would not increase by more than 1 dB in the training airspace. Supersonic training would occur in the BMGR airspace (i.e., R-2301, R-2304, and R-2305) and Sells MOA, which are currently approved for supersonic training. The number of sonic booms in the BMGR would increase from 3.1 to 3.5 per day and the C-weighted day-night average sound level (CDNL) would increase from 56 to 57 dB. The average number of sonic booms per day beneath the Sells MOA would increase from 2.1 to 2.2 per day and CDNL would increase from 54 to 56 dB. 	<p>Implementation of the AFRC F-35A mission would result in adverse but not significant noise impacts at Homestead ARB. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Section 2.5).</p> <p>Installation:</p> <p>Affected by DNL of 65 dB or greater:</p> <p><i>Scenario A</i> Acres – 2,926 Estimated Population – 62</p> <p><i>Scenario B</i> Acres – 3,088 Estimated Population – 79</p> <p><i>Scenario C</i> Acres – 3,263 Estimated Population – 104</p> <p>Other items of note:</p> <ul style="list-style-type: none"> All of the estimated population affected by DNL greater than 65 dB are located at the South Dade Center (S02). The highest SEL experienced at representative locations would remain the same or decrease under the AFRC F-35A mission except at the Biscayne Bay Visitor Center where it would increase by 4 dB from 88 to 92 dB. The DNL at Biscayne Bay National Park offshore would increase by 10 dB, 9 dB, and 8 dB under Scenarios A, B, and C, respectively. The DNL at Audubon Park would increase by 8 dB under all scenarios. The DNLs at other representative locations studied would increase by 1 to 4 dB under Scenarios A and B and by as much as 5 dB under Scenario C. <p>Airspace:</p> <ul style="list-style-type: none"> L_{dnmr} would increase by as much as 6 dB beneath training airspace. The number of sonic booms would decrease and supersonic training would be conducted in areas currently authorized for supersonic activities. L_{dnmr} in the Ocala National Forest would range from 48 to 56 dB. 	<p>Implementation of the AFRC F-35A mission would result in significant noise impacts at NAS Fort Worth JRB. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Section 2.5).</p> <p>Installation:</p> <p>Affected by DNL of 65 dB or greater:</p> <p><i>Scenario A</i> Acres – 2,350 Estimated Population – 8,593</p> <p><i>Scenario B</i> Acres – 2,369 Estimated Population – 8,622</p> <p><i>Scenario C</i> Acres – 2,386 Estimated Population – 8,648</p> <p>Other items of note:</p> <ul style="list-style-type: none"> Under Scenario A, DNL at all 11 representative locations studied would exceed 65 dB. At 5 of the locations DNL would exceed 70 dB, and at 1 location DNL would exceed 75 dB. DNL under Scenarios B and C would be the same as under Scenario A except at White Settlement Library where it would increase under Scenarios B and C by 3 dB rather than 2 dB. DNL at Malaga Park and Luelle Merritt Elementary School would increase by 5 dB, to 71 and 67 dB, respectively. DNL at the other locations would increase 1 to 4 dB. The estimated number of residents exposed to outdoor 24-hour equivalent noise levels (L_{eq24}) >80 dB would increase by 40 under Scenario A, 42 under Scenario B, and 44 under Scenario C. These individuals would be exposed to noise levels that are associated with an increased risk of measureable noise-induced hearing loss under certain circumstances. <p>Airspace:</p> <ul style="list-style-type: none"> L_{dnmr} would remain at baseline levels or below 45 dB beneath the training airspace, with the exception of R-5601/R-5602 (Falcon Range). The L_{dnmr} at R-5601/R-5602 would increase from less than 45 dB to 49 dB. Supersonic training would continue to occur above the Brownwood MOAs and the number of sonic booms would average less than one per day. 	<p>Implementation of the AFRC F-35A mission would result in significant noise impacts at Whiteman AFB. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Section 2.5).</p> <p>Installation:</p> <p>Affected by DNL of 65 dB or greater:</p> <p><i>Scenario A</i> Acres – 2,421 Estimated Population – 2,226</p> <p><i>Scenario B</i> Acres – 2,517 Estimated Population – 2,507</p> <p><i>Scenario C</i> Acres – 2,620 Estimated Population – 2,804</p> <p>Other items of note:</p> <ul style="list-style-type: none"> Under all scenarios, DNL at Knob Noster Elementary School would increase from 61 dB to 65 dB and DNL at Knob Noster High School would increase from 55 to 62 dB. The DNL at residential area 3 would increase from 57 to 66 dB under Scenarios A and B, and from 57 to 67 dB under Scenario C. At Residential Areas 1 and 2, DNL would increase to 69 dB and 73 dB, respectively under all scenarios. The DNL at Knob Noster State Park would increase from 48 dB to 54 dB under Scenario A and to 55 dB under Scenarios B and C. <p>Airspace:</p> <ul style="list-style-type: none"> L_{dnmr} would remain at baseline levels beneath the training airspace, with the exception of R-4501 and the Cannon and Salem MOAs. L_{dnmr} below these areas would increase by up to 2 dB. Supersonic training is not authorized in the training airspace associated with this alternative and would not occur. 	<p>Under the No Action Alternative at Davis-Monthan AFB, Homestead ARB, NAS Fort Worth JRB and Whiteman AFB, existing aircraft operations would continue unchanged until retirement of the current aircraft. Construction associated with the AFRC F-35A beddown would not occur. Noise levels at each of the four installations would continue as described in this EIS under baseline conditions, and there would be no new F-35A-related noise impacts. At NAS Fort Worth JRB, Lockheed Martin would continue to build F-35 and other aircraft at the adjacent assembly facility and Lockheed Martin pilots would continue to conduct F-35 test flights for the new aircraft.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Air Quality	<p>Installation:</p> <ul style="list-style-type: none"> Net emissions were determined to be insignificant in that they were less than the General Conformity applicability threshold for the maintenance criteria pollutant and the Prevention of Significant Deterioration (PSD) threshold used as an indicator of significance for the area’s attainment criteria pollutants. Area is in attainment for all criteria pollutants but is a maintenance area for carbon monoxide (CO); the General Conformity applicability analysis determined the net direct and indirect emissions to be below the <i>de minimis</i> threshold for CO and the action may proceed without a conformity determination. Volatile organic compound (VOC), CO, nitrogen oxide (NO_x), particulate matter less than or equal to 10 micrometers in diameter (PM₁₀) and particulate matter less than or equal to 2.5 micrometers in diameter (PM_{2.5}) emissions would be reduced and sulfur oxide (SO_x) concentrations would increase slightly but not exceed the indicator threshold. <p>Airspace:</p> <ul style="list-style-type: none"> Emissions in the training airspace would decrease. 	<p>Installation:</p> <ul style="list-style-type: none"> Net emissions were determined to be insignificant in that they were less than the PSD threshold used as an indicator of significance for the area’s attainment criteria pollutants. Area is in attainment for all criteria pollutants. <p>Airspace:</p> <ul style="list-style-type: none"> Emissions in the training airspace would decrease. 	<p>Installation:</p> <ul style="list-style-type: none"> Net emissions were determined to be insignificant in that they were less than the General Conformity applicability thresholds for the nonattainment criteria pollutant precursors and the PSD threshold used as an indicator of significance for the area’s attainment criteria pollutants. Tarrant County is in moderate nonattainment of the 2008 ozone (O₃) standard and in marginal nonattainment of the 2015 O₃ standard; the General Conformity applicability analysis determined the net direct and indirect emissions to be below the <i>de minimis</i> thresholds for O₃ precursor pollutants and the action may proceed without a conformity determination. VOC emissions would reduce with the new mission and all other pollutant emissions would increase but not exceed their respective indicator thresholds. <p>Airspace:</p> <ul style="list-style-type: none"> Emissions in the training airspace would decrease. 	<p>Installation:</p> <ul style="list-style-type: none"> Net emissions were determined to be insignificant in that they were less than the PSD threshold used as an indicator of significance for the area’s attainment criteria pollutants. Area is in attainment for all criteria pollutants. <p>Airspace:</p> <ul style="list-style-type: none"> Emissions in the training airspace would decrease. 	<p>Under the No Action Alternative, baseline conditions at each installation would remain unchanged until retirement of the current aircraft. No F-35A-related construction emissions would occur, and operational emissions would be identical to the current baseline conditions. No additional F-35A-related impacts would occur.</p>
Safety	<p>Installation:</p> <ul style="list-style-type: none"> No specific aspect of the AFRC F-35A mission would create any unique or extraordinary safety issues. No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects and would be completed in compliance with all applicable Occupational Safety and Health Administration (OSHA) regulations to protect workers. Emergency response and mishap plans, including fire and crash response plans (including aircraft containing composite material), would be updated and followed. Due to the current safety record of the F-35A, the increasing safety trend for single-engine fighter aircraft, and increases in safety as an airframe matures operationally, it is reasonable to expect nominal changes in flight-safety risk. No changes to existing Accident Potential Zones (APZs) or Clear Zones (CZs). Bird/Wildlife-Aircraft Strike Hazard (BASH) Plans and procedures would continue to be followed. No significant impacts to installation safety are anticipated. <p>Airspace:</p> <ul style="list-style-type: none"> Compliance with fire management plans and mutual response agreements would continue. The frequency of flare use would remain the same or decrease and primarily be used above 15,000 feet MSL reducing the potential risk of accidental fires. Compliance with all flight safety procedures and requirements would minimize the chances for aircraft mishaps. BASH Plan and procedures would continue to be followed. No significant impacts to airspace safety are anticipated. 				<p>Under the No Action Alternative, baseline conditions at each installation would continue as they are today until retirement of the current aircraft. The number and types of operations would remain the same as those described under baseline conditions.</p>
Soil and Water Resources	<p>Implementation of the AFRC F-35A mission would not result in significant impacts to soil and water resources at any of the four bases.</p>				<p>Conditions at each installation would remain unchanged. None of the construction associated with the AFRC F-35A mission would occur and no F-35A-related impacts to soil and water resources would occur.</p>
	<p>Installation:</p> <ul style="list-style-type: none"> Total disturbed area - approximately 15.2 acres, total new impervious area – 1.6 acres Most of the construction would occur in areas which have been previously disturbed. No changes to the existing aircraft deicing operations would occur. <p>Airspace: Not applicable.</p>	<p>Installation:</p> <ul style="list-style-type: none"> Total disturbed area - approximately 2.3 acres, total new impervious area - approximately 2 acres. Most construction would occur in disturbed areas. <p>Airspace: Not applicable.</p>	<p>Installation:</p> <ul style="list-style-type: none"> Total disturbed area - approximately 7.7 acres, total new impervious area – approximately 1.2 acres Most of the construction would occur in areas which have been previously disturbed. No changes to the existing aircraft deicing operations would occur. <p>Airspace: Not applicable.</p>	<p>Installation:</p> <ul style="list-style-type: none"> Total disturbed area - approximately 2.9 acres, total new impervious area – reduction of approximately 0.4 acres Most of the construction would occur in areas which have been previously disturbed. No changes to the existing aircraft deicing operations would occur. <p>Airspace: Not applicable.</p>	

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Biological Resources	<p>Installation:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. Construction and demolition (C&D) projects would occur in developed and previously disturbed areas resulting in no significant impacts to vegetation. No federal- listed species are known to occur on Davis-Monthan AFB. The U.S. Fish and Wildlife Service (USFWS) indicated that no further Section 7 consultation is required (see Volume II, Appendix A, Section A.2.4.5). State-listed species known to occur at Davis-Monthan AFB include Gila monster (<i>Heloderma suspectum</i>), cactus ferruginous pygmy-owl (<i>Glaucidium brasilianum</i>), western burrowing owl, cave myotis (<i>Myotis velifer</i>), and western yellow bat (<i>Lasiurus xanthinus</i>); one state-protected species, the Saguaro cactus (<i>Carnegiea giganteus</i>), is known to occur at Davis-Monthan AFB. No impacts to federal- or state-listed species are anticipated. No significant impacts to wildlife are anticipated. Wildlife would adapt, acclimate, and habituate to the increase in noise from aircraft operations. C&D projects would not occur in wetlands resulting in no impacts to wetlands. <p>Airspace:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. Ground disturbance would be limited to flare and munitions use which would be less than or the same as used by the current A-10 mission. No significant impacts to vegetation are anticipated. 90 percent of F-35A operations would occur at elevations greater than 15,000 feet and 99 percent of operations would occur at elevations higher than 5,000 feet. No significant impacts to wildlife or protected species are anticipated. Supersonic operations would occur at the BMGR and above the Sells MOA at elevations typically greater than 30,000 feet MSL (~90 percent of time). The number of sonic booms would increase from 3.1 to 3.5 per day below the BMGR resulting in an increase of the CDNL from 56 to 57 dB. The number of sonic booms above the Sells MOA would increase from 2.1 to 2.2 per day but the CDNL would increase from 54 to 56 dB. No significant impacts to wildlife or protected species are anticipated. 	<p>Installation:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. C&D projects would occur in developed and previously disturbed areas resulting in no significant impacts to vegetation. 10 federal- listed species are known to occur on Homestead ARB. USAF determined that the proposed action would have <i>No Effect</i> on the American alligator (<i>Alligator mississippiensis</i>), American crocodile (<i>Crocodylus acutus</i>), Eastern indigo snake (<i>Drymarchon corais couperi</i>), sand flax (<i>Polygala smallii</i>), Small’s milkpea (<i>Galactia smallii</i>), and <i>May Effect</i> but is <i>Not Likely to Adversely Affect</i> the Everglade snail kite (<i>Rostrhamus sociabilis plumbeus</i>), rufa red knot (<i>Calidris canutus rufa</i>), Florida bonneted bat (<i>Eumops floridanus</i>), wood stork (<i>Mycteria americana</i>), and least tern (<i>Sterna antillarum</i>). Consultations with the USFWS are complete. No significant impacts to federal- or state-listed species are anticipated. No significant impacts to wildlife are anticipated. Animals would adapt, acclimate, and habituate to the increase in noise from aircraft operations. C&D projects would not occur in wetlands resulting in no impacts to wetlands. <p>Airspace:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. 2 percent decrease in aircraft operations. Ground disturbance would be limited to flare and munitions use which would be less than or the same as used by the current F-16 mission. No significant impacts to vegetation are anticipated. 94 percent of F-35A operations would occur at elevations above 10,000 feet and 99 percent of operations would occur at elevations higher than 5,000 feet. Supersonic operations would occur only in areas currently authorized for supersonic activities. No significant impacts to wildlife or threatened and endangered species are anticipated. 	<p>Installation:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. C&D projects would occur in developed and previously disturbed areas resulting in no significant impacts to vegetation. No federal- or state-listed species are known to occur on NAS Fort Worth JRB. No impacts to federal- or state-listed species are anticipated. The USFWS indicated that no further Section 7 consultation is required (see Volume II, Appendix A, Section A.2.6.4). No significant impacts to wildlife are anticipated. Wildlife would adapt, acclimate, and habituate to the increase in noise from aircraft operations. C&D projects would not occur in wetlands resulting in no impacts to wetlands. <p>Airspace:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. Ground disturbance would be limited to flare and munitions use which would be less than or the same as used by the current F-16 mission. No significant impacts to vegetation are anticipated. 94 percent of F-35A operations would occur at elevations greater than 10,000 feet and 99 percent of operations would occur at elevations higher than 5,000 feet. No significant impacts to wildlife or threatened and endangered species are anticipated. Supersonic operations would continue to occur above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher. No significant impacts to wildlife or threatened and endangered species are anticipated. 	<p>Installation:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. C&D projects would occur in developed and previously disturbed areas resulting in no significant impacts to vegetation. No federal- or state-listed species are known to occur on Whiteman AFB and no trees would be cleared. No impacts to federal- or state-listed species are anticipated. The USFWS indicated that no further Section 7 consultation is required (see Volume II, Appendix A, Section A.2.7.4). No significant impacts to wildlife are anticipated. Wildlife would adapt, acclimate, and habituate to the increase in noise from aircraft operations. C&D projects would not occur in wetlands resulting in no impacts to wetlands. <p>Airspace:</p> <ul style="list-style-type: none"> No significant impacts to biological resources or wetlands are anticipated. Ground disturbance would be limited to flare and munitions use which would be less than or the same as used by the current A-10 mission. No significant impacts to vegetation are anticipated. 94 percent of F-35A operations would occur at elevations greater than 10,000 feet and 99 percent of operations would occur at elevations higher than 5,000 feet. No supersonic operations would occur. No significant impacts to wildlife or threatened and endangered species are anticipated. 	<p>Under the No Action Alternative, baseline conditions at each of the four bases and associated airspace would continue as they are today until retirement of the current aircraft. There would be no F-35A related changes to vegetation or wildlife habitat resulting in no impacts to biological resources.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Cultural Resources	<p>Installation: No adverse impacts to cultural resources are anticipated.</p> <p>Airspace: No adverse impacts to cultural resources are anticipated.</p> <p>Consultations: Native American</p> <ul style="list-style-type: none"> • No adverse Section 106 impacts to tribal resources or traditional cultural properties are anticipated. • Section 106 consultation with Native American tribes is complete. USAF will continue to coordinate with interested tribes throughout the EIS process. <p>SHPO</p> <ul style="list-style-type: none"> • No National Register of Historic Places (NRHP)-eligible or listed resources affected. • The Arizona State Historic Preservation Office (SHPO) concurred with the Area of Potential Effects (APE) and the USAF determination of no adverse effect (See Volume II, Appendix A, Section A.2.4.3). 	<p>Installation: No adverse impacts to cultural resources are anticipated.</p> <p>Airspace: No adverse impacts to cultural resources are anticipated.</p> <p>Consultations: Native American</p> <ul style="list-style-type: none"> • No adverse Section 106 impacts to tribal resources or traditional cultural properties are anticipated. • Consultations with Native American tribes are ongoing. <p>SHPO</p> <ul style="list-style-type: none"> • No NRHP-eligible or listed resources affected. • The Florida SHPO concurred with the APE and the USAF determination of no adverse effect (see Volume II, Appendix A, Section A.2.5.3). 	<p>Installation: No adverse impacts to cultural resources are anticipated.</p> <p>Airspace: No adverse impacts to cultural resources are anticipated.</p> <p>Consultations: Native American</p> <ul style="list-style-type: none"> • No adverse Section 106 impacts to tribal resources or traditional cultural properties are anticipated. • Section 106 consultation with Native American tribes is complete. The USAF will continue to coordinate with interested tribes throughout the EIS process. <p>SHPO</p> <ul style="list-style-type: none"> • No NRHP-eligible or listed resources affected. • The Texas SHPO concurred with the APE and the USAF determination of no adverse effect (See Volume II, Appendix A, Section A.2.6.3). 	<p>Installation: No adverse impacts to cultural resources are anticipated.</p> <p>Airspace: No adverse impacts to cultural resources are anticipated.</p> <p>Consultations: Native American</p> <ul style="list-style-type: none"> • No adverse Section 106 impacts to tribal resources or traditional cultural properties are anticipated. • Section 106 consultation with Native American tribes is complete. USAF will continue to coordinate with interested tribes throughout the EIS process. <p>SHPO</p> <ul style="list-style-type: none"> • No NRHP-eligible or listed resources affected. • The Missouri SHPO concurred with the APE and the USAF determination of no adverse effect (See Volume II, Appendix A, Section A.2.7.3). 	<p>Under the No Action Alternative, there would be no F-35A-related building renovation, demolition or construction at any of the four bases thus resulting in no changes to cultural resources. In addition, aircraft operations in the airspace would not change resulting in no changes to cultural resources under the airspace currently used by pilots from each of the four bases until retirement of the current aircraft. Implementation of the No Action Alternative would result in no effect to cultural resources and/or historic properties.</p>
Inadvertent discovery of archaeological resources is considered unlikely. An inadvertent discovery of previously unrecorded cultural resources would be managed in compliance with federal and state laws and USAF regulations.					

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Land Use and Recreation	<p>Installation: No significant impacts to land use resources would result from the proposed on-base physical development.</p> <p>Affected by day-night average sound level (DNL) of 65 decibels (dB) or greater:</p> <p>Scenario A Total Acres – 1,566 Residential Acres – 91</p> <p>Scenario B Total Acres – 1,679 Residential Acres – 85</p> <p>Scenario C Total Acres – 1,762 Residential Acres – 79</p> <p>The AFRC F-35A mission would not expose any land or property outside of the AEZ to DNL of 65 dB or greater.</p> <p>None of the recreational facilities identified near the base would be exposed to a DNL of 65 dB or greater under any of the afterburner scenarios. However, as shown in Tables DM3-10, DM3-11, and DM3-13, the change in noise levels at some of the locations would be noticeable. Saguaro National Park would not be affected by DNL greater than 45 dBA.</p> <p>Airspace: Six Special Use Land Management Areas (SULMAs) would experience an indiscernible 1 dB L_{dnmr} increase above baseline. Sonic booms would occur in areas where they occur today and at an intensity comparable to what occurs today with an average of one more per day.</p> <p>The increase in the number of sorties in training airspace above some recreational areas would indiscernibly affect the noise level, but a slight increase (1 per day) in supersonic events could affect recreational users.</p>				<p>Under the No Action Alternative, land use conditions at each installation would remain as they are today. No F-35A-related changes would occur to planning noise contours surrounding the installations and no F-35A-related land use changes would occur in the installation boundaries.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Socioeconomics (all numbers are approximated)	<p>Due to the increased noise, implementation of the AFRC F-35A mission would result in significant socioeconomic impacts.</p> <p>Installation^a:</p> <p>Population Decrease of 30 full-time mission personnel. Less than 0.01 percent decrease in the population of Pima County.</p> <p>Economic Activity Construction activities would be temporary and provide limited economic benefit. Total construction costs of \$87.3 million could generate \$44.5 million in direct, indirect and induced income for the duration of the construction activity.</p> <p>Housing The 30 outgoing full-time personnel would no longer require off-base housing. Properties which have not changed ownership since 2004 could experience a noise discount on property values. The exact percent of discount would depend upon a number of factors, including the noise indicators used, thresholds, types of properties evaluated, and other factors. However, as Table DM3-43 at page DM3-91 demonstrates, prices for homes in the southern Arizona region have increased over the last several years, particularly homes within a 1-mile radius of Davis-Monthan AFB, due to economic and population growth in the region. The general impact on home pricing would be the same regardless of which afterburner scenario is selected.</p> <p>Education Approximately 30 military and non-military dependents of school age would no longer attend schools in Pima County. This decrease in students would not be noticed in the dynamic Pima County Schools System. Griffin Foundation Schools would be exposed to DNL of 65 dB or greater which could interfere with learning. The number of schools and students impacted by increased noise would constitute a significant impact.</p> <p>Public Services No measurable effect to public services would be anticipated.</p> <p>Base Services No measurable effect to base services would be anticipated.</p> <p>Airspace: Not applicable.</p>	<p>Installation^a:</p> <p>Population Decrease of 91 full-time mission personnel. Less than 0.01 percent decrease in the population of Miami-Dade County.</p> <p>Economic Activity Construction activities would be temporary and provide limited economic benefit. Total construction costs of \$18.6 million could generate \$9.8 million in direct, indirect and induced income for the duration of the construction activity.</p> <p>Housing Military housing is not available at Homestead ARB. The 91 outgoing full-time personnel would no longer require off-base housing.</p> <p>Education Approximately 89 military and non-military dependents of school age would no longer attend the Miami-Dade Public School (M-DCPS) district. The M-DCPS district schools would not be adversely impacted by the reduction in enrollment. No off-base schools would be exposed to a DNL of 65 dB or greater.</p> <p>Public Services No measurable effect to public services would be anticipated.</p> <p>Base Services No measurable effect to base services would be anticipated.</p> <p>Airspace: Not applicable.</p>	<p>Installation^a:</p> <p>Population Decrease of 102 full-time mission personnel. Less than 0.1 percent decrease in the population of Tarrant County.</p> <p>Economic Activity Construction activities would be temporary and provide limited economic benefit. Total construction costs of \$21.7 million could generate \$11.4 million in direct, indirect and induced income for the duration of the construction activity.</p> <p>Housing The 102 outgoing full-time personnel would no longer require off-base housing.</p> <p>Education Approximately 100 military and non-military dependents of school age would no longer attend schools in Tarrant County. Tarrant County schools would not be noticeably affected. Six off-base schools are currently exposed to DNL of 65 dB or greater and three additional schools would be exposed to a DNL of 65 dB or greater. One school currently exposed to a DNL of 65 dB or greater would be exposed to a DNL of 70 dB or greater. The number of schools and students exposed to increased noise would constitute an adverse impact.</p> <p>Public Services No measurable effect to public services would be anticipated.</p> <p>Base Services No measurable effect to base services would be anticipated.</p> <p>Airspace: Not applicable.</p>	<p>Installation^a:</p> <p>Population 11 additional full-time mission personnel. Less than 0.1 percent increase in the population of Johnson County.</p> <p>Economic Activity Construction activities would be temporary and provide limited economic benefit. Total construction costs of \$32.5 million could generate \$8.0 million in direct, indirect and induced income for the duration of the construction activity.</p> <p>Housing Assuming all 11 incoming full-time military personnel associated with the AFRC F-35A mission would require off-base housing, the housing market in the Region of Influence (ROI) would be anticipated to support the change in personnel.</p> <p>Education Approximately 11 military and non-military dependents of school age would enter public school districts in the ROI. Johnson County schools would not be noticeably affected. One off-base childcare facility and one off-base school would be newly exposed to DNL of 65 dB or greater. Educational services are identified in the JLUS as a generally compatible use with sound attenuation measures within the 65 to 70 dB DNL contour.</p> <p>Public Services No measurable effect to public services would be anticipated.</p> <p>Base Services No measurable effect to base services would be anticipated.</p> <p>Airspace: Not applicable.</p>	<p>Under the No Action Alternative, socioeconomic conditions would remain as they are today. No new F-35A-related personnel increases or decreases would occur at any of the installations and no F-35A-related construction would occur.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
<p>Environmental Justice and Other Sensitive Receptors</p>	<p>Implementation of the AFRC F-35A mission would result in disproportionate impacts to minority and low-income populations.</p> <p>Installation:</p> <p>Scenario A</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 6 of the 9 census blocks groups (BGs) (i.e., ROIs) affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would occur in 3 of the 9 ROIs affected by the increased noise (DNL of 65 dB or greater). Implementation of Scenario A would expose an additional estimated 281 children and 223 elderly persons to DNL of 65 dB or greater. <p>Scenario B</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 6 of the 9 ROIs affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would occur in 3 of the 9 ROIs affected by the increased noise (DNL of 65 dB or greater). Implementation of Scenario B would expose an additional estimated 269 children and 206 elderly persons to DNL of 65 dB or greater. <p>Scenario C</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 6 of the 9 ROIs affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would occur in 3 of the 9 ROIs affected by the increased noise (DNL of 65 dB or greater). Implementation of the Scenario C would expose an additional estimated 258 children and 194 elderly persons to DNL of 65 dB or greater. 	<p>Implementation of the AFRC F-35A mission would result in disproportionate impacts to minority and low-income populations.</p> <p>Installation:</p> <p>Scenario A</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in the 1 ROI affected by affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would impact 1 ROI affected by the increased noise (DNL of 65 dB or greater) Implementation of the Scenario A would expose an additional estimated 22 children and 3 elderly persons to DNL of 65 dB or greater. <p>Scenario B</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in the 1 ROI affected by affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would impact 1 ROI affected by the increased noise (DNL of 65 dB or greater) Implementation of the Scenario B would expose an additional estimated 28 children and 4 elderly persons to DNL of 65 dB or greater. <p>Scenario C</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in the 1 ROI affected by affected by the increased noise (DNL of 65 dB or greater) Disproportionate impact to low-income populations would impact 1 ROI affected by the increased noise (DNL of 65 dB or greater) Implementation of Scenario C would expose an additional estimated 37 children and 5 elderly persons to DNL of 65 dB or greater. 	<p>Existing disproportionate impacts to minority populations in 13 ROIs and to low income populations in 8 ROIs. Implementation of the AFRC F-35A mission would result in disproportionate impacts to minority populations and low-income populations.</p> <p>Installation:</p> <p>Scenario A</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 17 ROIs that would be newly exposed to DNL of 65 dB or greater. Disproportionate impact to low-income populations would occur in 10 ROIs that would be newly exposed to DNL of 65 dB or greater. Implementation of Scenario A would expose an additional estimated 2,188 children and 1,126 elderly persons to DNL of 65 dB or greater. <p>Scenario B</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 17 ROIs that would be newly exposed to DNL of 65 dB or greater. Disproportionate impact to low-income populations would occur in 10 ROIs that would be newly exposed to DNL of 65 dB or greater. Implementation of Scenario B would expose an additional estimated 2,192 children and 1,129 elderly persons to DNL of 65 dB or greater. <p>Scenario C</p> <ul style="list-style-type: none"> Disproportionate impact to minority populations would occur in 17 ROIs that would be newly exposed to DNL of 65 dB or greater. Disproportionate impact to low-income populations would occur in 10 ROIs that would be newly exposed to DNL of 65 dB or greater. Implementation of Scenario C would expose an additional estimated 2,200 children and 1,129 elderly persons to DNL of 65 dB or greater. 	<p>The analysis of environmental justice populations at Whiteman AFB identified 3 ROIs with disproportionately high minority populations and 1 ROI with disproportionately high low-income populations. These populations are currently impacted by DNL of 65 dB or greater and would continue to be impacted by DNL of 65 dB or greater under the all three afterburner scenarios. Therefore, implementation of the AFRC F-35A mission would not result in disproportionate impacts to minority or low-income populations.</p> <p>Installation:</p> <p>Scenario A</p> <p>Implementation of the new mission would expose an additional estimated 669 children and 196 elderly persons to DNL of 65 dB or greater.</p> <p>Scenario B</p> <p>Implementation of the new mission would expose an additional estimated 764 children and 194 elderly persons to DNL of 65 dB or greater.</p> <p>Scenario C</p> <p>Implementation of the new mission would expose an additional estimated 863 children and 207 elderly persons to DNL of 65 dB or greater.</p>	<p>Under the No Action Alternative, baseline conditions at Davis-Monthan AFB, Homestead ARB, NAS Fort Worth JRB and Whiteman AFB would remain as described in Sections DM3.10.1, HS3.10.1, FW3.10.1 and WM3.10.1.</p> <p>Disproportionate impacts to minority and low income populations would continue to occur under baseline conditions at NAS Fort Worth JRB and Whiteman AFB and children and elderly persons would continue to be exposed to DNL of 65 dB or greater at both of these installations.</p>

Table 2-12. Comparative Summary of Environmental Consequences (Continued)

Resource Area	Davis-Monthan AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	Homestead ARB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	NAS Fort Worth JRB 24 F-35A aircraft (+2 BAI) Replace 24 F-16 aircraft	Whiteman AFB 24 F-35A aircraft (+2 BAI) Replace 24 A-10 aircraft	No Action
Infrastructure	<p>Installation: Implementation of the proposed AFRC F-35A mission is not anticipated to result in significant impacts to infrastructure systems (e.g., potable water, wastewater, stormwater, electrical, natural gas, solid waste management, and transportation).</p> <p>Airspace: Not applicable.</p>				<p>Under the No Action Alternative, baseline conditions at each installation would continue as they are today until retirement of the current aircraft. No new F-35A-related construction would occur and no new F-35A-related personnel would arrive or decrease at any of the installations. No additional impacts to the infrastructure system at any of the installations would occur.</p>
Hazardous Materials and Waste	<p>Installation: Implementation of the proposed AFRC F-35A mission is not anticipated to result in significant impacts to hazardous materials and waste management.</p> <ul style="list-style-type: none"> • Quantities and types of hazardous materials needed for maintenance would be less than those currently generated by maintaining A-10 and F-16 aircraft. • Operations and maintenance involving hydrazine, cadmium, and hexavalent chromium primer, and various heavy metals have been eliminated or greatly reduced for the F-35A. • The proposed demolition and renovation projects would be reviewed for asbestos-containing material (ACM) and lead-based paint (LBP) according to established procedures. If present or located, all remediation and disposal would be performed according to USAF policies and procedures and in compliance federal, state, and local regulations. • The proposed construction, demolition, and renovation projects and operations are not expected to affect known Environmental Restoration Program (ERP) locations. <p>Airspace: Not applicable.</p>				<p>Under the No Action Alternative, conditions at each installation would remain as they are today until retirement of the current aircraft. Each installation would continue to use hazardous materials and dispose of hazardous waste as described for each installation's baseline conditions.</p>

^a For purposes of the EIS analysis a change in personnel assumes those personnel will leave the area. It is possible that these personnel could remain in the area and associated changes in population, housing, and education would not occur. Impacts for such a small change in personnel would be negligible.
 Note: "Installation" includes the base and the area surrounding the base.

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2.5 MITIGATION

Mitigation measures avoid, minimize, remediate, or compensate for environmental impact. CEQ regulations (40 *CFR* 1508.20) define mitigation to include the following:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action, and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

If mitigation measures are identified during an Environmental Impact Analysis Process (EIAP), the USAF would consider these measures during preparation of the Final EIS and Record of Decision (ROD). If mitigation measures are determined to be operationally feasible and to not negatively affect training or safety, they would be addressed in a mitigation plan. The mitigation plan would identify principal and subordinate organizations responsible for the execution and oversight of specific mitigation measures. The plan would be prepared in accordance with 32 *CFR* 989.22(d) and CEQ mitigation and monitoring guidance.

Table 2-13 presents potential measures to reduce noise that were considered but determined to be operationally infeasible. Avoiding, minimizing, or reducing potential impacts has been a priority for the USAF in guiding the development of the proposed AFRC F-35A mission and associated aircraft operations. Specific measures to avoid, reduce, or minimize impacts have been built or designed into the proposed action and alternatives; applied to construction, operation, and maintenance involved in the action; or implemented as compensatory measures. Specific measures (where applicable) to reduce impacts are presented in each of the base-specific sections contained in Chapter 4.

Table 2-13. Measures Considered to Reduce Potential Noise Impacts

Alternative Base	Measures Considered
All Bases	<p>Potential operational modifications to mitigate significant noise impacts were considered in terms of their effects on safety of flight. Measures that were considered unsafe by members of the operational community were eliminated from further analysis and not considered as practicable. Other measures to reduce noise were found to result in substantial reductions in training effectiveness because they would provide negative training (i.e., reinforcement of non-standard flight procedures in pilots) or would reduce training efficiency (i.e., reducing the number of training goals met per flight hour). Reductions in training effectiveness could potentially affect unit combat readiness. Measures considered at all bases included:</p> <ol style="list-style-type: none"> 1. Reduce the number of practice approaches. In order to accommodate training requirements, AFRC F-35A pilots fly approximately one practice second approach for every four sorties flown. Although AFRC considered a lesser number of practice second approaches to reduce noise, it was determined that flying a reduced number of second approaches would not allow pilots to meet training requirements. In addition to evaluating a reduction in the number of practice approaches, AFRC evaluated flying second approaches at other airfields. Because of the lack of availability and the inefficiency of using other airfields, aircraft noise was modeled under the assumption that all practice second approaches would be conducted at the primary installation. 2. Adjust runway usage patterns so that loud overflights occur less frequently over areas of greater noise sensitivity. Currently, runway selection for approaches and departures is made based on considerations including winds, noise sensitivities, and air traffic flows at nearby airfields. Flight safety is improved by flying into the wind during landing and takeoff. When runway use is not dictated by winds, runways can be selected according to noise sensitivities such that the loudest operations (i.e., departures) overfly less-noise-sensitive areas. At installations near other airfields, maintaining a single direction of air traffic flow at all airfields is important to maintain safety of both civilian and military flight. Base-specific runway use considerations that were evaluated are discussed below by alternative base. 3. Increase distance between aircraft and noise-sensitive locations by increasing altitudes or adjusting routing. Aircraft flight procedures currently used at each alternative base have been refined over several years to provide the greatest safety and operational efficiency while also minimizing noise to the extent practicable. Wing leadership meets regularly with subordinate units to discuss issues including potential adjustments to flying procedures that could improve safety/effectiveness and/or reduce noise impacts. Current flight procedures at each alternative base reflect a balancing of several factors to achieve safe and efficient operations while also reducing noise. 4. Place restrictions on late-night flying. Late-night flying (i.e., between 10:00 P.M. and 7:00 A.M.) comprises a small fraction (4 percent or less) of total operations expected to be flown by AFRC F-35A pilots at each of the alternative bases. Further reductions in the number of late-night flights would limit operational flexibility, preventing pilots from accomplishing night training during portions of the year when the sun sets late in the day. Limiting runway usage, altitudes, or routing specifically during these times could decrease safety and/or reduce operational effectiveness, as described above.

Table 2-13. Measures Considered to Reduce Potential Noise Impacts (Continued)

Alternative Base	Measures Considered
Davis-Monthan AFB	<p>In addition to the general types of mitigation measures described above, the following potential mitigation measures specific to Davis-Monthan AFB were considered. Potential noise mitigation measures considered for Davis-Monthan AFB were evaluated in context of extensive previous and ongoing collaboration between the base, Tucson International Airport (TUS), and the local community.</p> <ol style="list-style-type: none"> 1. Due to lack of alternate airfield availability, the USAF cannot commit to conducting any particular number of practice approaches at airfields such as Libby Army Airfield. Therefore completing second approach training requirements at locations other than Davis-Monthan AFB is not a viable mitigation measure. Libby Army Airfield could be used by AFRC F-35A pilots on an occasional basis for practice second approaches, but there is currently a high tempo of aircraft operations at Libby Army Airfield and availability of the runway for practice approaches would be uncertain. 2. Increasing the percentage of departure operations conducted toward the less-densely populated areas of Tucson to the south is not a viable mitigation measure. Currently, approximately 67 percent of operations are conducted on Runway 12 (toward the south) and 33 percent of operations are conducted on Runway 30 (toward the north), which is similar to the traffic flow pattern at nearby TUS. If Davis-Monthan AFB were to conduct operations in the opposite direction of TUS operations, air traffic controllers at both airfields would be required to delay both civilian and military air traffic until opposing traffic separation minimums could be guaranteed. 3. Local flight procedures have been restricted to avoid direct overflights of several noise-sensitive locations in Tucson (e.g., neighborhoods, Reid Park Zoo, etc.). Further flight procedure restrictions to reduce noise impacts were not operationally feasible. The Tucson Military/Community Relations Committee and other avenues are available for communication of ideas relating to new noise abatement procedures. 4. Because approximately 1 percent of proposed AFRC F-35A operations would be conducted between 10:00 P.M. and 7:00 A.M., the reduction of operations during this time was found to result in only minor noise reductions; further reducing this number could prevent pilots from accomplishing night training during portions of the year when the sun sets late in the day. <p>In conclusion, the USAF has considered several categories of potential noise mitigation for Davis-Monthan AFB, but none of the measures would be operationally feasible.</p>

Table 2-13. Measures Considered to Reduce Potential Noise Impacts (Continued)

Alternative Base	Measures Considered
NAS Fort Worth JRB	<p>In addition to the general types of mitigation measures described above, the following potential mitigation measures specific to NAS Fort Worth JRB were considered.</p> <ol style="list-style-type: none"> 1. No alternative runways have been identified near NAS Fort Worth JRB that are appropriate to accommodate F-35A practice second approaches. 2. The areas immediately north and immediately south of NAS Fort Worth JRB are both densely populated, and shifting departure operations from one runway to the other would simply shift elevated noise levels from one set of noise-sensitive locations to another. Therefore, changing patterns of runway usage was not considered as a viable mitigation option. 3. Test pilots from the Lockheed Martin aircraft assembly plant located directly across the runway fly approximately 2,900 sorties per year; modifications to flight routing would impact both USAF pilots and Lockheed Martin pilots. Therefore, no modifications to flight routing or altitude profiles to reduce noise impacts have been proposed at this time. The USAF is not aware of changes to local flying procedures that would reduce noise impacts without adversely affecting safety and/or training effectiveness. 4. Because less than 1 percent of F-35A operations would be conducted between 10:00 P.M. and 7:00 A.M., the reduction of operations during this time was found to result in only minor noise reductions; further reducing this number could prevent pilots from accomplishing night training during portions of the year when the sun sets late in the day. <p>In conclusion, the USAF has considered several categories of potential noise mitigation for NAS Fort Worth JRB, but none of the measures would be operationally feasible.</p>
Whiteman AFB	<p>In addition to the general types of mitigation measures described above, the following potential mitigation measures specific to Whiteman AFB were considered.</p> <ol style="list-style-type: none"> 1. No alternative runways near Whiteman AFB were considered appropriate to accommodate the proposed AFRC F-35A practice second approaches. 2. Increasing the percentage of departure operations on Runway 19 (this southerly traffic flow currently comprises 65 percent of total) would not match runway usage patterns used by current missions at Whiteman AFB, which could potentially lead to delay of the launch of strategic B-2 aircraft. 3. No modifications to flight routing or altitude profiles were considered operationally feasible. The USAF is not aware of changes to local flying procedures that would reduce noise impacts without adversely affecting safety and/or training effectiveness. 4. Because approximately 4 percent of the proposed AFRC F-35A operations would be conducted between 10:00 P.M. and 7:00 A.M., reductions of operations during this time was found to result in only minor noise reductions; further reducing this number could prevent pilots from accomplishing night training during portions of the year when the sun sets late in the day. <p>In conclusion, the USAF has considered several categories of potential noise mitigation for Whiteman AFB, but none of the measures would be operationally feasible.</p>

2.5.1 Best Management Practices to Reduce the Potential for Environmental Impacts

A variety of different general mitigation and best management practices (BMPs) have been incorporated into design of the AFRC F-35A beddown in furtherance of 32 *CFR* 989.22 or to fulfill permit requirements, regardless of the location alternative. These measures include BMPs for construction practices and continuation of ongoing operational restrictions and avoidance measures. These BMPs are listed according to specific resources and are presented in Table 2-14.

Table 2-14. Best Management Practices to Reduce the Potential for Environmental Impacts

Resource Area/Alternative	Best Management Practices
Airspace Management and Use	
All Bases	<ol style="list-style-type: none"> 1. To the extent practical, AFRC F-35A pilots would utilize advanced simulators for training purposes. 2. AFRC F-35A pilots would operate in existing SUA and maintain close contact with the FAA Air Route Traffic Control Centers (ARTCCs), ATC and other FAA entities to minimize conflicts with civil and commercial aviation.
Noise	
All Bases	<ol style="list-style-type: none"> 1. As a follow-up to this EIS, once the AFRC F-35A beddown is complete and the full operational tempo of the squadron is in place, the USAF would validate the noise impacts identified in this EIS in a new AICUZ. In addition, the USAF would continue to work closely with local communities to minimize noise impacts.
Air Quality	
All Bases	<ol style="list-style-type: none"> 1. Construction personnel would minimize idling of all vehicles during construction 2. Truckloads of dirt, sand or gravel will be covered at all times. 3. Disturbed areas will be revegetated as soon as possible post construction 4. Maintain all equipment to manufacturer specifications 5. Employ fugitive dust control and soil retention practices including: <ul style="list-style-type: none"> • Use water spray trucks to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area. • Suspend all soil disturbance activities when visible dust plumes emanate from the site. • Minimize vehicle traffic on non-paved roads • Designate personnel to monitor the dust control program and to order increased watering, as necessary, to prevent the transport of dust off-site.
Safety	
All Bases	<ol style="list-style-type: none"> 1. Emergency and mishap response plans would be updated to address the needed procedures and response actions specific to the F-35A airframe.
Soil and Water	
All Bases	<ol style="list-style-type: none"> 1. Develop Stormwater Pollution Prevention Plans (SWPPPs), as required by state and federal Clean Water Act (CWA) requirements, to include the new AFRC F-35A building construction. 2. Post-construction, all disturbed areas would be re-graded to pre-construction contours. 3. Silt fence, interceptor trenches, hay bales, or other suitable erosion and sediment control measures would be used during construction, and revegetation of disturbed areas will occur as soon as practical.

Table 2-14. Best Management Practices to Reduce the Potential for Environmental Impacts (Continued)

Resource Area/Alternative	Best Management Practices
Biological Resources	
All Bases	Continue adherence to BASH program
Homestead ARB	<p>Surveys for bats would be conducted prior to any demolitions and/or facility modification or new construction that occurs in areas with potential roosting habitat. Extensive acoustic surveys using simultaneous multiple song meters, combined with roost surveys at sunset would be conducted on the base and adjacent areas northward toward Mystic Lake. Surveys would be conducted to locate roosts and any removal of occupied habitat would be coordinated with the USFWS and be mitigated. Should Florida bonneted bats be identified in a facility proposed for modification or demolition, the Homestead ARB natural resource manager would contact the USFWS to develop the appropriate plans prior to any construction. Homestead ARB would continue to employ measures outlined in the Florida Bonneted Bat Management Plan to avoid impacts to local populations near the installation.</p> <p>Prior to any construction, demolition, or renovation actions, Homestead ARB would coordinate with the USFWS to determine potential direct, adverse impacts to federally listed plant species. Should sand flax plants be identified as impacted by construction, the Biological Opinion (BO) specifies a replanting ratio of 5:1 (i.e., number of plants replaced: number of plants affected). Should Small’s milkpea plants be identified as impacted by construction, the BO specifies a replanting ratio of 3:1 (i.e., number of plants replaced: number of plants affected) (USFWS 2019).</p>
Cultural Resources	
All Bases	<ol style="list-style-type: none"> 1. Consultation with the SHPOs and Native American tribes is complete. Coordination with interested tribes will continue throughout the EIS process. 2. Track results of government-to-government consultation with tribes. 3. In the case of unanticipated or inadvertent cultural resource discoveries, the USAF would comply with Section 106 of the NHPA and follow the standard operating procedures outlined in the Integrated Cultural Resource Management Plan (ICRMP).
Land Use and Recreation	
All Bases	Once the full complement of F-35A aircraft are operating at the selected base, prepare an update to the current AICUZ Study to validate operational data and identify projected noise levels based on the most recent noise data.
Socioeconomics	
All Bases	No base-specific management actions identified.
Environmental Justice and Protection of Children	
All Bases	No base-specific management actions identified.
Infrastructure	
All Bases	<ol style="list-style-type: none"> 1. Incorporate Leadership in Energy and Environmental Design (LEED) and sustainable development concepts into construction projects to achieve optimum resource efficiency, sustainability, and energy conservation, except to the extent limited or prohibited by law. 2. Continue and enhance recycling and reuse programs to accommodate waste generated by the AFRC F-35A beddown.

Table 2-14. Best Management Practices to Reduce the Potential for Environmental Impacts (Continued)

Resource Area/Alternative	Best Management Practices
Hazardous Materials and Waste	
All Bases	<ol style="list-style-type: none"> 1. Update Hazardous Waste Management Plans (HWMPs) to account for any new and/or changed waste streams or new procedures, if any, for managing hazardous materials and wastes associated with F-35A aircraft. 2. Review construction plans to identify any monitoring wells that would need to be removed and/or replaced. 3. Review construction plans to identify any buildings containing toxic substances such as LBP and ACM.

2.6 UNAVOIDABLE IMPACTS

Potential impacts that could occur and cannot be mitigated include the following:

- The existing capacity of regional landfills would be reduced due to the solid waste generated.
- Although anticipated to be similar in type to what is currently generated or what was recently generated at all four bases, hazardous and nonhazardous waste would be generated as a result of maintenance functions associated with the new aircraft.
- Individual species would be affected by land disturbance and air operations.
- Stormwater runoff and associated erosion would increase due to construction.
- There is potential for an increase in the number of bird/wildlife-aircraft strikes and aircraft mishaps resulting from the increased number of annual operations.

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CHAPTER 3

DEFINITION OF RESOURCE AND METHODOLOGY FOR ANALYSIS



How to Use This Document

Our goal is to provide a reader-friendly document that provides an in-depth, accurate analysis of the proposed action, the alternative basing locations, the No Action Alternative, and the potential environmental consequences for each base. The organization of this Environmental Impact Statement (EIS) is shown below.

EXECUTIVE SUMMARY

- Synopsis of Purpose and Need and Proposed Action and Alternatives
- Comparison of Impacts

VOLUME I OVERALL SUMMARY

CHAPTER 1

- Purpose and Need for the Air Force Reserve Command (AFRC) F-35A Operational Beddown

CHAPTER 2

- Description of the Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of the Proposed Action and Alternatives

CHAPTER 3

- Resource Definition and Methodology

CHAPTER 4

- Base Alternatives and the No Action Alternative

VOLUME I BASE-SPECIFIC INFORMATION

	Davis-Monthan AFB	Homestead ARB	NAS Fort Worth JRB	Whiteman AFB	No Action Alternative
Section DM1.0 Proposed Action Overview	Section HS1.0 Proposed Action Overview	Section FW1.0 Proposed Action Overview	Section WH1.0 Proposed Action Overview	This section describes the effects of not implementing the AFRC F-35A mission at any of the four bases.	
Section DM2.0 Base-Specific Project Details	Section HS2.0 Base-Specific Project Details	Section FW2.0 Base-Specific Project Details	Section WH2.0 Base-Specific Project Details		
Section DM3.0 Affected Environment and Environmental Consequences	Section HS3.0 Affected Environment and Environmental Consequences	Section FW3.0 Affected Environment and Environmental Consequences	Section WH3.0 Affected Environment and Environmental Consequences		
Section DM4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section HS4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section FW4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section WH4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources		

VOLUMES I AND II SUPPORTING INFORMATION

CHAPTER 5

- References

- List of Preparers

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APPENDICES: VOLUME II

- Appendix A – Correspondence
- Appendix B – Noise Modeling, Methodology, and Effects
- Appendix C – Air Quality

3.0 DEFINITION OF RESOURCE AND METHODOLOGY FOR ANALYSIS

This chapter directly corresponds to the baseline conditions and the analysis of consequences for the environmental resource areas described in Volume I, Chapter 4, for each of the four alternative bases under consideration. For each environmental resource area, this chapter provides a definition of the resource, the regulatory setting, if applicable, and a description of the methodology used to evaluate the environmental resource area.

Because the same resource areas were analyzed for each of the four bases, the definition, regulatory setting, and methodology for each resource area are the same for all four bases. The analysis methodology addresses both the context of the environmental resource and the intensity of potential consequences to the resource resulting from implementation of the Air Force Reserve Command (AFRC) F-35A mission.

3.1 AIRSPACE MANAGEMENT AND USE

3.1.1 Definition of the Resource

Airspace management generally refers to the manner in which the Federal Aviation Administration (FAA), U.S. Department of Defense (DoD), and other responsible agencies coordinate and integrate use of the nation's navigable airspace so as to ensure all aviation activities are conducted safely and efficiently. The following sections describe how the National Airspace System is classified and regulated to meet both military and civil aviation needs.

For the purposes of this airspace analysis, the Region of Influence (ROI) for the proposed action and No Action Alternative includes the airspace proposed for use near each of the alternative bases and the airspace and ranges proposed for use by AFRC F-35A pilots.

3.1.2 Regulatory Setting

Federal Aviation Regulations define navigable airspace as airspace at and above the minimum flight altitudes prescribed by *United States Code (USC)* Title 49, Subtitle VII, Part A, and includes airspace needed to ensure safety in the takeoff and landing of aircraft (49 *USC* 40102). This navigable airspace is a limited resource that Congress has charged the FAA to administer in the public interest as necessary to ensure the safety of aircraft and its efficient use (FAA Order 7400.2L 2017).

Management of the National Airspace System considers how this limited resource is designated, used, and administered to best accommodate the individual and common needs of military, commercial, and general aviation pilots. The FAA considers multiple and competing demands for aviation airspace and other special needs to determine how the National Airspace System can best be structured and regulated to address all user requirements. Management of the navigable airspace also considers, as appropriate, those conditions where flight restrictions or other measures could be needed for avoidance of obstacles and other sensitive land use areas.

The FAA has categorized U.S. airspace as Controlled, Special Use, Other, or Uncontrolled airspace. Controlled airspace has defined dimensions within which air traffic control (ATC) service is provided to pilots operating by Instrument Flight Rules (IFR) or Visual Flight Rules (VFR) in accordance with the airspace classification. Controlled airspace is categorized into Classes A through E; uncontrolled airspace is designated as Class G. The following extracts from the FAA Aeronautical Information Manual and the Pilot/Controller Glossary (FAA 2018) define the specific classifications most relevant to the affected airspace environment at each alternative base and associated training areas described in Chapter 2.

Class A airspace generally extends from 18,000 feet mean sea level (MSL) up to and including 60,000 feet MSL or Flight Level (FL) 600 and includes established Jet Routes. Class A airspace also includes Air Traffic Control Assigned Airspace (ATCAA), which is normally established over a Military Operations Area (MOA) for high-altitude training.

Class B airspace generally extends from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of each Class B airspace area is individually tailored, consists of a surface area and two or more layers (some Class B airspace areas resemble upside-down wedding cakes), and is designed to contain all published instrument procedures once an aircraft enters the airspace. ATC clearance is required for all pilots to operate in the areas, and all pilots that are cleared to operate receive separation services within the airspace.

Class C airspace generally extends from the surface to 4,000 feet above the airport elevation (charted in MSL) surrounding airports that have an operational ATC tower, are serviced by a radar approach control facility, and have a certain number of IFR operations or passenger enplanements. Although the actual configuration of Class C airspace is individually tailored, it usually consists of a surface area within a 5-nautical mile (NM) radius from the surface to 1,000 feet above the airport elevation and an outer circle within a 10-NM radius from 1,200 feet to 4,000 feet above the airport elevation. The primary purpose of Class C airspace is to improve aviation safety by reducing the risk of midair collisions in the terminal area and enhancing the management of air traffic operations therein.

Class D airspace generally extends from the surface to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational ATC 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 those procedures. Arrival extensions for instrument approach procedures may be designated as Class D or Class E airspace.

Class E airspace is controlled airspace that is not Class A, B, C, or D. Class E airspace has several purposes, but those that relate to the alternative bases include controlled airspace around the airfields to protect the instrument approach procedures for those airfields and the airspace in which the Federal Airways used by en-route pilots are established.

Class G airspace is uncontrolled airspace that has not been designated as Class A, B, C, D, or E airspace. ATC does not have authority over operations within Class G airspace, where the primary users are general aviation pilots operating by VFR.

Most Restricted Areas (RAs) are designated joint use (i.e., IFR/VFR operations can be authorized by the controlling ATC facility when the airspace is not being utilized by the using agency). MOAs are also considered joint use airspace (i.e., nonparticipating pilots operating by VFR are permitted to enter a MOA, even when the MOA is active for military use). Pilots operating by IFR must remain clear of an active MOA unless approved by the responsible ATC agency. Flight by both participating and nonparticipating pilots operating by VFR is conducted under the "see-and-avoid" concept, which stipulates that when weather conditions permit, pilots operating by VFR are required to observe and maneuver to avoid other aircraft.

ATCAAs are contained in Class A airspace and are assigned by ATC for the purpose of providing air traffic segregation between military training activities and other IFR traffic. The U.S. Air Force (USAF) manages airspace in accordance with processes and procedures detailed in Air Force Instruction (AFI) 13-201, *Airspace Management*. AFI 13-201 implements Air Force Policy Directive (AFPD) 13-2, *Air Traffic, Airspace, Airfield, and Range Management*, and DoD

Directive 5030.19, *DoD Responsibilities on Federal Aviation*. AFI 13-201 addresses the development and processing of Special Use Airspace (SUA) and covers aeronautical matters governing the efficient planning, acquisition, use, and management of airspace required to support USAF flight operations. USAF management of training ranges involves the development and implementation of the processes and procedures required by AFI 13-212, *Range Planning and Operations*, to ensure that USAF ranges are planned, operated, and managed in a safe manner; that all required equipment and facilities are available to support range use; and that proper security for range assets is present. The overall purpose of range management is to balance the military's need to accomplish realistic testing and training with the need to minimize potential impacts of such activities on the environment and surrounding communities.

3.1.3 Methodology

Potential impacts to airspace use in the airfield environment at each alternative base and the SUA areas were assessed by comparing the projected AFRC F-35A and total sorties/flight operations, as appropriate, with baseline conditions. Because no modifications or additions are proposed for the current airspace structure at any of the alternative bases, this analysis focused primarily on what effects, if any, the proposed AFRC F-35A operations could have on other airspace uses.

3.2 NOISE

3.2.1 Definition of the Resource

Noise, which is defined simply as unwanted sound, has the potential to affect several environmental resource areas. In this Environmental Impact Statement (EIS), the noise analysis for each alternative base describes potential impacts of noise (e.g., human annoyance and health as well as physical effects on structures). Noise impacts to biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomics (e.g., property values), and environmental justice/protection of children are discussed in sections dedicated to those resources. The primary sources of noise considered in this EIS are aircraft operations at the alternative bases and in the training airspace. Other components of the proposed AFRC F-35A mission (e.g., construction, operation of Aerospace Ground Equipment [AGE] for maintenance purposes, and vehicle traffic) would produce transitory noise that would negligibly contribute to the overall noise environment. For the purposes of this noise analysis, the ROI for the proposed action and No Action Alternative includes areas that experience aircraft noise at each alternative base, training airspace, and areas overflown by pilots traveling to and from the training airspace.

Noise and sound are expressed in logarithmic units of decibels (dB). A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB; sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 to 140 dB are felt as pain (Berglund and Lindvall 1995). The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. The human ear perceives a doubling (or halving) of a sound's loudness when the sound level changes by 10 dB and a quadrupling (or quartering) of loudness when the sound level changes by 20 dB.

All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or hertz (Hz). To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements usually employ an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to

add the “A” to the measurement unit in order to identify that the measurement has been made with this filtering process (i.e., A-weighted decibels [dBA]). In this EIS, the dB unit refers to A-weighted sound levels. “C-weighting” is typically applied to impulsive sounds such as sonic booms, and are specially denoted in this EIS.

Because noise is a subjective experience, noise analysis requires assessing a combination of physical measurement of sound, physical and physiological effects, plus psycho- and socio-acoustic effects. Individual response to noise depends on several non-acoustic factors, including, but not limited, to the person’s perceived importance of the noise, its appropriateness in the setting, the time of day, and the activity the person is involved in when the noise occurs. Further information on noise effects, metrics, modeling, and related information is contained in Appendix B.

3.2.1.1 Noise Metrics

In accordance with DoD guidelines and standard practice for environmental impact analysis documents, the noise analysis in this EIS uses multiple descriptors (known as metrics) to provide a thorough description of noise levels and impacts.

Maximum Noise Level (L_{max}). The L_{max} is the highest sound level measured during a single event in which the sound level changes with time (e.g., an aircraft overflight). During an aircraft overflight, the sound level starts at the ambient level (i.e., background sound level without aircraft noise), rises to the maximum level as the aircraft is nearest to the observer, and returns to the background level as the aircraft recedes into the distance. L_{max} defines the maximum noise level occurring for a fraction of a second as measured by a sound level meter on ‘fast’ setting (generally 1/8th of a second). Maximum noise levels generated by several aircraft types in flight configurations used near airfields are listed in Table 3-1. Maximum noise levels generated by several aircraft types in typical training airspace flight configurations are listed in Table 3-2. In this EIS, L_{max} is used to predict speech interference and for comparison between aircraft noise levels.

Table 3-1. Maximum Noise Levels (L_{max}) in Takeoff and Landing Configurations

Aircraft (engine type)	Power Setting	Power Unit	L_{max} Values (in dB) at Varying Distances (in feet) ^a				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations (at 300 knots airspeed)							
F-35A ^b	100%	ETR	119	111	103	90	79
F-35A (afterburner)	150%	ETR	124	117	108	97	87
A-10A	6,200	NF	100	92	82	67	56
B-1 ^c	97.5%	RPM	113	105	97	83	71
F-15 (P220)	90%	NC	112	104	96	84	73
F-16 (P229)	93%	NC	114	106	98	85	74
F-22	100%	ETR	120	113	104	92	81
Landing/Arrival Operations (at 160 knots airspeed)							
F-35A ^b	40%	ETR	100	93	85	72	60
A-10A	5,225	NF	97	89	79	59	45
B-1	90%	RPM	105	97	89	75	63
F-15 (P220)	75%	NC	91	84	76	65	54
F-16 (P229)	83.5%	NC	93	86	78	65	54
F-22	43%	ETR	111	104	96	83	71

^a Engine power settings are not constant during flight. Power settings shown are typical.

^b Based on field noise level measurements conducted at Edwards Air Force Base (AFB) in 2013.

^c B-1 departure modeled with afterburner because afterburner is almost always used with this aircraft.

Key: Engine Unit of Power: RPM=revolutions per minute; ETR=engine thrust request; NC=engine core RPM; and NF=engine fan RPM.

Source: SELCALC3 using standard weather conditions of 59 degrees Fahrenheit (°F) and 70 percent relative humidity.

Table 3-2. Maximum Noise Levels (L_{max}) in Training Airspace and Cruise Configurations

Aircraft (engine type)	Power Setting/Unit	Speed (knots)	L_{max} Values (in dBA) at Varying Distances (in feet) ^a				
			500	1,000	2,000	5,000	10,000
Representative Training Airspace Flight Configuration							
F-35A ^b	90% ETR	425	117	110	101	89	77
A-10A	5,333 NF	300	98	90	80	61	47
F-15E (PW220)	81% NC	500	100	94	86	76	67
F-16 (GE100)	95.4% NC	500	102	94	86	74	62
F/A-18E/F	90.5% NC	500	114	107	99	85	73
Cruise							
F-35A ^b	35% ETR	350	96	89	81	69	57
A-10A	87% NC	250	98	90	80	61	47
F-15E (PW220)	82% NC	500	102	95	88	78	69
F-16 (GE100)	90% NC	350	94	86	78	66	54
F/A-18E/F	84% NC	300	108	100	92	78	65

^a Engine power settings are not constant during flight. Power settings shown are typical during level, steady, high-speed flight.

^b Based on field noise level measurements conducted at Edwards AFB in 2013.

Key: Engine Unit of Power: RPM=revolutions per minute; ETR=engine thrust request; NC=engine core RPM; and NF=engine fan RPM.

Source: SELCALC3 using standard weather conditions of 59 °F and 70 percent relative humidity.

Sound Exposure Level (SEL). The SEL represents both the sound level of a single event and its duration. It captures the total sound energy from the beginning of the acoustic event to the point when the sound is no longer heard. The SEL metric represents all of the noise energy of an event as if it occurred within a single second. The noise generated by an aircraft overflight typically lasts for multiple seconds; therefore, the SEL (representing the energy in all of those seconds) for an event is typically higher than the L_{max} (which is momentary). SELs generated by several aircraft types in flight configurations used near airfields are listed in Table 3-3. SELs generated by several aircraft types in typical training airspace flight configurations are listed in Table 3-4. In this EIS, SEL is used to predict the probability of awakening.

Table 3-3. Sound Exposure Levels in Takeoff and Landing Configurations

Aircraft (engine type)	Power Setting	Power Unit	SEL Values (in dB) at Varying Distances (in feet) ^a				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations (at 160 knots airspeed)							
F-35A ^b	100%	ETR	125	119	113	103	95
A-10A	6,200	NF	105	99	91	80	71
B-1 ^c	97.5%	RPM	119	113	106	96	86
F-15 (P220)	90%	NC	120	115	109	100	91
F-16 (P229)	93%	NC	119	114	107	98	89
F-22	100%	ETR	127	121	115	106	98
Landing/Arrival Operations (at 160 knots airspeed)							
F-35A ^b	40%	ETR	107	102	95	86	76
A-10A	5,225	NF	98	92	83	67	55
B-1	90%	RPM	111	105	98	88	79
F-15 (P220)	75%	NC	99	94	88	79	71
F-16 (P229)	83.5%	NC	97	92	86	77	68
F-22	43%	ETR	115	109	103	94	85

^a Engine power settings are not constant during flight. Power settings shown are typical.

^b Based on field noise level measurements conducted at Edwards AFB in 2013.

^c B-1 departure modeled with afterburner because afterburner is almost always used with this aircraft. All other aircraft-type departure noise levels are modeled without afterburner.

Key: Engine Unit of Power: RPM=revolutions per minute; ETR=engine thrust request; NC=engine core RPM; and NF=engine fan RPM.

Source: SELCALC3 using standard weather conditions of 59 °F and 70 percent relative humidity

Table 3-4. Sound Exposure Levels in Training Airspace and Cruise Configurations

Aircraft (engine type)	Power Setting	Power Unit	Speed (knots)	SEL Values (in dB) at Varying Distances (in feet) ^a				
				500	1,000	2,000	5,000	10,000
Representative Training Airspace Flight Configuration								
F-35A ^b	90%	ETR	425	120	114	107	97	87
A-10A	5,333	NF	300	97	91	83	66	53
F-15 (P220)	81%	NC	500	101	97	93	86	79
F-16 (GE-100)	95.4%	NC	500	105	99	93	83	73
F/A-18E/F	90.5%	NC	500	115	109	103	92	81
Cruise								
F-35A ^b	35%	ETR	350	99	94	88	78	68
A-10A	87%	NC	250	98	92	83	66	54
F-15 (P220)	82%	NC	500	103	99	95	88	81
F-16 (GE-100)	90%	NC	350	97	91	85	75	65
F/A-18E/F	84%	NC	300	112	106	99	88	77

^a Engine power settings are not constant during flight. Power settings shown are typical.

^b Based on field noise level measurements conducted at Edwards AFB in 2013.

Key: Engine Unit of Power: RPM=revolutions per minute; ETR=engine thrust request; NC=engine core RPM; and NF=engine fan RPM.

Source: SELCALC3 using standard weather conditions of 59 °F and 70 percent relative humidity.

Equivalent Noise Level (L_{eq}). The L_{eq} represents aircraft noise levels decibel-averaged over a specified time period. The L_{eq} is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$) or a 24-hour period (denoted L_{eq24}).

Day-Night Average Sound Level (DNL). The DNL noise metric is the decibel-averaged sound level measured over a 24-hour period, with a 10 dB penalty assigned to noise events occurring between 10:00 P.M. and 7:00 A.M. to account for added intrusiveness of late night noise. DNL is the preferred noise metric of the U.S. Department of Housing and Urban Development (HUD), FAA, U.S. Environmental Protection Agency (USEPA), and DoD. Studies of community annoyance in response to numerous types of environmental noise show that there is a positive correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise (refer to Appendix B for details). The DNLs referenced in this EIS are A-weighted unless otherwise noted. The DNL metric is used to predict the likelihood of annoyance in response to noise and is the basis for land use compatibility recommendations. Similar to the ‘Time-Weighted Average’ noise metric referenced in workplace noise regulations, DNL averages noise levels over an extended period of time (see Section 3.2.3). However, DNL is specifically designed to account for additional annoyance associated with late-night noise events.

Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}) is a version of DNL that has been modified to account for the nature of flying operations in training airspace. While aircraft operations at airfields tend to be continuous or patterned, operations in airspace are sporadic and dispersed. L_{dnmr} also accounts for the specific effects of low-altitude and high-speed operations that can occur in airspace such as MOAs or RAs. Because military jet aircraft can exhibit a rate of increase in sound level (onset rate) of up to 150 dB per second, the L_{dnmr} metric is adjusted to account for the startle effect with addition of up to 11 dB to the normal SEL. Unlike the use of DNL around airfields, the land use compatibility guidelines do not readily apply to land use under military airspace. The implications of increased L_{dnmr} depend upon the underlying land uses and the degree of change in noise levels.

C-weighted Day-Night Average Sound Level (CDNL) is a variation of DNL used to describe the frequency and intensity of impulsive noises such as sonic booms. Peak overpressure, measured in pounds per square foot, is used to characterize the strength of a single impulsive noise such as a sonic boom.

3.2.2 Regulatory Setting

Because legal limits on allowable noise levels could, in some cases, reduce the combat effectiveness of military equipment, military equipment is exempt from regulations that impose noise limitations. However, several policies and regulations are in place to limit the effects of military noise.

The USAF recognizes that noise-sensitive land uses are not compatible with elevated aircraft noise levels and has implemented the Air Installations Compatible Use Zones (AICUZ) program, as described in AFI 32-7063, *Air Installations Compatible Use Zones Program*, and Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones (AICUZ)*, to minimize incompatible land use. In 1992, the Federal Interagency Committee on Noise (FICON) established a set of guidelines detailing which land uses are recommended as compatible at which noise levels; these guidelines have been adopted as part of the AICUZ program. These guidelines are provided to state and local communities as recommendations only, and a recommendation that a certain land use is incompatible with residential use does not mean that the land is uninhabitable.

Areas with DNL of 65 to 74 dB are considered “generally incompatible” with noise-sensitive land uses (e.g., residences, schools, hospitals, and public services). Although discouraged, residential development is compatible within the 65–69 and 70–74 dB DNL contours, provided noise reduction levels of 25 dB and 30 dB, respectively, are achieved. Commercial/retail businesses are compatible without restrictions up to 69 dB, and up to 79 dB DNL, provided that minimum noise reduction levels are achieved for public areas. Industrial/manufacturing, transportation, and utility land uses are less noise-sensitive, and, therefore, are considered compatible within the higher noise exposure zones.

Workers in known high-noise exposure locations could be required to wear hearing protection devices, including, but not limited to, earplugs and earmuffs. The hearing conservation programs at each alternative base are conducted in accordance with AFI 48-127, *Occupational Noise and Hearing Conservation Program*, DoDI 6055.12, *DoD Hearing Conservation Program*, and Title 29 of the *Code of Federal Regulations (CFR)* Section 1910.95, *Occupational Noise Exposure*. The Bioenvironmental Engineering Office administers the Hearing Conservation Program at each of the alternative bases. Representatives from the Bioenvironmental Engineering Office visit facilities in which workers could potentially be exposed to noise levels exceeding noise exposure thresholds. A health risk assessment involving dosimeter testing of a representative sample of employees is conducted. An audiometric monitoring program is initiated if noise exposure exceeds established thresholds.

Per DoD policy, the 80 dB DNL noise contour is used to identify populations most at risk of potential hearing loss (USD 2009). In cases in which people are exposed to DNL greater than 80 dB on a regular basis, the policy directs that methodology defined in USEPA report number 550/9-82-105 be used to quantify the risk (Section 3.2.3).

3.2.3 Methodology

3.2.3.1 Base Vicinity

Noise levels near the bases were modeled using NOISEMAP, version 7.3. NOISEMAP references a database of field-measured sound levels generated by each aircraft type in various flight configurations. In accordance with current USAF policy, NOISEMAP runs were conducted using the topographic effects module, which accounts for the effects of local terrain and ground surface type on the propagation of sound. In accordance with current DoD and USAF policies, noise levels were calculated for an Annual Average Day, which is defined as a day with 1/365th of total annual

operations. Median atmospheric conditions for sound propagation were selected from local climate data for use in noise modeling. NOISEMAP runs used F-35A engine power, airspeed, and altitude profiles provided by F-35A pilots at other installations where the aircraft is currently based. As described in Section 2.3.3, as the F-35A program has matured over the last several years, information from other USAF installations indicates that F-35A pilots are using afterburner on a higher number of takeoffs. As shown on Figure 3-1, use of afterburner allows the aircraft to accelerate faster and reach takeoff airspeeds earlier than standard military power departures. During afterburner takeoffs, the aircraft typically leaves the ground sooner and is at slightly higher altitudes throughout the climbout compared to standard military power takeoffs.

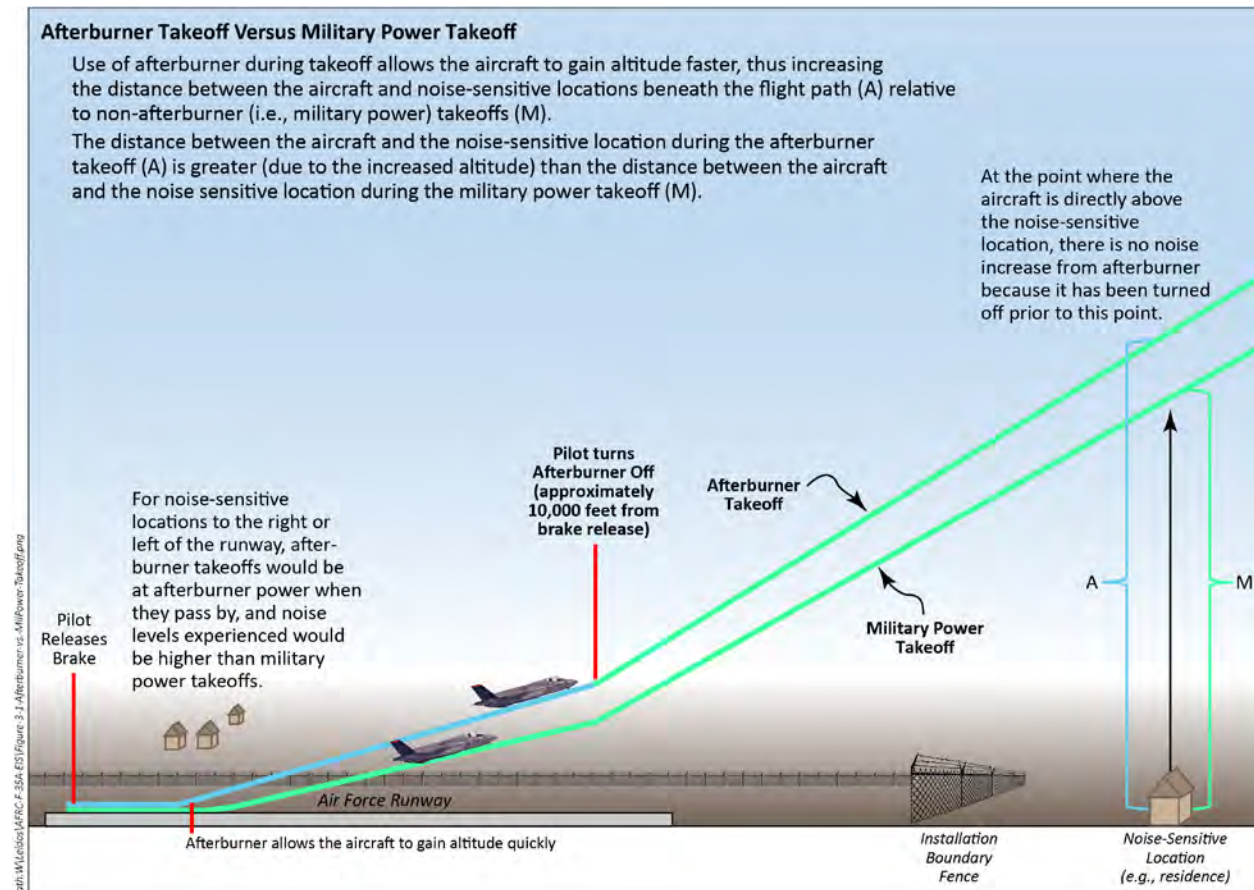


Figure 3-1. Afterburner Takeoff versus Military Power Takeoff

During afterburner takeoffs, F-35A pilots typically turn the afterburner off at approximately 10,000 feet from brake release to conserve fuel and avoid accelerating beyond airspeeds allowable near an installation. After turning the afterburner off, the aircraft continues its climb at standard military power (i.e., the same power setting used by pilots conducting standard military power takeoffs). At locations perpendicular to the runway, the increased noise generated by the afterburner results in maximum noise levels being slightly louder, as measured in A-weighted sound levels, than standard military power takeoffs. However, locations further down the aircraft flight path are overflown at slightly higher altitudes and the same engine power setting during afterburner takeoffs than during standard military power takeoffs. As a result, afterburner takeoff overflight noise levels are often slightly less loud than standard military power takeoff noise levels at locations beyond the end of the runway due to the difference in the distance between the aircraft and the noise-sensitive location.

For this EIS, the USAF evaluated three different scenarios for afterburner use: Scenario A is afterburner use on 5 percent of total takeoffs, Scenario B is afterburner use on 50 percent of total takeoffs, and Scenario C is afterburner use on 95 percent of total takeoffs.

Flight paths, pattern altitudes, and other operational parameters specific to each alternative base were used following current base procedures. Noise modeling of the proposed AFRC F-35A mission reflects the noise that would be generated by AFRC F-35A aircraft operations combined with noise generated by ongoing based and transient aircraft operations that would continue under all alternatives. The analysis does not include aircraft operations at other airfields. When airfields are located near each other, airspace near each airfield is apportioned to provide separation between aircraft operating under guidance from the ATC tower at each airfield. Although noise generated by aircraft operating at nearby airfields could be audible within the ROI, pilots typically operate in separate volumes of airspace during departure, pattern maneuvers, and final approach to land (i.e., the loudest phases of flight).

Areas exposed to elevated DNL are shown using contours at 5-dB increments from 65 to 85 dB. Elevated DNL implies that overflight noise is particularly frequent and intense. In general, noise levels are highest on and near airfields and decrease with distance from the airfield. Frequently used flight paths are often reflected by elevated time-averaged noise levels.

The number of off-base residents within each 5-dB DNL increment was estimated using U.S. Census 2017 American Community Survey (ACS) data at the block group level. First, the fraction of each census block that occurs within each noise level increment was calculated. Then the census block's population was apportioned to inside or outside of the noise level increment based on the fraction of the census block affected. The accuracy of the population estimates was improved by excluding areas not classified as being used for residential purposes. This method assumes an even distribution of population within the residential portions of census blocks. The U.S. Census counts permanent residents; non-permanent residents are not counted using this method.

3.2.3.1.1 Annoyance

Annoyance is the most common impact associated with aircraft noise. Social surveys have found that, in areas exposed to higher DNL, individuals are more likely to become highly annoyed by the noise (see Appendix B for additional details). Individuals have variable sensitivity to noise depending on a number of factors. Extreme examples of noise-sensitivity can be found in people on the autism spectrum or those afflicted with post-traumatic stress disorder.

3.2.3.1.2 Speech Interference

Interference with conversation and other communication-related activities is one of the most common complaints received about noise. Communication could be interrupted when background noise levels (e.g., the noise generated by aircraft overflights) exceed 50 dB L_{max} . The number of speech interference events is quantified by the average number of daytime (7:00 A.M. to 10:00 P.M.) events per hour exceeding 50 dB L_{max} . Indoor events account for 15 or 25 dB of noise attenuation (i.e., windows open or closed, respectively).

3.2.3.1.3 Classroom Interference

Noise can interfere with learning by interfering with communication and by disrupting concentration. American National Standards Institute (ANSI) guidelines recommend limiting background transportation noise levels to 35-40 dB L_{eq} (depending on classroom size) and limiting single events to less than 50 dB L_{max} (ANSI 2009). Noise generated by sources other than aircraft (e.g., ground vehicle traffic, air conditioning systems, etc.) are outside the scope of this analysis and

are assumed to be minimal. This EIS provides the indoor L_{eq} and average number of events per hour exceeding 50 dB L_{max} during the school day (7:00 A.M. to 4:00 P.M.) with windows closed and with windows open. This EIS also includes the number of daytime (7:00 A.M. to 10:00 P.M.) events per hour exceeding 50 dB L_{max} outside the school. The outdoor noise level is not part of ANSI criteria, but would be relevant to assessing potential noise impacts to sports, recess, and other school-related activities that occur outside the school building.

3.2.3.1.4 *Sleep Disturbance*

Lack of quality sleep has the potential to affect health and concentration. This EIS includes the probability of being awakened at least once per night by overflights occurring between 10:00 P.M. and 7:00 A.M. (when most people sleep). Following a procedure published by the ANSI, the probability of being awakened by each overflight type was first calculated based on the overflight SEL (ANSI 2008). Next, the probabilities of being awakened by each type of event were summed to determine overall probability of being awakened at least once per night. Results are presented for people sleeping indoors with windows open and for people sleeping indoors with windows closed. The calculations account for 15 dB of structural noise level reduction with windows open and 25 dB of structural noise-level reduction with windows closed.

3.2.3.1.5 *Potential for Hearing Loss*

Risk of noise-related hearing loss has been extensively studied, with most studies conducted in workplace environments. Populations exposed to DNL greater than 80 dB are at the greatest risk of potential hearing loss, and DoD policy calls for estimation of long-term Noise-Induced Permanent Threshold Shift (NIPTS) risk in such areas using a process defined in the USEPA's *Guideline for Noise Impact Analysis* (Undersecretary of Defense for Acquisition Technology and Logistics 2009). A permanent threshold shift is a change in the lowest sound level audible that does not disappear over time. Some hearing loss is normal as people age, and the NIPTS is specifically defined as the difference in threshold shifts between people exposed to noise and those who are not exposed. Numerically, the NIPTS is the change in threshold averaged over several frequencies that can be expected from exposure lasting 8 hours per day, 5 days per week starting at age 20 and continuing for 40 years. Because individual sensitivity to noise varies, NIPTS is estimated for a person with average sensitivity and for a person in the most sensitive 10 percent of the population. Many people spend at least part of their day indoors, where aircraft noise levels are lower. A 2-year USEPA-sponsored telephone survey of more than 9,000 persons found that the average American spends approximately 87 percent of their time indoors (Klepeis et al. 2001). This percentage was found to be fairly constant across the 48 contiguous United States. Table 3-5 shows the "average NIPTS" and the "10th percentile" NIPTS as a function of L_{eq24} if the person is fully exposed to the noise level at his or her residence (i.e., outdoors 100 percent of the time) or if he or she is outdoors for the national average 13 percent of the day. It was assumed for the purposes of this study that residents would remain at their residences 24 hours per day, 365 days per year.

Table 3-5. Estimated Average Noise-Induced Permanent Threshold Shift and 10th Percentile Noise-Induced Permanent Threshold Shift as a Function of L_{eq24}

L_{eq24} (dB) ^a	100 Percent of Time Outdoors		National Average Percentage of Time Outdoors	
	Average NIPTS (dB) ^b	10th Percentile NIPTS (dB) ^b	Average NIPTS (dB) ^b	10th Percentile NIPTS (dB) ^b
80–81	3	7	N/A ^c	N/A ^c
81–82	3.5	8	N/A ^c	N/A ^c
82–83	4	9	1	3.5
83–84	4.5	10	1	4

Table 3-5. Estimated Average Noise-Induced Permanent Threshold Shift and 10th Percentile Noise-Induced Permanent Threshold Shift as a Function of L_{eq24} (Continued)

L_{eq24} (dB) ^a	100 Percent of Time Outdoors		National Average Percentage of Time Outdoors	
	Average NIPTS (dB) ^b	10th Percentile NIPTS (dB) ^b	Average NIPTS (dB) ^b	10th Percentile NIPTS (dB) ^b
84–85	5.5	11	1.5	4.5
85–86	6	12	2	5.5
86–87	7	13.5	2.5	6.5
87–88	7.5	15	3	7
88–89	8.5	16.5	3.5	8
89–90	9.5	18	4	9

^a Relationships between DNL and NIPTS were derived from *Environmental Impact Statements with Respect to Noise* (CHABA 1977).

^b NIPTS values rounded to the nearest 0.5 dB.

^c Equivalent exposure noise level is less than 75 dB DNL, below the threshold at which NIPTS has been demonstrated to occur.

To put these changes in time-averaged noise level (DNL) in perspective, a 3-dB change in instantaneous noise level is typically barely perceptible to a person with normal hearing in a non-laboratory setting. Furthermore, no known evidence suggests that a NIPTS of 5 dB is perceptible or has any practical significance for the individual. Lastly, the variability in audiometric testing is generally assumed to be ± 5 dB (USEPA 1974).

The preponderance of available information on risk of hearing loss for the adult working population is from the workplace with continuous exposure throughout the day for many years. According to *Long Term Effects of Military Jet Aircraft Noise Exposure During Childhood on Hearing Threshold Levels*, military personnel who as children had lived in or near stations where jet operations were based had no significant differences in audiometric test results compared to a similar group who had no such exposure as children (Ludlow and Sixsmith 1999). For the purposes of hearing loss analysis, it could be assumed that the limited data on hearing loss are applicable to the general population, including children, and provide a conservative estimate of hearing loss.

3.2.3.1.6 Workplace Noise

In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dB as an 8-hour, time-weighted average. This exposure limit was reevaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss (NIOSH 1998). Following the reevaluation using a new risk assessment technique, NIOSH published another criteria document in 1998 which reaffirmed the 85 dB recommended exposure limit (NIOSH 1998). Active-duty and reserve components of the USAF, as well as civilian employees and contractor personnel working on USAF bases and Air Guard stations, must comply with Occupational Safety and Health Administration (OSHA) regulations (29 CFR § 1910.95), DoDI 6055.12., AFI 48-127 (February 2016), and the Occupational Noise and Hearing Conservation Program (including material derived from the International Standards Organization 1999.2, *Acoustics-Determination of Occupational Noise Exposure and Estimation of Noise Induced Impairment*). Per AFI 48-127, the Hearing Conservation Program is designed to protect workers from the harmful effects of hazardous noise by identifying all areas where workers are exposed to hazardous noise.

3.2.3.1.7 Non-Auditory Health

Non-auditory health effects of long-term noise exposure have not been documented at levels below those at which noise-induced hearing loss is a substantial risk. Research studies regarding the non-auditory health effects of aircraft noise are ambiguous and often contradictory. The potential for

noise to affect physiological health, such as the cardiovascular system, was identified as a concern during scoping; however, no unequivocal evidence exists to support any links between noise and physiological health (Harris 1997). Other topics that are unsupported include flyover noise producing increased mortality rates, increase in admissions to mental hospitals, and adverse effects on pregnant women and fetuses (Harris 1997).

3.2.3.1.8 Animals in the Care of Humans

The reactions of animals in the care of humans (e.g., pets, other domesticated animals, and animals kept in zoos) to noise depends on several factors including temperament, training, and past experiences associated with the noise. Aircraft approaching and departing the airfield typically operate at airspeeds and altitudes such that there is some time between when the aircraft is first heard and the maximum noise of the overflight. The relatively slow rise-time of sounds during overflights near the base tends to be less frightening to animals than sudden onset noise. Even so, some animals could react strongly to noise generated by aircraft overflights. Horses can be particularly prone to strong reactions, and can pose a risk to riders if they are not accustomed to the noise. Animals tend to become accustomed to noise over time if the noise is not accompanied by any unpleasant experiences.

3.2.3.2 Airspace

3.2.3.2.1 Subsonic

Subsonic flight activity for the airspace and ranges considers the following factors in the noise analysis: flight operations, flight durations, flight areas and/or tracks, flight profiles, and climatological data. Modeled flight operations are summarized in each alternative's section. The MR_NMAP computer program model was used to calculate L_{dnmr} values for average daily aircraft subsonic flight operations during the busiest month for each modeled airspace unit. For the defined airspace units, single L_{dnmr} noise levels were calculated from the MR_NMAP program. Airspace units used and scheduled together consistently were assessed as one area.

For airspace environments where noise levels are calculated to be less than 45 dB, the noise levels are stated as "<45." This annotation is used because in calculating time-averaged sound levels, the reliability of the results varies at lower noise levels. This arises from the increasing variability of individual aircraft sound levels at the longer distances (greater than 1 mile versus less than 1 mile) due to atmospheric effects on sound propagation and the presence of other ambient sources of noise.

Time-averaged outdoor sound levels less than 45 dB are substantially less than any currently accepted guidelines for aircraft noise compatibility. As discussed under land use, most of the guidelines for the acceptability of aircraft noise are on the order of 65 dB and greater.

3.2.3.2.2 Supersonic

Aircraft exceeding the speed of sound create a sonic boom, but the sonic boom does not always reach the ground. A sonic boom is characterized by a rapid increase in pressure, followed by a decrease before a second rapid return to normal atmospheric levels. This change occurs very quickly, usually within a few tenths of a second. It is usually perceived as a "bang-bang" sound. The amplitude of a sonic boom is measured by its peak overpressure, in pounds per square foot. The amplitude depends on the aircraft's size, weight, geometry, Mach number, and flight altitude. Altitude is usually the biggest single factor. Maneuvers (turns, dives, etc.) also affect the amplitude of particular booms. As altitude increases, air temperature and sound speed decrease. These layers of sound speed change, causing sonic booms to be turned upward as they travel toward the ground.

Depending on the altitude of the aircraft and the Mach number, many sonic booms can be bent upward such that they never reach the ground. This phenomenon, referred to as “cutoff,” also acts to limit the amount of area affected by sonic booms that do reach the ground.

The overpressures of booms that reach the ground are well below those that would begin to cause physical injury to humans or animals (see Appendix B). They can, however, be annoying, and can cause startle reaction in humans and animals. On occasion, sonic booms can cause physical damage (e.g., to a window) if the overpressure is of sufficient magnitude. The condition of the structure is a major factor when damage occurs, the probability of which, tends to be low. For example, the probability of a 1 pound per square foot boom (approximate average overpressure in airspace) breaking a window is between one in one billion (Sutherland 1990) to one in one million (Hershey and Higgins 1976). Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it will often crack due to shrinkage while curing or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high as a result of these factors. In general, for well-maintained structures, the threshold for damage from sonic booms is 2 pounds per square foot (Haber and Nakaki 1989), below which damage is unlikely.

Training for air combat usually begins with opposing aircrews setting up at opposite edges of the training airspace and then proceeding toward each other. Aircraft can become supersonic at various times during an engagement exercise. Supersonic flight segments can occur as the aircraft accelerate toward each other, during dives in the engagement itself, and during disengagement. Most supersonic flight occurs within a generally elliptical region aligned between the setup points. The long-term, average pattern of sonic booms experienced on the ground, as quantified by CDNL and numbers of booms, reflects this pattern of flight.

Modeling of supersonic flight activity considers the following factors: airspace geometry, flight operations, flight durations, flight areas, flight profiles (altitude distribution, maneuver characteristics), and atmospheric effects. The BOOMAP computer model was used to calculate CDNL for average daily aircraft supersonic flight operations for each area in which supersonic flight would be conducted. This EIS shows single tabulated CDNL levels in applicable airspace and defines the number of booms per day.

3.3 AIR QUALITY

3.3.1 Resource Definition

Air quality in a given location is defined by the size and topography of an air basin, the air emissions that occur within and outside of the air basin, local and regional meteorological influences, and the resulting types and concentrations of pollutants in the atmosphere. The significance of a pollutant concentration is often determined by comparing its concentration to an appropriate national or state ambient air quality standard. These standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. The USEPA established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter less than or equal to 10 micrometers in diameter (PM₁₀), particulate matter less than or equal to 2.5 micrometers in diameter (PM_{2.5}), and lead. Units of concentration for the NAAQS are generally expressed in parts per million (ppm) or micrograms per cubic meter (µg/m³). Table 3-6 presents the NAAQS. The following paragraph contains the specific attainment definitions for each criteria pollutant.

Table 3-6. National Ambient Air Quality Standards

Pollutant	Averaging Time	National Standards ^a	
		Primary ^b	Secondary ^c
O ₃	8-hour	0.070 ppm (137 µg/m ³)	Same as primary
CO	8-hour	9 ppm (10 mg/m ³)	NA
	1-hour	35 ppm (40 mg/m ³)	NA
NO ₂	Annual	0.053 ppm (100 µg/m ³)	Same as primary
	1-hour	0.10 ppm (188 µg/m ³)	NA
SO ₂	3-hour	NA	0.5 ppm (1,300 µg/m ³)
	1-hour	0.075 ppm (196 µg/m ³)	NA
PM ₁₀	24-hour	150 µg/m ³	Same as primary
PM _{2.5}	Annual	12 µg/m ³	15 µg/m ³
	24-hour	35 µg/m ³	Same as primary
Lead	Rolling 3-month period	0.15 µg/m ³	Same as primary

^a Concentrations are expressed first in units in which they were promulgated. Equivalent units are included in parentheses.

^b Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

^c Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Key: NA = not applicable

The NAAQS 8-hour O₃ standard is attained when the 3-year average of the fourth-highest daily maximum 8-hour concentration measured each year is less than or equal to 0.070 ppm. For CO and PM₁₀, the NAAQS are not to be exceeded more than once per year. The NAAQS annual NO₂ standard is attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm. The 1-hour NO₂ standard is attained when the 3-year average of the 98th percentile of the daily maximum 1-hour average concentration does not exceed 0.10 ppm. For SO₂, the primary NAAQS is attained when the 99th percentile of 1-hour daily maximum concentrations, averaged over 3 years, is less than or equal to 0.075 µg/m³. The NAAQS PM_{2.5} standards are attained when the annual arithmetic mean concentration is less than or equal to 12 µg/m³ and when the 98th percentile of the 24-hour concentration is less than or equal to 35 µg/m³, both averaged over 3 years.

O₃ concentrations are typically highest during the warmer months of the year and coincide with periods of high insolation. However, there are circumstances that can contribute to higher levels of ozone under cooler temperatures. Maximum O₃ concentrations tend to be homogeneously spread throughout a region, as it often takes several hours to convert precursor emissions to O₃ (mainly nitrogen oxides [NO_x] and photochemically reactive volatile organic compounds [VOCs]) in the atmosphere. Inert pollutants, such as CO, tend to have the highest concentrations during the colder months of the year, when light winds and nighttime/early morning surface-based temperature inversions inhibit atmospheric dispersion. Maximum inert pollutant concentrations are usually found near an emission source.

3.3.1.1 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. GHG emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. Human activities are contributing to climate change, primarily

by releasing GHGs into the atmosphere. Climate change refers to any significant change in the measures of climate lasting for an extended period of time (USEPA 2016). The U.S. Global Change Research Program (USGCRP) report, *Climate Science Special Report: Fourth National Climate Assessment* (USGCRP 2017), states the following:

- Global annually averaged surface air temperature has increased by about 1.8°F (1.0°C) over the last 115 years (1901–2016). This period is now the warmest in the history of modern civilization.
- It is extremely likely that human activities, especially emissions of GHGs, are the dominant cause of the observed warming since the mid-20th century.
- Over the next few decades (2021–2050), annual average temperatures are expected to rise by about 2.5°F for the United States, relative to the recent past (average from 1976–2005), under all plausible future climate scenarios.
- Many other aspects of global climate are changing, including rising oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor.
- Global average sea level has risen by about 7 to 8 inches since 1900, a rate that is greater than during any preceding century in at least 2,800 years. Global sea level rise has already affected the United States; the incidence of daily tidal flooding is accelerating in more than 25 Atlantic and Gulf Coast cities. Global average sea levels are expected to continue to rise by at least several inches in the next 15 years and by 1 to 4 feet by 2100. A rise of as much as 8 feet by 2100 cannot be ruled out. Sea level rise will be higher than the global average on the East and Gulf Coasts of the United States.
- Annual trends toward earlier spring melt and reduced snowpack are already affecting water resources in the western United States and these trends are expected to continue. Under higher emission scenarios and assuming no change to current water resources management, chronic, long-duration hydrological drought is increasingly possible before the end of this century.
- The magnitude of climate change beyond the next few decades will depend primarily on the amount of GHGs (especially carbon dioxide [CO₂]) emitted globally. Without major reductions in emissions, the increase in annual average global temperature relative to preindustrial times could reach 9°F (5°C) or more by the end of this century. With significant reductions in emissions, the increase in annual average global temperature could be limited to 3.6°F (2°C) or less.

GHGs include water vapor, CO₂, methane (CH₄), nitrous oxide, O₃, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its lifetime and ability to trap heat in the atmosphere. The GWP rating system is standardized to CO₂, which has a value of one. For example, CH₄ has a GWP of 28, which means that it has a global warming effect 28 times greater than CO₂ on an equal-mass basis (USGCRP 2017). To simplify GHG analyses, total GHG emissions from a source are often expressed as a carbon dioxide equivalent (CO₂e). The CO₂e is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While CH₄ and nitrous oxide have much higher GWPs than CO₂, CO₂ is emitted in such greater quantities that it is the overwhelming contributor to global CO₂e emissions from both natural processes and human activities.

The potential effects of GHG emissions generated by the proposed AFRC F-35A mission are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Nonetheless, GHG emissions from the proposed AFRC F-35A mission have been quantified in this Draft EIS for use as indicators of their potential contributions to climate change effects.

3.3.2 Regulatory Setting

The Clean Air Act (CAA) and its subsequent amendments establish air quality regulations and the NAAQS, and delegate the enforcement of these standards to the states. The CAA establishes air quality planning processes and requires states to develop a State Implementation Plan (SIP) that details how they will maintain the NAAQS or attain a standard in nonattainment within mandated timeframes. The requirements and compliance dates for attainment are based on the severity of the nonattainment classification of the area. The following summarizes the air quality rules and regulations that apply to the proposed AFRC F-35A mission.

3.3.2.1 Federal Regulations

CAA Section 176(c) and USEPA's General Conformity Rule (GCR) generally prohibit federal agencies from engaging in, supporting, permitting, or approving any activity that does not conform to the most recent USEPA-approved SIP. This means that federal projects in such areas or other activities using federal funds or requiring federal approval (1) will not cause or contribute to any new violation of an NAAQS; (2) will not increase the frequency or severity of any existing violation; or (3) will not delay the timely attainment of any standard, interim emission reduction, or other milestone. The USEPA's GCR regulations implementing the prohibitions of CAA Section 176(c) are promulgated at 40 *CFR* Part 93, Subpart B.

The GCR applies to federal actions affecting areas that are in nonattainment of an NAAQS, and to designated maintenance areas (attainment areas that have been reclassified from a previous nonattainment status and are required to prepare an air quality maintenance plan). Conformity requirements only apply to nonattainment and maintenance pollutants and their precursor emissions. Conformity determinations are required when the annual direct and indirect emissions that would result from a proposed federal action equal or exceed an applicable *de minimis* threshold. These thresholds vary by pollutant and the severity of nonattainment conditions in the region that would be affected by the proposed action. If the GCR applicability analysis shows that the net annual direct and indirect emissions generated by the proposed AFRC F-35A actions in these areas will be below the applicable *de minimis* threshold of 100 tons per year of CO and VOCs/NO_x, respectively, then the action will be exempt from any further requirements under the GCR (40 *CFR* § 93.153(c)(1)).

As part of the Prevention of Significant Deterioration (PSD) Regulation, the CAA provides special protection for air quality and air quality-related values (including visibility and pollutant deposition) in selected areas of the U.S. (National Parks greater than 6,000 acres or National Wilderness Areas greater than 5,000 acres). These Class I areas are areas in which any appreciable deterioration of air quality is considered significant. In 1999, the USEPA promulgated a regional haze regulation that requires states to establish goals and emission reduction strategies to make initial improvements in visibility within their respective Class I areas. Visibility impairment is defined as a reduction in the visual range and atmospheric discoloration. Criteria to determine the significance of air quality impacts in Class I areas usually pertain to stationary emission sources, because mobile sources are generally exempt from permit review by regulatory agencies.

However, Section 169A of the CAA states the national goal of prevention of any future impairment of visibility within Class I areas from manmade sources of air pollution. Therefore, due to the proximity of these pristine areas to some areas proposed for aircraft operations, this Draft EIS provides qualitative analyses of the potential for emissions generated by the AFRC F-35A mission to affect visibility within these areas. The PSD program also includes permitting requirements and standards for new major stationary sources and major modifications to existing major stationary sources designed to prevent the air quality in attainment areas from deteriorating into nonattainment. Unless otherwise noted, none of the stationary source modifications under the proposed action or alternatives would trigger those PSD permitting requirements under either 40 *CFR* § 51.166 (state plan requirements) or 40 *CFR* § 52.21 (federal requirements for areas without an approved state plan). While these PSD regulatory permitting requirements only apply to stationary sources, the PSD permitting threshold of 250 tons per year for new stationary sources under either 40 *CFR* § 51.166(b)(1)(i)(b) or § 52.21(b)(1)(i)(b) was used as an initial indicator of significance or non-significance for any net annual construction and operational emission increases that would occur from an alternative located in areas that attain a NAAQS.

Hazardous air pollutants (HAPs) are air pollutants known or suspected to cause serious health effects or adverse environmental effects. HAPs are compounds that generally have no established ambient standards. The CAA identifies 187 substances as HAPs (e.g., benzene, formaldehyde, mercury, and toluene). HAPs are emitted from a range of industrial facilities and vehicles. The USEPA sets federal regulations to reduce HAP emissions from stationary sources. A “major” source of HAPs is defined as any stationary facility or source that directly emits or has the potential to emit 10 tons per year or more of any HAP or 25 tons per year or more of combined HAPs. The USEPA also sets ambient levels of concern for HAPs.

Under the CAA, state and local agencies can establish ambient air quality standards and regulations of their own, provided these are at least as stringent as the federal requirements. These state and local standards and regulations are described in the affected environment sections for each alternative base (see Draft EIS Sections DM3.3, HS3.3, FW3.3, and WM3.3).

3.3.2.2 *Greenhouse Gases*

The USEPA has promulgated several final regulations involving GHGs, either under the authority of the CAA, or as directed by Congress, but none of them apply directly to the proposed AFRC F-35A mission. At this time, climate change presents a global problem caused by increasing global atmospheric concentrations of GHG emissions. The current state of the science surrounding climate change does not support determining the global significance of local or regional emissions of GHGs from a particular action. Therefore, the quantitative analysis of CO₂e emissions contained in this EIS is intended only to disclose the local net effects of the proposed action and alternatives, and to potentially aid in making reasoned choices among alternatives.

3.3.3 **Methodology**

The air quality analysis estimated the magnitude of emissions that would be generated by proposed AFRC F-35A mission construction and operational activities at each alternative base. The estimation of operational impacts is based on the net change in emissions that would result from the replacement of existing aircraft operations with AFRC F-35A aircraft operations.

Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in

40 *CFR* 1508.27. This requires that the significance of an action be analyzed in respect to the setting of the action and based relative to the severity of the impact. For attainment area criteria pollutants, the project air quality analysis uses the USEPA's prevention of significant deterioration permitting threshold of 250 tons per year as an initial indicator of the local significance of potential impacts to air quality. It is important to note that these indicators only provide a clue to the potential impacts to air quality. In the context of criteria pollutants for which the proposed project region is in attainment of a NAAQS, the analysis compares the annual net increase in emissions estimated for each project alternative to the 250 tons per year prevention of significant deterioration permitting threshold. The prevention of significant deterioration permitting threshold represents the level of potential new emissions below which a new or existing minor, non-listed, stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for a project alternative is below 250 tons per year in the context of an attainment criteria pollutant, the indication is the air quality impacts would be insignificant for that pollutant. To be conservative, the analysis also uses the conformity *de minimis* threshold for a maintenance area of 100 tons per year as an initial indicator of the significance of potential impacts to attainment area criteria pollutant levels. In the case of criteria pollutants for which the proposed project region does not attain a NAAQS, the analysis compares the net increase in annual direct and indirect emissions to the applicable pollutant *de minimis* threshold(s). If the net direct and indirect emissions from the project alternative equal or exceed an applicable *de minimis* threshold, then a positive general conformity determination would be required before any emissions from the action(s) are generated.

If emissions exceed an indicator threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if emissions (1) do not contribute to an exceedance of an ambient air quality standard or (2) conform to the approved SIP, then impacts would not be significant.

3.3.3.1 Construction

The proposed AFRC F-35A mission at each alternative base would require construction and/or renovation of airfield facilities (e.g., training facilities, hangars, taxiways, and maintenance and fueling facilities). Air quality impacts associated with proposed construction and demolition activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions (PM₁₀/PM_{2.5}) from demolition and the operation of equipment on exposed soil.

The USAF Air Conformity Applicability Model (ACAM) version 5.0.12a was used to estimate air emissions that would be generated by construction activities associated with the proposed AFRC F-35A mission (Solutio Environmental, Inc. 2018). Construction activity data developed for each alternative base were used as inputs for ACAM. Appendix C includes ACAM output reports that detail the calculations that estimate criteria pollutant emissions and GHGs that would be generated by proposed construction activities at each alternative base.

Inclusion of standard construction practices and Leadership in Energy and Environmental Design (LEED) Silver certification into proposed construction activities would potentially reduce fugitive dust emissions from the operation of construction equipment on exposed soil by 50 percent from uncontrolled levels (Countess Environmental 2006). The standard construction practices for fugitive dust control include the following:

1. Use water trucks to keep areas of vehicle movement damp enough to minimize the generation of fugitive dust.
2. Minimize the amount of disturbed ground area at a given time.

3. Suspend all soil disturbance activities when winds exceed 25 miles per hour or when visible dust plumes emanate from the site, and stabilize all disturbed areas with water application.
4. Designate personnel to monitor the dust control program and to increase watering, as necessary, to minimize the generation of dust.

The air quality analysis assumed that all construction activities for the proposed AFRC F-35A mission would begin in 2021 and be completed in 2023.

3.3.3.2 Operations

Implementation of the AFRC F-35A mission at each alternative base would primarily affect emissions from existing and proposed (1) aircraft operations at alternative base locations and in associated airspace, (2) aircraft engine maintenance and testing, and (3) AGE. The relatively minor net changes in personnel that would result from implementation of the AFRC F-35A mission at each alternative base would result in inconsequential changes in emissions from other sources (e.g., onsite government motor vehicles or privately-owned vehicles). The net changes in emissions that would result from the replacement of existing aircraft operations with proposed AFRC F-35A aircraft operations from the three different afterburner scenarios were compared to pollutant indicators to determine significance.

The analysis of proposed aircraft operations is limited to operations that would occur in the lowest part of the atmosphere, because this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality. In accordance with the GCR (40 *CFR* 93 Subpart B), when the applicable SIP or Transportation Implementation Plan does not specify a mixing height, the federal agency can use 3,000 feet (914 meters) above ground level (AGL) as a default mixing height. Only Davis Monthan AFB and NAS Fort Worth JRB have SIPs for their areas; however, these SIPs do not specify a mixing height. Therefore, the analysis used 3,000 feet AGL as a default mixing height at all project locations.

Flight operations (including arrivals, departures, and pattern operations) are derived by utilizing the same site-specific operational data as the noise impact analysis. Both analyses (noise and air quality) factor in the number and type of operations, location-specific landing and take-off patterns, aircraft power settings, and other relevant details of the affected environment, the proposed action(s), and alternatives necessary to produce a consistent determination of environmental consequences. The air quality impact analysis at each location was evaluated based on the USEPA's Time In Mode (TIM) Model and site-specific representative TIM cycles. Representative TIM cycles factored in weighted frequency and times in each mode of flight operations (i.e., TIMs) that occur at or below 3,000 feet AGL, based on the site-specific flight profiles developed and the projected frequency of use of each flight profile. Calculations showing the time-weighted average assigned to each pattern based on the TIM and its percentage of use, consistent with the operational data used throughout this analysis, are contained in Appendix C. Methodologies and calculations showing how representative TIM cycles were derived from weighted-averaging based on the flight profiles are also contained in Appendix C.

The ACAM was used to estimate emissions from existing A-10 and F-16 and proposed AFRC F-35A aircraft flight operations and AGE usages. Site-specific representative TIM cycles developed for each alternative base were used as inputs to ACAM (see Chapter 2, Table 2-4, of this Draft EIS). The air quality analysis uses year 2024 conditions to define existing and proposed emissions for the F-35A mission (baseline year). Appendix C includes the ACAM output reports that detail the calculations used to estimate criteria pollutant emissions and GHGs from proposed operations at each alternative base.

3.4 SAFETY

3.4.1 Resource Definition

For the purposes of this analysis, safety addresses the explosive, construction and demolition (C&D), airfield, and flight safety, as well as bird/wildlife-aircraft strike hazard (BASH), associated with the proposed AFRC F-35A mission. The F-35A will have undergone approximately 10 years of flight testing before regularly operating from any of the bases under consideration for basing aircraft in this EIS. C&D safety considers issues associated with facility construction/renovation, operations and maintenance (O&M) activities that support base operations, including fire response and anti-terrorism/force protection measures at each location.

F-35A flight risks and safety issues associated with aircraft operations at each alternative base and in associated airspace are addressed. Any F-35A accident at an airfield would have direct impacts on the ground in the immediate vicinity of the mishap as a result of explosion/fire and debris spread. Class A mishaps and bird-aircraft strike hazards are specifically addressed.

3.4.2 Regulatory Setting

Numerous federal, civil, and military laws and regulations govern operations at each alternative base and in the surrounding airspace(s). These laws and regulations individually and collectively prescribe measures, processes, and procedures required to ensure safe operations and to protect the public, military, and property.

3.4.3 Methodology

The elements of the F-35A beddown that could potentially affect safety are evaluated relative to the degree to which the action increases or decreases safety risks to the public or private property. Explosive, C&D, airfield, and flight safety, as well as BASH, are assessed for the potential to increase risk and the capability to manage that risk by responding to emergencies.

3.4.3.1 Explosive Safety

Department of Defense Explosives Safety Board Standard 6055.09, *DoD Ammunition and Explosives Safety Standards*, and Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards*, represent DoD and USAF guidelines for complying with explosives safety. Explosives include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment.

Siting requirements for munitions and ammunition storage and handling facilities are based on safety and security criteria. Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called explosive safety quantity-distance (ESQD) arcs, are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has ESQD arcs extending outward from its sides and corners for a prescribed distance. Within these ESQD arcs, development is either restricted or prohibited altogether to ensure personnel safety and to minimize potential for damage to other facilities in the event of an accident. In addition, explosives storage and handling facilities must be located in areas where security of the munitions can be maintained at all times. Identifying the ESQD arcs ensures that construction does not occur within these areas.

3.4.3.2 *Construction and Demolition Safety*

Short-term safety risks are associated with any C&D activity, including C&D activities proposed as part of the AFRC F-35A mission. However, adherence to standard safety practices (OSHA Standard 29 *CFR*) would minimize any potential risks.

3.4.3.3 *Airfield Safety*

Determining accident potential relies on identifying where most accidents have occurred in the past at military airfields. This approach does not produce accident probability statistics because the question of probability involves too many variables for an accurate prediction model to be developed. The analysis of the history of military aircraft accidents focuses on determining where (within the airfield environments) an accident would likely occur and estimates the size of the impact area that would likely result from any single accident. Per DoDI 4165.57, all structures on the ground have the potential to create hazards to flight. The FAA provides detailed instructions for the marking (i.e., paint schemes and lighting) of obstructions to warn pilots of their presence. Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet AGL or exceeds any obstruction standard contained in 14 *CFR* 77 should normally be marked and/or lighted. The FAA can also recommend marking and/or lighting a structure that does not exceed 200 feet AGL or 14 *CFR* 77 standards because of its particular location. The obstruction standards in 14 *CFR* 77 are primarily focused on structures in the immediate vicinity of airports and approach and departure corridors from airports (14 *CFR* 77).

3.4.3.4 *Flight Safety*

The primary public concern with regard to flight safety is the potential for aircraft accidents (mishaps). Such mishaps could occur as a result of mid-air collisions, collisions with man-made structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions. Collisions with structures around the airfield are controlled through airfield setbacks and safety zones that restrict construction around the airfield so that both the ground surface is clear for ground maneuvering and the airspace is clear of obstructions such as groves of trees, poles and power lines, and tall structures. An AICUZ study defines the accident potential zones (APZs) around the airfield and prescribes restrictions on any construction in the clear zone (CZ). Land use restrictions are recommended for APZs I and II, based mostly on the intensity of use. That is, activities where people congregate are not recommended, and uses where people spend a high percentage of time (such as residential) are also not recommended.

The USAF defines five major categories of aircraft mishaps: Classes A, B, C, D, and E, which includes high-accident potential. Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of \$2 million, and/or destruction of an aircraft. Class B mishaps result in permanent partial disability or inpatient hospitalization of three or more personnel and/or a total cost of between \$500,000 and up to \$2 million. Class C mishaps involve an injury resulting in any loss of time from work beyond the day or shift on which it occurred, an occupational illness that causes loss of time from work at any time, or an occupational injury or illness resulting in permanent change of job and/or reportable damage of between \$50,000 and up to \$500,000. High-accident-potential events include any hazardous occurrence that has a high potential for becoming a mishap. Class C mishaps and high-accident potential, the most common types of accidents, represent relatively unimportant incidents because they generally involve minor damage and injuries, and rarely affect property or the public.

Class D mishaps result in total cost of property damage of \$20,000 or more, but less than \$50,000; or a recordable injury or illness not otherwise classified as a Class A, B, or C mishap. Note that in

2010, the threshold for determining the class of mishaps was raised from \$1 million to \$2 million for Class A mishaps, and the ceiling was raised for Class B from \$1 million to \$2 million.

Accident rates for commercial aircraft are determined using accidents per million departures (or flight cycles), because there is a stronger statistical correlation between accidents and departures than there is between accidents and flight hours, between accidents and the number of airplanes in service, or between accidents and passenger miles or freight miles.

This EIS focuses on USAF Class A mishaps because of their potentially catastrophic results. Based on historical data on mishaps at the four alternative bases, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Mishap rates do not consider combat losses due to enemy action. In evaluating this information, it should be emphasized that data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft. Mishap rates are statistically assessed as an occurrence rate per 100,000 flying hours.

The analysis of flight safety risk examines the historic and current Class A mishap rates of aircraft currently operated at the alternative bases compared to the F-35 Class A mishap rate. At the time of this writing, the F-35A has not amassed the 100,000 flight hours necessary for a statistically robust comparison to legacy aircraft; therefore, while not ideal, this EIS makes use of the flight safety record using USAF data available to-date for the F-35A and using data from other F-35 variants. Through March 2019, the F-35A has more than 76,000 flying hours with three Class A mishaps, resulting in a Class A mishap rate of 3.94 (USAF 2019) (these statistics are updated annually). These mishaps included an engine failure during takeoff preparation (the aircraft was safely brought to a halt), an aborted takeoff with damage confined to the engine, and a hydraulic failure resulting in collapsed nose landing gear that occurred after landing and parking. No injuries occurred during these events.

An aircraft crash is what is known in the probability analysis world as a low-probability/high-consequence risk. Aircraft are designed to ensure that aircraft accidents are rare events. To minimize these accidents, factors that cause or contribute to accidents must be understood and prevented. Accident data have been studied to determine these factors. However, the low rate of accidents makes it difficult to discover repeating patterns of these factors.

3.4.3.5 Bird/Wildlife-Aircraft Strike Hazard (BASH)

Bird/wildlife-aircraft strikes constitute a safety concern for the USAF because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft crashes. Aircraft can encounter birds at altitudes up to 30,000 feet MSL or higher. However, most birds fly close to the ground. According to the Air Force Safety Center BASH statistics, from 1995 to 2016, where altitude at time of strike was known, more than 50 percent of the strikes occurred below 400 feet AGL, and 90 percent occurred below 2,000 feet AGL (USAF 2017).

To address the issue of bird-aircraft strikes, the USAF has developed the Avian Hazard Advisory System (AHAS) to monitor bird activity and forecast bird strike risks. Using Next Generation Radar (NEXRAD) weather radars and models developed to predict bird movement, the AHAS is an online, near real-time, geographic information system (GIS) used for bird strike risk flight planning across the continental United States. Additionally, as part of an overall strategy to reduce BASH risks, the USAF has developed a Bird Avoidance Model using GIS technology. The Bird Avoidance Model is a key tool for analysis and correlation of bird habitat, migration, and breeding characteristics and is combined with key environmental and man-made geospatial data. The model was created to provide USAF pilots and flight schedulers/planners with a tool for making informed

decisions when selecting flight routes. The model was created in an effort to protect human lives, wildlife, and equipment during aircraft operations. This information is integrated into required pilot briefings that occur prior to any sortie.

3.5 SOIL AND WATER RESOURCES

3.5.1 Resource Definition

The term “soils” refers to unconsolidated materials formed from the underlying bedrock or other parent material. Soils play a critical role in both the natural and human environment.

Water resources include surface water, groundwater, and floodplains. Surface water resources include lakes, rivers, and streams and are important for a variety of reasons, including economic, ecological, recreational, and human health factors. Groundwater includes the subsurface hydrologic resources of the physical environment; its properties are often described in terms of depth to aquifer or water table, water quality, and surrounding geologic composition. Floodplains are lowland areas adjacent to surface waterbodies where flooding events periodically cover areas with water. Wetlands are discussed in Section 3.6.

For the purposes of this analysis of soil and water resources, the ROI for the proposed action and No Action Alternative includes the areas proposed for infrastructure upgrades and construction, along with areas immediately downstream of base outfalls that could be impacted during construction.

3.5.2 Regulatory Setting

The Clean Water Act (CWA) of 1977 (33 *USC* 1251 et seq.) and the USEPA Stormwater General Permit regulate pollutant discharges. Pollutants regulated under the CWA include “priority” pollutants, including various toxic pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH.

Section 438 of the Energy Independence and Security Act (EISA) (42 *USC* §17094) establishes into law stormwater design requirements for federal construction projects that disturb a footprint of greater than 5,000 square feet of land. EISA Section 438 requirements are independent of stormwater requirements under the CWA. A project footprint consists of all horizontal hard surface and disturbed areas associated with project development. Under these requirements, pre-development site hydrology must be maintained or restored to the maximum extent technically feasible with respect to temperature, rate, volume, and duration of flow. Pre-development hydrology is calculated using recognized tools and must include site-specific factors such as soil type, ground cover, and ground slope. Site design shall incorporate stormwater retention and reuse technologies such as bioretention areas, permeable pavements, cisterns/recycling, and green roofs to the maximum extent technically feasible.

Post-construction analyses shall be conducted to evaluate the effectiveness of the as-built stormwater reduction features. These regulations were incorporated into applicable DoD Unified Facilities Criteria (UFC) in April 2010, which stated that low-impact development (LID) features need to be incorporated into new construction activities to comply with the restrictions on stormwater management promulgated by EISA Section 438. LID is a stormwater management strategy designed to maintain site hydrology and mitigate the adverse impacts of stormwater runoff and non-point source pollution. LIDs can manage the increase in runoff between pre- and post-development conditions on the project site through interception, infiltration, storage, and evapotranspiration processes before the runoff is conveyed to receiving waters. Examples of the methods that could reduce the potential impacts of a proposed action include bioretention, permeable pavements, cisterns/recycling, and green roofs. Additional guidance is provided in USEPA’s *Technical*

Guidance on Implementing the Storm Water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (USEPA 2009).

Section 404 of the CWA and EO 11990, *Protection of Wetlands*, regulate development activities in or near streams and wetlands. Actions that affect streams and/or wetlands require a permit from the U.S. Army Corps of Engineers (USACE) for dredging and filling in wetlands. EO 11988, *Floodplain Management*, requires federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or location within floodplains. Wetlands are discussed in Section 3.6.

The Farmland Protection Policy Act was created to minimize federally aided conversion of farmland and includes provisions to protect important soils that comprise farmlands. These soils include prime, unique, and state and locally important farmlands. These farmlands are not discussed in the EIS because the proposed construction is for national defense purposes and the surrounding land is already in urban development.

With respect to soil erosion, Section 402(p) of the CWA regulates non-point source discharges of pollutants, under the National Pollutant Discharge Elimination System (NPDES) program, or state equivalent program. This section of the CWA was amended to require the USEPA to establish regulations for discharges from active construction sites. NPDES General Construction Permits require preparation of a Stormwater Pollution Prevention Plan (SWPPP) for projects that would disturb more than 1 acre of land.

3.5.3 Methodology

Impacts to soils and surface water can result from earth disturbance that exposes soil to wind or water erosion. Analysis of impacts to soils and surface water examines the potential for such erosion at each alternative base and describes typical measures taken to minimize erosion. In addition, soil limitations and associated typical engineering remedial measures are evaluated with respect to proposed construction.

Criteria for evaluating impacts related to soil resources associated with implementation of the proposed AFRC F-35A mission are impacts on unique soil resources, minimization of soil erosion, and the siting of facilities relative to potential soil limitations. Should development proposed as part of the AFRC F-35A mission substantially affect any of these features, impacts would be considered significant. Soil disturbance that would result from implementation of the AFRC F-35A mission at each alternative base was calculated by summing the square footages of the proposed construction.

Criteria for evaluating impacts related to water resources associated with implementation of the proposed AFRC F-35A mission are water availability, water quality, adherence to applicable regulations, and existence of floodplains. Impacts are measured by the potential to reduce water availability to existing users; to endanger public health or safety by creating or worsening health hazards or safety conditions; or to violate laws or regulations adopted to protect or manage water resources.

Flooding impacts are evaluated by determining if proposed construction is located in a designated floodplain. Groundwater impacts are evaluated by determining if groundwater resources beneath the project site would be used for implementing the proposed AFRC F-35A mission, and if so, by determining the potential to adversely affect those groundwater resources. Impacts to soil and water resources are not evaluated for the areas below where the proposed AFRC F-35A aircraft operations would be conducted because no ground-disturbing activities or use of water resources would occur at these locations.

3.6 BIOLOGICAL RESOURCES

3.6.1 Resource Definition

Biological resources include the native and introduced terrestrial and aquatic plants and animals found in the ROI. For the purposes of this biological resources analysis, the ROI for the proposed action and No Action Alternative is defined as the land area (habitats) that could potentially be affected by infrastructure and construction projects on the base and the airspace where AFRC F-35A pilots would train. The ROI generally includes the developed cantonment and airfield areas of the respective bases, but could also include areas near but outside the base boundary. Examples of off-base areas include managed wildlife areas and surface waters that could be indirectly affected by noise or changes in water quality, respectively. Habitat types are based on floral, faunal, and geophysical characteristics.

Sensitive habitats include areas that the federal government, state governments, or the DoD have designated as worthy of special protection due to certain characteristics such as high species diversity, special habitat conditions for rare species, or other unique features.

For the purposes of this analysis, biological resources were organized into four categories: vegetation, wildlife, special-status species, and wetlands. Vegetation includes existing terrestrial plant communities, but does not include special-status plants, which are described below and in Section 3.6.2. Plant species composition within an area generally defines ecological communities and indicates the type of wildlife that could be present. Marine vegetation (plants that inhabit the seas and oceans) would not be impacted by implementation of the AFRC F-35A mission at any of the alternative bases and therefore are not further described in this EIS.

Wildlife includes all vertebrate animal species, with the exception of special-status species, which are described below and in Section 3.6.2. Typical wildlife includes animal groups such as large and small mammals, songbirds, waterfowl, reptiles, amphibians, and seabirds. The attributes and quality of available habitats influences the composition, diversity, and abundance of terrestrial and marine wildlife communities.

Special-status species are defined as those plant and animal species protected by various regulations established by federal and state agencies. These regulations and the species addressed by them are described in Section 3.6.2.

Wetlands are areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

3.6.2 Regulatory Setting

The Sikes Act was approved 15 September 1960 (as amended in 2003) and is implemented to promote effectual planning, development, maintenance, and coordination of wildlife, fish, and game conservation and rehabilitation on military reservations. The Sikes Act applies to federal land under DoD control and requires military services to establish Integrated Natural Resources Management Plans (INRMPs) to conserve natural resources for their military installations. AFI 32-7064, *Integrated Natural Resources Management*, explains how to manage natural resources on USAF property in compliance with federal, state, and local standards. The chief tool for managing base ecosystems is the INRMP. Based on an interdisciplinary approach to ecosystem management, the INRMP ensures the successful accomplishment of the military mission by integrating all aspects of natural resources management with each other and the rest of the base's mission.

Special-status plant and wildlife species are subject to regulations under the authority of federal (U.S. Fish and Wildlife Service) and state (Arizona Game and Fish Department [AZGFD], Texas Parks and Wildlife Department [TPWD], Florida Fish and Wildlife Commission [FWC], and the Missouri Department of Conservation [MDC]) agencies. Special-status species include species designated as threatened, endangered, or candidate species by state or federal agencies. Under the Endangered Species Act (ESA) (16 *USC* 1536), an endangered species is defined as any species in danger of extinction throughout all or a significant portion of its range. A threatened species is defined as any species likely to become an endangered species in the foreseeable future. Candidate species are those species for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher-priority listing activities. Although candidate species receive no statutory protection under the ESA, the USFWS believes it is important to advise government agencies, industry, and the public that these species are at risk and could warrant protection under the ESA.

The Migratory Bird Treaty Act (MBTA) of 1918 (16 *USC* 703-712) is the domestic law that affirms, or implements, the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protect selected species of birds that are common to both countries (i.e., species occur in both countries at some point during their annual life cycle). The act protects all migratory birds and their parts (including eggs, nests, and feathers).

The Bald and Golden Eagle Protection Act (BGEPA) (16 *USC* 668-668d) is legislation in the United States that protects two species of eagles. The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from “taking” bald eagles. Taking involves molesting or disturbing birds, their parts, nests, or eggs. The BGEPA prescribes criminal penalties for persons who “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald or golden eagles... [or any golden eagle], alive or dead, or any part, nest, or egg thereof.”

The Marine Mammal Protection Act (MMPA) is a statute enacted in 1972 by the United States to protect marine mammals and their habitat. The MMPA prohibits the “taking” of marine mammals, and enacts a moratorium on the import, export, and sale of any marine mammal, along with any marine mammal part or product within the United States. The Act defines “take” as “the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such.” The MMPA defines harassment as “any act of pursuit, torment or annoyance which has the potential to either: a. injure a marine mammal in the wild, or b. disturb a marine mammal by causing disruption of behavioral patterns, which includes, but is not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.”

Section 404 of the CWA established a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. Activities in waters of the United States that are regulated under this program include fills for development, water resource projects (e.g., dams and levees), infrastructure development (e.g., highways and airports), and conversion of wetlands to uplands for farming and forestry. The USACE is the lead agency in protecting wetland resources. The USACE maintains jurisdiction over federal wetlands (33 *CFR* 328.3) under Section 404 of the CWA (33 *CFR* 323.3) and Section 10 of the Rivers and Harbors Act (30 *CFR* 329). The USEPA assists the USACE (in an administrative capacity) in the protection of wetlands (40 *CFR* 225.1 to 233.71). In addition, the USFWS and the National Marine Fisheries Service provide support with important advisory roles.

Furthermore, EO 11990, *Protection of Wetlands*, requires federal agencies, including the USAF, to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. EO 11990 requires federal agencies to avoid, to the extent possible, the long- and short-term, adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative; if construction in wetlands cannot be avoided, the USAF would issue a Finding of No Practicable Alternative (FONPA).

Under CWA Section 401, applicants for a federal license or permit to conduct activities that could result in the discharge of a pollutant into waters of the United States must obtain certification from the state in which the discharge would originate or, if appropriate, from the interstate water pollution control agency with jurisdiction over affected waters at the point where the discharge would originate. Therefore, all projects that have a federal component and could affect state water quality (including projects that require federal agency approval, such as issuance of a Section 404 permit) must also comply with CWA Section 401.

3.6.3 Methodology

The first step in the analysis of potential impacts to biological resources was to determine the locations of sensitive habitats and species at each alternative base in relation to the proposed AFRC F-35A mission. Maps were examined to locate sensitive habitats and species. Next, areas of overlap for the proposed development and sensitive habitats and species were identified. Scientific literature was reviewed for studies that examined similar types of noise-related impacts to biological resources. The literature review included a review of basic characteristics and habitat requirements of each sensitive species. Where available, information was also gathered relative to management considerations, incompatible resource management activities, and threats to each sensitive species. Impact analyses were then conducted based on the information gathered from the literature reviews and discussions with natural resource managers at each alternative base. The analyses included an assessment of the impacts to biological resources that would result from both construction activities (ground disturbance) and daily aircraft operations (changes in takeoffs, landings, engine runups) at the alternative bases and in the associated airspace and ranges. Impacts that could result from implementation of the AFRC F-35A mission at any of the alternative bases include temporary and permanent impacts associated with the construction and use of facilities, disturbance to wildlife from noise and effects associated with aircraft overflight, and ground impacts associated with the use of defensive countermeasures.

Measures to avoid and/or minimize adverse impacts to biological resources are also presented. The following criteria were evaluated when determining the significance of an effect on biological resources that could result from implementation of the AFRC F-35A mission:

- The direct impact or taking of a protected special-status species, including habitat alteration.
- The importance (legal, commercial, ecological, or scientific) of the resource.
- The relative sensitivity of biological resources that could be affected by implementation of the mission.
- The quantity or percentage of biological resources affected by implementation of the mission relative to overall abundance in the ROI.
- The expected duration of potential impacts that would result from implementation of the mission.

The focus of the analysis is on the federally and state listed or candidate threatened and endangered species. Other species of conservation concern are addressed, but are not analyzed to the same level of detail as the species listed by the USFWS as threatened or endangered. Impacts to threatened, endangered, and special status species/communities that would result from implementation of the AFRC F-35A mission at any of the alternative bases include potential habitat loss, temporary and permanent impacts associated with the construction and use of facilities, and ground impacts associated with the use of defensive countermeasures.

Plant species below the airspace and range areas proposed for use were excluded from extensive review and analysis because the proposed AFRC F-35A aircraft operations would not result in new ground disturbance. Ordnance delivery and flare use would not exceed baseline levels and would occur in locations already used and authorized for those purposes. Invertebrates and fish in areas below the airspace and ranges proposed for use were also excluded from review and analysis because they would not likely be impacted by implementation of the AFRC F-35A mission.

Determination of the significance of wetland impacts is based on (1) loss of wetland acreage, (2) the function and value of the wetland, (3) the proportion of the wetland that would be affected relative to the occurrence of similar wetlands in the region, (4) the sensitivity of the wetland to proposed activities, and (5) the duration of ecological ramifications. Impacts to wetland resources are considered significant if high-value wetlands would be adversely affected or if wetland acreage is lost. High-value wetlands are those wetlands that provide a significant function or value (i.e., flood control, unique wildlife habitat, etc.).

3.7 CULTURAL RESOURCES

3.7.1 Resource Definition

Cultural resources are districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, historic architectural/engineering resources, and traditional resources. Only significant cultural resources are considered for potential adverse impacts from an action. Significant cultural resources are historic properties as defined by the National Register of Historic Places (NRHP) (36 *CFR* 60.4) or resources identified as important to tribes or other traditional groups, as outlined in the American Indian Religious Freedom Act (AIRFA); the Native American Graves Protection and Repatriation Act (NAGPRA); and EO 13007, *Indian Sacred Sites*. Historic properties are any prehistoric, historic, or traditional resource included in or eligible for inclusion on the NRHP (36 *CFR* 800.16(l)).

For a cultural resource to be considered eligible for the NRHP, it must possess integrity of location, design, setting, materials, workmanship, feeling, or association, and it must meet one or more of the following criteria (36 *CFR* 60.4):

- Association with events that have made a significant contribution to the broad patterns of our history (Criterion A).
- Association with the lives of persons significant in our past (Criterion B).
- Embodiment of distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C).
- Have yielded, or may be likely to yield, information important in prehistory or history (Criterion D).

In general, these resources must be more than 50 years old; however, younger resources may be eligible if they are exceptionally significant or date to a defined period of historic significance (e.g., the Cold War).

Section 101(d)(6)(A) of the National Historic Preservation Act (NHPA) states that properties of traditional religious and cultural importance to a tribe or Native Hawaiian organization can be determined eligible for inclusion on the NRHP. National Register Bulletin 38, *Guideline for Evaluating and Documenting Traditional Cultural Properties* (NPS 1998) defines a traditional cultural property as a resource that is eligible for inclusion on the NRHP. Eligibility could be based on association with cultural practices or beliefs of a living community that are rooted in that community's history and are important in maintaining the continuing cultural identity of the community. Traditional cultural properties can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, landscapes, and minerals that tribes and other groups consider essential for the continuance of traditional cultures.

Properties of traditional religious and cultural importance need not be determined eligible for the NRHP to be a significant cultural resource considered for potential adverse impacts from an action. On 21 November 1999, the DoD promulgated its American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. The policy requires an assessment, through consultation, of the effect of proposed DoD actions that could have the potential to significantly affect protected tribal resources, tribal rights, and tribal and Alaska Native lands, before decisions are made by the services. DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*, implements DoD policy, assigns responsibilities, and provides procedures for DoD interactions with federally recognized tribes in accordance with its American Indian and Alaska Native Policy and other DoD directives and policies. The USAF implements DoDI 4710.02 through AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes*.

EO 13007 defines sacred sites as any specific, discrete, narrowly delineated location on federal land that is identified by a tribe or individual as sacred by virtue of its established religious significance to or ceremonial use by a tribal religion and identified as such to the land managing agency. EO 13007 also requires agencies to accommodate access to, and ceremonial use of, sacred sites by tribal religious practitioners and to avoid adversely affecting their physical integrity.

3.7.2 Regulatory Setting

DoDI 4715.16, *Cultural Resources Management* (DoD 2008), and AFI 32-7065, *Cultural Resources Management* (USAF 2014), outline and specify proper procedures for cultural resource management on USAF bases.

Laws pertinent to the proposed action include the NHPA of 1966, as amended; the Antiquities Act of 1906; the Historic Sites Act of 1935; NEPA; the Archeological and Historic Preservation Act of 1974; the Archeological Resources Protection Act of 1979; the NAGPRA of 1990; and the AIRFA of 1978.

Under Section 106 of the NHPA, the USAF is required to consider the effects of its undertakings at each location on historic properties listed, or eligible for listing, on the NRHP and to consult with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office, and others regarding potential effects as per 36 *CFR* 800. Under AFI 32-7065, recorded cultural resources not evaluated for NRHP eligibility must be managed as eligible. Under Section 110 of the NHPA, each location is mandated to maintain an active historic preservation program and

provide stewardship of cultural resources “consistent with the preservation of such properties and the mission of the agency (Section 470 h-2(a)).”

Federal regulations governing cultural resource activities include the following: 36 *CFR* 60, *National Register of Historic Places*; 36 *CFR* 63, *Determinations of Eligibility for Inclusion in the National Register*; 36 *CFR* 79, *Curation of Federally Owned and Administered Archaeological Collections*; 36 *CFR* 800, *Protection of Historic Properties* (incorporating amendments effective 5 August 2004); and 43 *CFR* 7, *Protection of Archaeological Resources*. Cultural resource-related EOs that may affect the locations include: EO 11593, *Protection and Enhancement of the Cultural Environment*; EO 13007, *Indian Sacred Sites*; EO 13175, *Consultation and Coordination with Indian Tribal Governments*; and EO 13287, *Preserve America*.

3.7.3 Methodology

Impact analysis for cultural resources focuses on assessing whether the proposed AFRC F-35A mission would have the potential to affect cultural resources that are eligible for listing on the NRHP or have traditional significance for tribes. For this EIS, impact analysis for cultural resources focuses on, but is not limited to, guidelines and standards set forth in the implementing regulations of NHPA Section 106 (36 *CFR* 800). Under Section 106 of the NHPA, the proponent of an action is responsible for determining whether any historic properties are located in the area, assessing whether the proposed undertaking would adversely affect the resources, and notifying the SHPO of any adverse effects. An adverse effect is any action that may directly or indirectly change the characteristics that make a historic property eligible for listing on the NRHP. If an adverse effect is identified, the federal agency consults with the SHPO and federally recognized tribes to develop measures to avoid, minimize, or mitigate the adverse effects of the undertaking.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Impacts could occur through the following:

- Physically altering, damaging, or destroying all or part of a resource.
- Altering characteristics of the surrounding environment that contribute to a resource’s significance.
- Introducing visual or audible elements that are out of character with a property or alter its setting.
- Neglecting a resource to the extent that it deteriorates or is destroyed.

Direct impacts are assessed by (1) identifying the nature and location of all elements of the proposed action and alternatives; (2) comparing those locations with identified historic properties, sensitive areas, and surveyed locations; (3) determining the known or potential significance of historic properties that could be affected; and (4) assessing the extent and intensity of the effects. Indirect impacts occur later in time or farther from the location(s) of the proposed action. Indirect impacts to cultural resources generally result from the effects of project-induced population increases (e.g., the need to develop new housing areas, utility services, and other support functions to accommodate population growth, or increased visitation of a remote area due to improved vehicle access). These activities and the subsequent use of the facilities can impact cultural resources.

A key component of this analysis is defining the Area of Potential Effects (APE), defined as “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist” (36 *CFR* 800.16(d)). For the proposed AFRC F-35A mission, the APE is defined as the viewshed for historic facilities and

the areas of ground disturbance associated with construction, demolition, and renovation at each alternative base. The APE also includes the primary airspace and ranges.

Archaeological and historic architectural resources at the alternative bases were characterized using existing survey and analysis information from Integrated Cultural Resources Management Plans (ICRMPs), archaeological survey reports, historic buildings survey reports, local histories, and the records of the NRHP and National Historic Landmarks. These documents provided information on known locations of significant resources. In compliance with Section 106 of the NHPA, the USAF consulted with the relevant SHPOs regarding the APE and potential cultural resource concerns for the proposed action. NRHP-eligible or -listed properties at each alternative base are identified in the base-specific sections contained in Chapter 4.

The potential for traditional resources at the alternative bases was identified using ICRMPs and information provided by base cultural resource management staff. Potentially interested tribes were contacted to request information on potential concerns about the proposed action.

In this analysis, demolition, construction, and other alternative base-specific actions needed to support the AFRC F-35A mission are part of the alternatives. The assessment of adverse effects takes into account both the potential for physical damage or destruction of historic properties at the alternative bases and the potential adverse effects of visual intrusions, noise, and vibration on historic properties at the alternative bases. Impacts on properties of traditional religious and cultural importance can result from noise and visual effects of aircraft overflights on rituals and ceremonies and on wildlife resources.

3.8 LAND USE AND RECREATION

3.8.1 Resource Definition

3.8.1.1 Land Use

Land use describes the way the natural landscape has been modified or managed to provide for human needs. The attributes of land use addressed in this analysis include ownership and status, land management plans and general land use patterns. For each alternative base and surrounding areas, land management plans and zoning regulations determine the type and extent of land use in specific areas to limit conflicting uses and protect certain designated or environmentally sensitive areas. In some cases, the DoD has partnered with local municipal governments to develop Joint Land Use Studies (JLUSs). JLUSs include zoning overlays in which local municipal governments have implemented zoning restrictions to protect lands located in APZs or lands subjected to high noise levels.

The attributes of land use addressed in this analysis include the land use regulatory setting, general land use patterns, and Special Use Land Management Areas (SULMAs). SULMA is a term used to categorize types of land uses for analysis purposes and is not an official term used by federal or state agencies. SULMAs generally include recreation, conservation, or natural areas under the airspace owned by state and federal agencies. SULMAs also include Native American Reservation lands. On-base land uses are described at a general level considering that facilities are sited on the installation per their functional use (i.e., proposed hangars would be adjacent to the runway).

3.8.1.2 Recreation

Recreational resources provide outdoor recreational opportunities apart from where people live. These resources include public facilities in urban and suburban areas (i.e., parks, zoos, playing fields, amphitheaters, and outdoor sports facilities), and natural areas (i.e., state and federal lands)

and associated developed picnic areas, campgrounds, historical and educational sites, and trails that are designated or available for public outdoor recreational use.

3.8.2 Regulatory Setting

3.8.2.1 Land Use

The regulatory setting for land use includes the key federal, state, and local statutes, regulations, plans, policies, and programs applicable to land use on and near each alternative base. The land use analysis assumed the federal noise compatibility requirements as identified below, but also addresses state-specific compatibility requirements (e.g., for Arizona). The specific state and local land use regulations applicable to each alternative base are summarized in the base-specific sections contained in Chapter 4 (Sections DM3.8, HS3.8, FW3.8, and WH3.8).

DoD UFC 3-260-01, *Airfield and Heliport Planning and Design*. To maintain safety, the USAF adheres to guidelines set forth in UFC 3-260-01. Several siting criteria have been established specific to land development and use at commercial and military airfields. These criteria include CZs, APZs, and other obstruction zones relative to airfield environments. These and other criteria related to safety, security, and other land use issues are used to assist planners and decision makers with appropriate siting of facilities affecting design and physical layout of USAF bases.

Federal Interagency Committee on Urban Noise (FICUN) Land Use Guidelines (1980). In 1980, FICUN was formed to develop federal policy and guidance on noise. The committee included the USEPA, FAA, Federal Highway Administration, DoD, HUD, and the U.S. Department of Veterans Affairs. The designations contained in the FICUN compatibility table for land use do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities.

The FICUN guidelines consider areas exposed to DNL of 75 dB or greater as unacceptable living environments. Areas exposed to DNL of 65 to 74 dB are considered “generally unacceptable” for noise-sensitive land uses such as residences, schools, hospitals, and public services. Houses located in areas exposed to DNL of 65 to 74 dB may not qualify for federal mortgage insurance without additional costs associated with installing noise attenuation. In the outdoor noise environment, DNL greater than 65 dB can be annoying to some people during communications. Generally, residential development is not recommended in areas exposed to DNL of 65 dB or greater. Although discouraged, residential development is compatible in areas exposed to DNL of 65 to 69 dB and 70 to 74 dB, provided noise reduction levels of 25 dB and 30 dB, respectively, are achieved. Commercial/retail businesses are compatible without restrictions up to DNL of 69 dB and 79 dB, provided that noise reduction levels of 25 dB and 30 dB, respectively, are achieved for public areas. Industrial/manufacturing, transportation, and utility companies have a high noise level compatibility, and therefore, can be located within the higher noise zones.

AFI 32-7063, *Air Installations Compatibility Use Zones Program*. AFI 32-7063 establishes the AICUZ program, which is similar to the FAA’s Federal Aviation Regulations Part 150 program for civil airports. The AICUZ program is a DoD discretionary program designed to promote compatible land use around military airfields. The military services maintain an AICUZ program to protect the operational integrity of their flying mission.

Despite well-maintained aircraft and highly trained aircrews, areas around airfields are exposed to the potential of aircraft accidents. The DoD developed the AICUZ program to aid in the

development of planning mechanisms that protect the safety and health of personnel on and near military airfields and to preserve operational capabilities. The AICUZ program consists of the following distinct parts: CZs, APZs, hazards to air navigation (height and obstruction criteria established by the FAA), and noise zones.

Bases use the AICUZ program to provide land use compatibility guidelines for areas exposed to increased safety risks and noise near the airfield. The noise compatibility guidelines recommended in the AICUZ program are similar to those used by the HUD, FAA, and the U.S. Department of Veterans Affairs to provide information to surrounding jurisdictions to guide planning and regulation of land use. When DNL exceed 65 dB, residential land uses are normally considered incompatible.

AFI 32-7062, *Air Force Comprehensive Planning Program*. AFI 32-7062 establishes the Comprehensive Planning Program for USAF installations (USAF 2017). The Comprehensive Planning Program is a USAF discretionary program designed to establish a framework for decision making with regard to the development of USAF installations. It incorporates USAF programs such as operational, environmental, urban planning, and others to identify and assess development alternatives and ensure compliance with applicable federal, state, and local laws, regulations, and policies. The Installation Development Plan (IDP) is the only plan document required by all major installations under AFI 32-7062. The IDP guides land use decisions on an installation.

Governance of Tribal Lands. A federal Indian Reservation is an area of land reserved for a tribe or tribes under treaty or other agreement with the United States (e.g., EO, or federal statute or administrative action) as permanent tribal homelands, and where the federal government holds title to the land in trust on behalf of the tribe. Approximately 55.7 million acres of land are held in trust by the United States for various Indian tribes and individuals. Approximately 326 Indian land areas in the United States are administered as federal Indian Reservations (i.e., reservations, pueblos, rancherias, missions, villages, communities, etc.). Tribes possess the right to license and regulate activities within their jurisdiction, to zone, and to exclude persons from tribal lands. Other types of Indian lands include allotted lands, restricted status lands, and state Indian Reservations. American Indian and Alaska Native tribes, businesses, and individuals can also own land as private property; such privately owned land is subject to state and local laws, regulations, codes, and taxation.

Section 3.7 identifies regulations that address required government-to-government consultation between the DoD and federally recognized tribes regarding military activities that could affect tribal resources, including lands. Section 3.7 also identified regulations that address how the federal government assesses the potential for activities to affect cultural resources that are eligible for listing on the NRHP or have traditional significance for Native American tribes.

3.8.2.2 *Recreation*

Guidance and recommendations for noise compatibility with some recreational activities is provided in the same guidelines, regulations, and programs described in Section 3.8.2.1. No specific regulations govern the availability of recreational resources. Under the Federal Land Policy and Management Act, federal land managers are responsible for preserving and managing public lands for the benefit of the public at large, including access to and enjoyment of public lands for recreational purposes. This requires balancing uses to meet multiple needs of individuals and national interests.

3.8.3 Methodology

3.8.3.1 Land Use

For the purposes of this land use analysis, the ROI for the proposed action and No Action Alternative includes the area around each of the four alternative bases that encompasses the full extent of airfield APZs, areas exposed to noise levels of concern, and lands underneath the airspace and ranges proposed for use.

Potential impacts to land use can result from actions that (1) change the suitability of a location for its current or planned use (e.g., noise exposure in residential areas); (2) cause conditions that are unsafe for public welfare; (3) conflict with the current and planned use of the area based on current zoning, amendments, agreements, regulatory restrictions, management, and land use plans; or (4) displace a current use with a use that does not meet the goals, objectives, and desired use for an area based on public plans or resolutions. The degree of land use effects (negligible, minor, moderate, or significant) is based on the level of land use sensitivity in areas affected by a proposed action, the magnitude of change, and the compatibility of a proposed action with existing or planned land uses. The assessment considers multiple contextual factors that are both quantitative and qualitative.

3.8.3.1.1 Military Installation

The methodology for evaluating land use impacts on and near each of the four alternative bases includes the following steps:

1. Characterize and describe existing land use and conditions.
 - a. Describe general context for the base (whether urbanized, rural, or natural) and describe jurisdictional boundaries.
 - b. Generally describe the land use setting surrounding the base.
 - c. Describe current compatibility planning efforts for the base and status of compatibility around the airfield (based on AICUZ studies, JLUSs, zoning districts, airfield noise complaint logs).
 - d. Identify current noise exposure for land uses surrounding the airfield (using GIS maps with baseline noise contours superimposed on aerial photography), describe noise levels affecting current uses and compatibility of the current exposure levels, and identify specific sensitive receptors affected by incompatible noise levels (e.g., schools and child development centers) based on the DoD noise compatibility guidelines.
2. Evaluate the effects of new C&D on land use.
3. Evaluate effects of new O&M activities on land use. Qualitatively consider if changes in O&M activities can have indirect effects on the suitability of areas outside the base for their current or planned uses. These effects could include dust, noise, traffic, or visual modifications.
4. Assess whether any induced changes (e.g., new housing demands in the local area) pose any particular concerns for land use.
5. Quantify and locate changes in noise exposure from aircraft operations including engine run-ups, takeoffs, and landings.

- a. Estimate change in acreage of off-base land exposed to noise levels of 65 dB L_{Adn} and greater at 5-dB intervals. Consider the relative degree of change in exposure in the area surrounding each alternative base.
- b. For each alternative base, overlay the baseline and the three afterburner scenario noise contours on aerial photographs to locate where changes in noise exposure would occur. In some cases, alternative bases and surrounding communities have adopted noise contours from a previous JLUS. For the purposes of the land use analysis, the JLUS contours are also shown. The extent to which off-base land uses near each alternative base would be affected was analyzed by determining the acres of land use types and the approximate number of people affected. The methodology for estimating the affected populations near each alternative base is described in Chapter 3, Section 3.2. Additional data were provided to address the State of Arizona compatibility requirements that apply within the state-regulated vicinity of military airports in Arizona. <http://www.re.state.az.us/airportmaps/militaryairports.aspx#MILITARY%20AIRPORT%20MAPS>
- c. Where changes in exposure would interact with incompatible land uses near each of the four alternative bases, a more careful evaluation of the zoning and potential future development of the affected area is included. This considers potential for future changes in land use or infill that could heighten an existing incompatible condition. Where residential land would be impacted, review of aerial photography and zoning ordinances is used to determine the relative density of homes and potential for future infill. The analysis also identifies whether current noise compatibility planning is adequate to protect airfield and community interests.

The impact assessment considers the degree or intensity of projected accident risk at the airfield in combination with current or possible future incompatible uses in the APZs (context). The analysis rates the degree of existing land use compatibility in the CZs and APZs based on the DoD's land use compatibility guidelines using levels of incompatible land uses and occupied structures within the APZs and CZs. Because accident risk is low, the current condition of land use compatibility in the APZs and CZs is the primary criteria in assessing impacts to land use.

For land uses near each of the four alternative bases, the analysis used GIS data from local jurisdictions. To support comparison of the four alternative bases, land use was classified according to a standardized set of land use classifications that are based on the generalized land use categories described in Air Force Handbook (AFH) 32-7084, *The AICUZ Program Manager's Guide*. Because local land use classifications differ from categories in AFH 32-7084, some aggregation of local land use classifications was required. For example, land use data available at each of the four alternative bases do not support differentiating low-density residential (i.e., less than one dwelling unit per acre), as described in AFH 32-7084, from other residential land uses. Therefore, all residential land uses were aggregated as simply residential for this analysis. As another example, transportation is not specifically listed in the AFH 32-7084 generalized land use categories, but was a predominant feature in land use datasets provided by localities. In instances such as this, where the description of generalized land use types in AFH 32-7084 did not specifically state a land use type included in local land use data, the most appropriate land use was selected. Transportation is similar to open and agricultural in terms of having relatively low noise sensitivity and similar noise compatibility criteria in the standard USAF land use compatibility matrix and was aggregated with open and agricultural in this analysis. Descriptions of the land use categories used in this analysis include:

- Residential: Includes all types of residential activity (e.g., single and multi-family residences and mobile homes) at a density greater than one dwelling unit per acre.
- Commercial: Offices, retail, restaurants, and other types of commercial establishments. For this analysis, airfields other than the alternative base airfields were classified as commercial.
- Industrial: Includes manufacturing, warehousing, and other similar uses.
- Public/Quasi-Public: Publicly owned lands and/or land to which the public has access, including military reservations and training grounds, prisons, public buildings, schools, churches, cemeteries, and hospitals.
- Recreational: Land areas designated for recreational activity, including parks, golf courses, wilderness areas and reservations, conservation areas, and areas designated for trails, hiking, camping, etc.
- Open/Agricultural/Mining/Low-Density: Includes undeveloped land areas, agricultural areas, and grazing lands. This land could include single-family residences located on an agricultural parcel and areas with residential densities less than or equal to one dwelling unit per acre.

3.8.3.1.2 *Airspace*

For land under the proposed airspace, the land use analysis focused on the degree of change that would result from noise. The methodology used baseline aircraft operations in various SUAs to determine baseline noise levels. Proposed AFRC F-35A aircraft operations were then used to determine the noise levels that would result from implementation of the proposed mission. In addition, SULMAs were identified using the Environmental Systems Research Institute (ESRI) federal lands dataset and the Managed Areas Database (MAD). The ESRI federal lands dataset identified lands administered by various federal agencies such as the U.S. Forest Service (USFS), USFWS, and National Park Service (NPS), as well as National Monuments, Wilderness Areas and Federal Indian Reservation lands held in trust by the Bureau of Indian Affairs. The MAD dataset was filtered to show items at a state or local level because federal lands were already covered in the ESRI dataset. Lands included in the MAD dataset are state and local parks and state wildlife refuges. Wilderness Study Areas in New Mexico were left out of the ESRI federal lands dataset but included in the MAD dataset.

Where L_{dnmr} was projected to increase by 1 dB or greater over baseline, the area of each SULMA was calculated using GIS to determine the acreage below the affected airspace units. If a SULMA consisted of more than one part (i.e., polygon), the areas were totaled so that calculations used the entire area. If a small SULMA such as a natural area was contained inside a larger SULMA, only the larger SULMA was identified and the smaller areas within were given equal consideration and evaluation. Airspace units were “intersected” with the land use SULMA layers to identify the overlap with the SULMAs and the percentage of overlap was calculated. Airspace units were calculated individually because some MOAs, ranges, and RAs overlap each other. The affected SULMAs were exported in a tabular format and organized by airspace unit. The impacts to SULMAs were evaluated by reviewing changes in noise compared to baseline noise levels. Only SULMAs under airspace that would be exposed to L_{dnmr} increases of 1 dB or greater above baseline are included for evaluation.

3.8.3.2 *Recreation*

For the purposes of this recreation analysis, the ROI for the proposed action and No Action Alternative includes the area around each of the four alternative bases that encompasses the full

extent of airfield APZs and lands under the airspace proposed for use. The recreation ROI does not include lands under routes where AFRC F-35A pilots would travel between each installation and the airspace proposed for use. There are no proposed established routes between each installation and the proposed airspace. Aircraft travel between each alternative base and the airspace proposed for use is highly variable depending on meteorological conditions, air traffic and other factors such as mission type.

Evaluation of recreational resources determines if implementation of the proposed action would preclude, displace, or alter the suitability of an area or facility for ongoing or planned recreational uses. This could be triggered by changes in noise, access, availability of recreational resources or change in desired qualities of an area that contributes to recreational opportunities. This is a qualitative assessment based on popularity/visitation of the area, management goals, and availability of similar recreational opportunities. If an impact is identified by this analysis, the assessment considers the level of significance using a subjective scale based on the value of the resources and degree of change and degree of interference with current activities and management standards.

3.8.3.2.1 Military Installation

For the areas surrounding the four alternative bases, the following are considered and evaluated relative to recreation.

Effects of changes in noise levels and aircraft operations activity. The analysis uses the FAA’s recommended land use compatibility average sound levels (see Table 3-7) for various recreational facilities, activities, and events as the basis for evaluating impacts. Also considered are the degree of change in noise exposure, change in frequency of operations, and the time of day. A person with normal hearing in a non-laboratory setting can typically barely perceive a 3-dB change in instantaneous noise level, and a 5-dB change in instantaneous noise level is easily detectable in the same circumstances.

Effects from noise and dust or changes in visual context from construction on outdoor recreation activities or facilities. The analysis considers the distance of potential construction areas from recreational sites, and the relationship between new facilities and surrounding recreational areas and uses.

Effects of increased personnel and family members on local recreational resources. The analysis considers the relative change in population resulting from the action in the given community and the degree to which this could affect the capacity of local recreational resources to serve area residents.

Table 3-7. Recreational Land Use Compatibility with Yearly Day–Night Average Sound Levels

Recreational Land Use	Annual DNL (dB)					
	< 65	65–69	70–74	75–79	80–85	> 85
Outdoor sports arenas and spectator sports	Y	Y ^a	Y ^a	N	N	N
Outdoor music halls, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusement parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

^a Land use compatible, provided special sound reinforcement systems are installed.

Key: Y = Land use and related structures are compatible without restrictions; N = Land use and related structures are not compatible and should be prohibited; 25 / 30 = Land use and related structures are generally compatible; recommend noise level reduction (outdoor to indoor) of specified dB through incorporation of noise attenuation in structures.

3.8.3.2.2 *Airspace*

The analysis of potential effects of noise generated by military aircraft in airspace on regional recreational resources considers the noise sensitivity of affected recreational sites or settings, degree of change in noise exposure, frequency of operations, altitudes of overflights, and time of day. Also considered is the relative popularity and value of recreational activities and opportunities for residents and visitors/tourists within the context of the region. The analysis emphasizes the potential change in noise exposure on areas that are relatively pristine or quiet. The analysis addresses increases in sound levels of specific events and sonic booms, which can be startling to persons in outdoor settings.

Typical effects from aircraft noise on recreational uses are provided below, and could result from the proposed AFRC F-35A mission evaluated in this EIS. Most impacts result from specific events affecting persons engaged in a recreational activity at a particular time. The varying levels of operations could increase the potential for effects from single events. The following paragraphs provide a review of the multiple considerations and the relativity of a noise-driven impact assessment on recreation.

Noise generated by aircraft operations can change the context in which recreation is undertaken. Recreational opportunity is partially classified by the Bureau of Land Management (BLM) by the type of challenge afforded to participants. One of the opportunity factors is degree of isolation and remoteness. Quiet and naturalness is an intrinsic part of remote recreational experiences. Changes to quiet settings could affect the spectrum of recreational opportunities and the quality of the experience in an area or region, but is not expected to change recreational use opportunities of the area. People's reactions to noise in recreational settings vary. A study by the USFS found that wilderness area visitors did not generally notice high altitude aircraft noise intrusions, although startle effects from low-flying high speed aircraft were noticed and reported as annoying by some visitors (NPS 1992). According to NPS publication Report on Effects of Aircraft Overflights on the National Park System, Report to Congress (NPS 1994), natural quiet is an important part of visitor experiences and a reason for visiting national parks and monuments for about 91 percent of persons surveyed. Increased airspace use over NPS units has the potential to impact visitor experience and the setting and feeling of the areas.

Visitors have varying perspectives on whether aircraft overflights are a positive or detrimental factor to their outdoor experience. For example, some outdoor sporting participants generate localized noise through the use of vehicles and mechanical equipment (e.g., portable generators). Others seek a more natural experience on foot away from vehicles. Reactions vary depending upon individual expectations and the context where aircraft noise occurs. These incidences are not likely to be persistent and would have only temporary impacts on any given experience. These events are not expected to change visitor habits or recreational land uses overall, but intermittent overflight during individual recreational events could annoy some affected participants.

A common concern is the potential for noise to interfere with hunting activities. A sudden, low-level overflight could startle an animal and a hunter preparing to shoot. Some animals or birds (e.g., pheasants and sage grouse) could be susceptible to noise and scatter when a sudden, loud noise occurs. This interference could be annoying and degrade the quality of the outdoor experience for some hunters. While these isolated events can happen, behavior of game animals and their reproduction and populations are not significantly affected by noise. Higher noise levels are not expected to noticeably reduce populations of popular game species or negatively impact hunting. Hunting is a viable local land use under much of the airspace proposed for use. Hunting

can and does coexist with infrequent and random, low-level military overflights, but this does not reduce the perceived significance of the impact to residents or visitors to this area.

Startle effects could also result in safety risks for rock climbing or other physically challenging tasks requiring a high degree of concentration. Locations where training would be performed on weekends would have higher potential to affect recreation, as this is the time when most recreation activity takes place. The F-35A is normally flown at higher altitudes than other fighter aircraft to perform its air-to-ground mission. Considering this, intrusion from high-altitude operations of the F-35A is less likely to cause startle effects on users of quiet recreational settings.

The noise effect of sonic booms could similarly disrupt or startle persons in outdoor settings. Even very infrequent sonic booms could cause annoyance for recreational activities where quiet is desirable (e.g., remote hiking, camping, and hunting). Because of their infrequency, sonic booms could be startling, but would have a minimal effect on the overall quality of recreational opportunities or experiences. Sonic booms can startle animals and could cause a horse or pack animal to react. This could result in infrequent accidents. There is no way to specifically avoid a location from experiencing a sonic boom if aircraft are performing supersonic maneuvers in approved airspace.

The interface between military aircraft and recreational use of airspace for flying, parasailing, gliding, and ballooning is an air safety concern. Because the proposed AFRC F-35A mission would use existing military training airspace, recreational aviation activities would already be known or identified with appropriate avoidance procedures in place. An increase in military use could affect the availability of airspace for recreational uses in some locations.

3.9 SOCIOECONOMICS

3.9.1 Resource Definition

Socioeconomics refers to features or characteristics of the social and economic environment. Socioeconomics evaluates the change in personnel and expenditures associated with the proposed AFRC F-35A mission that could potentially impact population, employment, earnings, housing, education, and public services. Socioeconomics also addresses potential noise effects to housing, schools, and other noise-sensitive social or economic activities. For the purposes of this socioeconomics analysis, the ROI for the proposed action and No Action Alternative generally includes the county area or areas where each alternative base is located.

3.9.2 Regulatory Setting

There is no applicable regulatory setting for socioeconomics.

3.9.3 Methodology

The socioeconomic analysis focuses on the effects that would result from personnel changes, construction, and/or O&M at each alternative base. As a basis for estimating population changes in the ROI, the total number of non-contractor, full-time personnel, and dependents and family members were added together and assumed to be either migrating in to the area or migrating out of the area. It was assumed that for all four alternative bases, the change in personnel represented 20 percent active duty military personnel and 80 percent full-time reservists; thus the full change in personnel was considered.

The economic impact analysis used to determine the effect of construction and O&M costs (if any) was conducted using the Impact Analysis for Planning (IMPLAN) economic forecasting model.

The IMPLAN model uses data from the U.S. Bureau of Labor Statistics and the U.S. Bureau of Economic Analysis to construct a mathematical representation of a local economy using region-specific spending patterns, economic multipliers, and industries. In this analysis, the IMPLAN model provided representations of the county-wide economy at each alternative base. Economic impacts are analyzed by introducing a change to a specific industry in the form of increased or decreased employment or spending; the IMPLAN model mathematically calculates the resulting changes in the local economy. In this analysis, the IMPLAN model was used to estimate the economic effects of the incoming and outgoing personnel on spending and employment in the established ROI. The economic impact analysis separates effects into three components: direct, indirect, and induced. Direct effects are the change in employment and income generated directly by the expenditures of the incoming or outgoing personnel. To produce the goods and services demanded by the incoming personnel, businesses, in turn, might need to purchase additional goods and services from other businesses. The employment and incomes generated by these secondary purchases would be indirect effects. Induced effects are the increased household spending generated by direct and indirect effects. The overall effect from the economic impact analysis is the total number of jobs created throughout the ROI by the direct, indirect, and induced effects. The construction and O&M costs used in the economic activity section were provided by the USAF during site surveys.

To determine whether the local housing market could support the personnel associated with the proposed AFRC F-35A mission it was assumed that the total number of homes required off base was equal to the total number of incoming or outgoing full-time military personnel. This number was compared against the number of vacant housing units as defined by the ACS 5-year estimate for years 2017-2022. If the number of incoming, full-time military personnel would not exceed the number of vacant housing units as defined by the ACS estimates, the housing market in the ROI would be able to support the incoming population.

During scoping people submitted comments concerning the potential impact the noise generated by AFRC F-35A aircraft operations would have on surrounding property values. The metric known as the Noise Depreciation Indices (NDIs) is used to determine the percent increase in the loss of property values due to a unit increase in noise exposure. Several studies have analyzed property values as they relate to military and civilian aircraft noise. One study conducted a regression analysis of property values as they relate to aircraft noise at two military installations (Fidell et al., 1996). This study found that while aircraft noise at these installations could have resulted in minor impacts to property values, it was difficult to quantify those impacts because other factors (e.g., the quality of the housing near the installations and the local real estate market) had a larger impact on property values. Therefore, the regression analysis was not able to predict the impact of aircraft noise on the property values of two comparable properties.

In a study performed by Nelson (2004), the author analyzed 20 different property value studies that attempted to quantify the impact of noise on property values (Nelson 2004). Nelson (2004) also analyzed the values of similar properties, using one property located near a noise source, specifically an airport, and one property not located near a noise source. The result of the study is that, considering all other factors (e.g., neighborhood characteristics and desirability, local real estate market conditions, school districts) as equal, an adverse impact on property values as a result of aircraft noise is possible. The Nelson study estimates that the value of a specific property could be discounted between 0.51 and 0.67 percent per decibel when compared with a similar property that is not impacted by aircraft noise. Additional indications are that the discount for property values as a result of noise would be higher for noise levels above 75 dB DNL (Nelson 2004). In comparison, a report by Trojanek (Trojanek et al., 2017) concluded that the majority of the NDI

estimates fell between 0.51 percent and 0.75 percent based on 79 studies from 1970 to 2016 from Wadud (2013) and their own research (Trojanek et al., 2017).

To determine the total dependents for each alternative base associated with the proposed AFRC F-35A mission, 65 percent of all non-contractor, full-time military personnel, as identified in the personnel tables in Chapter 2, Table 2-3, were assumed to be accompanied. Each accompanied military member was assumed to be accompanied by 2.5 dependents, or 1 spouse and approximately 1.5 children. All children were assumed to be attending child care or be of school age. Therefore, to determine the total number of school-aged children, a multiplier of 1.5 was applied to 65 percent of the non-contractor, full-time military personnel.

Public services were analyzed by considering the overall percentage change to the respective county population. Base services were analyzed by considering the capacity, staffing, and infrastructure available to support the incoming personnel.

The magnitude of potential impacts could vary depending on the alternative base. If potential socioeconomic changes were to result in substantial shifts in population trends or a decrease in regional spending or earning patterns, those effects would be considered adverse. The proposed AFRC F-35A mission could impact socioeconomic conditions in the surrounding ROI if the following were to occur:

- Change in the local business volume, employment, or population that exceeds the ROI's historical annual change.
- Adverse change in social services or social conditions, including property values, school enrollment, county or municipal expenditures, or crime rates.

3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

3.10.1 Resource Definition

The resource considered for environmental justice is potentially affected populations that meet certain characteristics based on race, income, and age. The resource is relatively defined in order to understand if impacts from an action occur in areas that are disproportionately composed of minorities and low-income persons. While not specifically part of environmental justice analysis, this section also considers similar impacts to youth and elderly populations. This concern arises because large impact projects have historically used sites where real estate values are lower and/or more industrialized. Locations with low property values tend to attract development of affordable and marginal housing. This dynamic tends to perpetuate and often pre-dates the enactment of community land use ordinances. The intent of environmental justice is to reduce the burden of impacts on socially and economically vulnerable populations.

3.10.2 Regulatory Setting

EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs federal agencies to address environmental and human health conditions in minority and low-income communities. In addition to environmental justice issues are concerns pursuant to EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children.

USAF guidance for implementation of EO 13045 is contained in the *Guide for Environmental Justice Analysis under the Environmental Impact Analysis Process (EIAP)*, dated November 2014

(USAF 2014). That guidance also explains the need to address impacts which may adversely impact elderly populations.

The terms minority, low-income, youth, and elderly are defined below for purposes of this analysis.

- **Minority:** The term “minority” for purposes of environmental justice analysis includes those individuals who have identified themselves as having one of the following origins: “Hispanic,” “Asian-American,” “Native Hawaiian and other Pacific Islander,” “Black or African-American,” “American Indian or Alaskan Native,” or “Some Other Race” (which does not include “White,” “Black or African-American,” “American Indian or Alaska Native,” “Asian,” or “Native Hawaiian or Other Pacific Islander” race categories) (USAF 2014).
- **Low-Income:** The U.S. Census Bureau defines the term “poverty” (also referred to as “low-income”) as “a set of money income threshold that vary by family size and composition to determine who is in poverty” (USCB 2018). A family and each individual in the family is considered in poverty if the total family income is less than the family’s threshold or the dollar amount calculated by the U.S. Census to determine poverty status. For poverty calculations, poverty status is determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years of age.
- **Youth:** Children are vulnerable to environmental exposure and potential health and safety effects to children are considered in this EIS under the guidelines established by EO 13045 and the USAF EIAP guidance. For purposes of this analysis, the term “youth” refers to any person under the age of 18.
- **Elderly:** The USEPA and the USAF EIAP guidance identify the importance of considering an elderly person as a sensitive receptor to potential environmental impacts. The term “elderly” refers to any person age 65 or older.

3.10.3 Methodology

Environmental justice analysis overlays the 65 dB or greater DNL contour resulting from each of the three afterburner scenarios on the census data polygons. The smallest census data which has the information necessary for analysis of potential impacts to environmental justice populations is used to determine potential impacts. The smallest group of census data which contain the needed information for this analysis is the Census Block Group (BG). Each BG that is partially or wholly encompassed by the 65 dB or greater DNL contour is defined as an ROI. There could be few or many ROIs for a specific environmental justice analysis, depending on the extent of the noise contour and the size of the BGs. The next higher level of census data is the Census Tract (CT). Each CT contains a number of BGs (ROIs). Example census units (CT and BG) are shown on Figure 3-2.

In order to identify disproportionate impacts from baseline or proposed action noise levels, a Community of Comparison (COC) is needed. The COC is defined by summing the population in all the CTs which contain any part of an ROI affected by the 65 dB or greater DNL contour. The percentages of minority and low-income persons are calculated for each ROI (i.e., BG). The ROI and COC percentages are then compared. If the percentage of minorities or low-income persons in an ROI is equal to or greater than the percentage of minorities or low-income persons in the COC, there is a disproportionate impact to the environmental justice population in that ROI (USAF 2014).

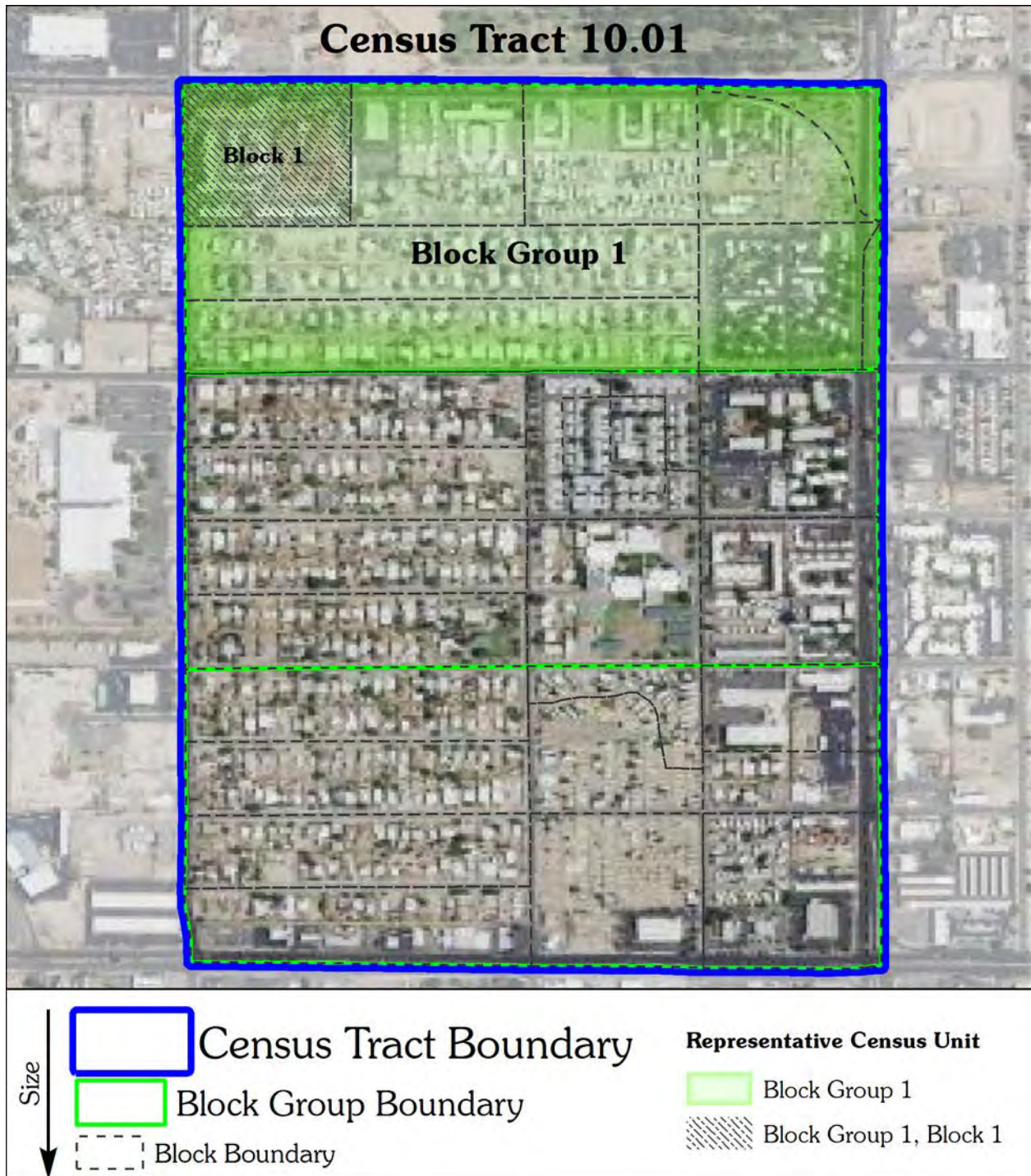


Figure 3-2. Census Units

3.11 INFRASTRUCTURE

3.11.1 Resource Definition

Infrastructure consists of the systems and physical structures that enable the population of a USAF base to function. Infrastructure is primarily human-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as urban, or developed built environment. The availability of infrastructure and its capacity for expansion are essential to the ability of a base to carry out a specific mission and provide for the needs of employees and residents.

Utilities analyzed for each of the four bases in this EIS include water supply and distribution, sanitary sewer and wastewater systems, stormwater drainage, electrical system, natural gas, solid waste, and transportation. Solid waste management primarily relates to the availability of systems and landfills to support a population's residential, commercial, and industrial needs. AFI 32-7042, *Waste Management*, incorporates the requirements of Subtitle D, 40 *CFR* 240 through 244, 257, and 258; applicable federal regulations; AFIs; and DoD directives. It also establishes the requirement for bases to have a solid waste management plan; procedures for handling, storage, collection, and disposal of solid waste; record keeping and reporting; and pollution prevention. The infrastructure information contained in this section provides a brief overview of each infrastructure component and describes its capacities, effectiveness, deficiencies, and existing general condition.

Ground traffic and transportation infrastructure includes the public roadway network, public transportation systems, airports, railroads, pedestrian/bicycle facilities, and waterborne transportation required for the movement of people, materials, and goods. Implementation of the AFRC F-35A mission has the potential to impact the public roadways that provide access to the alternative bases, base access control points or gates, and the internal roadway systems of the bases. Roadways are typically assigned a functional classification by state departments of transportation. Functional classification is the process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide. The three main functional classifications for roadways include:

- Arterial – These roadways provide mobility so traffic can move from one place to another quickly and safely.
- Local – These roadways provide access to homes, businesses, and other property.
- Collector – These roadways link arterial and local roads and perform some of the duties of each.

For the purposes of this infrastructure analysis, the ROI for the proposed action and No Action Alternative includes the areas proposed for infrastructure upgrades on each alternative base and areas surrounding each alternative base where traffic could be affected by implementation of the AFRC F-35A mission.

3.11.2 Regulatory Setting

There is no applicable regulatory setting for infrastructure resources.

3.11.3 Methodology

Effects on infrastructure were evaluated for the proposed action based on the potential for disruption or improvement of existing levels of service and additional needs for water, energy and natural gas

consumption, wastewater and stormwater drainage systems, and solid waste system availability. Changes in population and proposed development were used to determine impacts to infrastructure. At each alternative base, the maximum demand or impact to capacity was calculated for the potable water, wastewater, electric and natural gas systems based on the change in population. For the transportation analysis, any change in population was assumed to reside offbase.

The impact analysis consisted of 1) a quantitative assessment, based on available information for average and peak use and demand data for each on-base utility and the ability of a utility provider to absorb a given level of demand increase for its service area, and 2) a qualitative assessment of the physical condition of each on-base system. Impacts could arise from physical changes to utility supply and distribution systems over their design life cycle and energy needs created by either direct or indirect workforce and population changes related to base activities. An effect would be considered adverse if the proposed action requirements caused any of the following:

- A violation of a permit condition or contract with a utility provider.
- A capacity exceedance of a utility or solid waste facility.
- A system that could not sustain a mission increase due to poor condition, inefficient function, or operation.
- A mission increase that would require costly upgrades.
- A long-term interruption of a utility.

To assess the potential environmental consequences associated with ground traffic and transportation resources, increased utilization of the existing roadway system and base access gates due to the change in personnel is analyzed, as well as potential effects of construction activities. Impacts could arise from physical changes to circulation, construction-related traffic delays, and changes in traffic volumes. Adverse impacts on roadway capacities would be significant if roads with no history of capacity exceedance had to operate at or above their full design capacity as a result of implementation of the proposed action.

3.12 HAZARDOUS MATERIALS AND WASTE

3.12.1 Resource Definition

The terms “hazardous materials” and “hazardous waste” refer to substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristic, could present substantial danger to public health or the environment when released into the environment.

Products containing hazardous materials that could result in the generation of hazardous waste include aviation fuel, adhesives, sealants, conversion coatings, corrosion-prevention compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, and cleaners.

For the purposes of this hazardous materials and waste analysis, the ROI for the proposed action and No Action Alternative encompasses areas that could be impacted by AFRC F-35A mission-related changes to hazardous materials usage and management, hazardous waste generation and management, and hazardous waste disposal at each alternative base. Therefore, the ROI is defined as the boundary of each alternative base.

For environmental restoration sites, the ROI is the footprint of the proposed construction projects described in Chapter 2 of this EIS.

3.12.2 Regulatory Setting

The key federal regulatory requirements related to hazardous materials and waste include:

- Resource Conservation and Recovery Act (RCRA) of 1976 (42 *USC* 6901 et seq.)
- Emergency Planning and Community Right-to-Know (EPCRA) Act of 1986 (42 *USC* 11001-11050)
- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 (42 *USC* 9601-9675)
- Community Environmental Response Facilitation Act of 1992 (42 *USC* 9620)
- Asbestos Hazard Emergency Response Act (15 *USC* 2651)
- Spill Prevention, Control and Countermeasure (SPCC) Rule (40 *CFR* 112)
- USEPA Regulation on Identification and Listing of Hazardous Waste (40 *CFR* 261)
- USEPA Regulation on Standards for the Management of Used Oil (40 *CFR* 279)
- USEPA Regulation on Designation, Reportable Quantities, and Notification (40 *CFR* 302)
- EO 13514, *Federal Leadership in Environmental, Energy, and Economic Performance*
- Toxic Substances Control Act (TSCA) of 1976 (40 *CFR* 700–766)
- CAA of 1970, including the 1990 CAA Amendments (40 *CFR* 61)

Several USAF regulations address the management and safe handling of hazardous materials and wastes in accordance with applicable federal and state regulations. These include:

- AFI 32-7086, *Hazardous Material Management*
- AFI 32-7042, *Solid and Hazardous Waste Compliance*
- AFI 32-1052, *Facility Asbestos Management*

3.12.3 Methodology

The exact amounts of hazardous waste that would be generated as a result of implementation of the AFRC F-35A mission at each alternative base are unknown at this time. The qualitative and quantitative assessment of impacts from hazardous materials and waste management focuses on how (context) and to what degree (intensity) each location could affect hazardous materials usage and management, hazardous waste generation and management, and hazardous waste disposal. Potential impacts associated with hazardous materials and wastes were analyzed for the following five effects:

1. Generation of hazardous material/waste types or quantities could not be accommodated by the current management system.
2. Increased likelihood of an uncontrolled release of hazardous materials that could contaminate the soil, surface water, groundwater, or air.
3. Non-compliance with applicable federal and state regulations as a result of the proposed action.
4. Disturbance or creation of contaminated sites, resulting in adverse effects on human health and/or the environment.
5. Established management policies, procedures, and handling capacities that could not accommodate the proposed action.

CHAPTER 4

BASE ALTERNATIVES AND THE NO ACTION ALTERNATIVE



How to Use This Document

Our goal is to provide a reader-friendly document that provides an in-depth, accurate analysis of the proposed action, the alternative basing locations, the No Action Alternative, and the potential environmental consequences for each base. The organization of this Environmental Impact Statement (EIS) is shown below.

EXECUTIVE SUMMARY

- Synopsis of Purpose and Need and Proposed Action and Alternatives
- Comparison of Impacts

VOLUME I OVERALL SUMMARY

CHAPTER 1

- Purpose and Need for the Air Force Reserve Command (AFRC) F-35A Operational Beddown

CHAPTER 2

- Description of the Proposed Action and Alternatives
- Alternative Identification Process
- Summary Comparison of the Proposed Action and Alternatives

CHAPTER 3

- Resource Definition and Methodology

CHAPTER 4

- Base Alternatives and the No Action Alternative

VOLUME I BASE-SPECIFIC INFORMATION

Davis-Monthan AFB	Homestead ARB	NAS Fort Worth JRB	Whiteman AFB	No Action Alternative
Section DM1.0 Proposed Action Overview	Section HS1.0 Proposed Action Overview	Section FW1.0 Proposed Action Overview	Section WH1.0 Proposed Action Overview	This section describes the effects of not implementing the AFRC F-35A mission at any of the four bases.
Section DM2.0 Base-Specific Project Details	Section HS2.0 Base-Specific Project Details	Section FW2.0 Base-Specific Project Details	Section WH2.0 Base-Specific Project Details	
Section DM3.0 Affected Environment and Environmental Consequences	Section HS3.0 Affected Environment and Environmental Consequences	Section FW3.0 Affected Environment and Environmental Consequences	Section WH3.0 Affected Environment and Environmental Consequences	
Section DM4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section HS4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section FW4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	Section WH4.0 Cumulative Effects, Irreversible and Irretrievable Commitment of Resources	

VOLUMES I AND II SUPPORTING INFORMATION

CHAPTER 5

- References

- List of Preparers

- List of Repositories

- Glossary

- Index

APPENDICES: VOLUME II

- Appendix A – Correspondence
- Appendix B – Noise Modeling, Methodology, and Effects
- Appendix C – Air Quality

4.0 INTRODUCTION TO ALTERNATIVE BASE-SPECIFIC SECTIONS AND THE NO ACTION ALTERNATIVE

This Environmental Impact Statement (EIS) has been prepared as concisely as possible while still addressing the installation-specific concerns of individuals and agencies. This EIS meets the requirements for a comparative analysis to provide the U.S. Air Force (USAF) decision-maker with maximum flexibility to determine where the proposed Air Force Reserve Command (AFRC) F-35A mission should be located. The USAF evaluated and compared operational, economic, and environmental factors to determine whether to make a basing decision at this time and, if such a decision is made, where the AFRC F-35A mission would be located. During the public scoping period, the public and agencies submitted comments regarding base-specific concerns. The comments received covered a variety of different topics. Some comments applied to the AFRC F-35A mission at each of the four alternative bases, while other comments were specific to one alternative base. Therefore, this EIS analyzes the impacts that would result from implementation of the AFRC F-35A mission at each of the four alternative bases along with the No Action Alternative.

Chapter 3, Resource Definition and Methodology, applies to all four of the alternative bases. Chapter 4 is divided into five subsections, four of which apply to a specific alternative base and one of which applies to the No Action Alternative. Each subsection in Chapter 4 is labeled with a unique identifier in front of each of the section and page numbers. The alphabetical order and unique identifier (**bold**) used to present these subsections is as follows:

- Davis Monthan Air Force Base (AFB), Arizona (**DM**)
- Homestead Air Reserve Base (ARB), Florida (**HS**)
- Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas (**FW**)
- Whiteman AFB, Missouri (**WH**)
- No Action Alternative (**NA**)

Each of the base-specific sections contains four subsections. Subsections 1 and 2 describe the base and the details of the proposed action at that base should the AFRC F-35A mission be located at that base. Subsection 3 describes the affected environment (i.e., baseline conditions for 12 resource areas) and the consequences that would result from implementation of the proposed mission. Subsection 4 describes the cumulative effects and irreversible and irretrievable commitment of resources for each base.

The resource areas described in Subsection 3 are presented in the same order for each alternative base to allow for ready comparison of the alternatives. For example, the noise subsection for Davis-Monthan AFB is labeled as subsection DM3.2 and the noise subsection for Homestead ARB is labeled as HS3.2.

Implementation of the AFRC F-35A mission would involve four action elements that would affect the selected alternative base (if an alternative base is selected) and three action elements that would affect the airspace proposed for use by AFRC F-35A pilots that would be stationed at that base. Per the National Environmental Policy Act (NEPA) and Council on Environmental Quality (CEQ) regulations, this EIS focuses on the resource areas that would be affected by implementation of the AFRC F-35A mission and excludes discussion of resource areas not affected. For example, the affected environment and environmental consequences for some of the resource areas (e.g., infrastructure) were not evaluated under the airspace proposed for use because implementation of the proposed mission would not result in any changes or impacts to infrastructure under the

airspace proposed for use. Table 4-1 identifies the resource areas analyzed in this EIS and the range of analysis presented for each resource area (i.e., alternative base and airspace proposed for use).

Table 4-1. Resource Areas Analyzed in this EIS

Resource Area	Analysis of Affected Environment and Environmental Consequences at Alternative Base	Analysis of Affected Environment and Environmental Consequences Under Airspace Proposed For Use
Airspace Management and Use	Yes	Yes
Noise	Yes	Yes
Air Quality	Yes	Yes
Safety	Yes	Yes
Soil and Water Resources	Yes	No
Biological Resources	Yes	Yes
Cultural Resources	Yes	Yes
Land Use and Recreation	Yes	Yes
Socioeconomics	Yes	No
Environmental Justice/Protection of Children	Yes	No
Infrastructure	Yes	No
Hazardous Materials and Waste	Yes	No

As described in Chapter 2, Section 2.3.3, the USAF evaluated three different scenarios for afterburner use. Scenario A is afterburner use on 5 percent of takeoffs. Scenario B is afterburner use on 50 percent of takeoffs. Scenario C is afterburner use on 95 percent of takeoffs. Impacts to the airspace, safety, soil and water, biological, cultural, infrastructure, and hazardous materials and hazardous waste resource areas would not be affected by the afterburner scenario selected. Therefore, the different afterburner scenarios are not described for these resource areas.

The No Action Alternative for this EIS means that no AFRC F-35A mission would be implemented. Implementation of the No Action Alternative would mean that the AFRC F-35A aircraft beddown would not occur and no F-35A-related personnel or construction changes would occur at any of the four alternative bases. The current environmental situation, which includes ongoing, currently planned activities and programs, would continue unchanged at each of the four alternative bases until retirement of the current aircraft.

CHAPTER 4

BASE ALTERNATIVE: DAVIS-MONTHAN AIR FORCE BASE



DM1.0 DAVIS-MONTHAN AIR FORCE BASE OVERVIEW

Davis-Monthan Air Force Base (AFB) is located on the southeastern edge of the City of Tucson in Pima County, Arizona (Figure DM1-1). The majority of the base, with the exception of the southeastern portion, is located within the city limits of Tucson. The base encompasses approximately 10,700 acres, of which approximately 5,700 acres are developed or semi-improved, 4,700 acres are undeveloped, and 300 acres are under easement and maintained by Pima County. Davis-Monthan AFB is surrounded by heavy to light industrial development to the south and west and the City of Tucson to the north. The Aerospace Maintenance and Regeneration Group (AMARG) dominates land use to the east, with some residential development to the northeast. (Figure DM1-1). The primary runway at Davis-Monthan AFB, Runway 12/30, is 13,645-feet long and 200-feet wide with 1,000-foot overruns at each end (Figure DM1-2).

The Air Combat Command (ACC) 355th Fighter Wing (355 FW) is the host unit at Davis-Monthan AFB. The primary mission of the 355 FW is to deploy, employ, support, and sustain attack airpower for military commanders worldwide. The 355 FW provides medical, logistical, mission, and operational support to all assigned units.

The Air Force Reserve Command (AFRC) 924th Fighter Group (924 FG) is an “associate” unit to the 355 FW. As an associate unit, the 924 FG works with the 355 FW to train and produce qualified A-10 pilots for theater commanders worldwide. The 47th Fighter Squadron (47 FS), as a unit of the 924 FG, operates 24 A-10C aircraft at Davis-Monthan AFB; these aircraft would be replaced with 24 F-35A aircraft should the installation be selected to receive the AFRC F-35A mission. The 924 FG currently occupies facilities along the northeast edge of the flightline in support of their mission.

The major tenants at Davis-Monthan AFB include Headquarters (HQ) 12th Air Force, the 162nd Fighter Wing (162 FW), the 563rd Rescue Group (563 RQG), the 943rd Rescue Group (943 RQG), the AMARG, the 55th Electronic Combat Group (55 ECG), the 214th Reconnaissance Group (214 RG), the Western Air Defense Sector (WADS) Alert Detachment, and U.S. Customs and Border Protection (CBP). The tenants and the AMARG operate a wide variety of both fixed and rotary wing aircraft at Davis-Monthan AFB, including but not limited to C-130, Cessna 210, F-16, P-3, HH-60, UH-60, and AS-350. The Air National Guard Air Force Reserve Command Test Center (AATC) also operates a detachment of test mission A-10C aircraft at Davis-Monthan AFB. The AMARG provides a single location to process and maintain aircraft and components stored by all branches of the Armed Services.

Refer to Chapter 1 for the purpose and need for the AFRC F-35A mission, a description of the F-35A aircraft characteristics, and information about public involvement and agency coordination. Refer to Chapter 2 for the description of the proposed action and alternatives, and a description of the strategic basing and alternative identification processes. In the base-specific sections that follow, Section DM2 presents the description of the proposed action at Davis-Monthan AFB. Section DM3 addresses baseline conditions and environmental consequences that could result from implementation of the proposed action at Davis-Monthan AFB. Section DM4 identifies other, unrelated past, present, and reasonably foreseeable future actions in the affected environment and evaluates whether these actions would cause cumulative effects when considered along with the AFRC F-35A beddown. This section also presents the irreversible and irretrievable resources that would be committed should the proposed action be implemented at Davis-Monthan AFB.

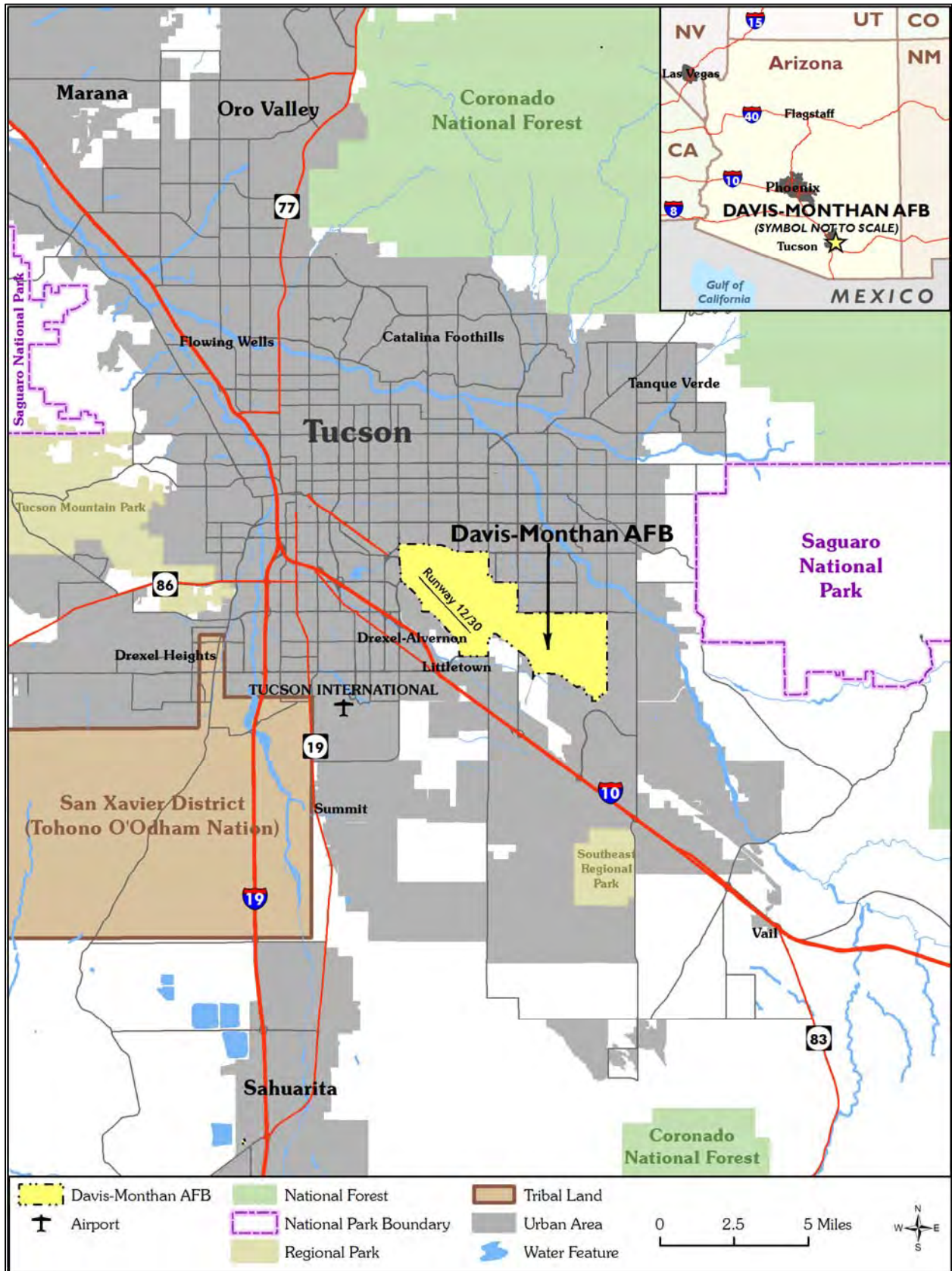


Figure DM1-1. Regional Location of Davis-Monthan AFB

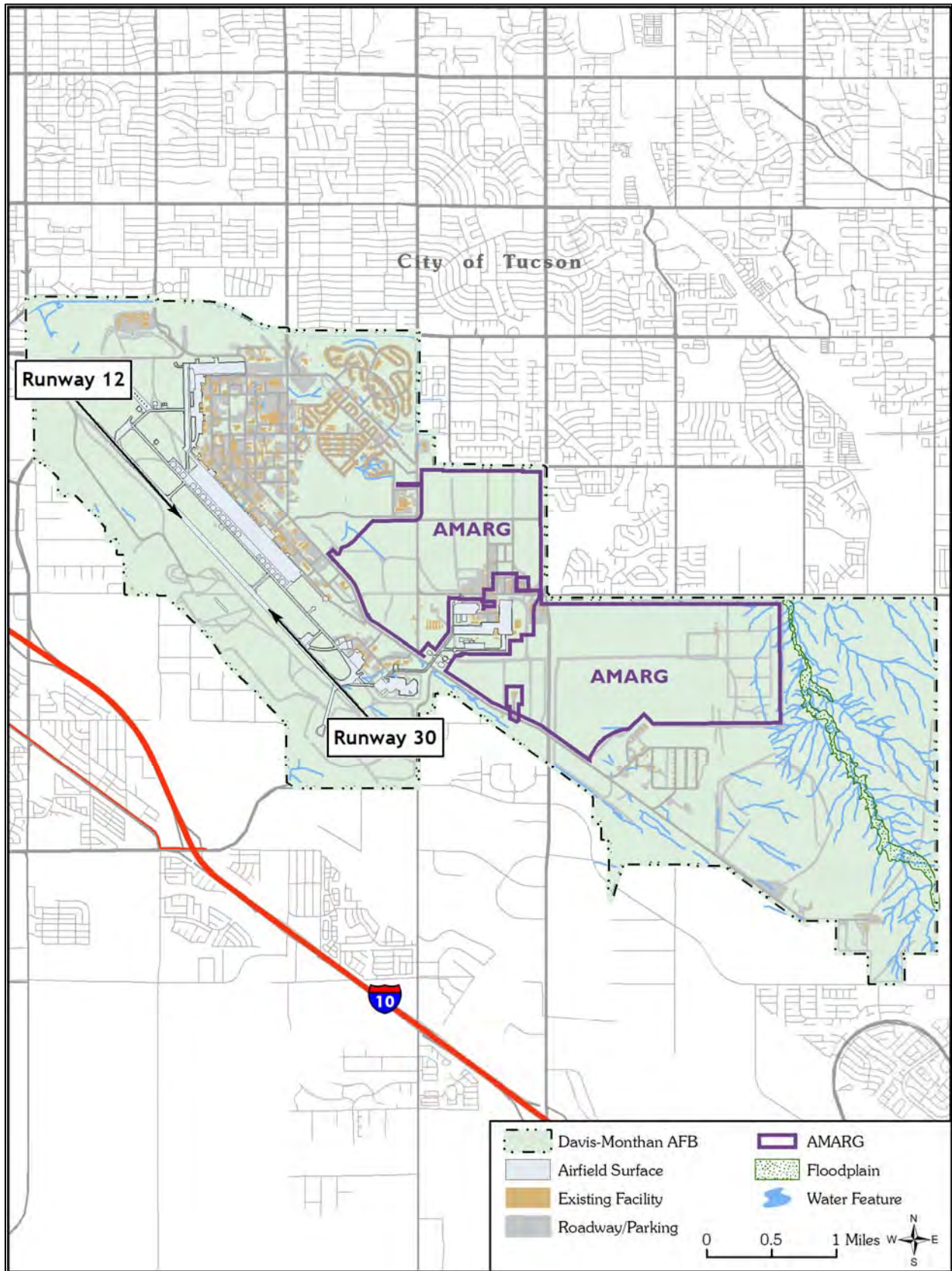


Figure DM1-2. Primary Runways at Davis-Monthan AFB

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DM2.0 DAVIS-MONTHAN AIR FORCE BASE ALTERNATIVE

This section presents the specifics of the proposed action at Davis-Monthan AFB. Four elements of the proposed action have the potential to affect the base and associated airspace: (1) facility and infrastructure projects to support the F-35A beddown; (2) personnel changes necessary to meet F-35A requirements; (3) airfield operations conducted by AFRC F-35A pilots; and (4) airspace and range use by AFRC F-35A pilots. Each element is explained in the following subsections. In addition, this section also presents state and federal consultation efforts and associated permits that would be required should Davis-Monthan AFB be selected to receive the AFRC F-35A mission.

Under the proposed action, 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft would start to arrive at Davis-Monthan AFB in early 2024. Delivery of the full complement of 24 PAA F-35A aircraft and 2 Backup Aircraft Inventory (BAI) is anticipated to take 2 years. At that time, the F-35A aircraft would completely replace the existing 24 A-10 aircraft assigned to the 924 FG. The A-10 aircraft that would be replaced by the F-35A aircraft would be reassigned or removed from the U.S. Air Force (USAF) inventory.

DM2.1 FACILITIES AND INFRASTRUCTURE

To support the AFRC F-35A mission, additional infrastructure and facility modifications would be required at Davis-Monthan AFB (Table DM2-1). A total of 17 different improvement projects and 2 demolition projects would be implemented in 2021 at Davis-Monthan AFB (Figure DM2-1). The USAF estimates that \$87.3 million in Military Construction (MILCON) expenditures would be required to implement the proposed AFRC F-35A mission at Davis-Monthan AFB.

Table DM2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Davis-Monthan AFB

Project ^a	Size (ft ²) ^b
Demolition	
Demolish Building 5247	18,418
Demolish Building 5251	47,432
Demolition Total	65,850
Renovation	
Building 5111 addition for hazardous materials storage	9,301
Building 5111 renovation for collateral storage	500 ^c
Building 404 medical building addition	2,178
Building 1358 renovation for the security forces facility modifications	500 ^c
Widen street north of Building 5111	11,920
Runway 30 approach end concrete modifications (not shown)	52,788
Ramp repairs (not shown)	398,445
Refurbish 23 sunshades to hardened tops (change tops of existing structures)	0
Renovation Total	475,632
New Construction	
Construct a 6-bay hangar	18,418
Construct an F-35A flight simulator building	13,650
Construct a squadron operations building	37,523
Construct a maintenance support building	32,636
Construct a munitions maintenance building (not shown)	5,000
Construct a munitions operations building (not shown)	4,800

Table DM2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Davis-Monthan AFB (Continued)

Project ^a	Size (ft ²) ^b
New Construction	
Construct a flare storage building (not shown)	4,800
Construct a storage igloo facility (not shown)	9,840
Construct 1 sunshade	6,400
New Construction Total	133,067

^a Data in this table were obtained from site interviews at Davis-Monthan AFB (Davis-Monthan AFB 2017a).

^b Size is the area covered by the footprint of the proposed facilities and consists of the designed limits of the structure, facility, apron, road, access, and/or parking lot.

^c Interior renovation only.

New construction and facility additions would require construction grading, clearing, and equipment laydown space. To account for this disturbance, this analysis also includes disturbance areas in addition to the facility size. These disturbance areas encompass 20 feet adjacent to linear features (e.g., roads, utility extensions, etc.) and 50 feet around the facility footprint for all other facilities. Repairs of existing aircraft aprons or ramps are not included in these calculations because these repairs would occur on paved or concrete surfaces. Interior renovations are also not included in these calculations because these renovations would not create ground disturbance or a change in impervious surfaces.

New construction and facility additions would also result in changes to existing impervious surfaces. It is assumed that any demolition would include demolition of the building slab and result in a reduction in impervious surfaces. In some cases, demolished facilities would be replaced by new construction or pavements. This increase in impervious surfaces is accounted for in the new construction. Table DM2-2 provides a summary of the ground disturbance and changes in impervious surfaces.

Table DM2-2. Summary of Facility and Infrastructure Projects for Davis-Monthan AFB

Project Type	Ground Disturbance (Acres)	Change in Impervious Surfaces (Acres)
Demolition	4.5	-1.5
Renovation ^a	2.0	+0.5
New Construction ^b	8.7	+2.6
Total	15.2	+1.6

^a Totals do not include interior renovation, runway, or ramp renovation projects.

^b Totals do not include construction of the sunshade.

Facility siting on military installations is predominantly functional-use based (i.e., locating facilities with like functional uses adjacent to one another). However, safety and compliance with policies and regulations are also used as planning factors. During the planning phase for a new aircraft mission beddown, military planners consider a variety of alternatives necessary to meet the requirements of the new mission, including the use of existing facilities that can be partially or entirely used to meet mission requirements. Depending on available infrastructure, facilities, and, to some degree, personnel available to support the AFRC F-35A mission, proposed construction, demolition, and renovation projects vary between alternatives. The facility siting analysis for each alternative base considered the functional requirements of the AFRC F-35A mission and compared them with the existing infrastructure and environmental constraints at each alternative base.

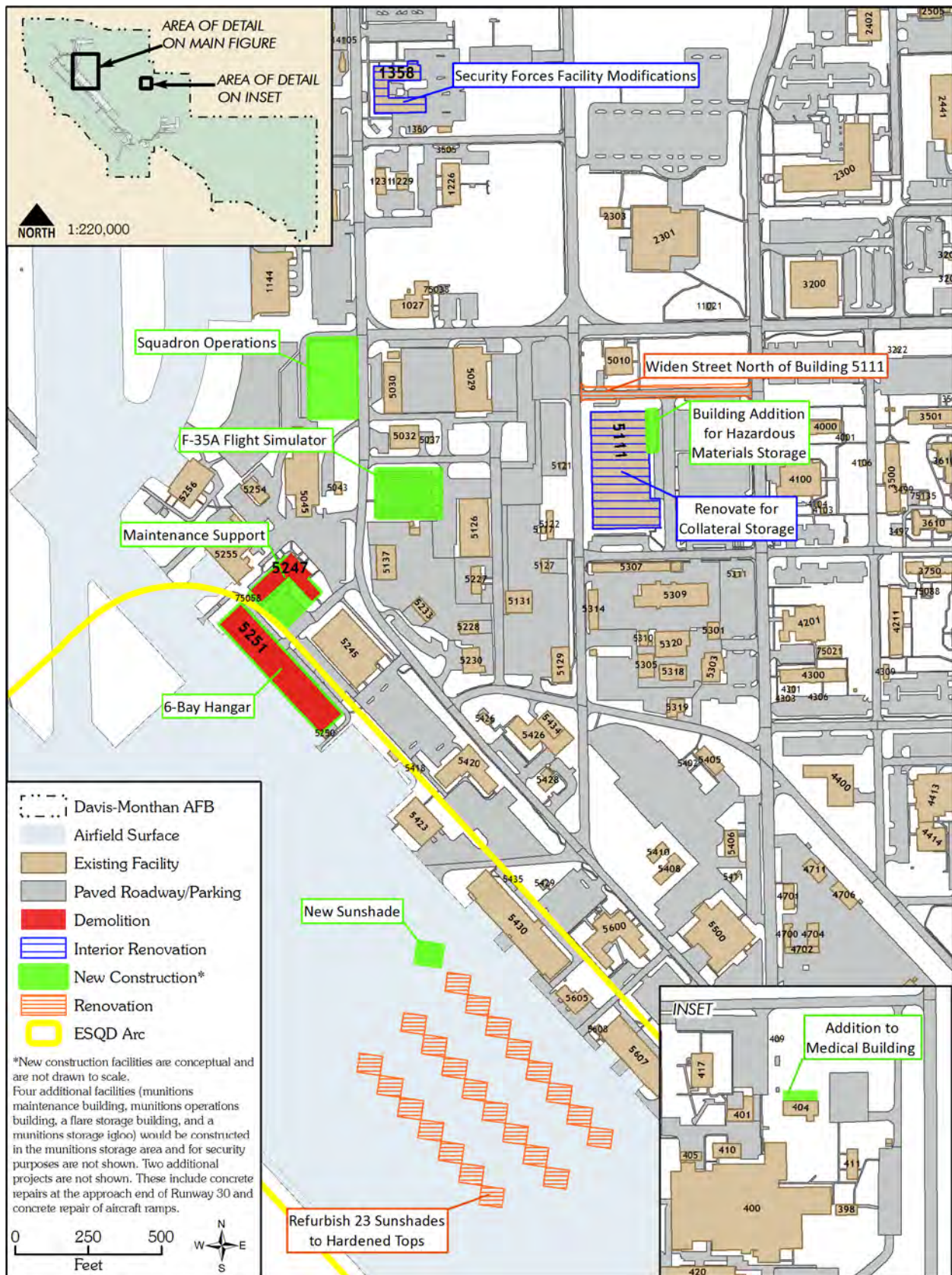


Figure DM2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Davis-Monthan AFB

New construction siting is a stepwise process that includes identifying suitable sites relative to existing facilities and base infrastructure to provide operational efficiencies and suitable cost-benefit values. Utility siting, including the re-routing of existing utilities or the installation of new utility infrastructure (e.g., power, water, sewer, and communication lines), could also be required to accommodate the new mission. The siting process for utilities focused on using existing conduits and previously disturbed areas or areas that would also be disturbed for facility modifications. Temporary construction laydown areas could also be required to support construction. Construction laydown areas would be located in developed or semi-developed areas, or previously disturbed or paved areas. Construction laydown areas not proposed for permanent disturbance would be returned to their pre-construction state upon completion of construction. All construction contracts would be managed under Unified Facilities Criteria (UFC) 3-101-01, *Best Management Practices*, and attainment of a Leadership in Energy and Environmental Design (LEED) Silver certification.

Construction and renovation projects within the 65-decibel (dB) noise contour would include acoustical design considerations for façade elements and interior design requirements per UFC 3-101-01. Land use would be consistent with Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*, and Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager’s Guide*.

DM2.2 PERSONNEL

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would require sufficient and appropriately skilled military and civilian personnel to operate and maintain the F-35A aircraft and to provide other necessary support services. Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in a decrease of 30 positions. This would constitute a 0.3 percent decrease in base staffing (Table DM 2-3).

Table DM2-3. Personnel Changes for the AFRC F-35A Mission at Davis-Monthan AFB

Baseline Personnel			Proposed F-35A Authorized Personnel			Percent Change to Total Personnel
Total Authorized Personnel	AFRC Authorized Personnel	Percent of Total Authorized Based Personnel	AFRC F-35A	Change to AFRC Unit Personnel Positions	Percent Change to AFRC Unit Personnel	
10,140	1,154	11.38%	1,124	-30	-2.60%	-0.3%

DM2.3 AIRFIELD OPERATIONS

The 924 FG is an integral part of the Combat Air Forces (CAF). The CAF defends the homeland of the United States and deploys forces worldwide to meet threats and ensure the security of the nation. To fulfill this role, the 924 FG must train as it would fight.

The USAF anticipates that once the full complement of aircraft is received, the 24 F-35A aircraft would be used to fly 11,580 operations per year from the airfield. Based on the proposed requirements and deployment patterns, AFRC F-35A pilots would fly additional operations during deployments, or at other locations for exercises or in preparation for deployments. In addition, AFRC F-35A pilots stationed at Davis-Monthan AFB could participate in remote training exercises. Some of these missions could involve ordnance delivery training or missile firing exercises (within the scope of existing National Environmental Policy Act [NEPA] documentation) at ranges approved for such ordnance use (e.g. Barry M. Goldwater Range [BMGR] in western Arizona).

Conducting 11,580 operations per year would represent an increase of 492 annual airfield operations compared to current A-10 aircraft operations (Table DM2-4). Of the 73,256 total airfield operations currently conducted at Davis-Monthan AFB, 15 percent are conducted by the 924 FG. Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in a 0.7 percent increase in annual total airfield operations.

Table DM2-4. Davis-Monthan AFB Baseline A-10 and Proposed F-35A Annual Airfield Operations

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
Based A-10 (924 FG only)	11,088	0
Proposed F-35A	0	11,580
Other Aircraft	62,168	62,168
Total Airfield Operations	73,256	73,748
Percent Change		0.7%

^a Total baseline operations is for the last year. Data in this table were collected from the operations staff at Davis-Monthan AFB in 2017 (Davis-Monthan AFB 2017a).

AFRC F-35A pilots would perform departure and landing procedures similar to those currently conducted by the A-10 pilots at the installation. Due to differences in aircraft characteristics and performance, the flight profiles and tracks used by AFRC F-35A pilots would slightly vary from those currently used by A-10 pilots. A-10 pilots from the 924 FG average 245 flying days per year. For the purposes of this analysis and to compare the alternatives on an equal basis, the total number of possible flying days for AFRC F-35A pilots is also assumed to be 245, including both Saturday and Sunday (on Unit Training Assembly [UTA] weekends).

Although the AFRC A-10 aircraft do not have afterburners, other military aircraft operating at Davis-Monthan AFB use afterburners on occasion when additional power is needed. As described in Chapter 2, Section 2.3.3, the USAF evaluated three different scenarios for afterburner use. Scenario A is afterburner use on 5 percent of takeoffs. Scenario B is afterburner use on 50 percent of takeoffs. Scenario C is afterburner use on 95 percent of takeoffs.

AFRC F-35A pilots would operate similar to the A-10 pilots. Currently, A-10 operations primarily begin at 7:00 A.M. and conclude by 10:00 P.M. on weekdays and on UTA weekends (except when weather contingencies or special exercises cause operations to occur after 10:00 P.M.). After-dark training is normally scheduled to be completed before 10:00 P.M. After-dark training for AFRC F-35A pilots would also be scheduled to be completed before 10:00 P.M. Because of the capabilities and expected tactics of the F-35A aircraft, AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC A-10 pilots depending on weather or special exercises.

DM2.4 AIRSPACE AND RANGE USE

Table DM2-5 identifies the Federal Aviation Administration (FAA)-designated airspace currently used by Davis-Monthan AFB A-10 pilots that is also proposed for use by AFRC F-35A pilots. Implementation of the AFRC F-35A mission would not require any new airspace or changes to existing airspace boundaries, and the type and number of ordnance used at any of the ranges approved for such use could decrease.

Table DM2-5. Davis-Monthan AFB Training Airspace

FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Fuzzy MOA	100 AGL	UTBNI 10,000
Jackal MOA	11,000 or 3,000 AGL whichever is higher	UTBNI 18,000
Jackal Low MOA	100 AGL	UTBNI 11,000 MSL or 3,000 AGL whichever is higher
Outlaw MOA	8,000 or 3,000 AGL whichever is higher	UTBNI 18,000
Ruby 1 MOA	10,000	UTBNI 18,000
Sells 1 MOA	10,000	UTBNI 18,000
Sells Low MOA	3,000 AGL	UTBNI 10,000
Tombstone A & B MOAs	500 AGL	UTBNI 14,500
Tombstone C MOA	14,500	UTBNI 18,000
Barry M. Goldwater Range (BMGR) R-2301E	Surface	UTBNI 80,000
BMGR R-2304	Surface	UTBNI 24,000
BMGR R-2305	Surface	UTBNI 24,000
Fort Huachuca Range R-2303A	Surface	UTBNI 15,000
Fort Huachuca Range R-2303B	8,000	UTBNI 30,000
Fort Huachuca Range R-2303C	15,000	UTBNI 30,000

^a Airspace used by F-35A pilots would include Air Traffic Control Assigned Airspaces (ATCAAs) that occur over the Military Operations Areas (MOAs) included in the table. The ATCAAs will accommodate training above 18,000 feet mean sea level (MSL).

^b Floor altitudes could exclude certain areas. See FAA Sectional Charts for exclusions.

Note: MSL is the elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level. The elevation of a mountain, for example, is marked by its highest point and is typically illustrated as a small circle on a topographic map with the MSL height shown in either feet or meters or both. Because aircraft fly across vast landscapes, where points above the ground can and do vary, MSL is used to denote the “plane” on which the floors and ceilings of Special Use Airspace (SUA) are established and the altitude at which aircraft must operate within that SUA.

Key: AGL = above ground level; UTBNI = Up To But Not Including

Source: FAA Phoenix (2018) and San Antonio (2018) Sectional Charts

DM2.4.1 Airspace Use

AFRC F-35A pilots would conduct missions and training activities necessary to fulfill the multi-role responsibility of this aircraft. All F-35A flight activities would occur in existing airspace. AFRC F-35A pilots would operate in the same airspace used by A-10 pilots from 924 FG, but at higher altitudes. A-10 pilots from the 924 FG use Military Operations Areas (MOAs), Restricted Areas (RAs), and Air Traffic Control Assigned Airspace (ATCAA) (Figure DM2-2 and Table DM2-5). To support realistic training, A-10 pilots schedule and use multiple adjacent airspaces together.

The FAA-designated airspace identified in Table DM2-5 is also used by other USAF pilots operating A-10, F-16, and F-35A aircraft and Navy pilots operating F-18 aircraft. A-10 pilots from the 924 FG conduct approximately 7 percent of the total sorties flown in the airspace identified in Table DM2-5. Although AFRC F-35A pilots would conduct missions similar to those of A-10 pilots, the capabilities of the F-35A aircraft allow for supersonic and higher altitude flight. Regardless of the altitude structure and percent use indicated in Table DM2-6, AFRC F-35A pilots (as do existing military aircraft pilots) would adhere to all established floors and ceilings of existing FAA-designated airspace. For example, the floor of the Sells Low MOA is 3,000 feet above ground level (AGL). While in this MOA, AFRC F-35A pilots would not fly below that altitude. Rather, AFRC F-35A pilots would adapt training to this and other airspace with lower floors.

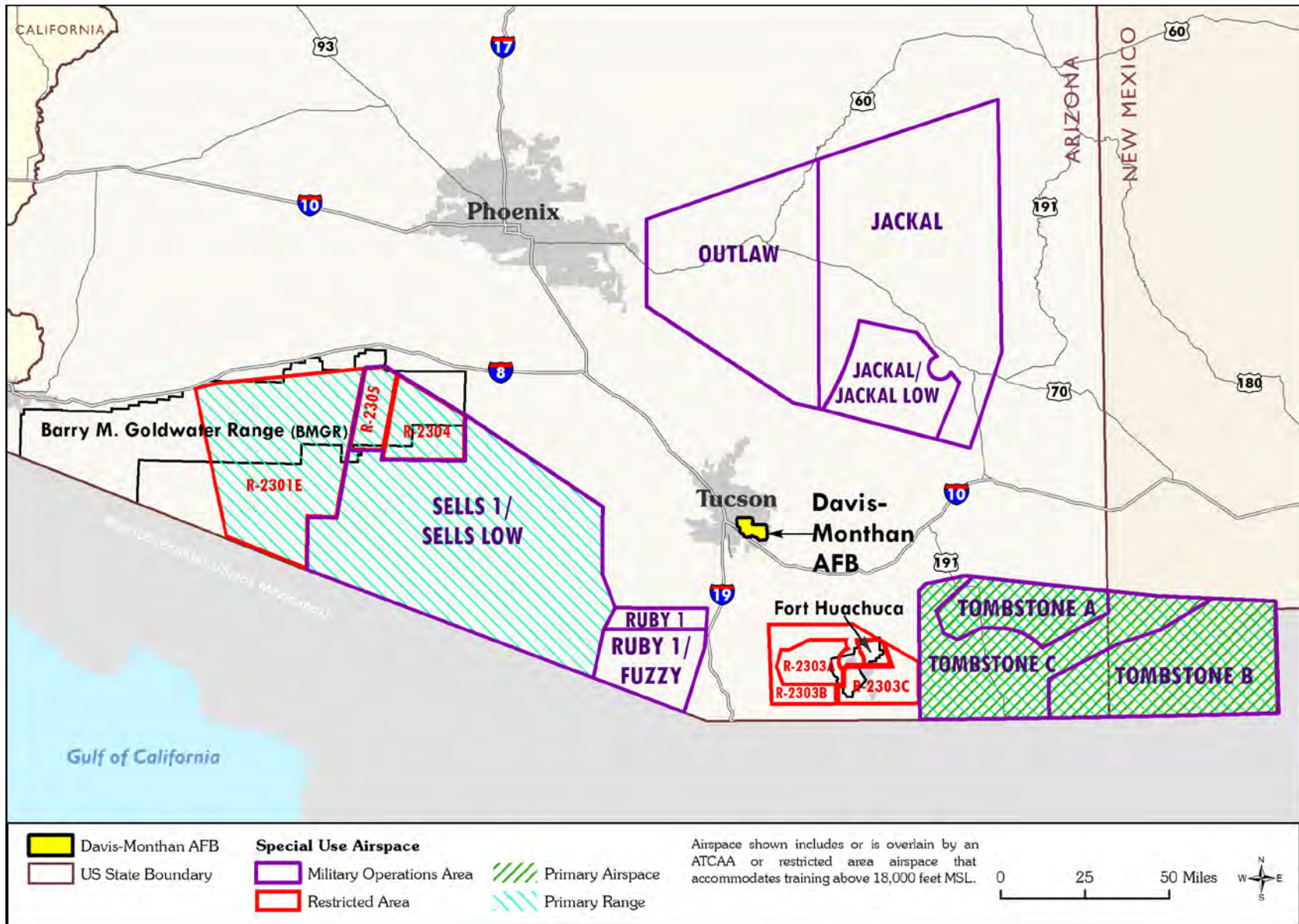


Figure DM2-2. Airspace Associated with Davis-Monthan AFB

Table DM2-6. Current and Proposed Aircraft Altitude Distribution in the Airspace

Altitude (feet)	Percentage of Use	
	A-10	AFRC F-35A
100 – 500 AGL	7%	0%
500 AGL – 2,000 AGL	30%	1%
2,000 – 5,000 AGL	26%	0%
5,000 AGL – 10,000 MSL	33%	5%
10,000 – 18,000 MSL	4%	23%
18,000 – 30,000 MSL	0%	60%
+30,000 MSL	0%	11%

A-10 pilots from the 924 FG generally operate 100 percent of the time at or below 18,000 feet mean sea level (MSL). In contrast, AFRC F-35A pilots would operate 71 percent of the time at or above 18,000 feet MSL, with 11 percent of the flight time above 30,000 feet MSL.

By 2030, total annual sorties would increase by 5 percent from baseline levels (Table DM2-7). In the most heavily used airspace, like the Tombstone MOA, AFRC F-35A sorties would account for 85 percent of total airspace sorties.

Table DM2-7. AFRC F-35A Airspace Sorties Flown from Davis-Monthan AFB

Airspace ^a	Total Baseline	A-10 Baseline	AFRC F-35A Sorties	Net Change (Total)	Percent Change (Total)
Southern Arizona	40,358	2,628	4,632	2,004	5.0%
Total	40,358	2,628	4,632	2,004	5.0%

^a Includes all airspace identified in Table DM2-5.

To train with the full capabilities of the aircraft, AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities. Due to the capability of the F-35A aircraft, the USAF anticipates that approximately 10 percent of the time spent in air combat training would involve supersonic flight. A-10 aircraft operating from Davis-Monthan AFB are not capable of supersonic flight.

AFRC F-35A missions would last approximately 45 to 115 minutes, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, AFRC F-35A pilots would fly approximately 20 to 60 minutes in the training airspace. Occasionally, AFRC F-35A pilots could fly up to 90-minute sessions. AFRC F-35A pilots would not fly in Special Use Airspace (SUA) during environmental night (10:00 P.M. to 7:00 A.M.), except for rare contingencies and special mission training.

DM2.4.2 Range Use

AFRC F-35A pilots would only use existing ranges. At Davis-Monthan AFB, AFRC F-35A pilots would use the BMGR.

Most air-to-ground training would be simulated (i.e., nothing is released from the aircraft and electronic scoring is used). However, as described in Chapter 2, Section 2.3.4.2, the F-35A (like the A-10) is capable of carrying and using several types of air-to-air and air-to-ground ordnance, and pilots would require training in their use. The type and number of ordnance used by AFRC F-35A pilots could decrease from that currently used by A-10 pilots. If in the future the USAF identifies weapon systems that are either new or could exceed currently approved levels, appropriate NEPA documentation would be completed prior to their use.

Similar to A-10 pilots, AFRC F-35A pilots would use flares as defensive countermeasures in training. Flares are one of the defensive mechanisms dispensed by military aircraft to avoid attack by enemy aircraft and air defense systems. For the purposes of this analysis, it is estimated that flare use by AFRC F-35A pilots would be less than or equal to that of A-10 pilots. Chapter 2, Section 2.3.4.2.1, provides details on the composition and characteristics of flares. Flares would only be used in areas currently approved for such use. Current restrictions on the altitude of flare use would also apply. Approximately 70 percent of F-35A flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete combustion of each flare.

DM2.5 PUBLIC, AGENCY, AND TRIBAL INVOLVEMENT

DM2.5.1 Scoping Process

The public scoping period for the AFRC F-35A Environmental Impact Statement (EIS) began on 22 March 2018 with publication of the Notice of Intent (NOI) in the *Federal Register*. During the following weeks, notification letters were mailed to federal, state, and local agencies; elected officials; federally recognized tribes (tribes)¹; nongovernmental organizations; and interested individuals as a part of an interagency/intergovernmental coordination process. Through this process, concerned federal, state, and local agencies are notified and allowed sufficient time to evaluate potential environmental impacts of a proposed action.

Volume II, Appendix A, provides sample notification letters, the notification mailing lists, and the agency comments and concerns received by the USAF during the public scoping period. For the Davis-Monthan AFB alternative, newspaper advertisements announcing the intent to prepare an EIS and hold a public scoping meeting were published in five different local newspapers, including one Spanish language newspaper. These advertisements were published in the weeks preceding the scheduled public scoping meeting.

For the Davis-Monthan AFB alternative, one public scoping meeting was held on 24 April 2018 at the Tucson Convention Center (260 South Church Avenue, Tucson, Arizona 85701). This meeting was held in an open-house format where attendees could sign in, if desired, review display boards about the proposed AFRC F-35A mission, and provide written comments on the project. During this meeting, USAF personnel presented information on the project through the use of display boards and fact sheets. The Davis-Monthan AFB public scoping meeting was attended by 230 people, including residents, elected officials, local business leaders, military affairs committee members, congressional staffers, base employees, local media, and others.

Throughout the public scoping period, the USAF offered multiple ways in which comments could be submitted. Comments were submitted at the public scoping meeting and through the project website, via email, and via regular mail or courier. The public scoping period closed on 11 May 2018, and 510 comments were received regarding the Davis-Monthan AFB alternative. Some comments were received after the public scoping period closed but were still considered during development of the Draft EIS.

¹ Per DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*, “tribe” refers to a federally recognized Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges (DoDI 4710.02, Section 3.5). Although not included as federally recognized tribes in the list, the USAF similarly must consult with Native Hawaiian organizations in accordance with DoDI 4710.03, *Consultation with Native Hawaiian Organizations (NHOs)*.

After the public scoping period closed, the USAF was made aware that the address provided for submittal of courier-delivered (e.g., Federal Express or United Parcel Service) public scoping comments was incorrect. Consequently, the USAF provided the correct address and an additional 10 working days to resubmit scoping comments from the time resubmittal instructions were published in the *Federal Register* on 13 August 2018 and in five local newspapers. During this second public scoping period, an additional 161 comments were received regarding the Davis-Monthan AFB alternative. These comments were also considered during development of the Draft EIS.

The majority of comments received for the Davis-Monthan AFB alternative were related to potential noise increases. Although some commenters expressed support for the proposed mission, other commenters expressed concerns about safety, airspace, biological resources, air quality, land use, and socioeconomics. To a lesser extent, some people submitted comments concerning hazardous materials and hazardous waste, environmental justice, cultural resources, infrastructure, traffic and transportation, and soil and water resources.

DM2.5.1.1 NEPA Process and Development of EIS

Several comments were made on the sufficiency of time allowed for scoping comments. One commenter expressed concern about how the USAF addresses comments by grouping them into categories and then summarizing the group with one sentence. One commenter wrote a letter on honesty and transparency, stating that the EIS must be honest and transparent and criticizing several previous USAF EISs that the commenter felt did not meet those qualifications.

DM2.5.1.2 Airspace Management and Use

Comments related to airspace included those that requested the EIS analyze any changes in airspace use, creation of new airspace, or alterations in flight paths. Concerns were raised about congested airspace near Tucson International Airport (TUS). Several comments suggested moving existing flight paths away from populated areas or other sensitive locations.

DM2.5.1.3 Noise

Comments received during scoping indicated a broad range of concerns and requested a comprehensive presentation of noise impacts. Many commentators noted the difference in noise level between the A-10 aircraft currently based at Davis-Monthan AFB and the F-35A aircraft.

The most commonly expressed concerns dealt with the potential for an increase in noise pollution and the effects of any noise increases on human health, quality of life issues, natural resources, animals (domesticated animals, zoo animals, and wildlife), wilderness and other natural areas, outdoor recreation, educational facilities, and vibrational effects to structures.

Several people submitted comments regarding the noise analysis in the EIS and requested the USAF use supplemental metrics other than day-night average sound level (DNL). Comments were received on the modeling parameters the USAF has used in past EISs and recommended parameters for inclusion in this EIS.

Several people submitted comments regarding overflight noise that could occur while the aircraft are transiting from the airfield to and from the airspace proposed for use. Other people submitted comments regarding noise impacts inside the current noise contours surrounding Davis-Monthan AFB. A number of facilities, neighborhoods and parks were listed, including, but not limited to, University of Arizona, Reid Park Zoo, elementary schools, medical facilities, and senior or assisted living facilities.

Some comments requested that the EIS include noise mitigation or recommended basing the F-35A aircraft in a more rural setting.

DM2.5.1.4 Air Quality

During scoping, people submitted comments regarding the pollutant impacts that could result from implementation of the proposed AFRC F-35A mission. Jet fuel and jet fumes were often mentioned, as were particulates, carbon dioxide, nitrous oxide, and ozone (O₃). Some commenters noted that the USAF does not appear to change flight conditions due to extreme temperatures or air quality warnings.

Some of the commenters expressed concern about future air pollution increases in the region and how pollution from the AFRC F-35A mission would add to that. Concern was also expressed about climate change-related impacts and weather inversions in the region's valleys.

DM2.5.1.5 Safety

Several people submitted comments regarding flight safety. Many of these commenters expressed concern about the safety of a single-engine aircraft in a major metropolitan area. Commenters also expressed concern about the number of deficiencies that have been reported for the F-35 aircraft and the general readiness of the aircraft.

Concern was also expressed over the safety of the composite materials used in the construction of the F-35 and a desire to see the full safety record of the F-35, including all Class A through Class C mishaps.

DM2.5.1.6 Soil and Water Resources

Several commenters expressed concern that the proposed mission would deplete groundwater supplies and contribute to water pollution through spills of cleaners and chemicals. It was mentioned that Tucson is in a drought and that the proposed mission would make it worse. Contamination of the groundwater from historical use of firefighting agents was also mentioned.

DM2.5.1.7 Biological Resources

A large number of commenters expressed concern about noise impacts to animals (domesticated, pets, wildlife, zoo animals, and threatened and endangered species) and to natural areas in the region. Areas mentioned included, but were not limited to, Tucson Mountains, Santa Ritas, Tortolitas, Rincons, Saguaro National Park, and Reid Park Zoo. One commenter requested that the EIS should include sound exposure level (SEL) values at parks, wilderness areas, forests, refuges, and monuments and another noted that noise impacts to animals varies between different species.

In a letter dated 3 May 2018, the Arizona Game and Fish Department (AZGFD) identified Cienega Creek and other riparian corridors as bird migration areas that should be avoided. Eagle nesting and Big Horn sheep lambing areas were also identified as areas that should be avoided.

DM2.5.1.8 Cultural Resources

During scoping, several people commented about the potential for noise to damage historical structures such as homes and buildings within the Barrio Santa Rosa Historic District. The noise level at the Arizona Inn was also mentioned as a potential concern. A private citizen expressed concern for impact to the Tohono O'odham and Pascua Yaqui tribal reservations as well.

DM2.5.1.9 Land Use

As part of the scoping process, representatives from various neighborhoods surrounding the installation expressed concerns about noise. These neighborhoods included the following: Broadmoor Broadway Village La Estancia, Barrio Kroeger Lane, Julia Keen, Sam Hughes, Keeling, Starr Pass and Arroyo Chico, among others. Comments were received expressing concern that increased noise would affect property values or impact recreational areas in the Tucson area. Comments were received about potential mitigation to homes affected by noise such as buy outs, reimbursement for repairs and upgrades to reduce interior noise levels. Comments were also received indicating that land use should be evaluated outside of the immediate base area.

Commenters also expressed concern about encroachment issues, the compatibility of a base in densely populated area, concern that new noise contours would exceed previously studied Joint Land Use Study (JLUS) contours, and a concern that housing would be deemed uninhabitable or incompatible. One commentator mentioned the potential for restricted property rights when DNL exceeds 65 dB.

During scoping, the National Park Service (NPS) submitted a letter indicating their desire to work with the USAF on the analysis of potential impacts to park resources and values associated with Davis-Monthan AFB. The letter indicated that increased noise levels resulting from the new mission could impact the park and could adversely affect wilderness qualities, wildlife, and park visitor experiences. The NPS indicated that supplemental noise metrics might be appropriate for the assessment of impacts to solitude in the Saguaro Wilderness Area.

DM2.5.1.10 Socioeconomics

Several comments received during scoping expressed concern about how increased noise would affect property values. Other concerns were related to potential impacts to tourism, hospitability, hotel usage, retirement, decreasing tax base, and enrollment and funding for educational institutions. Concerns were expressed about the sustainability of the base if it does not receive additional missions and the economic impacts associated with a base closure. Commenters also expressed concern about the potential impact that noise from the F-35A aircraft would have on the quality of life and health of residents. One commentator asked about the financial cost to repair walls and windows in the flight path. One commentator noted that an analysis showed how home sales within a 1-mile radius of Davis-Monthan AFB from 2010 through November 2016 increased almost 31 percent while home prices in the greater Tucson area increased only 14 percent during the same time period.

Pima County provided a letter that indicated the base provides substantial monetary benefits, no reduction of property values, and is an economic driver for the area. Several commenters expressed concern about what would happen to the economy without the presence of the base and several commenters wanted the EIS to state how many jobs the F-35A mission would add to the base and the expected economic benefit of the new mission.

DM2.5.1.11 Environmental Justice

During scoping, several people submitted comments regarding the potential noise impacts on children and education facilities. Some of the commenters expressed concern about how the project could impact minority, low-income populations, or special needs populations. Other commenters expressed concern that public outreach was not sufficient to reach minority and low-income groups.

DM2.5.1.12 Infrastructure

During scoping, people submitted comments about the potential for the AFRC F-35A mission to increase water use. Many commenters expressed concern about the impact of increased noise levels on older adobe homes, walls, windows, and foundations.

DM2.5.1.13 Hazardous Materials and Waste

Several commenters expressed concern that the new mission would cause more pollution because of cleaners and chemicals used on aircraft or from the increased use of jet fuel. Many commenters also requested that the USAF establish plans to prevent and clean up spills. Some comments indicated that sampling from homes in the area has found fuel residue and others expressed concerns of high cancer rates in the community. Some commenters mentioned the groundwater contamination that has recently been in the news.

Concerns were raised about dangers from the chemical stealth coating and composite materials used in the F-35A aircraft. Comments were received about hazardous materials used in the operation and maintenance of the F-35A aircraft.

DM2.5.1.14 Cumulative Impacts

One commenter wrote a letter regarding cumulative impacts. This individual indicated that the cumulative impacts must include all entities in the Region of Influence (ROI). For airspace, the EIS must evaluate the air traffic at TUS, vehicles, construction, etc., in combination with the proposed action. The letter stated that the impacts must be quantified and not summarized. Another commenter stated that the USAF should establish the proper geographic scope for cumulative impacts and include areas in New Mexico, etc.

DM2.5.2 Draft EIS Public and Agency Review

DM2.5.3 Consultation

DM2.5.3.1 Government-to-Government Consultation

In January 2012 the U.S. Department of Defense (DoD) updated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. This policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective DoD services. In an ongoing effort to identify significant cultural resources, tribal resources, or other issues of interest to tribes, and as part of the NEPA scoping process, combined notification and Section 106 consultation letters were submitted to the federally-recognized American Indian tribes associated with Davis-Monthan AFB.

Following standard USAF practice for government-to-government correspondence, tribal consultation was initiated by base Commanders who represent key leadership points of contact. Davis-Monthan AFB has identified 15 tribes potentially affiliated with the installation. These tribes, along with a record of consultations, are listed in Volume II, Appendix A, Section A.3. Nine (9) tribes have responded to a request for consultation. Additional direct communication efforts (phone calls and emails) were made for tribes that did not respond to USAF mailings. Section 106 consultation is considered complete for all tribes and Davis-Monthan AFB will continue to coordinate with interested tribes throughout the EIS process.

All communications with tribes will be completed in accordance with 54 *United States Code (USC)* 300101 *et seq.*, *National Historic Preservation Act of 1966* (NHPA), as amended; 36 *Code of Federal Regulations (CFR)* § 800, *Protection of Historic Properties*; Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*; and DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*.

DM2.5.3.2 State Historic Preservation Officer Consultation

Davis-Monthan AFB has determined that no historic properties would be affected by implementing the AFRC F-35A mission at the installation. All buildings within the Area of Potential Effects (APE) have been evaluated for National Register of Historic Places (NRHP) eligibility and determined non-eligible. The Arizona State Historic Preservation Officer (SHPO) concurred with the APE and the non-eligibility determination in a letter dated 14 May 2018 (Volume II, Appendix A, Section A.2.4.2).

DM2.5.3.3 U.S. Fish and Wildlife Service Consultation

Because no federally listed threatened, endangered, or candidate species and/or designated critical habitat occur near Davis-Monthan AFB, no impacts to federally listed species would result from implementation of the proposed AFRC F-35A mission. Although a variety of federally listed species have the potential to occur under the primary airspace and ranges proposed for use, the potential impacts would not be significant. In an email dated 26 June 2018, the U.S. Fish and Wildlife Service (USFWS) agreed that Endangered Species Act (ESA) Section 7 requirements had been applied and that no further Section 7 consultation is required (Volume II, Appendix A).

DM3.0 DAVIS-MONTHAN AIR FORCE BASE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**DM3.1 AIRSPACE MANAGEMENT AND USE****DM3.1.1 Base Affected Environment***DM3.1.1.1 Airfield Operations*

Baseline annual airfield operations at Davis-Monthan AFB are described in Section DM2.3 and shown in Table DM2-4. The primary runway at Davis-Monthan AFB, Runway 12/30, is described in Section DM1.0 and shown on Figure DM1-2. Runway 12 (takeoffs/landings to the southeast) is more frequently used for daily operations as noise abatement, wind directions, air traffic flows, and other such factors dictate the real-time “active” runway. The Davis-Monthan AFB air traffic control (ATC) tower is responsible for controlling and managing all airfield arriving and departing aircraft within a Class D airspace area designated as being northeast of Interstate (I)-10 within 5 nautical miles (NM) of the airport from the surface (field elevation 2,704 feet MSL) up to 5,500 feet MSL.

The FAA Albuquerque Air Route Traffic Control Center (ARTCC) has overall responsibility for managing airspace throughout this region and has delegated responsibility to the FAA Tucson Terminal Radar Approach Control (TRACON) facility for providing radar ATC services within approximately 40 NM of Davis-Monthan AFB below 17,000 feet MSL. This facility controls and separates all instrument flight rules (IFR) air traffic operating within this assigned airspace to include the different airport arrivals/departures and enroute traffic transiting through this airspace. Radar advisory services are also provided to visual flight rules (VFR) pilots, upon request, to enhance the flight safety of all military, commercial and general aviation operating within this airspace environment.

The Class C airspace established for this terminal area encompasses both Davis-Monthan AFB and TUS due to the close proximity (5 NM) of these two airfields and the joint control of both by the Tucson TRACON. As depicted on the FAA Phoenix Sectional Aeronautical Chart, this Class C inner area extends from the surface up to and including 6,600 feet MSL within a 5-mile radius of Davis-Monthan AFB airfield to the points where the 5-mile arc joins a 5-mile arc from the TUS Class C airspace area. The more highly controlled Class C airspace enhances aviation safety within an airport environment by requiring all aircraft, including VFR pilots transiting through this charted airspace, to establish two-way communications with the Tucson TRACON prior to entering this Class C boundary. The Tucson TRACON had approximately 191,000 air traffic operations in 2017 which includes all military and civilian IFR/VFR aircraft (FAA Air Traffic Activity System).

The navigational aids serving the Davis-Monthan AFB airfield include an Instrument Landing System (ILS) and a Tactical Air Navigation (TACAN) which provide instrument direction for military aircraft to navigate to/from the active runway during marginal weather conditions or as needed for training and managing/sequencing air traffic. Navigation aids transmit signals that provide directional bearing and distance information that guide the course and descent directions described on an instrument approach or departure procedure. Eight instrument approach and three departure procedures are published for Davis-Monthan AFB aircraft and the projected AFRC F-35As.

DM3.1.2 Base Environmental Consequences*DM3.1.2.1 Airfield Operations*

The Davis-Monthan AFB alternative for the AFRC F-35A beddown would generate the operational changes noted in Table DM2-4. Loss of the 11,088 A-10 airfield operations and

gaining the projected F-35A 11,580 operations while other aircraft operations remain unchanged would result in an overall 0.7 percent increase. The percentage of operations flown during environmental night by AFRC F-35A pilots would remain the same as the percentage currently conducted by A-10 pilots. The AFRC F-35A beddown could be accommodated within the Davis-Monthan airfield and Class C environment without adversely affecting the overall use of this airspace. No modifications would be required for this airspace structure or the manner in which ATC and local operating procedures manage Davis-Monthan AFB aircraft operations.

DM3.1.3 Airspace Affected Environment

DM3.1.3.1 Airspace and Range Use

The MOAs, ATCAAs, RAs, and ranges currently used by Davis-Monthan AFB aircraft and projected for use by AFRC F-35A pilots for flight and air-to-ground training are shown in Table DM2-5. The published floor and ceiling altitudes pilots must adhere to while operating within each airspace area are also shown in this table. While the Tucson TRACON controls departing and arriving mission aircraft in their delegated airspace, Albuquerque ARTCC is the controlling agency for all aircraft operations within the training airspace. Pilots must follow local operating procedures/practices for flights to/from the different training areas which helps standardize the manner in which ATC separates military aircraft from other IFR nonmilitary air traffic.

Table DM3-1 notes the baseline and projected F-35A sortie operations for each training complex as well as the responsible military agency for each airspace/range area. These agencies coordinate the scheduled use of each area with all concerned to ensure the individual training requirements of the different user groups are met to the extent possible.

Table DM3-1. Baseline and AFRC F-35A Annual Sorties

Training Airspace/Ranges	Using/Scheduling Agency	Baseline Total	924 FG A-10	AFRC F-35A	Proposed Total	Percent Change
Jackal MOA	Air National Guard (ANG), Tucson	3,207	-198	100	3,109	-3.1
Outlaw MOA	ANG, Tucson	2,980	-184	56	2,852	-4.3
Ruby/Fuzzy MOAs	ANG, Tucson	2,858	-177	157	2,838	-0.7
Sells MOA	56th Fighter Wing (56 FW), Luke AFB	11,330	-870	194	10,654	-6.0
Tombstone A B and C MOAs ^a	355 FW, Davis-Monthan AFB	2,128	-132	2,585	3,041	42.9
Barry M. Goldwater Range ^a	56 FW, Luke AFB	15,868	-981	1,540	16,427	3.5
Fort Huachuca Range	US Army, Ft. Huachuca/ 56 FW, Luke AFB	1,987	-86	0	1,901	-4.3
Total		40,358	-2,628	4,632	42,362	5.0

^a Primary Use Airspace and Ranges

DM3.1.4 Airspace Environmental Consequences

As noted in Table DM3-1, replacing the A-10 training with the projected F-35A sorties in the different MOAs, RAs, and ranges would result in a 5 percent increase in overall training airspace sorties. While the number of annual sorties conducted would decrease in most of the airspace and range areas proposed for use, the number of annual sorties conducted would increase in the Tombstone MOAs and in the BMGR/Sells MOA. An additional 2,453 annual sorties would be conducted in the Tombstone MOAs. Combined operations in the BMGR/Sells MOA would increase by 559 annual sorties.

The Tombstone MOAs are primarily used by the 355 FW at Davis-Monthan AFB and also used by the 56th Fighter Wing (56 FW) at Luke AFB and the 162 FW at TUS. A cooperative scheduling

agreement between the 56 FW at Luke AFB, 355 FW at Davis-Monthan AFB, and 162 FW at TUS assures all three units sufficient access to the region's airspace to accomplish their training goals.

As noted in Table DM2-6, the majority of A-10 activities in the SUA are conducted below 10,000 feet MSL, while 71 percent of the proposed AFRC F-35A operations would be above 18,000 feet MSL. Because VFR aircraft cannot operate above 18,000 feet MSL but are permitted to fly through an active MOA at lower altitudes, there would be less interactions between the F-35As and VFR aircraft than currently experienced with the A-10s. Albuquerque ARTCC separates all nonmilitary IFR traffic either from the active SUA or from aircraft in this airspace as necessary. Overall, the AFRC F-35A sorties could be accommodated in the training airspace, ranges, and while en route to/from these areas without adversely affecting other airspace uses throughout the affected region. Implementation of the AFRC F-35A mission would not result in the creation of new SUA or change the boundaries of existing SUA.

DM3.1.5 Summary of Impacts to Airspace Management and Use

Implementation of the AFRC F-35A mission would involve a one-for-one exchange of A-10 aircraft with F-35A aircraft, and would not require any changes to airspace or to how the airfield is managed. Eventual replacement of A-10 aircraft at Davis-Monthan AFB with F-35A aircraft would result in a 0.7 percent increase in airfield operations. This minor operational increase would not affect how local air traffic is managed. In addition, the AFRC F-35A sorties proposed for the airspace could be accommodated in the training airspace, ranges, and while en route to/from these areas without adversely affecting other airspace uses throughout the affected region. Therefore, impacts to airspace around Davis-Monthan AFB and the airspace proposed for use would not be significant.

DM3.2 NOISE

Although noise can affect several resource areas, this section describes potential noise impacts on human annoyance and health, physical effects on structures, and potential impacts to animals in the care of humans. Noise impacts on biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomics (e.g., property values), and environmental justice/protection of children are discussed in sections dedicated to those resources. Chapter 3, Section 3.2, defines terms used to describe the noise environment as well as methods used to calculate noise levels and assess potential noise impacts. These terms and analytical methods are uniformly applied to all four bases. A summary of noise metrics used in this EIS is also provided in Table DM3-2.

For consistency, the dB unit is used throughout this EIS. However, all subsonic aircraft noise levels described in this EIS are measured in A-weighted decibels (dBA). In compliance with current DoD Noise Working Group guidance, the overall noise environment is described in this EIS using the DNL metric. During scoping, people submitted comments expressing concern about use of the DNL metric. The DNL metric is used because it is the preferred noise metric of the U.S. Department of Housing and Urban Development (HUD), FAA, U.S. Environmental Protection Agency (USEPA), and DoD. Studies of community annoyance in response to numerous types of environmental noise show that there is a correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise. In addition to the DNL metric, supplemental noise metrics are used to provide a more complete picture of noise and particular types of noise impacts (Table DM3-2). Operations occurring during environmental nighttime hours are assessed a 10-dB penalty applied in calculation of DNL (refer to Chapter 3, Section 3.2.3, for more detailed resource definition and methodology used to evaluate impacts).

Table DM3-2. Summary of Noise Metrics Used in this EIS

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- The A-weighted decibel (dBA) is used to reflect a weighting process applied to noise measurements to filter out very low and very high frequencies of sound in order to replicate human sensitivity to different frequencies of sound and reflect those frequencies at which human hearing is most sensitive. Environmental noise is typically measured in dBA.
- Day-Night Average Sound Level (DNL) combines the levels and durations of noise events, the number of events over a 24-hour period, and more intrusive nighttime noise to calculate an average noise exposure.
- Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.
- C-Weighted Day-Night Average Sound Level (CDNL) is a day-night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of impulsive noise.
- Sound Exposure Level (SEL) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- Maximum Noise Level (L_{max}) is the highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight).
- Equivalent Noise Level (L_{eq}) represents aircraft noise levels decibel-averaged over a specified time period and is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$) and measured from 8:00 A.M. to 4:00 P.M.).

In this EIS, multiple noise metrics are used to describe the noise environment at each alternative base. This approach, which is in accordance with DoD policy, provides a more complete picture of the current and expected noise experience than can be provided by any one noise metric alone.

Comments received during scoping indicated a broad range of concerns and requested a comprehensive presentation of noise impacts. Therefore, this analysis covers a wide variety of potential noise impact categories. Additional details are provided in Volume II, Appendix B.

DM3.2.1 Base Affected Environment

This section discusses noise impacts near the installation. Noise generated in the training airspace and during training to and from the training airspace is discussed in Section DM3.2.2.1. Under baseline conditions, 73,256 airfield operations are annually conducted at Davis-Monthan AFB. This includes 11,088 operations by the AFRC's 924 FG A-10 aircraft, and 22,974 operations by other based A-10 aircraft. Fixed-wing (C-130) and rotary-wing (H-60) aircraft associated with a combat search and rescue mission conduct 17,446 operations annually. CBP operates several types of small, fixed-wing and rotary-wing aircraft conducting 16,532 operations annually. The AMARG carries out occasional test-flights of older aircraft being stored at Davis-Monthan AFB conducting 450 operations annually. Red Flag combat search and rescue training exercises involve approximately 672 operations annually, and F-16 pilots assigned to the Air National Guard (ANG) alert mission conduct 288 operations per year. A wide variety of transient aircraft types, which includes F-35A aircraft, conduct a total of 3,806 operations annually. Transient aircraft pilots use the airfield for a variety of purposes (e.g., stop-over during cross country flights, unfamiliar airfield for practice approaches, divert landing location during severe weather), and transient aircraft could potentially include any aircraft type. Approximately 6 percent of total airfield operations are conducted between 10:00 P.M. and 7:00 A.M. These late-night operations are primarily conducted

as part of combat search and rescue or CBP missions. Approximately 1 percent of 924 FG A-10 airfield operations are conducted between 10:00 P.M. and 7:00 A.M.

The land area around Davis-Monthan AFB is currently exposed to noise from both civilian and military aircraft operations and land is zoned accordingly. Recognizing that the comparatively quiet A-10 flying mission would likely eventually be replaced by a less-quiet flying mission, Davis-Monthan AFB, Pima County, and the City of Tucson initiated a study in 2002 to determine notional future mission noise levels. The “notional” future mission noise contours, which reflect five squadrons of F-16 aircraft operating at Davis-Monthan AFB, were combined with accident zones to establish the Airport Environs Zone (AEZ) in the 2004 JLUS (Arizona Department of Commerce 2004). As part of the JLUS process, Pima County and the City of Tucson adopted the AEZ. The notional future mission noise contours are henceforth referred to as the JLUS contour or the outer boundary of Noise Control District (NCD) A.

DM3.2.1.1 Noise Exposure

Because F-35A aircraft visit Davis-Monthan AFB as transient aircraft², many people in the local area have experienced noise generated by F-35A aircraft. As was noted in multiple scoping comments, F-35A aircraft are substantially louder than A-10 aircraft. Table DM3-3 compares A-10 and F-35A individual overflight noise levels at a representative noise-sensitive location north of Davis-Monthan AFB (Country Club Annex Park). The noise levels listed in Table DM3-3 reflect flight procedures at Davis-Monthan AFB (e.g., pattern altitudes) and are not directly applicable to other installations. The specific types of flight departure, arrival, or closed pattern procedures listed in the table were selected because they generate the highest dB SEL of any departure, arrival, or closed pattern procedure flown by that aircraft at the location studied. The same set of Davis-Monthan AFB specific flight procedures used to calculate DNL contours was also used to calculate noise levels in Table DM3-3.

Table DM3-3. Comparison of A-10 and F-35A Noise Levels at the Country Club Annex Park near Davis-Monthan AFB

Aircraft	Operation Type	Engine Power	Airspeed (knots)	Altitude (feet AGL)	Slant Distance (feet)	SEL (dB)	L _{max} (dB)
F-35A (Military Power)	Departure	100% ETR	300	2,161	2,835	104	97
F-35A (Afterburner Power) ^a		100% ETR	300	2,342	2,994	103	96
A-10		97% NC	200	1,613	2,385	88	80
F-35A (Overhead Break)	Arrival	35% ETR	300	1,500	2,289	97	87
A-10 (Hung Ordnance)		86% NC	130	498	865	89	86
F-35A (VFR Low Approach)	Closed Pattern	60% ETR	190	587	2,675	96	87
A-10 (Re-entry)		87% NC	250	2,059	2,788	75	70

Notes: Noise levels presented were calculated at Country Club Annex Park for the departure, arrival, and closed pattern flight that has the highest SEL at this location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^a For a detailed explanation of why F-35A afterburner departures might have lower SEL and L_{max} values than military power departures, see Chapter 3, Section 3.2.3.1. Essentially, during afterburner takeoffs, the aircraft reaches the required takeoff speed and leaves the ground sooner, and is at a slightly higher altitude throughout the flight profile. As a result, the aircraft altitude and slant distance at the location studied are both typically higher for the afterburner departure. Typically, the afterburner is turned off at approximately 10,000 feet from brake release, which occurs before the aircraft is over the location studied. The engine power (i.e., ETR) setting of the aircraft when it is above the location studied is the same for both the military power and the afterburner departure.

ETR = Engine Thrust Request. NC = core engine speed

² 480 transient F-35A operations were modeled as part of the baseline noise analysis. This number may vary from year to year.

At the representative noise-sensitive location (Country Club Annex Park), the maximum noise level (L_{\max}) generated by departing F-35A aircraft is approximately 16 dB louder than A-10 aircraft departure L_{\max} . During afterburner departures, F-35A pilots turn off the afterburner (see Chapter 3, Figure 3-1) soon after lifting off from the runway and then continue their climb-out in “military” power setting (i.e., 100 percent engine thrust without afterburner). Use of the afterburner during takeoff allows the aircraft to accelerate and climb slightly faster than departures that rely on military power setting alone. At the time the aircraft pass directly over Country Club Annex Park, afterburner power departures are approximately 200 feet higher than military power departures and both departure types are using the same power setting. Because of the altitude difference, afterburner power F-35A departure generates a slightly lower L_{\max} and SEL at the Country Club Annex Park than F-35A departures using military power, primarily due to the altitude of the aircraft as it flies over the Country Club Annex Park.

The F-35A arrival procedure with the highest SEL (i.e., overhead break) generates an L_{\max} that is (1 dB) higher than that generated by the A-10 profile with the highest SEL (i.e., hung ordnance approach), but the SEL is substantially higher (8 dB). The SEL noise metric reflects the duration of a noise event as well as its intensity (Chapter 3, Section 3.2.1.1). The F-35A overhead break flight procedure follows a circling path to the runway remaining in proximity to Country Club Annex Park for longer than the A-10 hung ordnance procedure which makes a straight-line approach to the runway. The longer duration of the overhead break noise event generates an SEL 10 dB higher than the L_{\max} whereas the straight-line A-10 approach SEL is only 3 dB higher than the L_{\max} .

The F-35A and A-10 closed pattern flight procedures compared in Table DM3-3 differ in L_{\max} by 17 dB. The F-35A profile passes Country Club Annex Park during descent to the runway at 190 knots whereas the A-10 profile is passing during climb-out at 250 knots. The slower speed of the F-35A descent results in a longer noise event duration, resulting in an SEL that is 21 dB higher than the A-10 SEL.

Several comments received during scoping requested the USAF provide individual overflight noise levels quantified using the SEL noise metric. The information on SELs shown in Table DM3-4 was calculated based on local flying procedures and conditions using methods described in Chapter 3, Section 3.2.3.1. Specifically, Table DM3-4 lists only the highest SEL generated by any flight procedure (e.g., departure, arrival or closed pattern) by any based or transient aircraft type. The table also identifies the number of times per year that the flight procedure occurs during “acoustic day” (i.e., 7:00 A.M. to 10:00 P.M.) and “acoustic night” (i.e., 10:00 P.M. to 7:00 A.M.). It is worth noting that the noise environment at a particular location is complex and the highest SEL is only one descriptor of this complex situation. In addition, actual flight paths vary, due to weather, winds, aircrew technique, and other factors, from the most-frequently followed (representative) flight paths used in noise modeling. Therefore, individual overflights could be closer to, or be farther away from, the representative noise-sensitive location, resulting in noise levels being slightly higher or lower than indicated in Table DM3-4.

Several factors, including, but not limited to, weather conditions, the precise flight path followed, and whether the aircraft is flying in formation, affect the sound level of individual overflights (Chapter 3, Section 3.2.3). Formation flights involve multiple aircraft, usually of the same type, flying together. The maximum noise level experienced during a formation overflight depends on the spacing and arrangement of the formation’s member aircraft. If the aircraft are spaced close together, then doubling the number of aircraft would add as much as 3 dB to the L_{\max} of the event. Since the SEL metric is an exposure-based metric, doubling the number of aircraft of a single aircraft type adds 3 dB to the event sound level. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL listed in Table DM3-3.

Table DM3-4. Highest SEL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline Conditions

Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					
Type	ID	Description	Aircraft	Aircraft Group	Operation Type	Annual Operations ^a at this SEL		SEL (dB) ^b
						7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
Park	P01	Parkview Park	F-35A	T	Departure	77	2	102
	P02	Swan Park	F-16C	T	Departure	455	26	96
	P03	Freedom Park	F-35A	T	Departure	20	1	95
	P04	Escalante Park	C-130	B	Closed Pattern	120	0	100
	P05	The Groves Park	F-35A	T	Departure	39	1	86
	P06	Country Club Annex Park	F-35A	T	Departure	77	2	104
	P07	Reid Park Zoo	F-35A	T	Departure	77	2	101
	P08	Jacobs Park and Ochoa Soccer Complex	F-35A	T	Arrival	109	3	95
	P09	Saguaro National Park (Tucson Mountain District)	C-130	B	Arrival	9	0	62
	P10	Arthur Pack Regional Park	C-130	B	Departure	240	5	72
School ^c	S01	Griffin Foundation Schools ^d	F-35A	T	Arrival	47	1	103
	S02	Roberts Elementary School	F-35A	T	Departure	77	2	96
	S03	Smith Elementary School (on-base)	F-35A	T	Departure	59	2	97
	S04	Borman Elementary School (on-base)	AH-64	T	Arrival	4	0	91
	S05	Irene Erickson Elementary School	C-130	B	Closed Pattern	120	0	100
	S06	Billy Lane Laufer Middle School	F-35A	T	Departure	118	3	95
	S07	University of Arizona	F-35A	T	Arrival	109	3	95
	S08	Robison Elementary	F-35A	T	Departure	77	2	101

^a The SEL dB numbers in this table do not account for the combined noise of all operations at each POI. As described in Table DM3-2, DNL is the noise metric that accounts for the overall exposure to noise (i.e., from total annual operations) at each representative noise-sensitive location; those numbers are shown in Table DM3-5.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c For the purposes of this noise analysis, noise levels at schools are described throughout this EIS using representative schools; discussion of noise at schools may not include all schools in the area.

^d Representative noise-sensitive location S01 is located at Children Reaching for the Sky (CRS) Elementary. CRS Elementary is part of The Griffin Foundation School District, which also includes Kids with a Smile Preschool and Future Investment Middle School. Because all three schools are located on the same property and would be exposed to the same noise levels, they are referred to as the Griffin Foundation Schools throughout this EIS. Key: T = Transient aircraft or non-Davis-Monthan AFB-based aircraft involved in training exercise; B = Based aircraft

Figure DM3-1 shows baseline DNL contours in 5-dB increments. Areas with the highest DNL are located along the runway and extended runway centerline or in areas where aircraft static engine runs are conducted. Although 100 acres of off-installation land area is exposed to DNL of 65 dB or greater, the affected area is industrial, commercial, and open space, and no residents are exposed. For reference, Figure DM3-1 also shows the boundary of the 2004 JLUS 65 dB DNL contour, which has been adopted by the City of Tucson and Pima County as the outer boundary of NCD A. The city and county use the NCD to plan land use decisions.

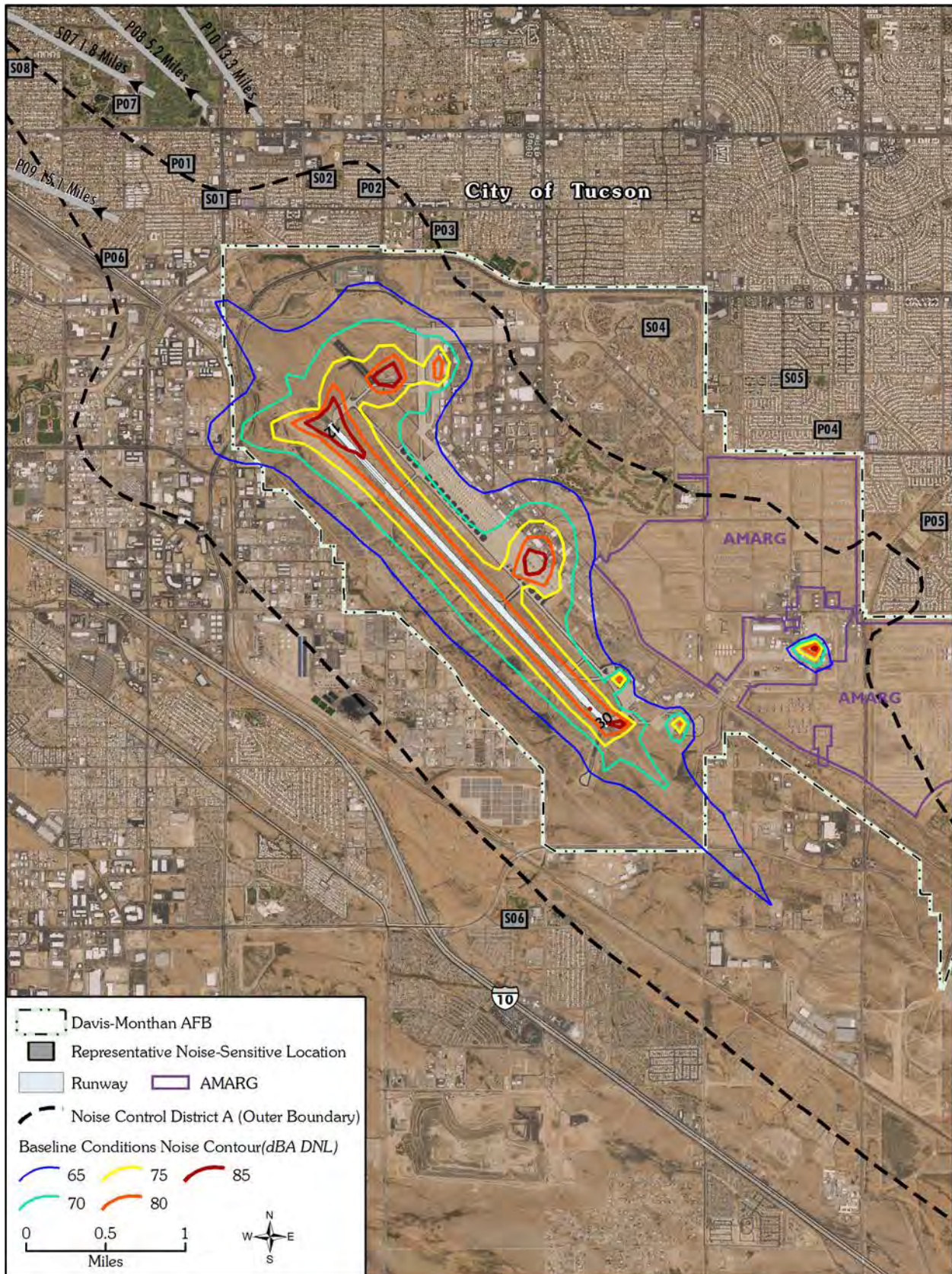


Figure DM3-1. Baseline DNL Contours at Davis-Monthan AFB

Table DM3-5 lists baseline DNL at several representative noise-sensitive locations around the base. These include parks, schools and a sports complex. Parks and schools are often located in residential areas, and the baseline DNL at the locations listed in Table DM3-5 is similar to the DNL in surrounding areas. None of the locations selected are currently exposed to DNL of 65 dB or greater. Several of the locations are exposed to aircraft DNL below 45 dB, which is a typical ambient noise level (i.e., noise level without aircraft noise) in lightly populated areas.

Table DM3-5. DNL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline Conditions

Type	ID	Description	DNL (dB)
Park	P01	Parkview Park	55
	P02	Swan Park	54
	P03	Freedom Park	55
	P04	Escalante Park	47
	P05	The Groves Park	<45
	P06	Country Club Annex Park	56
	P07	Reid Park Zoo	54
	P08	Jacobs Park and Ochoa Soccer Complex	46
	P09	Saguaro National Park (Tucson Mountain District)	<45 ^a
	P10	Arthur Pack Regional Park	<45
School	S01	Griffin Foundation Schools	56
	S02	Roberts Elementary School	53
	S03	Smith Elementary School (on-base)	53
	S04	Borman Elementary School (on-base)	51
	S05	Irene Erickson Elementary School	47
	S06	Billy Lane Laufer Middle School	48
	S07	University of Arizona	51
	S08	Robison Elementary School	56

^a Median existing ambient noise levels (i.e., the level exceeded 50 percent of the time) measured at four locations within Saguaro National Park ranged from 23 to 28 dB (NPS 2016). Although NOISEMAP calculates the DNL at a representative noise-sensitive location in the park to be 18 dB, NOISEMAP estimates of DNL are less reliable at extremely low noise levels due to uncertainties in actual noise propagation variations. However, the calculated DNL and number of events per hour with potential to interfere with speech (Table DM3-6) supports a conclusion that aircraft flights over Saguaro National Park resulting in DNL less than 45 dB are infrequent.

Areas outside the 65 dB DNL contour line could also experience noise that can be disturbing at times. A low time-averaged noise level (e.g., DNL) does not imply that loud individual aircraft overflights never occur. Although noise events are less frequent and/or less intense at locations exposed to DNL less than 65 dB than at locations exposed to DNL of 65 dB or greater, loud and potentially disturbing noise events do occur. Some people are more noise-sensitive than others as a result of physical, psychological, and emotional factors. People with autism and people afflicted with post-traumatic stress disorder (PTSD) can be particularly sensitive to sudden loud noises such as those that occur near an airport. The DNL metric is useful for describing the noise environment at a location with a single number, but it does not provide a complete description of the noise environment. In accordance with current DoD policy, this EIS makes use of several supplemental noise metrics (e.g., SEL, L_{max} , number of events exceeding dB threshold) to provide a more complete description of the noise experience.

DM3.2.1.2 Speech Interference

Speech interference is possible when noise levels exceed 50 dB. For the purposes of this analysis, any change to normal speech patterns is counted as an interference event. Table DM3-6 lists the current number of events exceeding L_{max} of 50 dB in buildings with windows open, in buildings with windows closed, and outdoors. Many of the parks listed in Table DM3-6 are near residential areas,

and noise levels are similar in the residential areas. Flight paths are variable and speech interference events sometimes occur far from standard Davis-Monthan AFB flight patterns.

Table DM3-6. Potential Speech Interference Under Baseline Conditions at Davis-Monthan AFB

Representative Noise-Sensitive Location			Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour		
Type	ID	Description	Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Parkview Park	3	1	6
	P02	Swan Park	2	<<1	8
	P03	Freedom Park	1	<<1	8
	P04	Escalante Park	1	<<1	5
	P05	The Groves Park	<<1	<<1	4
	P06	Country Club Annex Park	3	1	6
	P07	Reid Park Zoo	2	1	4
	P08	Jacobs Park and Ochoa Soccer Complex	1	<<1	2
	P09	Saguaro National Park (Tucson Mountain District)	<<1	<<1	<<1
	P10	Arthur Pack Regional Park	<<1	<<1	<<1

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

Key: <<1 indicates that the number of potential speech interference events (>50 dB) per hour resulting from Davis-Monthan based aircraft overflights is low (rounding to zero)

DM3.2.1.3 Interference with Classroom Learning

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. When considering intermittent noise caused by aircraft overflights, guidelines for classroom interference indicate that an appropriate criterion is a limit of 35 to 40 dB (depending on classroom size) on indoor background equivalent noise levels during the school day ($L_{eq(SD)}$) and a 50 dB L_{max} limit on single events. Table DM3-7 lists $L_{eq(SD)}$ and the average number of events per hour exceeding L_{max} of 50 dB at schools near Davis-Monthan AFB when windows are open and when windows are closed. $L_{eq(SD)}$ currently exceeds 40 dB at the Griffin Foundation Schools and Robison Elementary when windows are open, but not when they are closed. $L_{eq(SD)}$ at all other schools studied are below the equivalent noise level criterion. L_{max} temporarily exceeds 50 dB at a rate ranging from less than one event per hour to three events per hour. The number of outdoor events per hour with potential to interfere with speech is also listed for the hours between 7:00 A.M. and 10:00 P.M. because communication is important during recess and other activities that could occur outside the school building.

Table DM3-7. Indoor Classroom Learning Disruption Under Baseline Conditions at Davis-Monthan AFB

Type	ID	Description	Windows Open ^a		Windows Closed ^a		Outdoor
			$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Griffin Foundation Schools	42	3	<35	1	7
	S02	Roberts Elementary School	39	3	<35	<<1	8
	S03	Smith Elementary School (on-base)	37	1	<35	<<1	8
	S04	Borman Elementary School (on-base)	36	1	<35	1	6
	S05	Irene Erickson Elementary School	<35	1	<35	<<1	5
	S06	Billy Lane Laufer Middle School	<35	1	<35	<<1	5

Table DM3-7. Indoor Classroom Learning Disruption Under Baseline Conditions at Davis-Monthan AFB (Continued)

Type	ID	Description	Windows Open ^a		Windows Closed ^a		Outdoor
			L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
School	S07	University of Arizona	<35	2	<35	<<1	2
	S08	Robison Elementary	41	2	<35	2	3

^a Assumes standard values of 15 dB noise level reductions for windows open and 25 dB noise level reductions for windows closed, respectively.
^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).
^c Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).
 Key: L_{eq(SD)} is the equivalent noise level during a school day (defined as 8:00 A.M. to 4:00 P.M.); <<1 indicates that the number of potential speech interference (>50 dB) events per hour resulting from Davis-Monthan AFB based aircraft overflights is low (rounding to zero).

DM3.2.1.4 Sleep Disturbance

Nighttime flying, which is required as part of training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (ANSI) (ANSI 2008). The method first predicts the probability of awakening associated with each type of flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects all flying events that occur between 10:00 P.M. and 7:00 A.M., when most people sleep (Table DM3-8). Sleep disturbance probabilities listed for parks and schools are not intended to imply that people regularly sleep in parks or schools, but instead are indicative of impacts in nearby residential areas.

Table DM3-8. Average Probability of Awakening Under Baseline Conditions at Davis-Monthan AFB

Type	ID	Name / Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)	
			Windows Open ^a	Windows Closed ^a
Park	P01	Parkview Park	6	2
	P02	Swan Park	5	1
	P03	Freedom Park	6	1
	P04	Escalante Park	2	<<1
	P05	The Groves Park	2	<<1
	P06	Country Club Annex Park	8	4
	P07	Reid Park Zoo	5	2
	P08	Jacobs Park and Ochoa Soccer Complex	2	1
	P09	Saguaro National Park (Tucson Mountain District)	<<1	<<1
	P10	Arthur Pack Regional Park	<<1	<<1
School	S01	Griffin Foundation Schools	7	3
	S02	Roberts Elementary School	5	1
	S03	Smith Elementary School (on-base)	3	1
	S04	Borman Elementary School (on-base)	3	1
	S05	Irene Erickson Elementary School	2	1
	S06	Billy Lane Laufer Middle School	2	<<1
	S07	University of Arizona	4	2
	S08	Robison Elementary	5	3

^a Assumes standard values of 15 dB noise level reductions for windows open and 25 dB noise level reductions for windows closed, respectively.
 Key: Locations where the percentage probability of awakening rounds to zero are listed using the symbol <<1%.

DM3.2.1.5 Potential for Hearing Loss

Potential for Hearing Loss (PHL) applies to people living in high noise environments where they can experience long-term (40 years) hearing effects resulting from DNL greater than 80 dB (USD 2009). PHL is not an issue of concern because DNL greater than 80 dB only exist on Davis-Monthan AFB near the runways and aircraft parking aprons.

DM3.2.1.6 Occupational Noise

In on-base areas with high noise levels, existing USAF occupational noise exposure prevention procedures, such as hearing protection and monitoring, are undertaken in compliance with all applicable Occupational Safety and Health Administration (OSHA) and USAF occupational noise exposure regulations.

DM3.2.1.7 Non-Auditory Health Impact

During scoping, the question of the potential for non-auditory health effects from noise was raised. Several studies have been performed to see whether noise can cause health effects other than hearing loss. The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. Cantrell (1974) confirmed that noise can provoke stress, but noted that results on cardiovascular health have been contradictory. Some studies have found a connection between aircraft noise and blood pressure (e.g., Michalak *et al.* 1990; Rosenlund *et al.* 2001), while others have not (e.g., Pulles *et al.* 1990).

Kryter and Poza (1980) noted, “It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body.”

The connection from annoyance to stress to health issues requires careful experimental design and the resulting data are subject to different interpretations. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods under the approach path to Los Angeles International Airport. When the same data were subsequently analyzed by others (Frerichs *et al.* 1980), no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhood. But when the Centers For Disease Control performed a more thorough study near Hartsfield-Jackson Atlanta International Airport, no relationships were found for levels greater than 65 dB (Edmonds *et al.* 1979).

A carefully designed study, Hypertension and Exposure to Noise near Airports (HYENA), was conducted around six European airports from 2002 through 2006 (Jarup *et al.* 2005, 2008). There were 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires administered for health, socioeconomic, and lifestyle factors, including diet and physical exercise. Hypertension was defined by World Health Organization blood pressure thresholds (WHO 2003). Noise from aircraft and highways was predicted from models.

The HYENA results were presented as an odds ratio (OR). An OR of 1 would mean no added risk exists, while an OR of 2 would mean risk doubles. An OR of 1.14 was found for nighttime aircraft noise, measured by the equivalent noise level during nighttime hours (L_{night}). For daytime aircraft noise, measured by 16-hour equivalent noise level (L_{eq16}), the OR was 0.93. For road traffic noise, measured by 24-hour equivalent noise level (L_{eq24}), the OR was 1.1.

Note that OR is a statistical measure of change, not the actual risk. Risk itself and the measured effects were small, and not necessarily distinct from other events. Haralabidis *et al.* (2008) reported

an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise, and an increase of 7.4 mmHg for other indoor noises such as snoring. For the purpose of this EIS analysis, it is interesting to note that the studies demonstrated aircraft noise was a factor at night, while traffic noise was a factor for the full day.

Two recent studies examined the correlation of aircraft noise with hospital admissions for cardiovascular disease. Hansell *et al.* (2013) examined neighborhoods around London’s Heathrow Airport. Correia *et al.* (2013) examined neighborhoods around 89 airports in the United States. Both studies included areas of various noise levels. They found associations that were consistent with the HYENA results that found nighttime noise to have a higher OR (greater impact) than daytime noise.

The current state of scientific knowledge cannot yet support inference of a causal or consistent relationship between aircraft noise exposure and non-auditory health consequences for exposed residents. The large-scale HYENA study (Jarup et al. 2005, 2008) and the recent studies by Hansell et al. (2013) and Correia et al. (2013) offer indications, but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

DM3.2.1.8 Structural Damage

During scoping, several people expressed concern about increased noise resulting in structural damage to homes or other personal property. Noise that does not exceed 130 dB in any 1/3-octave frequency band or last for more than 1 second does not typically have the potential to damage structures in good repair (CHABA 1977). The term “frequency bands” refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Noise exceeding 130 dB in any 1/3-octave frequency band and lasting for more than 1 second of that intensity and duration does not occur except on the flightline immediately adjacent to jet aircraft. The installation has not received any claims for noise-induced property damage.

Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects within structures can occur during loud overflights, as was noted in scoping comments. Rattling of objects such as dishes, hanging pictures, and loose window panes can cause residents to fear damage. Rattling objects have the potential to contribute to annoyance along with other potential noise effects (e.g., speech interference, sleep disturbance).

DM3.2.1.9 Animals in the Care of Humans

Potential noise impacts on wildlife are discussed in Section DM3.6. However, pets, other domesticated animals, and animals kept in zoos live in different circumstances than wild animals and often react differently to human-generated noises. During scoping, people submitted comments regarding the impact of noise on the animals at the Reid Park Zoo and instances of pets fearfully reacting to aircraft noise under baseline conditions.

DM3.2.2 Base Environmental Consequences

Implementation of the AFRC F-35A mission would replace the 24 A-10 aircraft currently assigned to the 924 FG with 24 F-35A aircraft. The number of airfield operations annually flown by the 924 FG would change from 11,088 to 11,580, increasing the grand total number of airfield operations flown by all aircraft at Davis-Monthan AFB by less than 1 percent. AFRC F-35A aircrews would fly 4,632 sorties annually, whereas 924 FG A-10 aircrews fly 5,040 sorties annually. However, AFRC F-35A aircrews would fly an average of 1 practice second approach to

the runway per 4 sorties, whereas A-10 aircrews fly a practice approach as part of only 1 out of 10 sorties on average. The smaller number of sorties and larger number of second approaches per sortie flown by AFRC F-35A aircrews would result in a less than 1 percent net overall change in the number of airfield operations flown.

AFRC F-35A pilots would fly approximately 1 percent of their departures and initial approaches to the runway during the late-night time period between 10:00 P.M. and 7:00 A.M. This is roughly the same percentage of total flights that are conducted by 924 FG A-10 pilots late at night. As is currently the case with A-10 pilots, AFRC F-35A pilots would not conduct practice approaches or overhead break patterns between 10:00 P.M. and 7:00 A.M.

Based on context and intensity, noise impacts resulting from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would be considered significant for the area surrounding Davis-Monthan AFB. As described in Section 2.5, the USAF considered several potential noise mitigation measures. None of the measures considered were determined to be operationally feasible. Local flight procedures at Davis-Monthan AFB are internally reviewed on a regular basis for changes that create the best balance between safety (paramount concern), mission and training effectiveness, and minimizing noise impacts. Furthermore, the base maintains open lines of communication with the City of Tucson and local community leaders to develop and implement potential noise abatement procedures when possible. Currently, no additional noise abatement procedures have been identified that would reduce noise impacts without also adversely affecting safety of flight and/or mission effectiveness.

Operating procedures at Davis-Monthan AFB already include procedures to minimize noise impacts. These procedures, which have been developed over several years as part of a regularly-occurring procedural review process, have been selected to minimize mission impacts while maintaining operational efficiency and flexibility; these procedures would be applied to any new aircraft at the installation, including the F-35A. Noise modeling conducted as part of this EIS analysis reflects the following procedures:

- During designated quiet hours (10:30 P.M. and 6:30 A.M.), flying and maintenance engine run-up operations are severely restricted.
- During daytime (i.e., dawn to dusk) and in wind conditions up to a 10-knot tailwind, preference is given to conducting arrivals and departures to Runway 12 (i.e., approaches and departures toward the south). During night (i.e., dusk to dawn), weekends, and holidays, preference is given to departing aircraft from Runway 12 and conducting arrivals to Runway 30. These runway selection noise abatement procedures do not apply to alert missions or other missions in which operational requirements (e.g., live loads) dictate that another runway be used.
- Multiple practice approaches are typically only allowed for based flying units.
- Aircraft airspeeds are limited within 30 NM of Davis-Monthan AFB and beneath 10,000 feet MSL.
- Overhead approaches (i.e., high-speed approach to above the runway threshold followed by a circling maneuver descending to land) are not permitted before 9:00 A.M. on weekends and holidays, and are never permitted at night for transient aircraft.
- Aircrews are instructed to not directly overfly the University of Arizona, Reid Park Zoo, downtown Tucson, the Griffin Foundation Schools, or the Rita Ranch subdivision.

Construction and demolition (C&D) projects in support of the proposed AFRC F-35 mission would generate short-term, localized increases in noise. However, the installation is currently exposed to

elevated aircraft noise levels as well as noise generated by the day-to-day operation and maintenance (O&M) of vehicles and equipment. Construction would occur during normal working hours (i.e., 7:00 A.M. to 5:00 P.M.), and construction equipment would be equipped with mufflers. Workers would wear hearing protection in accordance with applicable regulations. Transportation of materials and equipment to and from the construction sites would generate noise similar to heavy trucks currently operating on base and along local roadways. In the context of ongoing frequent and intense aircraft noise events on an active military installation, construction noise generated by the AFRC F-35A mission would not result in significant impacts.

DM3.2.2.1 Noise Exposure

DM3.2.2.1.1 Scenario A

The F-35A aircraft is substantially louder than the A-10 aircraft, although the precise difference in noise level depends on the specific flight configurations being used by each aircraft and the aircraft's location relative to the listener (both of which are heavily dependent on the aircraft's performance characteristics). Pilots flying F-35A aircraft from other bases occasionally visit Davis-Monthan AFB. Scoping comments indicate that many people living near the base have taken note of the difference in noise level between the A-10 aircraft currently based at Davis-Monthan AFB and F-35A aircraft. Single overflight event noise levels (dB L_{max} and dB SEL) for F-35A and A-10 aircraft at a location near Davis-Monthan AFB are listed in Table DM3-3. The noise levels in the table were calculated in NOISEMAP based on field measurements (obtained under past controlled test conditions at other locations) of noise levels generated by both aircraft types and information on local conditions and flying procedures. Listening to A-10 and occasional transient F-35A aircraft overflights provides an alternative, non-numeric way to understand the differences between noise levels generated by the two aircraft. However, the experience of hearing individual transient F-35A aircraft overflights does not provide all of the information about the noise that would be generated by the AFRC F-35A mission. The number of flights, timing of flights, and other details also affect the intensity of noise impacts. The most accurate method available to estimate potential future noise impacts of an F-35A squadron operating at Davis-Monthan AFB involves computer noise modeling.

As noted in Chapter 3, Section 3.2.3, computer noise modeling was conducted in compliance with current USAF and DoD-approved methods. The modeling accounted for the effects of terrain relief (e.g., hills and valleys) near Davis-Monthan AFB as well as surface type on the propagation of sound. In accordance with standard modeling procedures, noise modeling at Davis-Monthan AFB used median atmospheric conditions for sound propagation based on local climate records. The modeling does not reflect possible future climates in Tucson, Arizona, in part because the degree to which the climate will change and the timeframe in which change would occur are not known at this time. Noise levels were calculated for an average annual day, which is a day with 1/365th of annual total operations. The computer noise model NOISEMAP references a database of field-measured sound levels for aircraft in various flight configurations. The model also uses data on flight procedures for current and proposed aircraft operations (e.g., where, how often, what time of day, and what configurations are used) based on recent inputs provided by Davis-Monthan AFB pilots and ATC. Application of noise results generated for another airfield (e.g., Luke AFB) would be inappropriate because flight procedures, terrain, and several other factors are different at other airfields. F-35A flight parameters (e.g., altitude, airspeed, and engine power setting) that are expected to be used at Davis-Monthan AFB were developed based on information provided by F-35A pilots at bases where the aircraft is operating currently, such as Luke, Hill, and Eglin AFBs. These flight parameters were used to generate results specific to Davis-Monthan AFB.

Several comments received during scoping requested that the USAF provide individual predicted overflight noise levels using the SEL noise metric. Information is provided on the flight procedure with the highest SEL at several representative noise-sensitive locations in Table DM3-9. A flight procedure is a specific type of operation (e.g., afterburner departure) on a specific flight path, by a specific aircraft type. Actual flight paths vary as a result of weather, winds, aircrew technique, and other factors, and individual flights would deviate in position and noise level from those listed in Table DM3-9. In addition, the flight procedure with the highest SEL is one aspect of a complex sound environment which includes many other flight procedures (e.g., flaps or gear position) as well as other noise sources. At all of the locations except for Freedom Park, the Griffin Foundation Schools, and the University of Arizona, the highest SEL would remain the same under the proposed action as under baseline conditions. At several locations, transient F-35A aircraft generate the highest SEL under baseline conditions, and following beddown of an F-35A flying unit at Davis-Monthan AFB, based F-35A aircraft would conduct the same flight procedures. However, following the proposed beddown, the frequency of F-35A operations would substantially increase. At Freedom Park, the Griffin Foundation Schools, and the University of Arizona, the highest SEL would increase by 2, 1, and 5 dB, respectively.

Table DM3-9. Highest SEL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline and AFRC F-35A Mission Conditions

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{b,c}
	Type	ID	Description	Aircraft	Aircraft Group	Operation Type	Annual Operations at this SEL ^a		
							7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
Baseline	Park	P01	Parkview Park	F-35A	T	Departure	77	2	102
		P02	Swan Park	F-16C	T	Departure	455	26	96
		P03	Freedom Park	F-35A	T	Departure	20	1	95
		P04	Escalante Park	C-130	B	Closed Pattern	120	0	100
		P05	The Groves Park	F-35A	T	Departure	39	1	86
		P06	Country Club Annex Park	F-35A	T	Departure	77	2	104
		P07	Reid Park Zoo	F-35A	T	Departure	77	2	101
		P08	Jacobs Park and Ochoa Soccer Complex	F-35A	T	Arrival	109	3	95
		P09	Saguaro National Park (Tucson Mountain District)	C-130	B	Arrival	9	0	62
		P10	Arthur Pack Regional Park	C-130	B	Departure	240	5	72
	School	S01	Griffin Foundation Schools	F-35A	T	Arrival	47	1	103
		S02	Roberts Elementary School	F-35A	T	Departure	77	2	96
		S03	Smith Elementary School (on-base)	F-35A	T	Departure	59	2	97
		S04	Borman Elementary School (on-base)	AH-64	T	Arrival	4	0	91
		S05	Irene Erickson Elementary School	C-130	B	Closed Pattern	120	0	100
		S06	Billy Lane Laufer Middle School	F-35A	T	Departure	118	3	95
		S07	University of Arizona	F-35A	T	Arrival	109	3	95
		S08	Robison Elementary	F-35A	T	Departure	77	2	101

Table DM3-9. Highest SEL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline and AFRC F-35A Mission (Continued)

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{b,c}
	Type	ID	Description	Aircraft	Aircraft Group	Operation Type	Annual Operations at this SEL ^a		
							7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
AFRC F-35A Mission	Park	P01	Parkview Park	F-35A	B/T	Departure	1,590	17	102
		P02	Swan Park	F-16C	T	Departure	455	26	96
		P03	Freedom Park	F-35A	B	Closed Pattern	666	0	97
		P04	Escalante Park	C-130	B	Closed Pattern	120	0	100
		P05	The Groves Park	F-35A	B/T	Departure	193	2	86
		P06	Country Club Annex Park	F-35A	B/T	Departure	1,590	17	104
		P07	Reid Park Zoo	F-35A	B/T	Departure	1,590	17	101
		P08	Jacobs Park and Ochoa Soccer Complex	F-35A	B/T	Arrival	416	21	95
		P09	Saguaro National Park (Tucson Mountain District)	C-130	B	Arrival	9	0	62
		P10	Arthur Pack Regional Park	C-130	B	Departure	240	5	72
	School	S01	Griffin Foundation Schools	F-35A	B	Closed Pattern	1,350	0	104
		S02	Roberts Elementary School	F-35A	B/T	Departure	1,590	17	96
		S03	Smith Elementary School (on-base)	F-35A	B/T	Departure	289	4	97
		S04	Borman Elementary School (on-base)	AH-64	T	Arrival	4	0	91
		S05	Irene Erickson Elementary School	C-130	B	Closed Pattern	120	0	100
		S06	Billy Lane Laufer Middle School	F-35A	B/T	Departure	3,230	35	95
		S07	University of Arizona	F-35A	B	Arrival	15	0	100
		S08	Robison Elementary	F-35A	B/T	Departure	1,590	17	101

^a The SEL dB numbers in this table do not account for the combined noise of all operations at each POI. As described in Table DM3-2, DNL is the noise metric that accounts for the overall exposure to noise (i.e., from total annual operations) at each representative noise-sensitive location; those numbers are shown in Table DM3-11.

^b SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^c SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

Key: T = Transient or non-Davis-Monthan AFB aircraft involved in training exercise; B = Based aircraft; B/T = both based and transient

Figure DM3-2 shows DNL contours in 5-dB increments that would result from Scenario A overlain on baseline contours for comparison. At Davis-Monthan AFB, the net change in number of airfield operations under the proposed action would be minimal and local flight procedures would remain approximately the same. The most important factor in the increase in DNL under Scenario A would be the higher noise levels generated by F-35A aircraft relative to A-10 aircraft.

The majority of the land newly exposed to DNL of 65 dB or greater under Scenario A is designated as industrial and open land. Residential areas including parts of the Roberts and Julia Keen neighborhoods are also included. The number of acres exposed to DNL of 65 dB or greater would increase by 1,566 acres. The estimated number of residents exposed to DNL of 65 dB or greater would increase from zero to 1,506. Although this land and the estimated residents would be newly exposed to this level of noise, all of these areas are located in the JLUS contour and the AEZ and

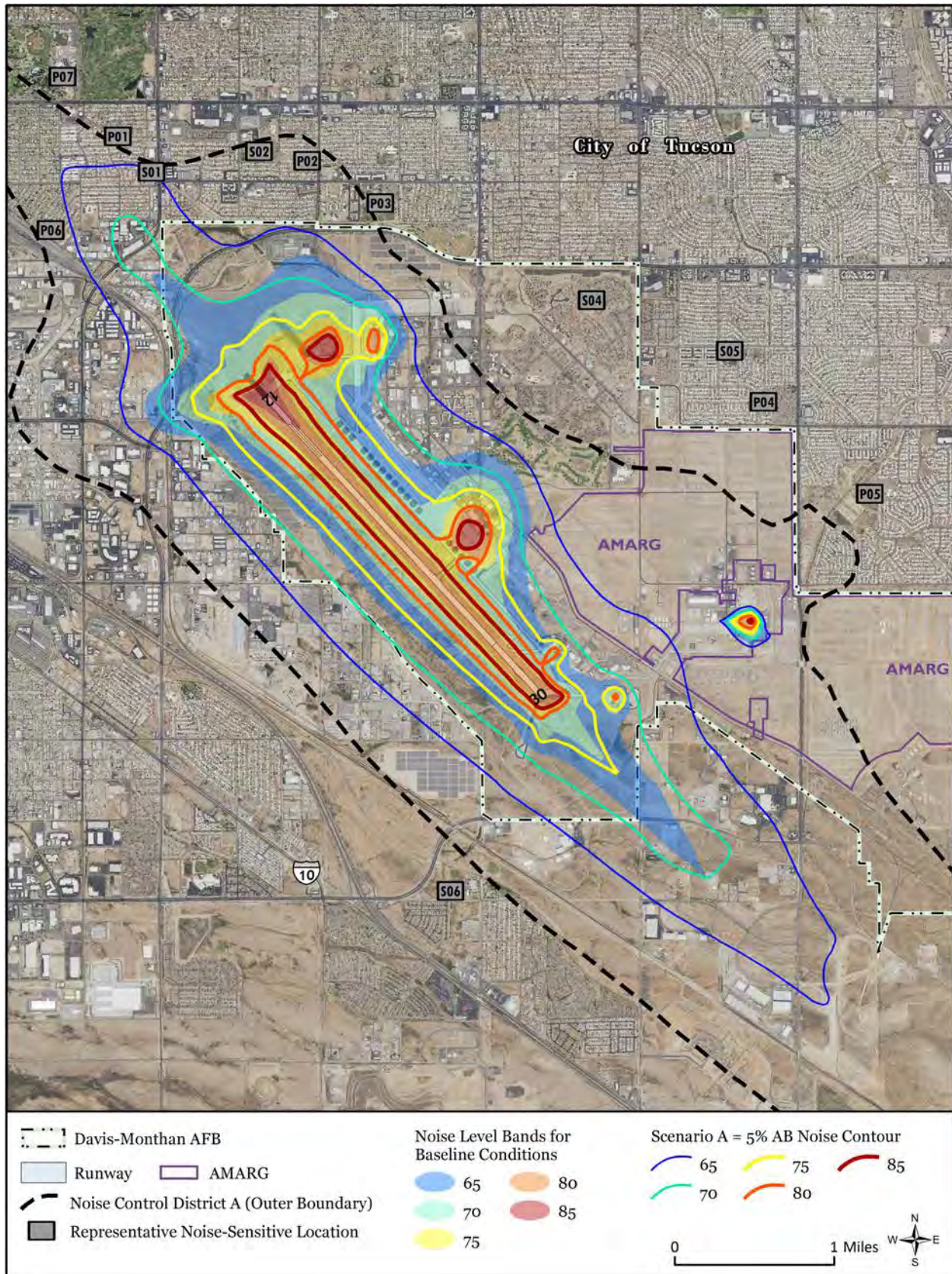


Figure DM3-2. AFRC F-35A Scenario A DNL Contours at Davis-Monthan AFB

are zoned accordingly (Table DM3-10). As described in Chapter 3, Section 3.2.3, the affected population was estimated based on U.S. Census data at the Block Group (BG) level with adjustments to remove non-residential areas from calculations (USCB 2016).

Table DM3-10. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario A at Davis-Monthan AFB

DNL (dB)	Acres				Estimated Population			
	JLUS Contour	Baseline	Scenario A	Change ^a	JLUS Contour	Baseline	Scenario A	Change ^a
65-69	6,521	100	1,433	1,333	14,234	0	1,497	1,497
70-74	2,369	0	233	233	1,111	0	9	9
75-79	689	0	0	0	179	0	0	0
80-84	117	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	9,696	100	1,666	1,566	15,524	0	1,506	1,506

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from implementation of Scenario A.

As noted in Chapter 3, Section 3.2.3, the probability that an individual will become annoyed by noise is impossible to predict with confidence because of differing physical and emotional variables between individuals (Newman and Beattie 1985). These variables include, but are not limited to, the person's feeling about the necessity or preventability of the noise, the person's attitude about the environment, and any feelings of fear the person might have about the noise source. It can be said with confidence that people in communities exposed to increased DNL would be more likely to become highly annoyed by the noise (Schultz 1978, Finegold et al. 1994, Meidema and Vos 1998). Studies conducted by Schultz in 1978 and Finegold et al. in 1994 indicated that approximately 12 percent of people exposed to DNL of 65 dB and 36 percent of people exposed to DNL of 75 dB could be expected to be highly annoyed by the noise (Schultz 1978, Finegold et al. 1994). More recent studies suggest that the percentage of people highly annoyed by noise—and aircraft noise in particular—might be higher than previously thought. A study conducted by Meidema and Vos in 1998 indicated that 28 percent of people could be expected to be annoyed by DNL of 65 dB, and 48 percent of people could be expected to be highly annoyed by DNL of 75 dB (Meidema and Vos 1998). Additional details on the prevalence of annoyance in communities exposed to high noise levels are contained in Volume II, Appendix B.

USAF land use compatibility guidelines classify residential land uses as incompatible with DNL greater than 65 dB unless the residences meet minimum structural noise reduction goals. Residential land uses are considered to be compatible if measures are incorporated which achieve outdoor-to-indoor noise level reduction of at least 25 dB in areas exposed to DNL of 65 to 69 dB and 30 dB in areas exposed to DNL of 70 to 74 dB. Structural elements with better-than-average temperature insulation properties (e.g., double-paned windows) tend to also provide better-than-average noise level reduction. A more detailed discussion of land use compatibility is contained in Section DM3-8.

As previously described, Pima County and the City of Tucson regulate land use in the AEZ. The AEZ is larger than the proposed action noise contours. The AEZ has been a basis for prohibiting noise-sensitive new development in designated noise control districts and/or requiring that minimum structural noise attenuation standards be met in new development and for certain renovation projects. Certain existing residences within the AEZ were retrofitted, at no expense to the homeowner(s), with structural elements selected to improve sound attenuation. Structures with improved sound attenuation reduce noise impacts while people are indoors. A more detailed discussion of land use compatibility and the effects of the AEZ on land use patterns is contained in Section DM3.8.

Representative DNL changes that would result from implementation of Scenario A are shown in Table DM3-11. Noise levels resulting from the new mission at the locations listed are similar to noise levels in nearby residential areas. Of the noise-sensitive receptors analyzed, Griffin Schools would be exposed to the highest noise levels (65 dB). According to the 2004 JLUS this level is considered generally compatible. Although there would be substantial increases in DNL at other locations, noise levels would be considered compatible in accordance with USAF guidelines.

Table DM3-11. DNL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline and Scenario A Conditions

Representative Noise-Sensitive Location			DNL (dB)		
Type	ID	Name / Description	Baseline	Scenario A	Change
Park	P01	Parkview Park	55	62	7
	P02	Swan Park	54	58	4
	P03	Freedom Park	55	58	3
	P04	Escalante Park	47	50	3
	P05	The Groves Park	<45	48	3
	P06	Country Club Annex Park	56	63	7
	P07	Reid Park Zoo	54	60	6
	P08	Jacobs Park and Ochoa Soccer Complex	46	50	4
	P09	Saguaro National Park (Tucson Mountain District)	<45 ^a	<45	0
	P10	Arthur Pack Regional Park	<45	<45	0
School	S01	Griffin Foundation Schools	56	65	9
	S02	Roberts Elementary School	53	59	6
	S03	Smith Elementary School (on-base)	53	58	5
	S04	Borman Elementary School (on-base)	51	54	3
	S05	Irene Erickson Elementary School	47	50	3
	S06	Billy Lane Laufer Middle School	48	56	8
	S07	University of Arizona	51	55	4
	S08	Robison Elementary	56	60	4

^a Median existing ambient noise levels (i.e., the level exceeded 50 percent of the time) measured at four locations within Saguaro National Park ranged from 23 to 28 dB (NPS 2016). Although NOISEMAP calculates the DNL at a representative noise-sensitive location in the park would be 18.5 dB under the AFRC F-35A mission, NOISEMAP estimates of DNL are less reliable at extremely low noise levels due to uncertainties in actual noise propagation variations. However, the calculated DNL and number of events per hour with potential to interfere with speech supports a conclusion that loud aircraft overflights are infrequent.

DM3.2.2.1.2 Scenario B

Scenario B differs from Scenario A only in that 50 percent rather than 5 percent of F-35A departures would use afterburner. Flight procedures under Scenario B would be the same as Scenario A, and the highest SELs experienced under Scenario B would be the same as listed for Scenario A in Table DM3-9. At all of the representative noise-sensitive locations except The Groves Park and Smith Elementary School (on-base), the SEL generated by the loudest military and afterburner power departures were within 1 dB of each other. At these locations, the number of annual operations at the highest SEL listed in Table DM3-9 includes both military power and afterburner power departure operations and these numbers would be constant under Scenarios A, B, and C. At The Groves Park, the loudest afterburner power departure SELs are slightly more than 1 dB louder than military power departure SELs. At Smith Elementary School, the afterburner departure would be 3 dB louder than the military power departure. Under Scenario B, 50 percent rather than 5 percent of F-35A departures would use afterburner and generate SELs that are 1 dB and 3 dB louder than military power departures at The Groves Park and Smith Elementary School, respectively.

As discussed in Section DM3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL

greater than 65 dB. The Scenario B 65 dB DNL contour is slightly larger than Scenario A noise contours in areas right and left of the runway but slightly smaller in areas farther out along departure flight paths (Figure DM3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-19 in Appendix B, Section B.4. These differences in time-averaged noise levels (DNL metric) reflect the noise level differences between individual afterburner and military power departure noise levels that were discussed above. As noted previously, there are no operational differences between Scenarios A and B other than the increased percentage of departures using afterburner power.

DNL greater than 65 dB would affect portions of the off-base industrial area west of the installation that are exposed to DNL less than 65 dB under baseline conditions or Scenario A. Residential areas, including parts of the Roberts and Julia Keen neighborhoods, would experience noise levels that are the same as or slightly lower under Scenario B than under Scenario A. These slight reductions in noise level are reflected by a minor contraction of noise contours in these areas. The total land area and estimated population exposed to DNL of 65 dB or greater are listed in Table DM3-12. The total number of acres exposed to DNL of 65 dB or greater would increase by 1,679 acres under Scenario B, whereas it would increase by 1,566 acres under Alternative A. The estimated number of residents exposed to DNL of 65 dB or greater would increase from zero to 1,428 under Scenario B, but would increase to 1,506 under Scenario A. The net decrease in estimated population exposed to DNL of 65 dB or greater under Scenario B relative to Scenario A would occur because a smaller fraction of the affected area would be residential. All of the areas exposed to DNL of 65 dB or greater are located in the JLUS contour and the AEZ and are zoned accordingly.

Table DM3-12. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario B at Davis-Monthan AFB

DNL (dB)	Acres				Estimated Population			
	JLUS Contour	Baseline	Scenario B	Change ^a	JLUS Contour	Baseline	Scenario B	Change ^a
65-69	6,521	100	1,500	1,400	14,234	0	1,419	1,419
70-74	2,369	0	279	279	1,111	0	9	9
75-79	689	0	0	0	179	0	0	0
80-84	117	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	9,696	100	1,779	1,679	15,524	0	1,428	1,428

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Changes in DNL at representative noise-sensitive locations under Scenario B are shown in Table DM3-13. As was the case under Scenario A, Griffin Foundation Schools would be exposed to 65 dB DNL – a noise level considered conditionally compatible according to USAF guidelines. DNL at all other locations would be less than 65 dB, and would be considered compatible accordance to USAF guidelines. DNL would increase by 2 dB or less compared to Scenario A.

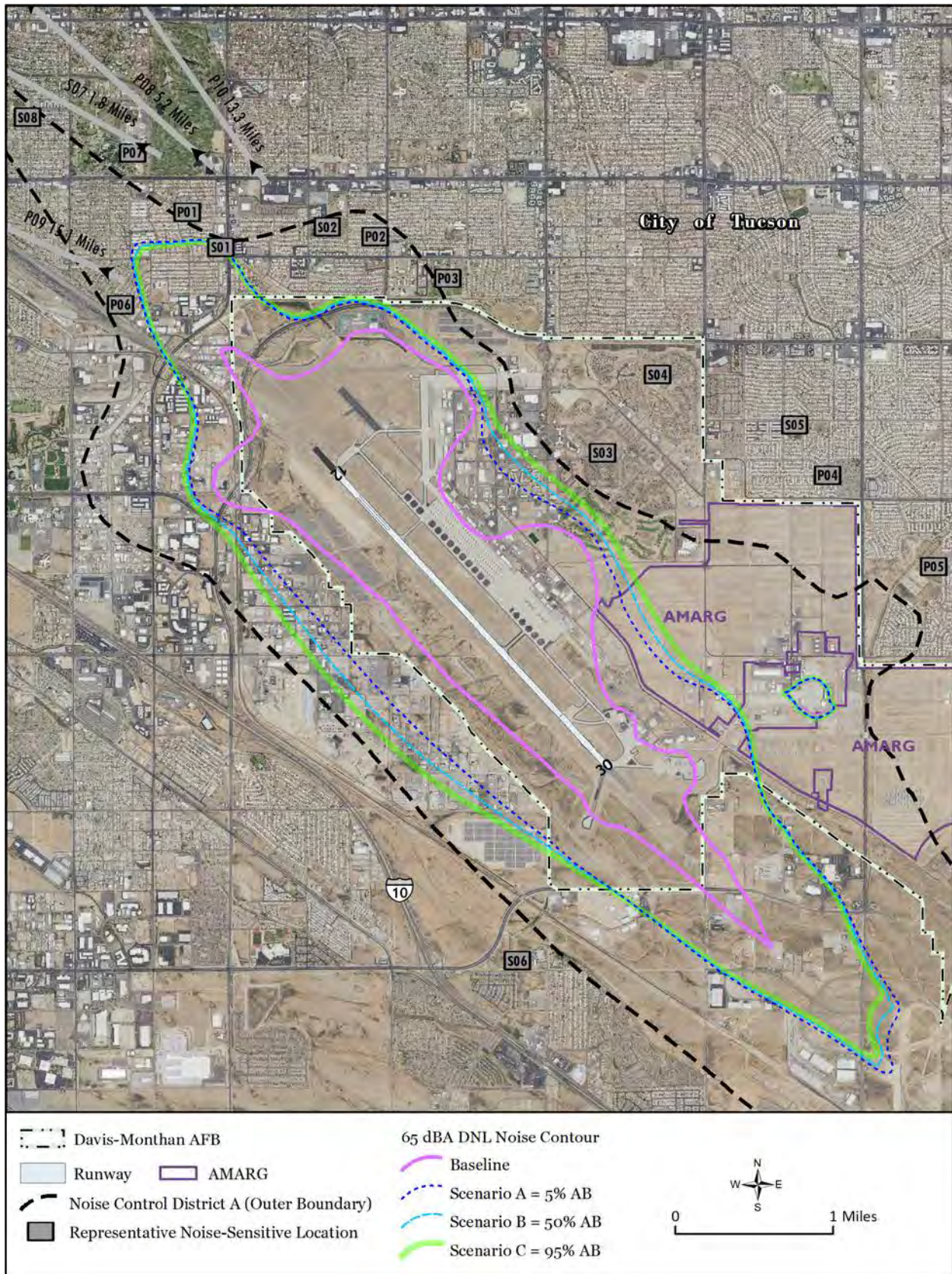


Figure DM3-3. AFRC F-35A Mission 65 dB DNL Contours (Scenarios A, B, and C) at Davis-Monthan AFB

Table DM3-13. DNL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline and Scenario B Conditions

Representative Noise-Sensitive Location			DNL (dB)		
Type	ID	Name / Description	Baseline	Scenario B	Change
Park	P01	Parkview Park	55	62	7
	P02	Swan Park	54	59	5
	P03	Freedom Park	55	58	3
	P04	Escalante Park	47	51	4
	P05	The Groves Park	<45	48	3
	P06	Country Club Annex Park	56	63	7
	P07	Reid Park Zoo	54	60	6
	P08	Jacobs Park and Ochoa Soccer Complex	46	50	4
	P09	Saguaro National Park (Tucson Mountain District)	<45 ^a	<45	0
	P10	Arthur Pack Regional Park	<45	<45	0
School	S01	Griffin Foundation Schools	56	65	9
	S02	Roberts Elementary School	53	59	6
	S03	Smith Elementary School (on-base)	53	60	7
	S04	Borman Elementary School (on-base)	51	55	4
	S05	Irene Erickson Elementary School	47	51	4
	S06	Billy Lane Laufer Middle School	48	56	8
	S07	University of Arizona	51	55	4
	S08	Robison Elementary	56	60	4

^a Median existing ambient noise levels (i.e., the level exceeded 50 percent of the time) measured at four locations within Saguaro National Park ranged from 23 to 28 dB (NPS 2016). Although NOISEMAP calculates the DNL at a representative noise-sensitive location in the park would be 18.5 dB under the AFRC F-35A mission, NOISEMAP estimates of DNL are less reliable at extremely low noise levels due to uncertainties in actual noise propagation variations. However, the calculated DNL and number of events per hour with potential to interfere with speech supports a conclusion that loud aircraft overflights are infrequent.

DM3.2.2.1.3 Scenario C

Ninety-five (95) percent of F-35A departures would be flown using afterburner under Scenario C (as opposed to 5 percent under Scenario A and 50 percent under Scenario B), but all other aspects of the mission would be identical to Scenarios A and B. The differences between afterburner and military power noise levels are described in Section DM 3.2.2.1.2.

The highest SEL experienced at representative noise-sensitive locations would be the same as shown in Table DM3-9. As was described in Section DM3.2.2.1.2, afterburner power SELs would differ from military power SELs by less than 1 dB at all locations studied except The Groves Park and Smith Elementary School (on-base), where they would be slightly greater than 1 dB and 3 dB louder than military power departures, respectively. The higher SEL associated with afterburner takeoffs would comprise a larger percent (95 percent rather than 5 percent) of departure noise events, and there would be correspondingly fewer military power noise events.

Noise contours under Scenario C exhibit the same relative differences in extent that exist between Scenarios A and B, but to a greater degree (see Figure DM3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-20 in Appendix B, Section B.4. Noise contours to the right and left of the runway are larger than contours under Scenarios A or B, and noise contours farther out along departure paths are slightly smaller than under Scenarios A or B. The reasons for these patterns of noise level differences are described in Section DM3.2.2.1.2. As discussed in Section DM3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB.

The total land area and estimated population exposed to DNL of 65 dB or greater from Scenario C are listed in Table DM3-14. DNL of 65 dB or greater would newly affect portions of the off-base

industrial area west of the installation under Scenario C that are exposed to DNL of 65 dB under baseline conditions and Scenario B. The number of acres exposed to DNL greater than 65 dB would increase by 1,762 under Scenario C. In residential areas north of the installation, DNL would remain the same or decrease slightly compared to Scenario A. The estimated number of people exposed to DNL of 65 dB or greater would increase by 1,361 under Scenario C, whereas it would increase by 1,506 under Scenario A and by 1,428 under Scenario B.

Table DM3-14. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario C at Davis-Monthan AFB

DNL (dB)	Acres				Estimated Population			
	JLUS Contour	Baseline	Scenario C	Change ^a	JLUS Contour	Baseline	Scenario C	Change ^a
65-69	6,521	100	1,524	1,424	14,234	0	1,336	1,336
70-74	2,369	0	338	338	1,111	0	25	25
75-79	689	0	0	0	179	0	0	0
80-84	117	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	9,696	100	1,862	1,762	15,524	0	1,361	1,361

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission

Noise level changes under Scenario C, as measured in DNL, are listed in Table DM3-15. Griffin Foundations Schools would be exposed to DNL of 65 dB, as would also be the case under Scenarios A and B. All other locations studied would be exposed to DNL less than 65 dB. DNL would increase by an additional 1 dB or less relative to Scenario B.

Table DM3-15. DNL at Representative Noise-Sensitive Locations near Davis-Monthan AFB Under Baseline and Scenario C Conditions

Representative Noise-Sensitive Location			DNL (dB)		
Type	ID	Name / Description	Baseline	Scenario C	Change
Park	P01	Parkview Park	55	62	7
	P02	Swan Park	54	59	5
	P03	Freedom Park	55	59	4
	P04	Escalante Park	47	51	4
	P05	The Groves Park	<45	49	4
	P06	Country Club Annex Park	56	63	7
	P07	Reid Park Zoo	54	60	6
	P08	Jacobs Park and Ochoa Soccer Complex	46	50	4
	P09	Saguaro National Park (Tucson Mountain District)	<45 ^a	<45	0
	P10	Arthur Pack Regional Park	<45	<45	0
School	S01	Griffin Foundation Schools	56	65	9
	S02	Roberts Elementary School	53	59	6
	S03	Smith Elementary School (on-base)	53	61	8
	S04	Borman Elementary School (on-base)	51	55	4
	S05	Irene Erickson Elementary School	47	51	4
	S06	Billy Lane Laufer Middle School	48	57	9
	S07	University of Arizona	51	55	4
	S08	Robison Elementary	56	60	4

^a Median existing ambient noise levels (i.e., the level exceeded 50 percent of the time) measured at four locations within Saguaro National Park ranged from 23 to 28 dB (NPS 2016). Although NOISEMAP calculates the DNL at a representative noise-sensitive location in the park would be 18.5 dB under the AFRC F-35A mission, NOISEMAP estimates of DNL are less reliable at extremely low noise levels due to uncertainties in actual noise propagation variations. However, the calculated DNL and number of events per hour with potential to interfere with speech supports a conclusion that loud aircraft overflights are infrequent.

DM3.2.2.2 Speech Interference

DM3.2.2.2.1 Scenario A

The number of daytime (7:00 A.M. to 10:00 P.M.) events per hour that could potentially interfere with speech under Scenario A are listed in Table DM3-16. Any aircraft noise event exceeding L_{max} of 50 dB was assumed to have some potential to interfere with speech. The interference would be for a few seconds for each overflight. Noise levels at the locations listed are similar to noise levels in nearby residential areas. The largest noise increase with windows open would occur at The Groves Park, where the average number of events per hour indoors would increase from infrequent (i.e., a number rounding to zero) to two events. At Swan and Freedom Parks, the average number of events per hour with windows closed would increase from infrequent to two events. The number of events per hour exceeding L_{max} of 50 dB would be one or less at other locations with windows open, windows closed, or outdoors. Any increases in the frequency of disruptions in communication have a high likelihood of being annoying.

Table DM3-16. Potential Speech Interference Resulting from Scenario A at Davis-Monthan AFB

Type	ID	Description	Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour					
			Scenario A			Change		
			Windows Open ^a	Windows Closed ^a	Outdoor	Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Parkview Park	4	2	7	1	1	1
	P02	Swan Park	3	2	8	1	2	0
	P03	Freedom Park	2	2	9	1	2	1
	P04	Escalante Park	2	<<1	6	1	0	1
	P05	The Groves Park	2	<<1	5	2	0	1
	P06	Country Club Annex Park	4	2	7	1	1	1
	P07	Reid Park Zoo	3	1	5	1	0	1
	P08	Jacobs Park and Ochoa Soccer Complex	1	<<1	2	0	0	0
	P09	Saguaro National Park (Tucson Mountain District)	<<1	<<1	<<1	0	0	0
	P10	Arthur Pack Regional Park	<<1	<<1	<<1	0	0	0

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

Key: <<1 indicates that the number of potential speech interference events (>50 dB) per hour resulting from Davis-Monthan based aircraft overflights is low (rounding to zero).

DM3.2.2.2.2 Scenario B

The numbers of daytime events per hour under Scenario B that could potentially interfere with speech would be the same as under Scenario A (see Table DM3-16) except at Escalante Park. Escalante Park would experience one potential speech interference event per hour under Scenario B with windows closed, whereas under Scenario A the number of events per hour with windows closed would round to zero. The number of speech interference events at Escalante Park with windows open and outdoor as well as the number of events at all other locations would be the same as under Scenario A.

DM3.2.2.2.3 Scenario C

Under Scenario C, the number of daytime (7:00 A.M. to 10:00 P.M.) events per hour that could potentially interfere with speech would be the same as under Scenario B.

DM3.2.2.3 Interference with Classroom Learning

DM3.2.2.3.1 Scenario A

Table DM3-17 presents changes in classroom noise levels with windows open and closed under Scenario A. As described in Section DM3.2.1.3, two of the eight schools with windows open are currently exposed to $L_{eq(SD)}$ greater than 40 dB under baseline conditions. Implementation of the AFRC F-35A mission would increase $L_{eq(SD)}$ at the Griffin Foundation Schools from less than 35 dB to 42 dB while windows are closed, exceeding the recommended background noise level. If windows are open, four additional schools would be exposed to $L_{eq(SD)}$ greater than 40 dB. The number of indoor events per hour with potential to interrupt speech would increase by as much as two with windows either closed or open.

Table DM3-17. Indoor Classroom Learning Disruption Resulting from Scenario A at Davis-Monthan AFB

Type	ID	Description	Scenario A					Change				
			Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
			$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c	$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Griffin Foundation Schools	52	4	42	2	8	10	1	7	1	1
	S02	Roberts Elementary School	46	4	36	2	8	6	1	1	2	0
	S03	Smith Elementary School (on-base)	44	2	<35	1	8	7	1	0	1	0
	S04	Borman Elementary School (on-base)	40	3	<35	2	6	3	2	0	1	0
	S05	Irene Erickson Elementary School	36	2	<35	0	6	3	1	0	0	1
	S06	Billy Lane Laufer Middle School	43	2	<35	1	6	9	1	0	1	1
	S07	University of Arizona	41	2	<35	1	3	5	0	0	1	1
	S08	Robison Elementary	47	3	37	2	4	6	1	2	0	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour during 8-hour school day (8:00 A.M. to 4:00 P.M.) at or above an indoor L_{max} of 50 dB.

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

DM3.2.2.3.2 Scenario B

Classroom noise levels with windows open and closed under Scenario B are presented in Table DM3-18. As described in Section DM3.2.1.3, two of the eight schools are currently exposed to interior $L_{eq(SD)}$ greater than 40 dB under baseline conditions with windows open. Implementation of Scenario B would increase $L_{eq(SD)}$ at the Griffin Foundation Schools from less than 35 dB to 42 dB while windows are closed, exceeding the recommended background noise level. If windows are open, four additional schools would be exposed to $L_{eq(SD)}$ greater than 40 dB. The number of indoor events per hour with potential to interrupt speech would increase by as much as two with windows closed and with windows open.

Table DM3-18. Indoor Classroom Learning Disruption Resulting from Scenario B at Davis-Monthan AFB

Type	ID	Description	Scenario B					Change				
			Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
			L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Griffin Foundation Schools	52	4	42	2	8	10	1	10	1	1
	S02	Roberts Elementary School	46	4	36	2	8	7	1	7	2	0
	S03	Smith Elementary School (on-base)	46	2	36	1	8	9	1	9	1	0
	S04	Borman Elementary School (on-base)	41	3	<35	2	6	4	2	4	1	0
	S05	Irene Erickson Elementary School	37	2	<35	1	6	2	1	4	1	1
	S06	Billy Lane Laufer Middle School	43	2	<35	1	6	8	1	9	1	1
	S07	University of Arizona	40	2	<35	1	3	5	0	5	1	1
	S08	Robison Elementary	46	3	36	2	4	6	1	6	0	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour during 8-hour school day (8:00 A.M. to 4:00 P.M.) at or above an indoor L_{max} of 50 dB.

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

DM3.2.2.3.3 Scenario C

Table DM3-19 lists classroom noise levels with windows open and closed under Scenario C. An additional four schools would be exposed to L_{eq(SD)} greater than 40 dB with windows open, and the L_{eq(SD)} at the Griffin Foundation Schools would increase from less than 35 to 42 dB with windows closed. The number of indoor events per hour with potential to interrupt speech would increase by as much as two with windows closed and with windows open.

Table DM3-19. Indoor Classroom Learning Disruption Resulting from Scenario C at Davis-Monthan AFB

Type	ID	Description	Scenario C					Change				
			Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
			L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Griffin Foundation Schools	52	4	42	3	8	10	1	7	2	1
	S02	Roberts Elementary School	46	4	36	2	8	7	1	1	2	0
	S03	Smith Elementary School (on-base)	47	2	37	1	8	9	1	2	1	0
	S04	Borman Elementary School (on-base)	41	3	<35	2	6	4	2	0	1	0
	S05	Irene Erickson Elementary School	38	2	<35	1	6	3	1	0	1	1
	S06	Billy Lane Laufer Middle School	43	2	<35	1	6	8	1	0	1	1
	S07	University of Arizona	40	2	<35	1	3	5	0	0	1	1
	S08	Robison Elementary	46	3	36	2	4	6	1	1	0	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour during 8-hour school day (8:00 A.M. to 4:00 P.M.) at or above an indoor L_{max} of 50 dB.

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

DM3.2.2.4 Sleep Disturbance

As noted in Chapter 3, Section 3.2.3, the probability of sleep being disturbed at least once per night is estimated based on the number of overflight events and the SEL of each event. Most of the night flying conducted from Davis-Monthan AFB is part of the combat search and rescue mission and would not change under the proposed action. The number of late-night flights by AFRC F-35A pilots would be similar to the number currently conducted by A-10 pilots. However, when AFRC F-35A night operations do occur, they would have higher SELs than A-10 operations. Increases in probability of being awakened would range from no increase to a 1 percent increase (Table DM3-20). Impacts to sleep disturbance resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table DM3-20. Average Probability of Awakening Resulting from the AFRC F-35A Mission at Davis-Monthan AFB

Type	ID	Name / Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)			
			AFRC F-35A Mission		Change	
			Windows Open ^a	Windows Closed ^a	Windows Open ^a	Windows Closed ^a
Park	P01	Parkview Park	6	3	0	1
	P02	Swan Park	6	1	1	0
	P03	Freedom Park	6	1	0	0
	P04	Escalante Park	2	1	0	1
	P05	The Groves Park	2	1	0	1
	P06	Country Club Annex Park	9	4	1	0
	P07	Reid Park Zoo	6	2	1	0
	P08	Jacobs Park and Ochoa Soccer Complex	2	1	0	0
	P09	Saguaro National Park (Tucson Mountain District)	<<1	<<1	0	0
	P10	Arthur Pack Regional Park	<<1	<<1	0	0
School	S01	Griffin Foundation Schools	7	3	0	0
	S02	Roberts Elementary School	6	1	1	0
	S03	Smith Elementary School (on-base)	3	1	0	0
	S04	Borman Elementary School (on-base)	3	2	0	1
	S05	Irene Erickson Elementary School	3	1	1	0
	S06	Billy Lane Laufer Middle School	2	1	0	1
	S07	University of Arizona	4	2	0	0
	S08	Robison Elementary	5	3	0	0

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

Key: <<1% indicates that the probability of awakening resulting from Davis-Monthan AFB based aircraft overflights is low (rounding to zero percent).

DM3.2.2.5 Potential for Hearing Loss

Implementation of the AFRC-F-35A mission (with any of the three afterburner scenarios selected) would not expose any on-base or off-base residences to DNL greater than 80 dB. Therefore, PHL would not result from implementation of the AFRC F-35A mission.

DM3.2.2.6 Occupational Noise

USAF occupational noise exposure prevention procedures (e.g., hearing protection and monitoring) would be implemented under the AFRC F-35A mission, regardless of which afterburner scenario is selected. These procedures would comply with all applicable OSHA and USAF occupational noise exposure regulations.

DM3.2.2.7 Non-Auditory Health Impacts

As noted in Section DM3.2.1.7, the current state of scientific knowledge does not yet support a consistent causal relationship between exposure to aircraft noise and non-auditory health impacts (i.e., impacts other than hearing loss). Several types of potential health impacts have been investigated in multiple studies with contradictory results (Meecham and Shaw 1979, Frericks *et al.* 1980, Jones and Tauscher 1978, Edmonds *et al.* 1979). The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. The connection from annoyance to stress to health issues requires careful experimental design, and the resulting data are subject to different interpretations. A recent, large-scale study indicated that nighttime aircraft noise could be linked to increases in the likelihood of hypertension (Jarup *et al.* 2005, 2008), but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

DM3.2.2.8 Structural Damage

Damage to structures is not anticipated to result from AFRC F-35A subsonic noise because noise resulting from implementation of the AFRC F-35A mission would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet (CHABA 1977).

Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating noise levels similar to those that would result from operation of the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels (Battis 1983). Additional discussion of the effects of noise on cultural resources can be found in Section DM3.7. Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects in structures would continue to occur. Induced vibrations do not normally result in structural damage, but the rattling of objects does have the potential to contribute to annoyance. Although the risk posed to structures by noise would be minimal, a process exists for dealing with any such damage. Any claims from USAF-related damage would begin by contacting the Davis-Monthan AFB Public Affairs Office with details of the claim. The USAF would then investigate the claim to establish the exact nature and extent of the damage.

DM3.2.2.9 Animals in the Care of Humans

During scoping, several people submitted comments concerning the reactions of animals in the care of humans (e.g., pets, other domesticated animals, and animals kept in zoos) to an increased number of loud overflight events. An animal’s reaction to noise depends on several factors including the animal’s temperament, training, and past experiences associated with the noise. Certain domesticated animal species (e.g., horses) are more likely to have strong reactions to noise than others. As mentioned previously, noise impacts on wildlife are discussed in Section DM3.6.

In the airfield environment, aircraft typically operate at slower speeds than are used in training airspace. Although these slower speeds mean that elevated sound levels last longer, they also result in a time lag between the aircraft first being heard and the overflight noise maximum. Sounds with slow rise-times are less likely to induce panic than sudden onset noise (USAF 1994). Because F-35 and A-10 aircraft operate at similar speeds in the airfield environment, the rise times of noise generated by the two aircraft are similar.

One of the most important factors affecting an animal’s reaction to noise is the level of familiarity with the noise source. Under baseline conditions, the ROI is overflown by several types of jet aircraft (F-16, A-10, C-550) including occasional visits by transient F-35A aircraft. As described in Section DM2.0, the replacement of 924 FG A-10 aircraft with F-35A aircraft would occur over

approximately 2 years, and the tempo of AFRC F-35A operations around the base would increase slowly as the new airframe gets established at the base. AFRC F-35A pilots would use flight paths and altitudes similar to those currently used by A-10 pilots. For the purposes of this analysis, all noise impacts show the full impact of 24 aircraft. AFRC F-35A pilots would use the flight paths identified in the 2004 JLUS (Arizona Department of Commerce 2004). Because the reactions of domestic animals depends on several factors (e.g., species, situation, predisposition), there is no single noise level below which behavioral reactions would never occur. However, if it is assumed that noise events with the potential to interfere with human conversation could also be bothersome to animals, then the number of noise events per hour with potential to interfere with speech (Table DM3-16) could be an indicator of how frequently animals could be bothered by noise. It is recognized that this metric of noise events per hour with potential to interfere with speech is an arbitrary metric for determining how frequently animals would be bothered by noise. The metric is used purely as a measure of relative change between the No Action Alternative and proposed action.

DM3.2.3 Airspace Affected Environment

This section presents noise levels in training airspace and ranges that would be used by AFRC F-35A pilots. As described in Section DM2.4.1, Davis-Monthan AFB-based F-35A pilots would operate in existing MOAs, RAs, and ATCAAs performing combat training missions similar to those currently conducted by Davis-Monthan AFB-based A-10 pilots. The noise analysis accounts for subsonic flight noise and supersonic flight noise generated in locations where supersonic flight is authorized. As noted in Chapter 3, Section 3.2.1.1, subsonic noise in training airspace is quantified using the onset-rate adjusted day-night average sound level (L_{dnmr}) and supersonic noise levels are quantified using C-weighted day-night average sound level (CDNL) as well as the number of booms per month that would be heard on the ground. The location, types, and number of munitions used during F-35A training would be similar to that used during A-10 training. Therefore, munitions noise levels would remain approximately the same as under baseline conditions.

DM3.2.3.1 Subsonic Noise

Figure DM3-4 shows baseline subsonic noise levels beneath airspace proposed for use by AFRC F-35A pilots from Davis-Monthan AFB. L_{dnmr} beneath the Outlaw, Jackal, and Tombstone MOAs and R-2303 are below 45 dB. Areas beneath the Ruby and Fuzzy MOAs are exposed to L_{dnmr} of 46 dB, areas beneath the Sells 1 MOAs are exposed to L_{dnmr} of approximately 64 dB, and areas beneath R-2031E / R-2304 / R-2305 are exposed to L_{dnmr} of 65 dB.

DM3.2.3.2 Supersonic Noise

Supersonic flight is permitted in R-2031E / R-2304 / R-2305 at or above 5,000 feet MSL and in Sells MOA at or above 10,000 feet MSL. A-10 aircraft, such as the ones based at Davis-Monthan AFB, are not capable of supersonic speeds. However, the airspace also supports training by aircraft types that are supersonic-capable, and sonic booms are generated on a regular basis. As shown on Figure DM3-4, the area beneath R-2301E, R-2304, and R-2305 experiences an average of three sonic booms per day, resulting in CDNL of 56 dB. Areas beneath the Sells MOA currently experience an average of two booms per day, resulting in CDNL of 54 dB.

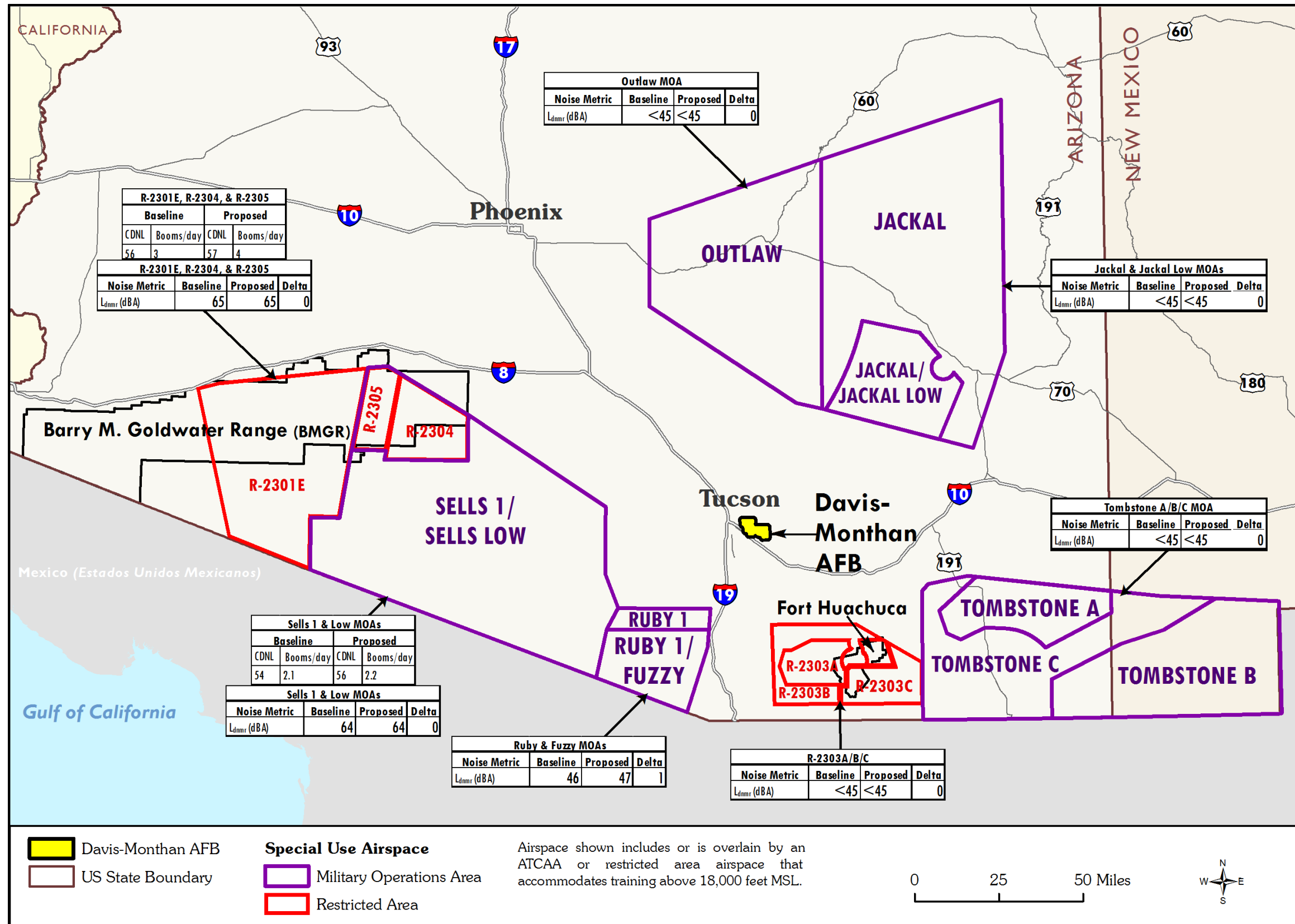


Figure DM3-4. Noise Levels in Training Airspace used by Davis-Monthan AFB Pilots

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DM3.2.4 **Airspace Environmental Consequences**

DM3.2.4.1 Subsonic Noise

Changes in sortie operations tempo under the proposed action are discussed in Chapter 2, Section 2.3.4.1, and Section DM.2.4.1. Late-night training (10:00 P.M. to 7:00 A.M.) by AFRC F-35A pilots would only be conducted in rare contingencies and special mission training. As shown on Figure DM3-4, L_{dnmr} would not increase by more than 1 dB below all of the airspace proposed for use except for the Ruby/Fuzzy MOAs. Implementation of the AFRC F-35A mission would result in an L_{dnmr} increase of 1 dB to areas beneath the Ruby/Fuzzy MOAs.

The overall number of sorties flown by the 924 FG would increase by about 5 percent (Table DM2-7). Although F-35A aircraft are louder than the 924 FG A-10 aircraft that they would replace when flying at the same altitude, AFRC F-35A pilots would predominantly train at high altitudes. Approximately 96 percent of A-10 training is conducted at altitudes below 10,000 feet MSL, but only about 6 percent of F-35A training would be conducted below 10,000 feet MSL (Table DM2-6). Several of the airspace areas proposed for use by AFRC F-35A pilots (i.e., R-2301, R-2304, R-2305, and Sells MOA, Ruby MOA, and Fuzzy MOA) are currently used by multiple F-35A squadrons based at Luke AFB and/or 162 FW F-16 pilots based at TUS. Training by these aircraft and other baseline users generates a noise environment in which training by an additional F-35A squadron would not increase the L_{dnmr} by more than 1 dB. The R-2303/Tombstone MOA airspace complex, Jackal MOA, and Outlaw MOA are large training airspace areas. Overflight of any particular location within these airspace areas would remain infrequent under the proposed action, such that L_{dnmr} would remain below 45 dB. Although L_{dnmr} would not increase in areas below all of the airspace proposed for use, except the Ruby and Fuzzy MOAs, the replacement of 924 FG A-10 aircraft with AFRC F-35A aircraft would increase the number of training sorties conducted with aircraft that are louder than the A-10. This increase in sorties could be considered annoying to people on the ground under these areas.

Overflight noise events have the potential to interfere with activities. An increase in the number of loud events would be expected to increase the percentage of the population that is highly annoyed by noise. The proposed AFRC F-35A training sorties would occur in several large training airspace areas. As shown in Table DM2-6, approximately 94 percent of F-35A training time is spent at altitudes above 10,000 feet MSL. Because training would occur across very large areas, and because most of the training would be at high altitudes, the loudest of the overflights (i.e., overhead at low altitudes) would be rare.

During scoping, several people submitted comments regarding overflight noise while the aircraft are transiting from the airfield to and from the airspace proposed for use. Aircrews transiting from the installation to training airspace and back again typically use a set of existing prescribed routes. As identified in the 2004 JLUS, actual ground tracks of transiting aircraft vary based on several factors, and non-standard routing can be used, as needed, in response to air traffic, weather, or other time-varying conditions. AFRC F-35A pilots would typically transit at high altitudes and in cruise configuration using lowered engine power settings to reduce noise impacts and improve fuel efficiency. In addition, flight at these altitudes allows the aircraft to arrive at the training airspace at an appropriate altitude to begin training. Single overflight event noise levels generated by F-35A aircraft in cruise configuration are listed in Chapter 3, Table 3-4.

Although AFRC F-35A pilots would implement measures to reduce noise, the noise generated by transiting aircraft can be disturbing, particularly when overflight noise affects national parks and other noise-sensitive places where ambient noise levels are low. Detailed discussion of recreation impacts is contained in Section DM3.8.

DM3.2.4.2 Supersonic Noise

AFRC F-35A pilots would conduct supersonic training in the BMGR airspace (i.e., R-2301, R-2304, and R-2305) and Sells MOA, which are currently approved for supersonic training. Although supersonic flight is permitted at lower altitudes, combat tactics developed to make the best use of the F-35A aircraft's capabilities concentrate supersonic flight at high altitudes. Approximately 90 percent of F-35A supersonic flight would occur above 30,000 feet MSL and the remaining 10 percent would occur at altitudes between 15,000 and 30,000 feet MSL (Chapter 2, Table 2-10). F-16 pilots conduct approximately 8 percent of supersonic flight between 10,000 feet and 15,000 feet MSL, 12 percent between 15,000 and 30,000 feet MSL, and the remaining 80 percent above 30,000 feet MSL. F-35A pilots from Luke AFB (as well as several other fighter aircraft type pilots) currently conduct supersonic operations in BMGR airspace, and sonic booms generated by 924 FG pilots operating F-35A aircraft would be the same as F-35A sonic booms experienced currently. The average number of booms per day on the ground beneath the BMGR airspace would increase from 3.1 to 3.5 and CDNL would increase from 56 to 57 dB. ANG F-16 pilots based at TUS conduct supersonic operations in Sells MOA on a regular basis. The overpressure generated by an F-16 in straight and level flight at the lowest permitted altitude (10,000 feet MSL) at Mach 1.2 is 4.9 pounds per square foot. An F-35A aircraft in straight and level flight at the same speed at 15,000 feet MSL generates an overpressure of approximately 4 pounds per square foot. The average number of sonic booms per day beneath the Sells MOA would increase from 2.1 to 2.2 and CDNL would increase from 54 to 56 dB. Sonic booms would be more common (increasing by as much as one additional sonic boom every other day), and the increase in frequency could be considered annoying.

DM3.2.5 Summary of Noise Impacts

Implementation of the AFRC F-35A Scenario A would expose an additional 1,566 acres of off-installation land and an estimated 1,506 people to DNL of 65 dB or greater. All of this land is located in the AEZ. Implementation of Scenario B would expose an additional 1,679 acres and an estimated 1,428 people to DNL of 65 dB or greater. Implementation of Scenario C would expose an additional 1,762 acres and an estimated 1,361 people to DNL of 65 dB or greater.

DNL would increase from 3 to 9 dB at 16 of the 18 representative noise-sensitive locations around Davis-Monthan AFB under Scenarios A, B, and C. With the exception of DNL at the Griffin Foundation Schools, DNL at all of the representative noise-sensitive locations would remain below 65 dB. All of the representative schools identified for evaluation in the EIS would experience an increase in the number of events causing speech interference (windows open and closed) with levels reaching up to 4 events per hour at the Griffin Foundation Schools with the windows open.

Regarding noise under the airspace proposed for use, L_{dnmr} would remain below 47 dB beneath the airspace proposed for use. L_{dnmr} beneath all of the airspace proposed for use would remain the same as baseline except beneath the Ruby and Fuzzy MOAs where the new mission would result in a 1 dB L_{dnmr} increase. Supersonic flight would only occur in the BMGR and Sells MOA. Increases in the CDNL resulting from the addition of supersonic activity would be between zero and 2 dB and sonic booms would increase by one additional sonic boom every other day. Noise impacts to the airspace proposed for use are not anticipated to be significant. Based on context and intensity, noise impacts to the area surrounding Davis-Monthan AFB resulting from implementation of the proposed AFRC F-35A mission would be considered significant.

DM3.3 AIR QUALITY

The proposed AFRC F-35A mission at Davis-Monthan AFB would result in net changes in air emissions due to the replacement of existing aircraft operations with operations from the proposed

mission in the base region and associated airspace. The following section describes the air quality affected environment and estimations of impacts due to proposed construction and operational activities within these project regions.

DM3.3.1 Base Affected Environment

Air emissions resulting from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would primarily affect air quality in the Tucson region and eastern Pima County. Pima County Department of Environmental Quality (PDEQ) has adopted standards that are the same as the National Ambient Air Quality Standards (NAAQS) for purposes of regulating criteria air pollutant levels in Arizona. Table 3-6 in Chapter 3, Section 3.3 of this Draft EIS presents the NAAQS.

DM3.3.1.1 Region of Influence and Existing Air Quality

Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as carbon monoxide [CO] and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O₃ can extend much farther downwind than for inert pollutants. The pollutant O₃ is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O₃ levels usually occurs several hours after they are emitted and many miles from their source.

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by the annual to tri-annual metrics described in Chapter 3, Section 3.3.1. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, eastern Pima County is designated by the USEPA as in attainment of the NAAQS for all pollutants (USEPA 2018a). However, the Tucson region that encompasses Davis-Monthan AFB is a maintenance area for the CO NAAQS.

In the 1970s and early 1980s, the Tucson Air Planning Area that encompasses Davis-Monthan AFB did not attain the CO NAAQS and a revision to the State Implementation Plan was required to comply with the Clean Air Act (CAA). Due to a reduction in emissions caused by federal emission standards for new vehicles, state clean fuels, and vehicle emissions testing programs, no violations of the CO NAAQS have been recorded in the region since 1984. The USEPA re-designated the region as in attainment for the CO standards on 25 April 2000. In the same year, the USEPA approved the first CO Limited Maintenance Plan for the region. This plan was updated and approved by the USEPA in 2009, with an effective date of January 2010 (Pima Association of Governments 2008). The plan maintains existing controls and contingency provisions and replaces the 2000 plan. This revision ensures maintenance of the CO standard through 2020.

The USEPA designated Pima County as in attainment of the 2015 O₃ NAAQS in April 2018. In August 2018, air monitoring data indicated that O₃ emissions measured at the Rincon Mountain District of Saguaro National Park exceeded the 2015 O₃ standard (Pima County 2018a). This is the first time any air monitoring station in Pima County had recorded O₃ emissions in excess of this recently promulgated standard. A violation of the NAAQS for O₃ occurs when the 3-year average of the fourth highest daily maximum 8-hour O₃ concentration within a region exceeds 0.070 parts per million. The period that comprises this violation includes years 2016 through 2018. The PDEQ is in the process of validating these O₃ data and they will then send documentation of these data to the USEPA for review. The current O₃ attainment designation will remain in effect until further action is taken by the USEPA.

DM3.3.1.2 Regional Air Emissions

Table DM3-21 summarizes estimates of annual emissions generated by activities within Pima County for year 2014. Emissions for Pima County were obtained from the National Emissions Inventory (NEI) process (USEPA 2018b). The majority of emissions within these regions occur from (1) on-road and nonroad mobile sources (VOCs, CO, NO_x, and carbon dioxide equivalent [CO_{2e}]), (2) industrial processes and fuel combustion by electrical utilities (NO_x and sulfur oxides [SO_x]), (3) solvent/surface coating usages (VOCs), and (4) fugitive dust (particulate matter less than or equal to 10 micrometers in diameter [PM₁₀]/particulate matter less than or equal to 2.5 micrometers in diameter [PM_{2.5}]).

Table DM3-21. Annual Emissions for Pima County, Arizona, 2014

Source Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Stationary Sources	13,592	25,142	5,896	1,361	38,427	6,770	NA
Mobile Sources	11,044	106,943	19,329	122	1,347	852	4,361,094
Total Emissions^a	24,636	132,084	25,225	1,484	39,773	7,622	4,361,094

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not available

Source: USEPA 2018b

DM3.3.1.3 Davis-Monthan AFB Emissions

The AFRC F-35A mission at Davis-Monthan AFB would replace activities associated with the 924 FG. This unit operates 24 A-10 aircraft at Davis-Monthan AFB. The proposed F-35A aircraft replacement action at Davis-Monthan AFB mainly would affect existing emissions from (1) A-10 operations, (2) A-10 engine maintenance and testing, and (3) Aerospace Ground Equipment (AGE). While the decrease of 30 personnel that would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would result in virtually inconsequential changes in emissions from other base sources associated with the 924 FG (e.g., onsite government motor vehicles or privately owned vehicles), those reductions have been calculated as part of the build-out emission calculations for the action. Nonetheless, the main focus of the project air quality analysis remains emissions from existing and proposed aircraft-specific source categories to determine the net changes in emissions from the AFRC F-35A mission.

To estimate emissions from A-10 aircraft operations and AGE usages associated with the 924 FG mission at Davis-Monthan AFB, the analysis employed the USAF Air Conformity Applicability Model (ACAM) version 5.0.13a (Solutio Environmental, Inc. 2019). Table DM3-22 summarizes the annual emissions estimated for the existing A-10 operations of the 924 FG. Volume II, Appendix C, presents details of the emission calculations presented in Table DM3-22. The net emissions change from the decrease of 30 personnel (e.g., emissions from government and privately owned vehicle miles traveled by those 30 personnel) were calculated as a net reduction in the build-out emission calculations for the action.

Table DM3-22. Annual Emissions of Existing A-10 Operations from the 924 FG at Davis-Monthan AFB

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Flight Operations and Engine Trim Tests - A-10s	41.59	118.12	7.35	1.83	11.87	5.28	5,074
Aircraft Engine Test Cells – A-10C	0.14	0.52	0.20	0.03	0.13	0.06	78
Aerospace Ground Equipment	65.56	91.30	139.20	6.81	17.74	17.19	4,475
Total Emissions^a	107.29	209.94	146.76	8.67	29.74	22.53	9,627

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons

DM3.3.1.4 Regional Climate

Meteorological data collected at the TUS are used to describe the climate of the Davis-Monthan AFB project region (WRCC 2018).

Temperature. Pima County is known for extreme heat in the summer months and mild conditions during the winter. The average high and low temperatures during the summer months at Davis-Monthan AFB range from about 100 to 68 degrees Fahrenheit (°F). The average high and low temperatures during the winter months range from 74 to 39°F.

Precipitation. Average annual precipitation for Davis-Monthan AFB is 11.4 inches. Annual precipitation in the region peaks in the summer months (July through September) due to monsoonal flow from the tropics. The peak monthly average rainfall of 2.4 inches occurs in July. Spring is the driest season, as the lowest monthly average of 0.2 inches occurs in May. Snowfalls in the region are rare and average 1.0 inch per year.

Prevailing Winds. Wind data collected in the Tucson area are used to describe the wind climate of the Davis-Monthan AFB project region (National Climatic Data Center 1998). The annual average wind speed at Davis-Monthan AFB is 8.3 miles per hour (National Climatic Data Center 1998). April through June experience the strongest winds, with a monthly average speed of 9 miles per hour during this period. The winds prevail from the southeast year round, except in June and July, when they prevail from the south-southeast.

DM3.3.1.5 Applicable Regulations and Standards

The Arizona Department of Environmental Quality (ADEQ) is responsible for enforcing air pollution regulations in Arizona. However, the PDEQ has the authority to regulate air quality in Pima County. The PDEQ enforces the NAAQS by monitoring air quality, developing rules to regulate and to permit stationary sources of air emissions, and contributing to the air quality attainment planning processes in Pima County. The PDEQ air quality regulations are found in Title 17 of the Pima County Code, “Air Quality Control” (Pima County 2018b).

DM3.3.2 Base Environmental Consequences

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the proposed AFRC F-35A mission at Davis-Monthan AFB. The estimation of operational impacts is based on the net change in emissions due to the replacement of existing A-10 aircraft operations with those of the proposed AFRC F-35A mission. Volume II, Appendix C, of this Draft EIS presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources at Davis-Monthan AFB.

The air quality analysis for the AFRC mission at Davis-Monthan AFB evaluates F-35A takeoff operations based on the three afterburner scenarios. Activity levels and resulting emissions for all other proposed operational activities would remain the same under each afterburner scenario.

The immediate area surrounding Davis-Monthan AFB within eastern Pima County is currently in attainment of all of the NAAQS. However, the Tucson region that encompasses Davis-Monthan AFB is a maintenance area for the CO NAAQS. Therefore, the analysis used the USEPA General Conformity Rule (GCR) *de minimis* threshold of 100 tons per year for CO and the prevention of significant deterioration permitting threshold of 250 tons per year for all other criteria pollutants as indicators of the significance of projected air quality impacts within the Davis-Monthan AFB project region.

DM3.3.2.1 Construction

The AFRC F-35A mission at Davis-Monthan AFB would require C&D and/or renovation of airfield facilities such as training facilities, hangars, runways, and maintenance and storage facilities. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM₁₀/PM_{2.5}) from demolition and/or renovation activities or the operation of equipment on exposed soil. Prior to project initiation, the AFRC would determine if asbestos-containing materials (ACM) exist in any facilities proposed for demolition and/or renovation, and AFRC would comply with the requirements of the PDEQ Asbestos [National Emissions Standards for Hazardous Air Pollutants] NESHAP Notification & Activity Permit Application process (PDEQ 2018).

Construction activity data were developed to estimate construction equipment usages and areas of disturbed ground due to the proposed AFRC F-35A mission. These data were used as inputs to ACAM, which was used to estimate air emissions from proposed construction activities at Davis-Monthan AFB. The air quality analysis assumed that all construction activities for the proposed mission would begin in 2021 and be completed in 2023.

Inclusion of standard construction practices and LEED Silver certification into proposed construction activities would potentially reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. Chapter 3, Section 3.3.3.1, of this EIS describes the standard construction practices that would control fugitive dust.

Table DM3-23 presents estimates of emissions from the infrastructure improvements for the AFRC F-35A mission at Davis-Monthan AFB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, temporary construction emissions associated with the proposed AFRC F-35A mission would not result in significant air quality impacts. Regulations and procedures associated with the demolition of buildings containing asbestos are discussed in Section DM3.11.2.6.

Table DM3-23. Total Construction Emissions from the AFRC F-35A Mission at Davis-Monthan AFB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Demolish Buildings	0.06	0.48	0.43	0.00	0.43	0.02	101
Renovate/Construct Buildings	0.86	3.49	3.16	0.01	0.34	0.14	722
Street/Ramp/Runway Repairs	0.16	0.93	0.92	0.00	0.65	0.05	175
Total Emissions^a	1.09	4.90	4.51	0.01	1.42	0.21	995
Annual Indicator Threshold	250	NA	250	250	250	250	NA
General Conformity De Minimis Threshold	NA	100	NA	NA	NA	NA	NA

^a Calculated values and totals have been rounded; therefore, sum total may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable

DM3.3.2.2 Operations

The proposed AFRC F-35A mission at Davis-Monthan AFB would primarily generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, and (3) AGE. The analysis also includes emissions that would occur from the net change in commuting activities between the proposed F-35A and existing A-10 missions at Davis-Monthan AFB. Because the mission would result in a net reduction of 30 personnel, this would produce a net reduction in emissions from commuting activities. To estimate emissions from the F-35A mission at Davis-Monthan AFB, the analysis employed the ACAM. The air quality analysis assumed that the

proposed mission would reach full operations and resulting emissions in 2024 after the completion of all required infrastructure improvements.

The analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer, where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

During scoping, people submitted comments regarding the pollutant impacts that could result from implementation of the proposed AFRC F-35A mission. Table DM3-24 summarizes the annual operational emissions that would result from implementation of the proposed mission at Davis-Monthan AFB. The data in Table DM3-24 show that the replacement of existing A-10 aircraft operations with the proposed AFRC F-35A operations would result in reductions of all criteria pollutant emissions for the three afterburner scenarios. The emission reductions would primarily result from differences in the emission rates and durations of operation between the (1) F-35A and A-10 aircraft and (2) AGE inventories for each aircraft. The data in Table DM3-18 also show that scenario emissions would increase with increasing afterburner use rates. Implementation of Scenario C (95 percent afterburner rate) would result in the most emissions, but the emissions would increase by less than 6 percent for any criteria pollutant compared to Scenario A (5 percent afterburner rate).

Table DM3-24. Projected Annual Emissions from the AFRC F-35A Mission Operations at Davis-Monthan AFB, 2024 – All Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Scenario A							
Flight Operations and Engine Trim Tests - F-35A	0.14	60.38	54.35	5.98	9.52	8.55	16,553
Aircraft Engine Test Cells – F-35A	0.00	0.41	1.95	0.13	0.17	0.15	374
Aerospace Ground Equipment	8.20	14.39	23.60	1.65	2.43	2.36	1,130
Net Commuting Activities (F-35A - A-10 staff)	(0.05)	(0.53)	(0.04)	(0.00)	(0.00)	(0.00)	(50)
Total F-35A Mission Emissions	8.29	74.65	79.86	7.76	12.12	11.06	18,007
Existing 924 FG Emissions	107.29	209.94	146.76	8.67	29.74	22.54	9,627
F-35A Mission Minus 924 FG Emissions	(98.99)	(135.29)	(66.89)	(0.91)	(17.62)	(11.47)	8,381
Scenario B							
Total F-35A Mission Emissions	8.30	76.77	80.16	7.86	12.21	11.14	17,946
F-35A Mission Minus 924 FG Emissions	(98.99)	(133.17)	(66.59)	(0.81)	(17.53)	(11.39)	8,320
Scenario C							
Total F-35A Mission Emissions	8.30	78.88	80.31	7.95	12.29	11.21	17,862
F-35A Mission Minus 924 FG Emissions	(98.99)	(131.06)	(66.44)	(0.72)	(17.45)	(11.32)	8,236
Indicator Threshold	250	NA	250	250	250	250	NA
General Conformity <i>De Minimis</i> Threshold	NA	100	NA	NA	NA	NA	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

The net change in emissions that would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would not exceed any indicator threshold. Therefore, operational emissions associated with the proposed AFRC F-35A mission at Davis-Monthan AFB would not result in significant air quality impacts.

The VOC, CO, NO_x, SO_x, PM₁₀, and PM_{2.5} emission reductions estimated to result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would result in the following positive effects within the Tucson region:

- VOC and NO_x emission reductions would result in a net benefit to ambient O₃ levels.
- CO, PM₁₀, and PM_{2.5} emission reductions would result in net benefits to these ambient pollutant levels.
- Proposed operations would generate hazardous air pollutants (HAPs), primarily in the form of VOCs and particulates from the combustion of aviation fuel in F-35A aircraft and AGE. The reductions in VOC, PM₁₀, and PM_{2.5} emissions would result in similar net reductions of HAPs. These emission reductions would result in a net benefit to ambient HAP levels.

DM3.3.2.3 General Conformity Statement

The above analyses show that the net change in annual CO emissions that would result from implementation of the AFRC F-35A mission at Davis-Monthan AFB would remain below the applicable conformity *de minimis* threshold of 100 tons per year. As a result, the proposed AFRC F-35A mission at Davis-Monthan AFB would not require a conformity determination under the GCR.

DM3.3.3 Airspace Affected Environment

Projected AFRC F-35A aircraft operations in the airspace proposed for use and along the flight routes between these locations and Davis-Monthan AFB would affect air quality within these portions of southern Arizona and southwestern New Mexico. Most of the regions below and adjacent to these areas currently attain all of the NAAQS. Areas that do not attain an NAAQS or are maintenance areas for these standards include (1) the Ajo sulfur dioxide (SO₂) maintenance area and Ajo PM₁₀ moderate nonattainment area within Pima County, (2) the Douglas SO₂ maintenance area and Douglas-Paul Spur PM₁₀ moderate nonattainment area within Cochise County, (3) the San Manuel SO₂ maintenance area in Pinal County, (4) the Hayden SO₂ maintenance area and Hayden Planning Area PM₁₀ moderate nonattainment area within Gila and Pinal Counties, and (5) the Miami SO₂ maintenance area and Miami Planning Area PM₁₀ moderate nonattainment area within Gila and Pinal Counties.

Several of the airspace areas proposed for use by AFRC F-35A pilots also are in close proximity to or overlie pristine Class I areas, including (1) the Galiuro Wilderness Area, (2) the Chiricahua Wilderness Area, (3) the Chiricahua National Monument Wilderness Area, (4) the Superstition Wilderness Area, (5) the Sierra Ancha Wilderness Area, and (6) the Mount Baldy Wilderness Area. Therefore, due to the proximity of these pristine areas to projected aircraft operations, this Draft EIS provides a qualitative analysis of the potential for projected emissions to affect air quality within these areas.

DM3.3.4 Airspace Environmental Consequences

AFRC F-35A pilots operating from Davis-Monthan AFB would operate in the same airspace and training areas as existing 924 FG pilots, but at higher altitudes. The proposed AFRC F-35A operations in these areas would occur above 3,000 feet AGL about 99 percent of the time (Table DM2-6) and therefore these operations would not appreciably affect ground-level air quality. A-10 pilots from the 924 FG currently conduct 46 percent of operations below 3,000 feet AGL.

To quantify the air quality effects of the F-35A mission within the Davis-Monthan AFB airspaces and training areas, the analysis employed the ACAM to estimate the net change in emissions between the replacement of existing A-10 aircraft operations with proposed F-35A aircraft operations within these areas. The analysis used aircraft flight profiles developed by the project

noise analyses as inputs to the ACAM. The analysis focused on operations within the lowest 3,000 feet of the atmosphere.

Table DM3-25 presents the annual operational emissions that would result from implementation of the F-35A mission within the Davis-Monthan AFB airspaces and training areas. These data show that the proposed changes in aircraft operations within these areas would result in net reductions in all air pollutant emissions within 3,000 feet AGL. Therefore, the proposed AFRC F-35A mission would result in a net improvement to ground-level air quality within proposed airspaces and training areas. This would also be the case for projected impacts within any pristine Class I area. Therefore, implementing the proposed AFRC F-35A mission in existing airspace and training areas would not result in significant air quality impacts.

Table DM3-25. Projected Annual Emissions from the AFRC F-35A Mission Operations within Davis-Monthan AFB Airspaces and Training Areas - 2024

Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Existing 924 FG Flight Operations - A-10	(0.21)	(3.94)	(19.14)	(1.91)	(4.76)	(3.01)	(5,785)
AFRC Mission Flight Operations – F-35A	0.00	0.22	11.89	0.58	0.63	0.57	1,748
F-35A Mission Minus 924 FG Emissions	(0.21)	(3.72)	(7.25)	(1.34)	(4.13)	(2.44)	(4,038)
Indicator Threshold	250	250	250	NA	NA	250	NA
General Conformity <i>De Minimis</i> Threshold	NA	NA	NA	100	100	NA	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e}(mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

DM3.3.5 Summary of Impacts to Air Quality

Pima County is in attainment for all criteria pollutants but is designated as a maintenance area for CO. However, the Tucson region that encompasses Davis-Monthan AFB is a maintenance area for the CO NAAQS. As shown in Table DM3-26, calendar year annual emissions from construction activities and the net change in aircraft operations around the base would not exceed threshold levels. Emissions would decrease in training airspace. Impacts to air quality resulting from implementation of the AFRC F-35A mission would not be significant.

Table DM3-26. Summary of Calendar Year Annual Emissions from the AFRC F-35A Mission at Davis-Monthan AFB

Activity/Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Construction – Year 2021	0.37	2.51	2.34	0.01	1.31	0.10	537
Construction – Year 2022	0.37	2.38	2.17	0.01	0.11	0.11	458
Construction – Year 2023	0.36	0.00	0.00	0.00	0.00	0.00	0
Net Change in Operations – Most Emissive Afterburner Scenario C -Year 2024+	(98.99)	(131.06)	(66.44)	(0.72)	(17.45)	(11.32)	8,236
Annual Indicator Threshold	250	NA	250	250	250	250	NA
General Conformity <i>De Minimis</i> Threshold	NA	100	NA	NA	NA	NA	NA

Key: CO_{2e}(mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions.

DM3.4 SAFETY

Air Force Instruction (AFI) 90-801, *Environment, Safety, and Occupational Health Councils*, implements the risk management guidance within Air Force Policy Directive (AFPD) 90-8, *Environment, Safety, and Occupational Health Management and Risk Management*. All USAF missions and daily routines involve risk. Requirements outlined in this document provide for a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety analysis contained in the following sections addresses issues related to the health and well-being of both military personnel and civilians living on or near Davis-Monthan AFB and under the training airspace.

Specifically, this section provides information on explosive safety; fire risk and management; hazards associated with aviation safety (Accident Potential Zones [APZs]); aircraft mishaps; and Bird/Wildlife Aircraft Strike Hazard [BASH]).

The FAA is responsible for ensuring safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. To fulfill these requirements, the FAA has established safety regulations, airspace management guidelines, a civil-military common system, and cooperative activities with the DoD. The primary safety concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird-aircraft strikes.

DM3.4.1 Base Affected Environment

DM3.4.1.1 Explosive Safety

Facilities/activities with explosive safety quantity-distance (ESQD) arcs at Davis-Monthan AFB include the Munitions Storage Area (MSA), the Explosive Ordnance Demolition area, the alert hangar and apron, combat aircraft parking areas, hot cargo pad, aircraft explosives cargo area, the arm/de-arm aprons on the airfield, the AMARG's Explosive Ordnance Disposal area, and ammunition shipping/inspection/storage facilities. The ESQD arcs at Davis-Monthan AFB are shown on Figure DM3-5.

DM3.4.1.2 Fire Risk and Management

Day-to-day O&M activities conducted at the base are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders (TOs), and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements including AFI 91-202, *The US Air Force Mishap Prevention Program*. Aircraft Rescue Firefighting services are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services.

Davis-Monthan AFB Fire Emergency Services responds to many different types of emergencies within their area of responsibility. These include, but are not limited to, aircraft and rescue firefighting emergencies, structural response, emergency medical services, hazardous material and technical rescue response such as confined space emergencies. The base is equipped with two command vehicles, two engines, one ladder, three aircraft rescue and firefighting trucks, one 5,000-gallon tanker, a hazardous material response vehicle, a technical rescue vehicle, a 1,000-gallon foam trailer and various support units/vehicles. The Fire Emergency Services Flight also has local mutual-aid agreements with the City of Tucson Fire Department and the 162 FW.

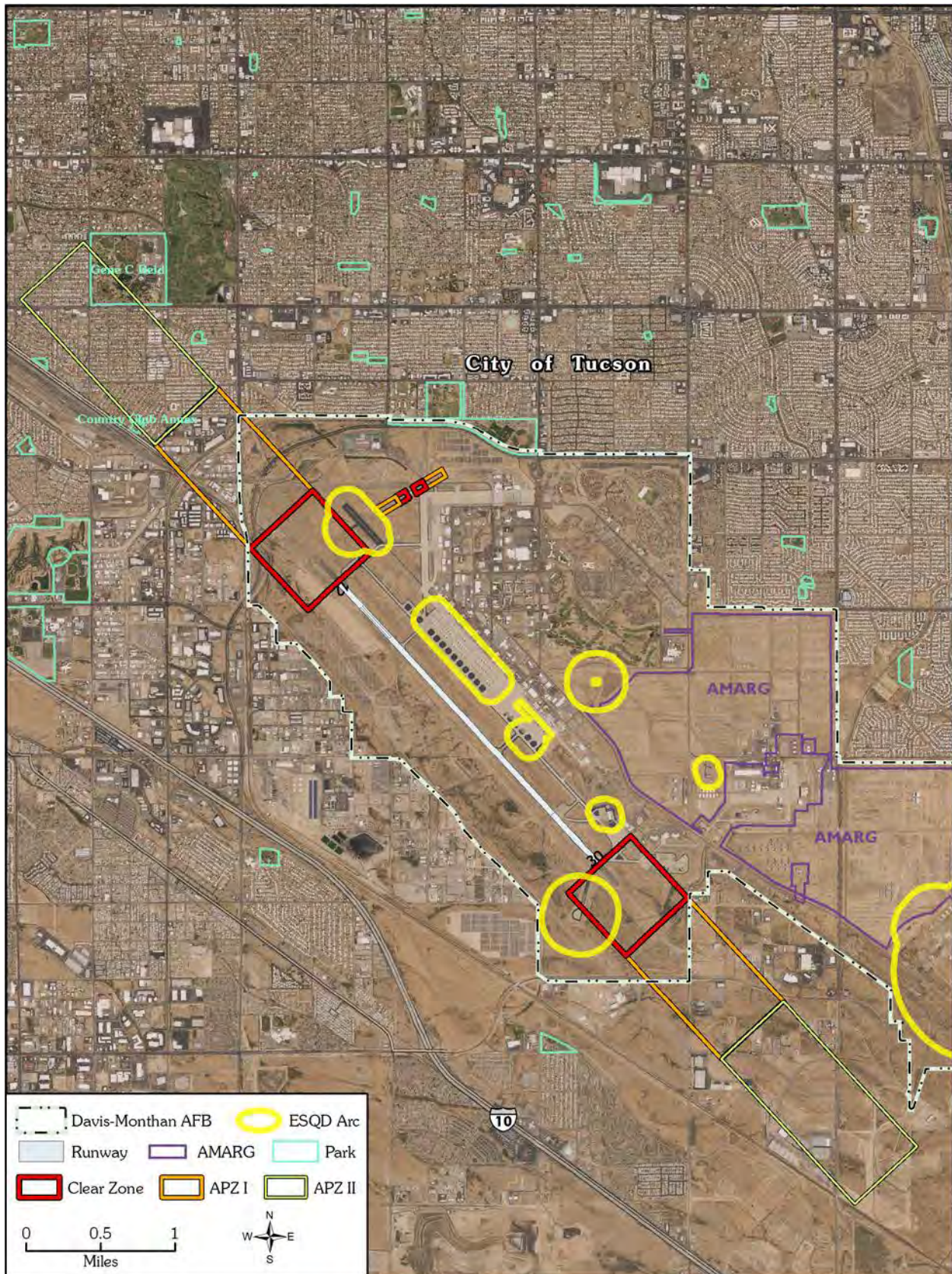


Figure DM3-5. CZs and APZs at Davis-Monthan AFB

Davis-Monthan AFB adheres to specific emergency-response procedures contained in TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, for aircraft mishaps involving composite materials. TO 00-105E-9 contains a section (Chapter 3) on Mishap Composite Awareness.

DM3.4.1.3 Accident Potential Zones

In accordance with DoDI 4165.57, APZs are established at military airfields to delineate recommended compatible land uses for the protection of people and property on the ground. APZs define the areas of a military airfield that would have the highest potential to be affected if an aircraft mishap were to occur. Air Installations Compatible Use Zones (AICUZ) guidelines identify three types of APZs for airfields based on aircraft mishap patterns: the Clear Zone (CZ), APZ I, and APZ II. The standard USAF CZ for Class B runways such as Runway 12/30 at Davis-Monthan AFB is a rectangle area that extends 3,000 feet from the end of a runway, is 3,000 feet wide, and identifies the area with the highest probability for mishaps. APZ I, which typically extends 5,000 feet from the end of the CZ, has a lower mishap probability, and APZ II, which typically extends 7,000 feet from the end of APZ I, has the lowest mishap probability of the three zones. If needed, to reflect different departure and arrival patterns, both the shape and size of APZs can be modified.

The CZs are located entirely within base boundaries. The northern APZ I is approximately 40 percent on-base and 60 percent off-base. The southern APZ I is approximately 20 percent on-base and 80 percent off-base. Both the northern and southern APZs II are almost entirely off-base. The northern APZ I has 24 acres of residential land use, which is incompatible. No other incompatible land use is found in the northern or southern CZs or APZs. Conditionally compatible land uses exist in both the northern and southern APZs. These include residential, commercial, industrial, and public/semi-public land uses (Arizona Department of Commerce 2004). Figure DM3-5 depicts the CZs and APZs at Davis-Monthan AFB.

DM3.4.1.4 Aircraft Mishaps

Mishaps are defined as any damage that occurs on the ground or in flight. As shown in Table DM3-27, mishaps are classified into four categories, based on the severity of the mishap relative to property damage or personnel injury. Class A mishaps are the most severe with total property damage of \$2 million or more or a fatality and/or permanent total disability. Comparison of Class A mishap rates for various engine types, as calculated per 100,000 flying hours provide the basis for evaluating risks among different aircraft and levels of operations. This safety section analyzes existing and projected Class A mishap potentials based on flying hours and aircraft types. While USAF mishaps affecting the general public are extremely rare, two mishaps involving Davis-Monthan AFB aircraft in the Tucson area have resulted in civilian casualties. These events happened 40 and 51 years ago and involved a single-engine A-7 and a twin-engine F-4, respectively. Since then, significant improvements have been made in aircraft safety and procedures.

Table DM3-27. Aircraft Class Mishaps

Mishap Class	Total Property Damage	Fatality/Injury
A	\$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	\$500,000 or more but less than \$2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	\$50,000 or more but less than \$500,000	Nonfatal injury resulting in loss of one or more days from work beyond day/shift when injury occurred
D	\$20,000 or more but less than \$50,000	Recordable injury or illness not otherwise classified as A, B, or C

Aircraft flight operations at Davis-Monthan AFB are governed by standard flight rules. Aircrews ensure flight safety when operating at the airfield by complying with all safety and aircraft operating requirements. No Class A mishaps have occurred during the past 3 years at Davis-Monthan AFB. Four Class B mishaps occurred in the same time period, two (A-10C and C-27J) were related to foreign object debris engine damage and the other two were engine related (A-10C and EC-130H). These Class B mishaps did not result in injury. The lifetime Class A mishap rate for the A-10 is 1.93 for every 100,000 hours of flight time (USAF 2018).

DM3.4.1.5 Bird/Wildlife-Aircraft Strike Hazard

Bird and wildlife-aircraft strikes and the hazards they present form another safety concern for aircraft operations. Bird/wildlife-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area.

According to the Air Force Safety Center BASH statistics, from 1995 to 2016, where altitude at time of strike was known, more than 50 percent of the strikes occurred below 400 feet AGL, and 90 percent occurred below 2,000 feet AGL (USAF 2017). Waterfowl generally present the greatest BASH potential due to their flocking flight patterns and because, when migrating, they can be encountered at altitudes up to 21,000 feet AGL. Raptors also present a substantial hazard due to their size and soaring flight patterns. In general, the threat of bird-aircraft strikes increases during March and April and from August through November due to migratory activities. The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 20 years indicates that 11 USAF aircraft have been destroyed and five fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2016 (USAF 2017).

The USAF BASH program was established to minimize the risk for collisions of birds and aircraft and the subsequent loss of life and property. AFI 91-202 requires each flying unit in the USAF to develop a BASH plan to reduce hazardous bird/animal activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined in the plan include monitoring the airfield for bird activity, issuing bird hazard warnings, initiating bird avoidance procedures when potentially hazardous bird activities are reported, and submitting BASH reports for all incidents. The 355 FW BASH Plan, which also provides BASH guidelines to 924 FG pilots, provides specific guidance and assigns responsibilities in developing an effective bird strike hazard reduction program for Davis-Monthan AFB (355 FW 2018).

From 2016 to present, the 355 FW recorded 83 bird strikes at Davis-Monthan AFB, with 55 of these occurring in 2016 (Foltz 2018). The concentration of birds at and around Davis-Monthan AFB poses a risk to flying operations. The terrain, bodies of water, and climate are ideal living conditions for birds year-round, as well as migratory species. Davis-Monthan AFB is located in the extreme eastern edge of the Pacific Migratory Flyway. Davis-Monthan AFB-specific wildlife hazards to air operations historically include mourning doves, ravens and raptors (hawks and falcons). Davis-Monthan AFB is also home to other desert wildlife including road runners, quail, burrowing owls, javelinas, and coyotes. Coyote strikes are less common than bird strikes, but have much higher potential to cause damage (355 FW 2018).

The Davis-Monthan AFB BASH Plan is implemented in two phases. The first phase is implemented outside of migration season (February to October). During this phase aircraft are

operated corresponding to current Bird Watch Conditions (BWC) which are categorized as Low, Moderate, or Severe. BWC Severe or Moderate requires action from the installation's wildlife dispersal team to reduce the BWC to Low as soon as possible. Phase II of the plan is used in conjunction with BWC procedures during the migratory season (September through January). Phase II elements include procedures for operations that occur one hour before to one hour after sunrise/sunset and or any other designated BASH window including weighing the benefits of the mission versus the increased bird strike risk when scheduling missions as well as visually surveying the airfield for significant bird activity prior to first takeoff (355 FW 2018).

The BASH Plan also establishes implementation procedures and actions to minimize the potential of bird-aircraft strikes. Such measures include eliminating broad-leaf weeds, maintaining grass heights between 7 and 14 inches, and periodic inspection requirements for ponding and proper drainage on the airfield whenever possible to reduce insect breeding (insects are a major food source for birds during much of the year). BASH reduction techniques currently employed by the base include abating nuisance avian species, pyrotechnics, and depredation when necessary (355 FW 2018).

DM3.4.2 Base Environmental Consequences

O&M activities conducted on Davis-Monthan AFB would continue to be performed in accordance with all applicable safety directives. No specific aspects of F-35A O&M would create any unique or extraordinary safety issues. Refer to Chapter 2, Section 2.3.4.2, for a discussion of the types of defensive countermeasures and ordnance that would be used by AFRC F-35A pilots. Only approved weapons systems would be used by AFRC F-35A pilots on the impact training ranges and pilots would adhere to all flare and live-fire use restrictions.

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All renovation and construction activities would be completed in compliance with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with antiterrorism/force protection requirements and explosives safety requirements. The USAF does not anticipate any significant safety impacts to result from construction, demolition, or renovation if all applicable AFOSH and OSHA requirements are implemented. In addition, O&M of the new munitions buildings would not result in significant safety impacts.

Although emergency and mishap response plans would be updated, the proposed AFRC F-35A mission at Davis-Monthan AFB is not expected to create new or unique ground safety issues. Emergency and mishap response plans would be updated to include procedures and response actions necessary to address a mishap involving AFRC F-35A aircraft and associated equipment. With this update, airfield safety conditions would remain similar to baseline conditions. As indicated in Section DM3.4.2.2, base Fire and Emergency Services would continue to be party to mutual-aid support agreements with nearby communities.

DM3.4.2.1 Explosive Safety

The construction and operation of the new munitions maintenance building, munitions operations building, flare storage building, and munitions igloo would comply with Department of Defense Explosives Safety Board (DDESB) Standard 6055.09, *DoD Ammunition and Explosives Safety Standards* (DoD 2008), Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards* (USAF 2017) and AFMAN 32-1084, *Facility Requirements* (USAF 2016). The new buildings' ESQD arcs would be calculated and sited to remain within current ESQD arcs and to be compatible with existing facilities. No changes to explosive safety would result from the construction and operation of the proposed facilities at Davis-Monthan AFB.

DM3.4.2.2 Fire Risk and Management

Fire and crash response would continue to be provided by Davis-Monthan AFB Fire and Emergency Services. TO 00-105E-9 provides guidance on fire response to aircraft containing composite materials, including the F-35A. Firefighters would continue to be fully trained and appropriately equipped for crash and rescue response and the proposed AFRC F-35A beddown would not change these abilities. Aircraft pre-incident plans would be developed for the F-35A. Aircraft pre-incident plans are required to be reviewed, validated and/or updated annually or anytime there is a change to TO 00-105E-9 for the applicable aircraft. Equipment and training specific to addressing F-35A mishaps would be obtained and conducted prior to beddown. Additionally, Davis-Monthan AFB would keep local firefighting departments informed about any new information or firefighting techniques associated with composite materials should an accident occur.

DM3.4.2.3 Accident Potential Zones

No changes to existing APZs or CZs would be required to accommodate AFRC F-35A operations. As documented in Section DM3.4.1.3, there is incompatible residential development in the northern APZ I. For the reasons described in Section DM3.4.2, implementation of the AFRC F-35A mission would not increase the safety risk to these or other off-base areas. Davis-Monthan AFB would continue to work with communities and developers to apply the AICUZ guidelines.

DM3.4.2.4 Aircraft Mishaps

Implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would replace the existing AFRC A-10 mission operated by the 924 FG. During public scoping, several commenters were concerned with the flight safety of the single-engine F-35A, as well as the increased use of composite aerospace materials in the construction of the F-35A. Although the A-10 does have some composite material in wing leading edges, composites were not extensively used in A-10 construction. Approximately 42 percent of the F-35A, by weight, is comprised of composite materials (Air Force Research Laboratory 2015).

DM3.4.2.4.1 Flight Safety

In general, twin-engine aircraft have a lower mishap rate than single-engine aircraft. However, it is also true that aircraft with newer engines and designs have a lower mishap rate than aircraft with older engines and designs (Table DM3-28) and that the safety and reliability of single-engine USAF fighter aircraft has increased substantially over time. Table DM3-28 demonstrates the decreases in engine-related and lifetime mishap rates for 11 historic and current single-engine aircraft. The Pratt & Whitney F135 engine used in the F-35A was derived from the F119 engine, which is used in the F-22 Raptor. The F-22 features a 0.54 lifetime engine-related Class A flight mishap rate.

Historical trends of USAF aircraft show that mishaps of all types decrease the longer an aircraft is operational. For example, when the last single-engine fighter fielded by the USAF (F-16) surpassed 100,000 hours in 1982, its Class A rate was 15.83 with four fatal mishaps (USAF 2018).

Since then, the mishap rate for the F-16 has decreased substantially. In 2017, the F-16 had a lifetime Class A mishap rate of 3.39, and its rate for the last 10 years is 1.83 (USAF 2019). Similarly, in 1979, when the A-10 surpassed 100,000 hours, its Class A rate was 9.24 with four fatalities recorded (USAF 2019). The A-10 has a lifetime Class A mishap rate of 1.90, and its rate for the last 10 years is 0.55 (USAF 2019).

Table DM3-28. Class A Flight Mishap Rates

Decade Introduced	Aircraft/Engine	Engine-Related Cumulative Class A Mishap Rate	Engine-Related Class A Mishap Rate Last 6 Quarters	Lifetime Class A Mishap Rate
1950s	F-100/ J57	5.61	No longer in service	21.22
	F-102/ J57	3.41	No longer in service	Not available
	F-104/ J79	9.48	No longer in service	Not available
	F-105/ J75	4.56	No longer in service	12.15
	F-106/ J75	2.04	No longer in service	Not available
1960s	A-7/TF41	1.73	No longer in service	5.71
1970s	F-16/ F100-200	1.84	No longer in service	3.43
1980s	F-16/ F110-100	1.06	0.76	
	F-16/ F100-220	0.96	0	
1990s	F-16/ F110-129	0.85	0	
	F-16/ F100-229	0	0	

As of March 2019, the F-35A has amassed more than 76,000 hours of flight time with three Class A mishaps, resulting in a mishap rate of 3.94 (Table DM3-29). These mishaps included an engine failure during takeoff preparation (the aircraft was safely brought to a halt), an aborted takeoff with damage confined to the engine, and a hydraulic failure resulting in collapsed nose landing gear that occurred after landing and parking. No injuries occurred during these events.

Table DM3-29. F-35A Class A Flight Mishap History

Fiscal Year	Class A		Destroyed		Fatal		Hours Flown Per Year	Cumulative Flight Hours
	Number of Mishaps	Rate	Aircraft	Rate	Pilot	All		
2010	0	0.00	0	0.00	0	0	0	0
2011	0	0.00	0	0.00	0	0	0	0
2012	0	0.00	0	0.00	0	0	215	215
2013	0	0.00	0	0.00	0	0	1,283	1,498
2014	1	37.54	0	0.00	0	0	2,664	4,162
2015	0	0.00	0	0.00	0	0	7,467	11,629
2016	0	0.00	0	0.00	0	0	11,343	22,972
2017	0	0.00	0	0.00	0	0	22,714	45,686
2018	2	11.90	0	0.00	0	0	30,514	76,200
Lifetime	3	3.94	0	0.00	0	0	-	76,200

Note: Flight “rates” are number of mishaps per 100,000 flight hours. Only Aviation “Flight” mishaps are reported here. An aviation “Flight” mishap is any mishap in which there is intent for flight and reportable damage to a DoD aircraft.

Source: USAF 2019

Because the F-35A has not yet reached 100,000 hours, this mishap rate is not directly comparable to other aircraft (Chapter 3, Section 3.4.3) with more flying hours. However, this rate does provide some indication of the overall safety of the F-35A aircraft. For example, this rate is much lower than the 18.65 rate of the F-16 after a comparable amount of hours. The mishap rate for the F-35A is expected to decline as the aircraft becomes operationally mature.

During scoping, some comments were received regarding safety deficiencies of the F-35A aircraft. In a review of the production program for all models of the F-35 (A, B, and C), the Government Accountability Office has noted various deficiencies as this advanced aircraft is developed and brought into production (GAO 2018). These deficiencies are being addressed as full-rate production is approached. The USAF recognizes that certain components have yet to reach full capability. The USAF would not operate any aircraft should safety-of-flight concerns be present. During scoping a request was made to include Class A, B, and C mishap data in the EIS. Class A mishap data is

discussed above. Data available online show no Class B mishaps for the F-35A. F-35A Class C mishaps deal with a wide range of mishaps that vary from maintenance personnel slipping to accidental damage to aircraft. These rates and causes are available online at <https://www.militarytimes.com/news/your-military/2018/04/06/military-times-aviation-database/>.

DM3.4.2.4.2 Composite Aerospace Materials

Advanced composites have been used in aircraft construction since the late 1960s, when a boron-epoxy rudder was installed on the F-4 jet. As composite technology has advanced, the percentage of composite material used in modern aircraft has increased. Types of composites include carbon fiber (e.g., graphite used in sporting equipment), metal-matrix composites (e.g., materials used on spacecraft and racing bicycles), and ceramic-matrix composites (e.g., medical implants). As noted by members of the public during the public scoping period, one disadvantage of certain composites is that these materials can degrade under extreme temperatures, resulting in the production of toxic fumes and airborne fibers. Because of these characteristics, composite aerospace materials present unique hazards to mishap responders. A burning aircraft could release toxic products, exposing personnel and the environment. Individuals exposed to a crash site could experience dermatological and respiratory problems. Exposure to these hazards would not necessarily end when a fire is extinguished; exposure to recovery crews, site security, the surrounding population, and others could continue (Navy 2016). Sampling at mishap sites of aircraft containing composite materials indicated the presence of respirable fibers/dusts in the air. In addition, laboratory studies have identified respirable fiber products and toxic gases (including high levels of CO, NO_x, and hydrogen cyanide) from burning composite materials (Navy 2016).

Due to the rarity of mishaps involving composite aerospace materials, no epidemiological data are available on personnel exposure to burning composites. Similarly, no studies have assessed the toxicology of carbon fibers generated in a fire scenario with extended post-exposure duration. Synergistic interactions between the solid, vapor, and gaseous combustion products have also not been determined. However, research and experience during several crash responses do indicate that composite fiber release is relatively low (Air Force Research Laboratory 2015).

In the event of a crash of an aircraft containing composite materials, the USAF would follow the guidance contained in the *Mishap Response Checklist for Advanced Aerospace Materials/Composites* (USAF Advanced Composites Program Office 1993).

- Areas in the immediate vicinity of the mishap site affected by direct and dense fallout from the fire/explosion-generated smoke plume would be evacuated, along with easily mobile critical equipment. Aircraft and flight operations exposed to the immediate fallout area would be altered or moved. All unprotected personnel would be restricted from assembling downwind of the crash site.
- The fire would be extinguished and composites cooled to below 300°F. Only firefighters equipped with a self-contained breathing apparatus would be authorized in the immediate vicinity of a burning/smoking mishap site until the fire chief declares the area safe. If possible, high-pressure water break-up and dispersal of composite structures would be avoided.
- The mishap site would be roped or cordoned off and a single entry/exit point would be established upwind of the wreckage. Only sufficiently protected individuals would be authorized in the immediate mishap site and peripheral areas.
- Should personnel other than those at the accident site be directly and substantially exposed to adverse material hazards, the medical staff would be consulted for evaluation and

tracking. Time permitting, the otherwise unthreatened populace in affected or fallout areas would be advised to do the following:

- Remain indoors;
 - Shut external doors and windows;
 - Turn off forced air intakes; and
 - Await further notification.
- Specific aircraft hazards would be identified by inspection and consultation with the crew chief or aircraft specialists. Composite and other hazardous materials would be identified to mishap response personnel. The On-Scene Commander would be advised of all findings and recommendations.
 - When exiting the crash site, personnel would use a high-efficiency particulate air-filtered vacuum, if available, to remove ACM from their outer clothing, work gloves, boots, headgear, and equipment. If unavailable, efforts would be made to wipe or brush off as much contamination as possible. Clean sites (i.e., tent or trailer) would be set up for donning/removal of personal protective equipment if practical.
 - Non-disposable clothing involved with crash/fire-damaged composite parts would be removed and laundered as determined by the base environmental engineer. Personnel should shower (in cool water) prior to going off-duty to preclude injury from loose fibers. Portable showers would be provided, if necessary.
 - Burned/mobile composite fragments and loose ash/particulate residue would be secured with firefighting foam or a fine water mist until a hold-down fixant material is applied to immobilize the fibers. Initial actions should concentrate on debris containment. Investigators, specific aircraft authority, and the base environmental engineer would be consulted before applying any fixant.

DM3.4.2.4.3 Aircraft Mishap Summary

Aviation in all forms has inherent risk and it is not possible to guarantee the future flight-safety risk of any aircraft. However, due to the current F-35A record, the increasing safety trend for single-engine fighter aircraft, and increases in safety as an airframe matures operationally, it is reasonable to expect nominal changes in flight-safety risk to result from implementation of the AFRC F-35 mission at Davis-Monthan AFB.

DM3.4.2.5 *Bird/Wildlife-Aircraft Strike Hazards*

The 0.7 percent increase in airfield operations that would result from implementation of the AFRC F-35A mission could negligibly increase the risk of bird/wildlife-aircraft strikes at Davis-Monthan AFB. The BASH plan would remain in place to reduce these risks.

DM3.4.3 Airspace Affected Environment

The airspace proposed for use by AFRC F-35A pilots from Davis-Monthan AFB includes Restricted Areas, MOAs, and ATCAAs (Table DM2-5 and Figure DM2-2). Aircraft flight operations are governed by standard flight rules. The volume of airspace encompassed by the combination of airspace elements constitutes the ROI for airspace safety. These training areas allow military flight operations to occur without exposing civil aviation users, military aircrews, or the general public to hazards associated with military training and operations. This section describes the existing safety procedures in the airspace proposed for use and the following section evaluates changes that would occur with the introduction of the F-35A.

DM3.4.3.1 Fire Risk and Management

Fires attributable to flares are rare for three reasons. First, the altitude and other restrictions on flare use minimize the possibility for burning material to contact the ground. Second, to start a fire, burning flare material must contact vegetation that is susceptible to burning at the time. The probability of a flare igniting vegetation is expected to be equally minimal. Third, the amount and density of vegetation, as well as climate conditions, must be capable of supporting the continuation and spread of fire.

DM3.4.3.2 Aircraft Mishaps

Aircraft flight operations are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (354 FW Instruction 11-250, *Flying Operations and Local Flying Procedures*, February 2012) to ensure flight safety.

DM3.4.3.3 Bird/Wildlife-Aircraft Strike Hazard

The primary threat to military aircraft operating in the airspace is migratory birds. The exact number of birds struck in the airspace areas is difficult to assess because small birds are not detected until post-flight maintenance checks and the location of such strikes cannot be determined. The BMGR lies within the Pacific Flyway, which is a minor flyway for waterfowl and a major flyway for raptors and small songbirds (CSU 2018). Refer to Section DM3.4.1.5 for more information regarding BASH and the actions that are implemented to minimize bird strikes.

DM3.4.4 Airspace Environmental Consequences

The addition of F-35A aircraft to the airspace would not require changes to the management or structure of existing airspace. AFRC F-35A pilots would fly mission profiles similar to those flown by A-10 pilots currently operating from Davis-Monthan AFB, only at higher average altitudes, including air-to-ground ordnance delivery, air combat training operations. Although mission profiles would be similar, unlike the A-10, AFRC F-35A pilots could fly supersonic in approved airspace. Implementation of the AFRC F-35A mission would result in a 5 percent increase in overall airspace sorties in the existing airspace proposed for use. As described in Section DM3.1.3.2, total operations would remain within the capability and capacity of the airspace and ranges proposed for use.

DM3.4.4.1 Fire Risk and Management

Flare and ordnance deployment in authorized ranges and airspace is governed by a series of regulations based on safety and environmental considerations and limitations. These regulations establish procedures governing the use of flares over ranges, other government-owned and -controlled lands, and nongovernment-owned or -controlled areas. Chapter 2, Section 2.3.4.2, details the flares and ordnance proposed for use by AFRC F-35A pilots.

The frequency of flare use would remain the same or decrease compared to baseline conditions. AFRC F-35A pilots would only use flares in compliance with existing airspace altitude and seasonal restrictions to ensure fire safety. Based on the emphasis of flight at higher altitudes, roughly 90 percent of F-35A flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires. Lands surrounding the air-to-ground training impact areas underlying airspace ensure public protection by restricting access to areas associated with laser use, emitters, and ordnance delivery. All guidance, regulations, and instructions for ordnance delivery at the ranges would be adhered to by AFRC F-35A pilots. Mutual fire response and suppression agreements would continue.

DM3.4.4.2 Aircraft Mishaps

Continued maintenance of situational awareness and use of available communications for tracking the scheduled and near real-time status of the SUAs would help maintain a safe flying environment for all concerned. Any changes to those capabilities and the current or future areas in which this service is provided would be appropriately addressed and communicated through those same venues. The majority of flight operations would be conducted over remote areas; however, in the unlikely event that an aircraft accident occurs, existing response, investigation, and follow-on procedures would be enforced to ensure the health and safety of underlying populations and lands. Implementation of flight safety procedures and compliance with all flight safety requirements would minimize the chances for aircraft mishaps.

DM3.4.4.3 Bird/Wildlife-Aircraft Strike Hazards

AFRC F-35A pilots would operate the aircraft in the same airspace environment as other pilots from Davis-Monthan AFB, but at a higher altitude than current aircraft. Therefore, the overall potential for bird-aircraft strikes would be reduced following the beddown of the F-35A. When BASH risk increases due to time of year, limits are and would continue to be placed on low-altitude flights. Briefings are provided to pilots when the potential exists for greater bird-strike risks within the airspace; AFRC F-35A pilots would also be subject to these procedures. Implementation of the AFRC F-35A mission would not result in significant BASH risks in the airspace proposed for use.

DM3.4.5 Summary of Impacts to Safety

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All new construction would incorporate antiterrorism/force protection requirements. All construction would be conducted in compliance with DDESB Standard 6055.09, AFMAN 91-201, and AFMAN 32-1084, and the ESQD arcs would not change. As of September 2017, the F-35A has amassed more than 36,000 hours of flight time with one Class A mishap resulting in a mishap rate of 2.73. Since the F-35A has not yet reached 100,000 hours, this rate is not directly comparable to other aircraft. As the F-35A becomes operationally mature, the F-35 mishap rate would be expected to continue to decline, as supported by the documented decline in mishap rates for the F-16 and A-10. Davis-Monthan AFB has an active BASH program and the 0.7 and 5 percent increases in aircraft operations/sorties at Davis-Monthan AFB and in the airspace proposed for use, respectively could increase BASH incidents. However, this increase is not anticipated to be significant. With regard to airspace, AFRC F-35A pilots would use the same airspace used by 924 FG pilots. Impacts to safety resulting from implementation of the new mission are not anticipated to be significant.

DM3.5 SOIL AND WATER RESOURCES

DM3.5.1 Base Affected Environment

DM3.5.1.1 Soil Resources

Davis-Monthan AFB is located in the Tucson Basin between the Tucson Mountains and the Rincon, Santa Catalina and Santa Rita mountains in the Sonoran Desert (Davis-Monthan AFB 2012). This area is characterized by deep alluvial deposits transported from the adjacent mountains. Mohave soils and urban land is the most common soil classification at Davis-Monthan AFB. Other soils include Tubac gravelly loam and Cave soils and urban land. These soils are all deep, well-drained

soils with a slight susceptibility to wind and water erosion. More detailed descriptions of the soils types on the base are provided by the Web Soil Service (Soil Survey Staff 2018).

DM3.5.1.2 Water Resources

DM3.5.1.2.1 Surface Water

The base is located along the border of the Upper Santa Cruz and Rillito Watersheds. A ridge extending roughly from the north to the south divides the installation with the west side of the installation draining to the Julian Wash. Julian Wash eventually flows into the Santa Cruz River. The east side of the installation drains to the Atterbury and Kinnison Washes and eventually flows into the Rillito River. None of the drainages on the base are perennial and only experience flows of water during and immediately after storms. The Atterbury Wash flows off the base and into Lakeside Park Lake, which is a man-made lake fed by stormwater runoff and groundwater. This lake is considered impaired by the ADEQ and eventually drains into the Pantano Wash. The stormwater drainage system on the base is directed by surface channels and underground pipes. The base has three large underground collector pipes that eventually drain into the retention pond located on the edge of the AMARG area.

The base is subject to the requirements of both the 2016 Small Municipal Separate Stormwater Sewer System (MS4) permit and the 2010 Multi-Sector General Permit (MSGP-2010) for industrial activities. Both permits are issued by the ADEQ under the Arizona Pollutant Discharge Elimination System (AZPDES) program. The MS4 permit is still in draft form and yet to become effective. ADEQ is also in the process of replacing the MSGP-2010 permit. However, the base continues to remain in compliance with the MSGP-2010 permit until the new permit becomes effective. The permit requires the base to enforce a program to address stormwater runoff from new development and redevelopment projects maintained by the installation.

As part of the MSGP, the base is required to prepare, implement and maintain a Stormwater Pollution Prevention Plan (SWPPP) (Davis-Monthan 2016a). The most recent version of the SWPPP was prepared in 2016 to address the requirements of the ADEQ 2016 Small MS4 permit. The plan is reviewed annually and revised as necessary.

The plan identifies 11 different drainage areas on the installation and includes the amount of impervious surface for each of the drainage areas. Each drainage area has one or more outfalls for a total of 16 outfalls. Six (6) of the 16 outfalls (001, 002A, 002B/C, 004, 007 and 010) are permitted by ADEQ for industrial stormwater discharges. With the exception of outfalls 002B/C, 007, and 010 (because they are substantially similar to outfall 004), stormwater discharge monitoring is conducted at the outfalls that are permitted for industrial discharge. Visual monitoring is conducted at 001, 002A, 004 and analytical monitoring is conducted at outfall 001 and 002 two times during each rain season. Because no deicing is performed at the installation, there are no monitoring requirements for the use of deicing fluids.

DM3.5.1.2.2 Groundwater

The primary water source for the base is groundwater from the Tinaja Beds of the Tucson Basin Aquifer. Groundwater is extracted through a series of wells on the base and is distributed through two separate distribution systems. The base does not have any interconnection with the City of Tucson or other water supply sources. Historically, the base has not experienced water shortages during peak demand. The wells combined with approximately 2.5 million gallons of water storage are considered more than adequate to meet the current needs of the base, with capacity for growth in demand.

DM3.5.1.2.3 Floodplains

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs), the base is located in an area categorized as Zone D, “Areas in which Flood Hazards are Undetermined.” FEMA FIRMs 04019C2265K and 04019C2262K indicate, via extrapolation, that the 100-year floodplains for three washes (the Julian Wash, Kinnison Wash, and Atterbury Wash) are located on Davis-Monthan AFB property. The extent of study of all three of the floodplains terminates just prior to entering the base. Therefore, it is assumed that the 100-year floodplains would be present on the base along these washes (Davis-Monthan AFB 2016a).

DM3.5.2 Base Environmental Consequences

DM3.5.2.1 Soil Resources

Implementation of the projects identified in Table DM2-1 would disturb approximately 15.2 acres of land, most of which has been previously disturbed. Impacts to soil resources near each of the project sites would result from ground disturbance (e.g., compaction; vegetation removal; and excavation for foundations, footings or utilities). The soil types in the areas proposed for construction are generally acceptable for construction or urban development. Onsite soils (predominantly Mohave and Urban land) have moderate potential for wind and water erosion but only slight limitations for shallow excavations (Soil Survey Staff 2018). Implementation of management practices would minimize impacts to soil resources. These actions could include, but would not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, as appropriate. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would result from implementation of the AFRC F-35A mission.

DM3.5.2.2 Water Resources

DM3.5.2.2.1 Surface Water

Impacts to surface water can result from land clearing, grading, and moving soil resulting in localized increases in stormwater runoff volume and intensity. New impervious surfaces would be created and pollutants have the potential to be introduced into construction areas. However, in accordance with UFC 3-210-10, *Low Impact Development (LID)* (as amended, 2016) and the Emergency Independence and Security Act (EISA) Section 438 (42 USC §17094), any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features (i.e., use of porous materials, directing runoff to permeable areas, and use of detention basins to release runoff over time). The integration of LID concepts incorporates site design and stormwater management principles to maintain the site’s pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Although the majority of the projects are located near the north end of the runway, two projects would be constructed in the MSA. Prior to construction, the contractor would be required to obtain coverage under an AZPDES Construction General Permit (2013 CGP) by filing a NOI with the ADEQ and prepare a site-specific SWPPP to manage stormwater discharges during and after construction until the area is revegetated. Upon revegetation, the contractor would file the Notice of Termination with the ADEQ to terminate permit coverage. The USAF would specify compliance with the stormwater discharge permit in all of the contractor construction requirements. The contractor would be required to prepare the SWPPP in accordance with the ADEQ SWPPP template and the plan would include site-specific management practices to eliminate or reduce sediment and

non-stormwater discharges. Other management practices could include the use of water sprays during construction to keep soil from becoming airborne, use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials and revegetating the site in a timely manner.

The Atterbury Wash is located approximately one mile from the nearest construction site in the MSA. Strict adherence to the SWPPP and the management actions identified for each construction site would reduce potential impacts to the Atterbury Wash and other water resources.

The areas planned for development as part of the proposed mission are located in drainage area 001, which has an existing impervious surface of approximately 384 acres (Davis-Monthan AFB 2016a). Less than 1.6 acres of impervious surface would be added to the existing impervious surface of this subbasin resulting in less than a 1 percent increase in impervious surface in this drainage area and a less than one percent increase of impervious surface over the entire installation.

The existing Davis-Monthan AFB SWPPP also identifies control practices to be followed for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. As part of the SWPPP, the base has identified individuals to be part of the Stormwater Pollution Prevention Team (SWPPT). The SWPPT meets annually, is responsible for all aspects of the SWPPP and provides recommendations to the Environment, Safety, and Occupational Health Leadership Committee regarding the SWPPP status, any deficiencies, and outfall monitoring data.

DM3.5.2.2.2 Groundwater

During scoping, people expressed concern about the new mission increasing demands for groundwater. Implementation of the AFRC F-35A mission would result in a decrease (-30) in personnel. Due to the decrease in personnel and the capacity for growth described in Section DM3.5.1.2.2, implementation of the AFRC F-35A mission is not anticipated to result in significant impacts to groundwater resources. See Section DM3.11.2.1 for a description of potable water use.

DM3.5.2.2.3 Floodplains

No floodplains are located near any of the areas proposed for infrastructure development on Davis-Monthan AFB. Therefore, impacts to floodplains would not result from implementation of the proposed AFRC F-35A mission.

DM3.5.3 Summary of Impacts to Soil and Water Resources

Implementation of the proposed action would disturb approximately 15.2 acres of land. Less than 1.6 acres of new impervious surface would be added resulting in less than a 1 percent increase in impervious surface in this drainage area. No floodplains would be impacted and a SWPPP would be prepared for the proposed construction. Implementation of management practices would minimize impacts to soil resources and projects would be designed and implemented in accordance with LID and EISA to minimize impacts to soil and water resources. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would result from implementation of the proposed action.

DM3.6 BIOLOGICAL RESOURCES

The ROI for biological resources is defined as the land area (habitats) that could potentially be affected by infrastructure and construction projects on the base, and the airspace where AFRC F-35A pilots would train. For the purposes of this biological resources analysis, the ROI for the proposed action and No Action Alternative includes Pima County, Arizona.

DM3.6.1 Base Affected Environment

DM3.6.1.1 Vegetation

Davis-Monthan AFB is located in the Tucson Basin at the east central edge of the Arizona Upland Subdivision of the Sonoran Desert ecoregion. Native vegetation transitions between two biotic communities, Paloverde-Cacti-Mixed Scrub Series and the Creosote-White Bursage Series. Historical livestock grazing and extensive development of the area have altered the overall vegetative structure. Most native vegetative cover has been disturbed by development, agriculture, landscaping, and the introduction of non-native and invasive plant species.

Davis-Monthan AFB includes mostly improved and semi-improved grounds that are urbanized, with mowed grassland or landscaped desert vegetation within the developed portions of the base. Mowed grasses are maintained at a height of approximately one to three inches and are composed primarily of Lehmann's lovegrass (*Eragrostis lehmanniana*) and Bermuda grass (*Cynodon* spp.). Common landscaped plant species include agaves (*Agave* sp.) and various cacti such as barrel (*Ferocactus* spp.), hedgehog (*Echinocereus* spp.), organ pipe (*Stenocereus thurberi*), prickly pear (*Opuntia* sp.), saguaro (*Carnegiea giganteus*), and senita (*Pachycereus schottii*). Common trees and shrubs include Mexican Washington fan palms (*Washingtonia gracilis*), blue and foothills palo verde (*Parkinsonia* spp.), mesquite (*Prosopis juliflora*, *P. chilensis*), junipers (*Juniperus* sp.), oleander (*Nerium* sp.), pines (*Pinus* spp.), desert broom (*Baccharis sarothroides*), and globemallow (*Sphaeralcea* spp.).

Unimproved grounds make up approximately 40 percent of the installation and consist of relatively undisturbed vegetation of three Sonoran desert scrub communities: the Paloverde-Cacti-Mixed Scrub Series of the Arizona Upland Subdivision, the Creosote-White Bursage Series of the Lower Colorado River Valley Subdivision and Sonoran xeri-riparian series. Vegetation management at Davis-Monthan AFB is guided by the Integrated Natural Resources Management Plan (INRMP) (Davis-Monthan AFB 2012), Invasive Plant Mapping and Management surveys (Davis-Monthan AFB 2015a), and BASH Plan (355 FW 2015).

DM3.6.1.2 Wildlife

Information on wildlife occurring on Davis-Monthan AFB is provided in the INRMP (Davis-Monthan AFB 2012). Common wildlife documented on the base includes a wide variety of birds, mammals, reptiles, and invertebrate species adapted for survival in the hot, dry environment of the Sonoran Desert. There are no fish resources at Davis-Monthan AFB and there is no hunting on base. Desert wildlife species documented at the installation within areas of human disturbance include road runners (*Geococcyx californianus*), quail (*Callipepla gambelii*), burrowing owls (*Athene cunicularia hypogea*), javelinas (*Tayassu tajacu*), and coyotes (*Canis latrans*).

DM3.6.1.3 Threatened, Endangered, and Special Status Species

DM3.6.1.3.1 Federally Listed Species

The USFWS's Information for Planning and Consultation (IPaC) online system was accessed on 8 February 2018 to identify current USFWS trust resources (e.g., migratory birds, species proposed or listed under the ESA (6 USC § 1531 et seq.), inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands) with potential to occur within the ROI for biological resources at Davis-Monthan AFB.

On 8 February 2018, the USFWS provided an automated *Official Species List* via Section 7 letter that identified 22 threatened and endangered species protected under the ESA (16 USC § 1531 et seq.) and 9 designated and proposed critical habitats that could occur in Pima County, Arizona. Table DM3-30 presents these species.

Table DM3-30. Federally Listed Species with Potential to Occur in Pima County, Arizona

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Davis-Monthan AFB?
Mammals				
Jaguar	<i>Panthera onca</i>	FE	The jaguar is very rare in the United States. In Arizona, the species could occur in desert scrub to pine-oak woodland.	No
Ocelot	<i>Felis pardalis</i>	FE	The ocelot is a habitat specialist; the species lives in areas of dense cover or vegetation and high prey populations. The ocelot avoids open country.	No
Sonoran Pronghorn	<i>Antilocapra americana sonoriensis</i>	FE	Sonoran pronghorn habitat is characterized by broad alluvial valleys separated by block-faulted mountains. Food includes forbs, cholla (summer and fall), shrubs, ocotillo and cacti (year-round).	No
Lesser Long-nosed Bat	<i>Leptonycteris curasoae yerbabuena</i>	Delisted	Lesser long-nosed bats occur in desert grassland and shrubland up to the oak transition. These bats roost in caves, mine tunnels, and occasionally in old buildings. The species forages in areas of saguaro, ocotillo, paloverde, prickly pear and organ pipe cactus and later in the summer among agaves. This species was listed as Federally Endangered during the initial data collection for this EIS. It was delisted in 2018.	No
Birds				
California Least Tern	<i>Sterna antillarum browni</i>	FE	California least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally on gravel rooftops.	No
Masked Bobwhite	<i>Colinus virginianus ridgwayi</i>	FE	Masked bobwhites use habitat patches with higher canopy coverage of woody plants. They select 10 to 45 percent brush cover in Sonora and 20 to 100 percent brush cover in Arizona.	No
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	FT	In Arizona, Mexican spotted owls occur primarily in mixed-conifer, pine-oak, and evergreen oak forests; the species also occurs in ponderosa pine forest and rocky Canyonlands.	No
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	FE	The southwestern willow flycatcher is a riparian obligate. The species prefers dense canopy cover, a large volume of foliage, and surface water during midsummer. The species appears to avoid riparian areas found in steep, closed canyons.	No
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	FT	In Arizona, yellow-billed cuckoos prefer streamside cottonwood, willow groves, and larger mesquite bosques for migrating and breeding. The species is rarely observed as transient in xeric desert or urban settings.	No

**Table DM3-30. Federally Listed Species with Potential to Occur in Pima County, Arizona
(Continued)**

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Davis-Monthan AFB?
Reptiles				
Northern Mexican Gartersnake	<i>Thamnophis eques megalops</i>	FT	In Arizona, three general habitat types are used: (1) source area ponds and cienegas; (2) lowland river riparian forests and woodlands; (3) upland stream gallery forests. Northern Mexican gartersnakes avoid steep mountain canyon stream habitats. The species is most abundant in densely vegetative cienegas, cienega streams, and stock tanks in the southern part of its distribution.	No
Sonoyta Mud Turtle	<i>Kinosternon sonoriense longifemorale</i>	FE	The Sonoyta mud turtle is found only in Quitobaquito Pond in Arizona and a few isolated sites in Sonora, Mexico.	No
Amphibians				
Chiricahua Leopard Frog	<i>Rana chiricahuensis</i>	FT	Chiricahua leopard frogs have historically inhabited cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations between 3,281 and 8,890 feet MSL in central, east-central, and southeastern Arizona. Currently, the species is often restricted to springs, livestock tanks, and streams in the upper portions of watersheds where non-native predators either have yet to invade or habitats are marginal.	No
Fish				
Desert Pupfish	<i>Cyprinodon macularius</i>	FE	No natural populations of desert pupfish remain in Arizona. Historic range includes the lower Gila River basin in Arizona and Sonora, Mexico, including the Gila, Santa Cruz, San Pedro, and Salt Rivers as well as the lower Colorado River in Arizona, California, and adjacent Mexican states from the vicinity of Needles downstream to the Gulf of California.	No
Gila Chub	<i>Gila intermedia</i>	FE	The Gila chub occupies cool-to-warm water in mid-to-headwater stretches of mid-sized streams of the Gila River basin. The species is typically found in deep, near-shore pools adjacent to swift riffles and runs, and near obstructions. Cover consists of root wads, boulders, undercut banks, submerged organic debris, or deep water.	No
Gila Topminnow	<i>Poeciliopsis occidentalis</i>	FE	The Gila topminnow occupies headwater springs, and vegetated margins and backwater areas of intermittent and perennial streams and rivers. The species prefers shallow warm water in a moderate current with dense aquatic vegetation and algae mats. Gila topminnows can withstand water temperatures from near freezing to 90 to 100°F and can live in a range of water chemistries, with a pH ranging from 6.6 to 8.9; dissolved oxygen readings from 2.2 to 11 milligrams per liter; and salinities from tap water to sea water.	No
Sonora Chub	<i>Gila ditaenia</i>	FT	The Sonora chub is endemic to streams of the Rio de la Concepcion drainage of Sonora, Mexico, and Arizona. In Arizona, the species occurs in Sycamore Creek (Bear Canyon), a tributary of the Rio Altar, 15.5 miles west of Nogales in Santa Cruz County.	No

Table DM3-30. Federally Listed Species with Potential to Occur in Pima County, Arizona (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Davis-Monthan AFB?
<i>Flowering Plants</i>				
Acuna Cactus	<i>Echinomastus erectocentrus var. acunensis</i>	FE	Acuna cactus occurs in valleys and on small knolls and gravel ridges of up to 30 percent slope in the Palo Verde-Saguaro Association of the Arizona Upland subdivision of the Sonoran Desert scrub at elevations between 1,198 and 3,773 feet MSL.	No
Canelo Hills Ladies-tresses	<i>Spiranthes delitescens</i>	FE	Canelo Hills ladies-tresses occurs in marshy wetlands or cienegas intermixed with tall grasses and sedges. The species grows on slopes near water, where the soil is drained although saturated. The species grows in very dense vegetation. As slope increases, growth increases. Based on records in the Heritage Data Management System (HDMS), this species occurs at elevations between 585 and 4,970 feet MSL.	No
Huachuca Water-umbel	<i>Lilaeopsis schaffneriana var. recurva</i>	FE	Huachuca water-umbel habitat consists of cienegas or marshy wetlands at elevations between 2,000 and 6,000 feet MSL, within Sonoran desert scrub, grassland or oak woodland, and conifer forest. The species can be found in unshaded or shaded sites in shallow water, saturated soil near seeps, springs, and streams. The species requires perennial water, gentle stream gradients, small- to medium-sized drainage areas, and mild winters.	No
Kearney's Blue-star	<i>Amsonia kearneyana</i>	FE	Kearney's blue-star habitat consists of dry, open, slopes at elevations between 4,000 and 6,000 feet MSL in Madrean evergreen woodlands/interior chaparral transition zones and on stable, partially shaded, coarse alluvium along dry washes at elevations between 3,600 and 3,800 feet MSL under deciduous riparian trees and shrubs in Sonoran desert scrub or desert scrub-grassland ecotone.	No
Nichol's Turk's Head Cactus	<i>Echinocactus horizonthalonius var. nicholii</i>	FE	Nichol's Turk's head cactus habitat is characterized by open vegetation, few trees, and scattered low shrubs. The species is found in bedrock habitat at higher elevations and in gravelly bajadas with limestone clasts at lower elevations.	No
Pima Pineapple Cactus	<i>Coryphantha scheeri var. robustispina</i>	FE	Pima pineapple cactus habitat consists of ridges in semidesert grassland and alluvial fans in Sonoran desert scrub.	No

Key: FE = federally endangered; FT = federally threatened

Source: AZGFD 2000, 2001a-c, 2002a-c, 2003a, b, 2004, 2005, 2008, 2010a, b, 2011, 2012, 2013, 2015, 2018a, b; Davis-Monthan AFB 2012; USFWS 2014a, b, 2018; Wakefield 2018

Of the 22 species identified in Table DM3-30, no federally threatened or endangered species are currently known to occur on Davis-Monthan AFB. This assessment is based on historical surveys completed by the Arizona Game and Fish Department (AZGFD) and subsequent annual survey work conducted in part of the INRMP (Davis-Monthan AFB 2012, 2016; Wakefield 2018). Additionally, no critical habitat occurs on Davis-Monthan AFB (USFWS 2018).

DM3.6.1.3.2 Migratory Birds

Migratory bird species protected under the Migratory Bird Treaty Act (MBTA) (16 USC §§ 703–712) could occur as residents or migrants near Davis-Monthan AFB. According to the installation INRMP, more than 120 species of birds are present or are known to utilize Sonoran desert scrub communities on or near the base. Under the INRMP and through various consulting local agencies (such as the AZGFD and University of Arizona), Davis-Monthan AFB manages and monitors populations of burrowing owls (*Athene cunicularia*), Swainson’s hawks (*Buteo swainsoni*), Cooper’s hawks (*Accipiter cooperii*), and great horned owls (*Bubo virginianus*) (Davis-Monthan AFB 2012, 2016). The AZGFD routinely monitors the western burrowing owl populations on the infield and runway ends and has recently begun active translocations to protect the species from BASH conflicts (Correll 2018). Under AFI 91-202 and AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*, Davis-Monthan AFB employs a BASH Plan that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes. The BASH Plan delineates responsibilities for minimizing potential hazards in the areas where tasked units assigned to Davis-Monthan AFB conduct flying operations. A U.S. Department of Agriculture (USDA) Wildlife Biologist employed at Davis-Monthan AFB manages potential wildlife hazards by removal, dispersal, and wildlife control methods to avoid any BASH incidents. Commonly controlled avian species include turkey vultures (*Cathartes aura*), ravens (*Corvus corax*), western burrowing owls, red-tailed hawks (*Buteo jamaicensis*), Swainson’s hawks, and American kestrels (*Falco sparverius*) (Correll 2018; Wakefield 2018). Davis-Monthan AFB is currently in the process of preparing a Wildlife Hazard Management Plan tailored specifically to wildlife at risk unique to Davis-Monthan AFB (Correll 2018).

DM3.6.1.3.3 Bald and Golden Eagles

Bald (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668-668c) are not known to occur on Davis-Monthan AFB. Golden eagles could be observed soaring within the Tucson area. Bald eagles are less common to the area and generally occur only as winter migrants.

DM3.6.1.3.4 State-Listed Species

The AZGFD Heritage Data Management System (HDMS) and Project Evaluation Program (PEP) online review tool was accessed on 9 February 2018 to identify special status species (e.g., Arizona Species of Conservation Concern, Species of Greatest Conservation Need, and Species of Economic and Recreation Importance) with potential to occur within the ROI for biological resources at Davis-Monthan AFB (Project ID: HGIS-06771). State-listed species known to occur at Davis-Monthan AFB include Gila monster (*Heloderma suspectum*), cactus ferruginous pygmy-owl (*Glaucidium brasilianum*), western burrowing owl, cave myotis (*Myotis velifer*), and western yellow bat (*Lasiurus xanthinus*). These species are monitored through the INRMP and Rare Species Assessments coordinated through the installation natural resource manager, AZGFD, USFWS, and the University of Arizona (Davis-Monthan AFB 2015b).

The Arizona Department of Agriculture (AZDA) maintains a list of native plant species that warrant protection under the Arizona Native Plant Law. Only one species of protected plant, the saguaro cactus, is known to occur at Davis-Monthan AFB. The saguaro cactus is present within the Sonoran habitat on base and is designated as Highly Safeguarded (i.e., a plant that is threatened for survival or in danger of extinction) (Davis-Monthan AFB 2012; AZDA 2018).

DM3.6.1.4 Wetlands

According to the installation INRMP, an analysis of potential Waters of the United States was conducted in 1996 at Davis-Monthan AFB. The survey identified 141,349 linear feet and 9.49 acres of Clean Water Act (CWA)-protected Waters of the United States (Davis-Monthan AFB 2012). The CWA-protected habitats at the installation are all ephemeral drainages; there are no perennial drainages on Davis-Monthan AFB. Several channelized ephemeral drainages carry runoff from the developed portions of the installation and exit the base through underground or open drainage systems. Atterbury Wash is the primary ephemeral drainage on the undeveloped portion of the base.

DM3.6.2 Base Environmental Consequences

DM3.6.2.1 Vegetation

Activities associated with construction, demolition, and renovation projects would occur in developed or disturbed areas within the commercial land use area of Davis-Monthan AFB. Revegetation of temporarily disturbed areas would be conducted as directed by the base natural resource manager to minimize the potential for erosion and dust generation. No significant impacts to vegetation would result from implementation of the AFRC F-35A mission at Davis-Monthan AFB.

DM3.6.2.2 Wildlife

Potential impacts to wildlife could include ground disturbance and construction noise from the associated facility and infrastructure projects. In addition, airfield operations can result in bird/wildlife-aircraft strikes and noise impacts.

The areas planned for development for the proposed AFRC F-35A mission at Davis-Monthan AFB are highly disturbed and provide little habitat for wildlife species. The existing turfgrass and landscaped areas provide some urban adapted wildlife species with limited habitat. This habitat would be lost with construction of the proposed facilities and infrastructure projects.

Noise resulting from the proposed construction, demolition, and renovation activities would be localized, short-term, and only occur during daylight hours. Areas proposed for construction are in a military/industrial land use with frequent elevated noise levels. Impacts to wildlife from construction noise would be minimal.

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in an approximately 0.7 percent increase in total airfield operations (see section DM2.3). Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Davis-Monthan AFB would continue to adhere to the installation's BASH Plan to minimize the risk of strikes.

Impacts to wildlife and domestic animals that could result from aircraft noise are summarized below and discussed in more detail in Volume II, Appendix B. As described in Section DM3.2.2.1, the number of acres exposed to DNL greater than 65 dB would increase. This increase in noise levels surrounding Davis-Monthan AFB would result in an increase in the numbers of animals exposed to higher noise levels. Animals hear noise at different levels, in different frequency ranges, and tolerate noise differently than humans. These differences make comparing the noise metrics created for evaluating human impacts to animal impacts difficult. However, the number of noise events per hour with potential to interfere with speech (Table DM3-16) can be used as an indicator of changing frequency noise events that could affect animals. For example, under baseline conditions animals that are outside at the Reid Park Zoo currently experience five events per hour that are at a sufficient level to interfere with human speech. Implementation of the AFRC F-35A mission would increase this number by one event per hour.

Volume II, Appendix B, summarizes a number of scientific studies that have been conducted on the effects of aircraft noise on animals. These studies have shown that animal species have a wide range of responses to aircraft noise. One conclusion of these studies is that a general response to noise by domestic animals and wildlife is a startle response. These responses vary from flight, trampling, stampeding, jumping, or running to the movement of the head in the directions of the noise. These studies report that the intensity and duration of the startle response decreases with time, suggesting no long-term, adverse effects. The majority of the studies suggest that domestic animal species and wildlife show behaviors characteristic of adaptation, acclimation, and habituation to repeated aircraft noise (Volume II, Appendix B). Therefore, significant impacts to wildlife in the ROI surrounding Davis-Monthan AFB would not result from the proposed action.

DM3.6.2.3 Threatened, Endangered, and Special Status Species

DM3.6.2.3.1 Federally Listed Species

Because no federally listed threatened, endangered, or candidate species and/or designated critical habitat occur in the ROI near Davis-Monthan AFB, no impacts to the areas surrounding Davis-Monthan AFB would result from implementation of the proposed AFRC F-35A mission. In an email dated 26 June 2018, the USFWS agreed that ESA Section 7 requirements had been applied and that no further Section 7 consultation is required (Volume II, Appendix A, Section A.2.4.4)

DM3.6.2.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in an increase (0.7 percent) in annual airfield operations. Any increase in operations could result in an increased opportunity for bird-aircraft strikes to occur. Adherence to the existing BASH program would minimize the risk of bird-aircraft strikes, including those for migratory birds, to negligible levels (Section DM3.4.1.5). Noise-related impacts to migratory birds nesting near Davis-Monthan AFB would be the same as those described for other wildlife. Minimal impacts to migratory birds would result from implementation of the proposed AFRC F-35A mission in the ROI near Davis-Monthan AFB.

DM3.6.2.3.3 Bald and Golden Eagles

No bald or golden eagle nesting is known to occur at Davis-Monthan AFB or in the immediate vicinity of the base and therefore impacts to sensitive nesting habitat would not occur. Both bald and golden eagles are known to occur in the general vicinity of the installation. Eagles are known to forage near the installation and noise-related impacts to these birds would be similar to those described for other wildlife. No significant impacts to eagles are anticipated to result from implementation of the proposed AFRC F-35 mission in the ROI near Davis-Monthan AFB.

DM3.6.2.3.4 State-Listed Species

Under the INRMP program and Rare Species Assessments (as coordinated through the installation natural resource manager, AZGFD, USFWS, and the University of Arizona), Davis-Monthan AFB would continue to closely manage and monitor populations of state-listed species. Should plants protected under the Arizona Native Plant Law be disturbed, the AZDA would be notified by the Davis-Monthan AFB natural resource manager before removal in accordance with the Native Plant Removal Procedures (AZDA 2018).

In a letter dated 3 May 2018, the AZGFD identified Cienega Creek and other riparian corridors as bird migration areas that should be avoided. Eagle nesting and Big Horn sheep lambing areas were also identified as areas that should be avoided. See Volume II, Appendix A, Section A.2.4.1, for a

copy of the scoping letter. AFRC F-35A pilots would continue to use the existing flight paths and runway approaches currently used by existing pilots at Davis-Monthan AFB. No impacts to state-listed species would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB.

DM3.6.2.4 Wetlands

Proposed facility and infrastructure projects at Davis-Monthan AFB would be confined to the installation's existing footprint. Construction, demolition, and renovation projects associated with the proposed action would not occur within or near any wetland areas. Therefore, there would be no impacts to wetlands in the ROI near Davis-Monthan AFB.

DM3.6.3 Airspace Affected Environment

The ROI for biological resources included in the analysis of primary airspace and primary ranges associated with the proposed action at Davis-Monthan AFB includes eight counties within Arizona and New Mexico. Counties under the primary airspace and primary ranges in Arizona include Maricopa, Pinal, Yuma, Pima, Cochise, and Santa Cruz. Counties under the primary airspace and primary ranges in New Mexico include Hidalgo and Luna Counties.

DM3.6.3.1 Vegetation

The airspace proposed for use by AFRC F-35A pilots from Davis-Monthan AFB covers approximately 19,996 square miles of land over southern Arizona and southwest New Mexico. The primary range area proposed for use covers approximately 7,858 acres over Arizona and the primary airspace area covers approximately 4,012 acres over southern Arizona and southwest New Mexico (DM2-2). Native vegetation varies greatly by elevation and ecological diversity is extremely high. The Madrean Archipelago and the Sonoran Basin and Range comprise the two primary ecoregions under the airspace proposed for use. Vegetation within the Madrean Archipelago ecoregion is mostly grama-tobosa shrub-steppe in the basins and oak-juniper woodlands on the ranges, except at higher elevations where ponderosa pine is predominant (USEPA 2013). The Sonoran Basin and Range contains scattered low mountains and large areas of paloverde-cactus shrub and giant saguaro cactus. Other typical Sonoran plants include white bursage (*Ambrosia dumosa*), ocotillo (*Fouquieria splendens*), creosote bush (*Larrea tridentata*), cholla (*Cylindropuntia* spp.), desert saltbush (*Atriplex parryi*), ironwood (*Ostrya virginiana*), mesquite (*Prosopis glandulosa*), and various cacti (USEPA 2013).

DM3.6.3.2 Wildlife

The Madrean Archipelago and the Sonoran Basin and Range ecoregions support a wide range of wildlife species. Some common bird and mammal species known to the region include Gambel's quail (*Lophortyx gambelii*), Gila woodpecker (*Melanerpes uropygialis*) roadrunner (*Geococcyx californianus*), curve-billed thrasher (*Taxostoma curvirostre*), mourning dove (*Zenaida macroura*), cactus wren (*Campylorhynchus brunneicapillus*), black-throated sparrow (*Amphispiza bilineata*), White-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), big horn sheep (*Ovis canadensis*), mountain lion (*Puma concolor*), coyote (*Canis latrans*), bobcat (*Felis rufus*), black-tailed jackrabbit (*Lepus californicus*), desert cottontail (*Sylvilagus auduboni*), Merriam's kangaroo rat (*Dipodomys merriami*), white-throated woodrat (*Neotoma albigula*), desert pocket mouse (*Perognathus penicillatus*) and round tailed ground squirrel (*Spermophilous tereticaudus*). Common reptiles and amphibians of the region include an expansive variety of snakes, lizards, whiptails, geckos, toads, frogs, and salamanders. Some of the most common include collard lizards (*Crotaphytus collaris*), desert spiny lizard (*Sceloporus magister*), common chuckwalla (*Sauromalus*

obesus), desert horned lizard (*Phrynosoma platyrhinos*), ground snake (*Sonora semiannulata*), gopher snake (*Pituophis catenifer*), Sonoran desert toad (*Bufo alvarius*), and American bull frog (*Lithobates catesbeianus*). Wildlife under the existing SUA and near existing ranges are exposed to overflight noise, sonic booms, use of munitions and flares, and bird-aircraft collisions.

DM3.6.3.3 Threatened, Endangered, and Special Status Species

DM3.6.3.3.1 Federally Listed Species

Federally listed threatened, endangered, and/or candidate mammal and bird species that could occur in the eight counties included in the analysis of primary airspace and range areas proposed for use are presented in Table DM3-31. Due to the limited nature of ground disturbance activity under the primary airspace, plant, invertebrate, and fish species were excluded from further analysis.

Table DM3-31. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Davis-Monthan AFB

Common Name	Scientific Name	Federal Listing Status	Habitat
Mammals			
Jaguar	<i>Panthera onca</i>	FE	The jaguar is very rare in the United States. In Arizona, the species could occur in desert scrub to pine-oak woodland.
Ocelot	<i>Felis pardalis</i>	FE	The ocelot is a habitat specialist; lives in areas of dense cover or vegetation and high prey populations. Avoids open country.
Sonoran Pronghorn	<i>Antilocapra americana sonoriensis</i>	FE	Sonoran pronghorn habitat is characterized by broad alluvial valleys separated by block-faulted mountains. Food includes forbs, cholla (summer and fall), shrubs, ocotillo and cacti (year-round).
Lesser Long-nosed Bat	<i>Leptonycteris curasoae yerbabuena</i>	Delisted	Lesser long-nosed bats occur in desert grassland and shrubland up to the oak transition. These bats roost in caves, mine tunnels, and occasionally in old buildings. The species forages in areas of saguaro, ocotillo, paloverde, prickly pear and organ pipe cactus and later in the summer among agaves. This species was listed as Federally Endangered during the initial data collection for this EIS. It was delisted in 2018.
Birds			
California Least Tern	<i>Sterna antillarum browni</i>	FE	California least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally on gravel rooftops.
Masked Bobwhite	<i>Colinus virginianus ridgwayi</i>	FE	Masked bobwhites use habitat patches with higher canopy coverage of woody plants. The species selects 10-45 percent brush cover in Sonora and 20-100 percent brush cover in Arizona.
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	FT	In Arizona, Mexican spotted owls occur primarily in mixed-conifer, pine-oak, and evergreen oak forests; the species also occurs in ponderosa pine forest and rocky Canyonlands.
Southwestern Willow Flycatcher	<i>Empidonax traillii extimus</i>	FE	The southwestern willow flycatcher is a riparian obligate. The species prefers dense canopy cover, a large volume of foliage, and surface water during midsummer. The species appears to avoid riparian areas found in steep, closed canyons.
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	FT	In Arizona, yellow-billed cuckoos prefer streamside cottonwood, willow groves, and larger mesquite bosques for migrating and breeding. The species is rarely observed as transient in xeric desert or urban settings.
Yuma Clapper Rail	<i>Rallus longirostris yumanensis</i>	FE	The Yuma clapper rail inhabits brackish water marshes and side waters. The species prefers the tallest, densest cattail and bulrush marshes. The Yuma clapper rail is the only species of clapper rail to breed in freshwater marshes.

Table DM3-31. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Davis-Monthan AFB (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat
Reptiles			
Narrow-headed Gartersnake	<i>Thamnophis rufipunctatus</i>	FT	The narrow-headed gartersnake is highly aquatic. Disjunct populations occur in fast-flowing, higher-elevation (typically between 3,937 and 6,233 feet MSL) headwater streams near and below the Mogollon Rim in Arizona and New Mexico.
Northern Mexican Gartersnake	<i>Thamnophis eques megalops</i>	FT	In Arizona, three general habitat types are used: (1) source area ponds and cienegas; (2) lowland river riparian forests and woodlands; (3) upland stream gallery forests. Northern Mexican gartersnakes avoid steep mountain canyon stream habitats. The species is most abundant in densely vegetative cienegas, cienega streams, and stock tanks in the southern part of its distribution.
Sonoyta Mud Turtle	<i>Kinosternon sonoriense longifemorale</i>	FE	The Sonoyta mud turtle is found only in Quitobaquito Pond in Arizona and a few isolated sites in Sonora, Mexico.
New Mexican Ridge-nosed Rattlesnake	<i>Crotalus willardi</i>	FT	The New Mexican ridge-nosed rattlesnake is found primarily in the mountains in southeastern Arizona. The species occurs at elevations between 4,800 and 9,000 feet MSL, but is most often found at elevations between 5,400 and 7,500 feet MSL.
Amphibians			
Chiricahua Leopard Frog	<i>Rana chiricahuensis</i>	FT	The Chiricahua leopard frog has historically inhabited cienegas, pools, livestock tanks, lakes, reservoirs, streams, and rivers at elevations between 3,281 and 8,890 feet MSL in central, east-central, and southeastern Arizona. Currently, the species is often restricted to springs, livestock tanks, and streams in the upper portions of watersheds where non-native predators either have yet to invade or habitats are marginal.
Sonora Tiger Salamander	<i>Ambystoma tigrinum stebbinsi</i>	FE	Sonora tiger salamanders live only in the grasslands and woodlands of the San Rafael Valley in Santa Cruz and Cochise Counties in southeastern Arizona and in the most northern parts of Sonora, Mexico. The species needs year-round availability of standing water for breeding, growth, and development.

Key: FE = federally endangered; FT = federally threatened

Source: AZGFD 1986, 1998, 2000, 2001a-h, 2002a-d, 2003a, b, 2004, 2005, 2008, 2009, 2010a, b, 2011, 2012, 2013a-c, 2015, 2018a, b; Davis-Monthan AFB 2012; NAU 2018; TPWD n.d.; USFWS 2014a, b, 2018; Wakefield 2018

Critical habitats for the Chiricahua leopard frog, Southwestern willow flycatcher, yellow-billed cuckoo, jaguar, Mount Graham red squirrel (*Tamiasciurus hudsonicus grahamensis*), Mexican spotted owl, and the New Mexican ridge-nosed rattlesnake, as designated by the USFWS, are present under the primary airspace and range areas proposed for use(USFWS 2018a).

DM3.6.3.3.2 Migratory Birds

The primary airspace and range areas proposed for use occur in the USFWS designated Bird Conservation Region 33 Sonoran and Mojave Deserts and Bird Conservation Region 34 Sierra Madre Occidental between the Pacific and Central Migratory Flyways (USFWS 2008).

Bird-aircraft strikes are currently rare in the airspace, and would not be expected to increase under the proposed action. AFRC F-35A pilots would predominantly fly above 5,000 feet AGL, which is above where 95 percent of strikes occur. In addition, current procedures for avoiding flight operations during periods of high concentrations of migratory bird (both in time and space) would

continue. Adherence to the existing, effective BASH program would minimize the risk of bird-aircraft strikes, including those for migratory birds, to negligible levels (Section DM3.4.2.5).

In accordance with AFI 91-202 and AFI 91-212, Davis-Monthan AFB employs a BASH Program that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes.

DM3.6.3.3.3 Bald and Golden Eagles

In the fall, bald eagles migrate to Arizona from the north and are found in a variety of habitats throughout the state. Habitat and historic range for the golden eagle includes the primary airspace and range areas proposed for use. Golden eagle nesting habitat in southern Arizona generally includes cliffs in remote mountains and canyons, although they are sometimes found nesting in trees among rolling hills near open foraging grounds. Outside the nesting season, golden eagles are found foraging in kind open or semi-open desert landscapes (AZGFD 2016).

DM3.6.4 Airspace Environmental Consequences

Impacts to biological resources occurring under the airspace proposed for use by AFRC F-35A pilots could result from overflights and associated noise, sonic booms, the use of munitions and flares, and bird-aircraft collisions. A review of current literature evaluating potential noise effects on wildlife is presented in Volume II, Appendix B.

DM3.6.4.1 Vegetation

Ground disturbance beneath the airspace proposed for use would be limited to the use of flares and munitions, which would be less than or the same as what is currently being used by A-10 mission pilots from Davis-Monthan AFB and would only occur in areas that are currently approved for such use. No significant impacts to vegetation would result from implementation of the AFRC F-35 mission in the airspace proposed for use by AFRC F-35A pilots stationed at Davis-Monthan AFB.

DM3.6.4.2 Wildlife

All airspace proposed for use by AFRC F-35A pilots is currently used as active military airspace by military jet aircraft; therefore, no new types of impacts would be introduced into these areas as a result of introducing the F-35A aircraft. Potential impacts are described below for overflights and associated noise, sonic booms, munitions and flares, and bird-aircraft collisions.

L_{dnmr} would remain the same in all of the airspace areas proposed for use, except under the Ruby and Fuzzy MOAs, where L_{dnmr} would increase by 1 dB (Figure DM3-4). Wildlife under the proposed airspace would not be exposed to a significant change in the noise environment and therefore no significant impacts to wildlife would occur from sub-sonic noise.

AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities (BMGR and Sells MOA). Approximately 90 percent of supersonic flight would occur at altitudes above 30,000 feet. The average number of booms per day beneath BMGR airspace would increase from three to four and CDNL would increase from 56 to 57 dB. The average number of sonic booms per day beneath the Sells MOA would remain the same and CDNL would increase from 54 to 56 dB.

Some physiological/behavioral responses (from both subsonic and supersonic noise) 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 (Volume II, Appendix B).

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 (Volume II, Appendix B).

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 could be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, the results of one study indicate that wood ducks appear to be more sensitive to noise and more resistant to acclimation to jet aircraft noise than Canada geese (Edwards et al. 1979). Similarly, wild ungulates (e.g., deer) 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 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 could 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.

In summary adverse behavioral responses ranging from mild to severe could occur in individual animals as a result of sonic booms. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance could be nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Volume II, Appendix B).

Wildlife under the BMGR and Sells MOA have been previously exposed to sonic booms and could be habituated to the sound. The increase in sonic booms is not anticipated to have long-term population level effects on species under the BMGR or Sells MOA.

Flares would be used as a defensive countermeasure by AFRC F-35A pilots during training operations. Flares would only be used in airspace areas currently approved for such use. Flare use by AFRC F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires or adverse impacts to underlying land areas and habitats. Ordnance delivery would only occur in ranges authorized for use. AFRC F-35A pilots would use less than or the same amount of flares and ordnance as currently used by the A-10 pilots; therefore, the new mission would not result in an increased potential for adverse impacts to wildlife under the training airspace.

AFRC F-35A pilots would fly at higher altitudes than A-10 pilots, with the majority (99 percent) of operations occur above 5,000 feet AGL (operations below 5,000 feet AGL would occur less frequently than baseline operations). Most birds fly below 500 feet, except during migration (Section DM3.6.4.3.2). No F-35A low-level flight training is expected to occur below 500 feet AGL and the potential for bird-aircraft collisions would be minor.

DM3.6.4.3 Threatened, Endangered, and Special Status Species

DM3.6.4.3.1 Federally Listed Species

Potential impacts to federally listed species and critical habitats that could occur under the airspace proposed for use would be the same as those described for wildlife. Therefore, it is anticipated that significant adverse impacts to federally listed species would not result from implementation of the AFRC F-35A mission.

DM3.6.4.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in an increase (5 percent) in aircraft sorties in the training airspace. Increased operations could result in an increased opportunity for bird-aircraft strikes. The chances of such bird-aircraft strikes are considered unlikely for the following reasons. AFRC F-35A pilots would fly predominantly above 5,000 feet AGL. Most bird strikes (95 percent) occur below 5,000 feet AGL. Except during migration most birds spend the majority of their time below 500 feet. Migrations typically occur in ranges from 500 to 2,000 feet. The highest known flight of a North American migratory bird species is that of the mallard duck (*Anas platyrhynchos*), which has been observed to fly as high as 21,000 feet (World Atlas 2016). Vultures (*Aegypius monachus*) sometimes rise to elevations higher than 10,000 feet in order to scan larger areas for food and to watch the behavior of distant vultures for clues to the location of food sources (Stanford University 1988). Due to the predominant use of higher altitudes, implementation of the proposed AFRC F-35A mission would result in minimal impacts to migratory birds protected under the MBTA.

Current procedures for avoiding flight operations during periods of high concentrations of migratory birds (both in space and time) would continue. Adherence to the existing BASH program would minimize the risk of bird-aircraft strikes, including those for migratory birds, to negligible levels (Section DM3.4.2.5). Therefore, minimal impacts to migratory birds protected under the MBTA would result from implementation of the proposed AFRC F-35 mission at Davis-Monthan AFB.

DM3.6.4.3.3 Bald and Golden Eagles

Potential impacts to bald and golden eagles and habitats that occur in areas under the primary airspace and range areas would be similar to those described in Section DM3.6.4.3.2. AFRC F-35A pilots would fly at higher altitudes than A-10 pilots, reducing the potential for BASH. As described in Section DM3.2.3, subsonic noise would increase in one SUA unit. Therefore, no impacts to eagles would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB.

DM3.6.5 Summary of Impacts to Biological Resources

Construction activities on the base would occur in previously disturbed areas. Impacts to wetlands and protected species would not result from implementation of the AFRC F-35A mission. Impacts to wildlife from construction noise would be minimal. Aircraft operations near Davis-Monthan AFB and sorties in the airspace proposed for use would expose some wildlife species to increased levels of noise, and the 0.7 percent increase in aircraft operations near the base and 5 percent increase in

sorties in the airspace proposed for use, respectively, could result in increased bird-aircraft strikes. However, because these percentages are low and species are currently exposed to military and commercial aircraft noise, impacts to biological resources are not anticipated to be significant.

DM3.7 CULTURAL RESOURCES

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, architectural/engineering resources, and traditional resources. Cultural resources that are eligible for listing on the NRHP are known as historic properties.

DM3.7.1 Base Affected Environment

DM3.7.1.1 Architectural Resources

Historical building inventories at Davis-Monthan AFB and on off-base lands controlled by the installation (TRC Mariah and Associates 1995, Davis-Monthan AFB 2005, Geo-Marine, Inc. 2009) have identified 39 buildings that are eligible for listing in the NRHP. Eleven (11) buildings are associated with the MSA (located in the eastern portion of the base) and 27 structures are part of the Titan Missile Complex (located off-base in Green Valley, Arizona). Hangar 8030, constructed in 1932 as part of the municipal airport, is an isolated hangar at the northwest end of the runway. Davis-Monthan has concluded that no other NRHP-eligible buildings are present on the installation.

DM3.7.1.2 Archaeological Resources

Numerous archaeological surveys have been conducted on Davis-Monthan AFB (Davis-Monthan AFB 2015c, SRI 2017) and approximately 74 percent of the base has been evaluated for archaeological resources. Some portions of the installation, such as the land under existing parking lots or other existing facilities have not been surveyed. Past surveys have identified 84 archaeological sites on or within 1 mile of Davis-Monthan AFB (SRI 2017). Ninety-nine (99) archaeological sites were evaluated as part of the recent survey conducted by Statistical Research, Inc. (SRI), and 20 of these contained a component that was recommended eligible for listing on the NRHP (SRI 2017).

DM3.7.1.3 Traditional Resources

Davis-Monthan AFB has identified 15 tribes potentially affiliated with the installation. These tribes, listed in Table A-1 in Volume II, Appendix A, Section A.2.4.2, were asked to provide information on any properties to which they attach religious and cultural significance. No known tribal sacred sites or properties of traditional religious and cultural importance are located on Davis-Monthan AFB.

DM3.7.2 Base Environmental Consequences

Implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would include the construction of nine new facilities, demolition of two buildings, and eight renovation projects (Table DM2-1 and Figure DM2-1). All buildings within the APE have been evaluated for NRHP eligibility and determined non-eligible. The Arizona SHPO concurred with the APE and the non-eligibility determination in a letter dated 14 May 2018 (Volume II, Appendix A, Section A.2.2.3.1).

No impacts to known archaeological resources would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB. All areas of the base proposed for construction are either in areas that have already been disturbed by previous construction or have been inventoried for archaeological resources. No NRHP-eligible archaeological resources have been identified in the

APE. Because ground-disturbing activities would occur in previously disturbed and inventoried areas, it is extremely unlikely that any previously undocumented archaeological resources would be encountered during facility demolition, renovation, addition, or construction. In the case of unanticipated or inadvertent discoveries, the USAF would comply with NHPA and Native American Graves Protection and Repatriation Act (NAGPRA) regulations.

NRHP-eligible facilities located on the installation (MSA and Building 8030) are located outside the APE and there would be no direct impact to historic properties. Indirect impacts on cultural resources from population changes, noise or visual intrusions would be extremely unlikely. The total authorized personnel for Davis-Monthan AFB would decrease (0.3 percent) with the proposed action. This small population change would not directly or indirectly impact cultural resources at the installation. The MSA is located outside of the proposed 65 dB DNL contour and Building 8030 is located between the 70 and 75 dB DNL contour lines. As described in Section DM3.2.2, the noise levels in these zones would not be at high enough levels to cause structural impacts to buildings. Visual intrusion from the proposed action would not be a significant issue. Building 8030 and the buildings in the MSA derive their historical significance from association with military activities and their setting within a military installation. New construction would occur in the context of an active USAF base, where changes in the infrastructure are common. The viewshed of remaining historic properties would not be affected by the proposed construction.

During scoping, several people commented about the potential for noise to damage historical structures such as homes and buildings within the Barrio Santa Rosa Historic District. The noise level at the Arizona Inn was also mentioned as a potential concern. As described in Section DM3.2.1.8, noise levels of 130 dB could cause structural damage to certain facilities. Single event noise levels were modeled for the Country Club Annex Park which is approximately 3 miles closer to Davis-Monthan AFB than the Barrio Santa Rosa Historic District. The highest SEL at that location was 104 dB. SEL levels at the Barrio Santa Rosa Historic District are anticipated to be lower than 104 dB and the potential to impact structures is considered unlikely. The Arizona Inn is located approximately 3.5 miles northeast of the Country Club Annex Park and noise levels would be anticipated to be less than those at the Country Club Annex Park. For additional information on noise levels at Country Club Annex Park, including the number of events per day that are anticipated to interfere with speech, see Section DM4.2.2.

No Section 106 impacts to tribal resources or traditional cultural properties are anticipated to result from implementation of the AFRC F-35A mission. As required by Sections 101(d)(6)(B) and 106 of the NHPA; implementing regulations prescribed in 36 *CFR* Section 800.2(c)(2); EO 13175, *Consultation and Coordination with Indian Tribal Governments*; DoDI 4710.02; and AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes*, Davis-Monthan AFB initiated Section 106 government-to-government consultation with 15 tribes to identify traditional cultural properties. Volume II, Appendix A, Section A.2.4.1, contains a record of these consultations. The consultation correspondence included an invitation to participate in the NEPA process, and an invitation to consult directly with the Davis-Monthan AFB Commander regarding any comments, concerns, and suggestions (see letter dated 11 May 2018, Volume II, Appendix A, Section A.2.2.3.1). Ten (10) of the tribes have responded to the invitation to participate in the NEPA/Section 106 process. Nine (9) of the 10 tribes (Ak-Chin Indian Community, Gila River Indian Community, Hopi Tribe of Arizona, Jicarillo Apache Nation, San Carlos Apache Tribe, Salt River Pima-Maricopa Indian Community of Salt River Reservation, Tohono O’odham Nation, White Mountain Apache Tribe of the Fort Apache Reservation, Pueblo of Zuni) indicated that they had no traditional resources in the APE. One (1) tribe, the Yavapai Nation of the Camp Verde Indian Reservation, has no comments at this time.

Section 106 consultation is considered complete. Davis-Monthan AFB will continue to coordinate with interested tribes throughout the EIS process.

DM3.7.3 Airspace Affected Environment

Table DM3-32 presents the NRHP-listed sites and Native American Reservation lands under training airspace proposed for use by AFRC F-35A pilots operating at Davis-Monthan AFB. Although the primary airspace and range areas occur over 8 Arizona counties, all of the training airspace overlies at least part of 10 Arizona counties (Apache, Cochise, Gila, Graham, Maricopa, Navajo, Pima, Pinal, Santa Cruz, and Yuma), and 2 New Mexico counties (Hidalgo and Luna). One-hundred eighteen (118) NRHP-listed properties have been identified under Davis-Monthan AFB airspace. Forty-two (42) of these are located under the primary airspace and range areas. Three Native American tribes (Fort Sill Apache Tribe of Oklahoma, San Carlos Apache, and the Tohono O’odham Nation) are known to own land under the airspace proposed for use including I’itoi Mo’o and ‘Oks Daha. No other known traditional cultural resources have been identified under the airspace proposed for use. It is possible that such resources could exist in the area as the exact location of some traditional cultural resources is confidential.

Table DM3-32. NRHP-Listed Sites and Native American Reservation Lands Under Davis-Monthan AFB Training Airspace

Airspace Designations	Number of NRHP Properties Under Airspace ^a	Native American Reservation Lands Under Airspace ^a
Jackal & Jackal Low MOAs	31	Fort Sill Apache Tribe of Oklahoma and San Carlos Apache
Outlaw MOA	39	San Carlos Apache
R-2301E	1	None
R-2303A/B/C	8	None
Ruby & Fuzzy MOAs	2	Tohono O’odham Nation
Sells 1 & Low MOAs; R-2304 & R-2305	10	Tohono O’odham Nation
Tombstone A/B/C MOA	27	None

^a Due to the sensitivity of the locations, archaeological sites are not included in this table or shown on any figures.

DM3.7.4 Airspace Environmental Consequences

Implementation of the proposed action would result in a 5 percent increase in the annual sorties conducted in the airspace proposed for use. As described in Section DM3.2, subsonic L_{dnmr} under the training airspace would remain the same or increase (1 dB) and would not exceed 65 dB. Supersonic flights would occur in the Sells 1 MOA/ATCAA at altitudes above 10,000 feet MSL and at R-2301E over the BMGR at altitudes above 5,000 feet MSL.

No impacts to historic properties under the airspace proposed for use are expected. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (Volume II, Appendix B, Section B.2.10).

Use of ordnance and flares would continue in areas already used for these activities. No additional ground disturbance would occur. Flare and ordnance use is not expected to impact historic properties under the airspace. Existing use of flares and ordnance is not known to have impacted these resources; therefore, the continued use of flares and ordnance from F-35A aircraft is not expected to result in any new impacts.

DM3.7.4.1 Native American Concerns

During scoping, the USAF contacted 15 federally affiliated Native American tribes to invite them to attend the public meetings and express their concerns about the potential AFRC F-35A beddown at Davis-Monthan AFB. During the scoping process, including the public meetings, one member of the public expressed concern that the proposed project would impact lands of the Tohono O'odham Nation or the Pascua Yaqui Tribe. No comments regarding potential impacts on traditional cultural resources or traditional cultural properties were received and no comments were received from the fifteen tribes.

In accordance with Section 106 of the NHPA and EO 13175, USAF also has contacted these 15 tribes to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and traditional cultural properties under the airspace associated with Davis-Monthan AFB. Section 106 consultation is considered complete and Davis-Monthan AFB will continue to coordinate with interested tribes throughout the EIS process.

DM3.7.5 Summary of Impacts to Cultural Resources

No archaeological sites are located in any of the proposed construction footprints at Davis-Monthan AFB. In the case of unanticipated or inadvertent discoveries, the USAF would comply with Section 106 of the NHPA. All buildings within the APE have been evaluated for NRHP eligibility and determined non-eligible and the Arizona SHPO has concurred with this finding. Davis-Monthan AFB is currently conducting government-to-government consultation with 15 associated tribes regarding their concerns with the proposed action at Davis-Monthan AFB and the airspace proposed for use. Section 106 consultation is considered complete and Davis-Monthan AFB will continue to coordinate with interested tribes throughout the EIS process. No impacts to historic properties under the airspace proposed for use are expected. Implementation of the AFRC F-35A mission is not anticipated to result in significant impacts to cultural resources.

DM3.8 LAND USE AND RECREATION

DM3.8.1 Base Affected Environment

DM3.8.1.1 Land Use

On-base construction would be consistent with established base land uses. Because potential land use consequences would primarily be noise-related, the discussion in this section focuses on noise-related land use regulations and compatibility constraints. The following paragraphs address federal, state, and local statutes, regulations, codes, programs, and plans that are relevant to the analysis of land use for Davis-Monthan AFB and surrounding areas.

Installation Development Plan (IDP). The Davis-Monthan IDP guides future development and land use decisions at Davis-Monthan AFB (Davis-Monthan AFB 2016c).

Davis-Monthan Air Force Base/Tucson/Pima County JLUS. The JLUS for Davis-Monthan AFB and Tucson and Pima County was published in 2004 as part of the Arizona Military Regional Compatibility Project. The JLUS was developed to facilitate implementation of compatible land uses around the base through a cooperative program between the USAF, the City of Tucson and Pima County, and with other interested and affected parties, including private and public institutions, corporations, and private citizens. As part of the JLUS process, two public information meetings were held to provide residents and stakeholders an opportunity to receive information on issues and to provide input and comments in a comfortable environment. The study area boundary used in the 2004 JLUS report extended from the Catalina Foothills to the Pima County Fairgrounds and

encompassed approximately 90,500 acres of land. This area focused on the CZ, APZs, approach-departure corridors (ADCs) and noise zones for both Davis-Monthan AFB and TUS. The JLUS compatible land use plan defines recommended compatible uses and performance standards to be used by the City of Tucson and Pima County to guide development in order to protect Davis-Monthan AFB's mission and its economic benefits, while increasing the economic diversity and viability of the community by facilitating the development of other key sectors in ways that are compatible with the base's mission. As part of the JLUS process, Pima County and the City of Tucson combined NCD A with accident zones and adopted this combined area as the AEZ (Figure DM3-6). Both Pima County and the City of Tucson regulate land use in the AEZ.

In 2004, the Military Airport comprehensive plan designation was adopted to manage development to ensure compatible zoning within the high noise zones (NCDs) and APZs of Davis-Monthan AFB in line with the JLUS Implementation Program Strategies. The strategies include provisions addressing land use and building height within the JLUS boundaries. In 2008, the Pima County Zoning Code was amended to implement the JLUS Compatible Land Use Plan recommendations and adopt amendments for internal noise mitigation under the International Building Code.

Pima Prospers Comprehensive Plan. The Pima County comprehensive plan describes planning goals for Pima County, including areas near Davis-Monthan AFB (Pima County 2015).

Plan Tucson. The City of Tucson's General and Sustainability Plan states that the planning goal for the area surrounding TUS is to conserve neighborhood centers and promote development of Airport-related commercial/industrial activities north and south of the Airport (City of Tucson 2013).

Arizona Revised Statutes. For the purposes of preserving health and safety, Title 28, Article 7, *Airport Zoning & Regulation* (ARS 28-8480, 28-8481, and 28-8482), requires political subdivisions in "a territory in the vicinity of a military airport" to adopt land use plans and enforce zoning regulations that ensure development is compatible with the high noise zones and APZs generated by military airport operations. Within this territory, the law requires disclosure to property owners that they are within the territory of a military airport. In addition, no new residential development in the NCDs and APZs is allowed unless the subject property had a building permit, had a residence constructed or was approved for development in a "development plan" prior to 31 December 2000.

Local Regulations and Ordinances. The City of Tucson and Pima County have regulations and ordinances that specifically address land use and zoning issues surrounding Davis-Monthan AFB. Both the City of Tucson and Pima County have adopted the AEZ, as shown on Figure DM3-6. Pima County Code Chapter 18.57, *Airport Environs and Facilities*, established height and land use overlay zones for the environs of TUS, Ryan Field, Davis-Monthan AFB, and Pinal Airpark.

The City of Tucson Unified Development Code (UDC) was adopted in 2012 by the Mayor and the City Council. The Airport Environs Overlay Zone (originally adopted 16 April 1990), as established in the City's UDC Exhibit LT-5B, shows the official State of Arizona Map that illustrates the noise contours, APZs, and ADCs for Davis-Monthan AFB, collectively referred to as the AEZ. Pima County and the City of Tucson have adopted the following corridors and districts surrounding Davis-Monthan AFB.

- ADC-1 – Northwest end of the Davis-Monthan AFB runway.
- ADC-2 – Southeast end of the Davis-Monthan AFB runway up to 30,000 feet from end of runway.

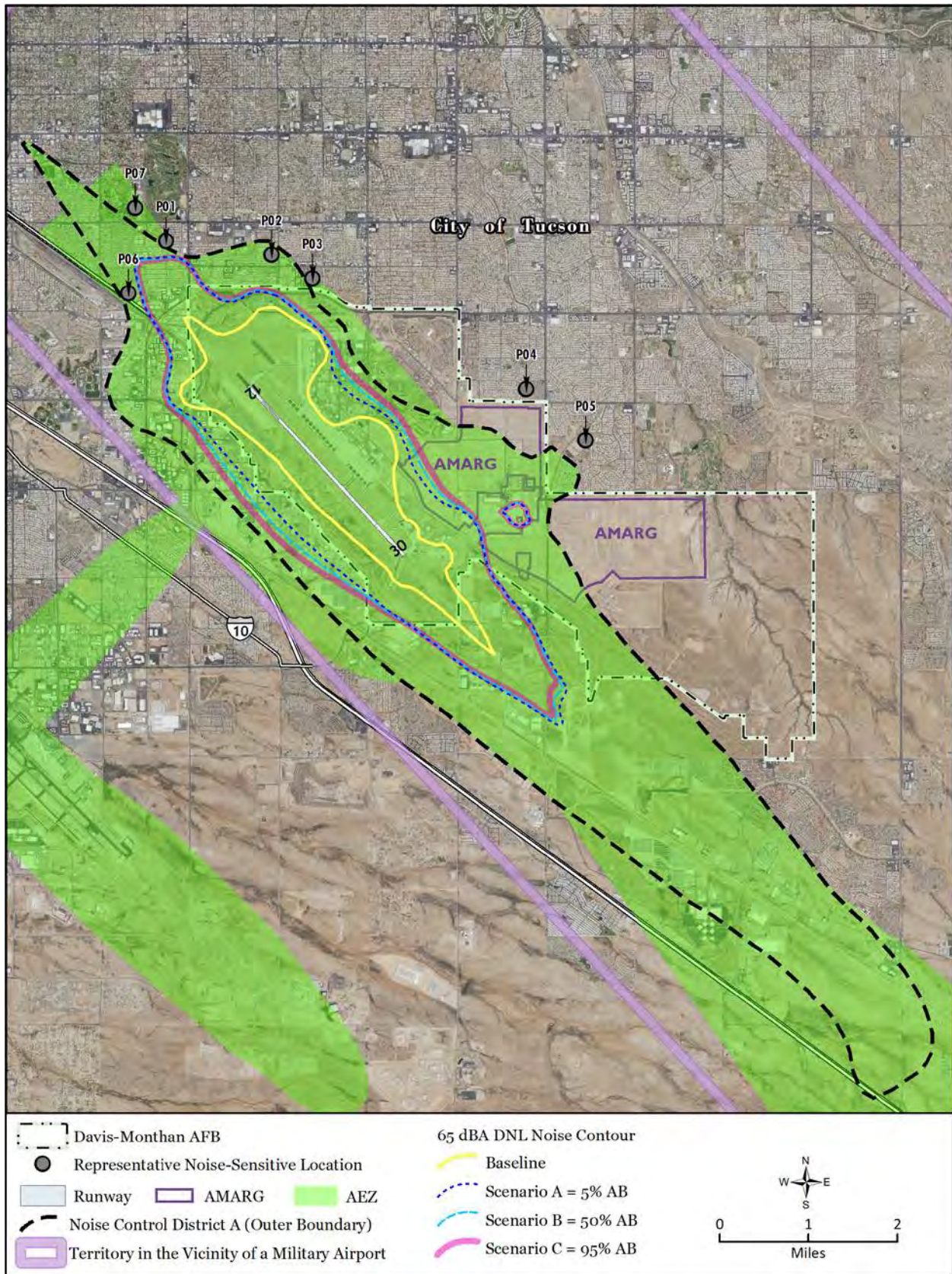


Figure DM3-6. City of Tucson and Pima County Airport Environs Zone

- ADC-3 – Southeast end of the Davis-Monthan AFB runway 30,000 to 50,200 feet from end of runway.
- NCD A – High Noise District with exposures of 65-70 L_{dn} designated at Davis-Monthan AFB.
- NCD B – High Noise District with exposures of 70+ L_{dn} designated at Davis-Monthan AFB
- Airport Hazard Districts – A specifically designated area of land where uses which constitute hazards to aircraft operations are prohibited and heights are limited.

The UDC outlines land use regulations that apply in each of the areas described above. Acoustical treatment of buildings in the AEZ is required to reduce exposure to high levels of airport noise. In addition, the UDC directs that the L_{dn} values are to be calculated based on the DoD NOISEMAP model that averages noise over the total flying days of the year (City of Tucson 2013).

On-Base Land Use. Davis-Monthan AFB occupies approximately 10,700 acres; 5,700 acres are developed or semi-improved, 4,530 acres are undeveloped, and 300 acres are under easement to and maintained by Pima County. Land use on the base is generally divided into seven Planning Districts. These Planning Districts include flightline operations, North Planning, Housing Planning; Main Base Planning, AMARG Planning, main base south and the munitions and ranges. The flightline operations district is the largest Planning District and encompasses the runway, taxiways, aprons and aircraft parking and hangar areas.

Surrounding Land Use. Davis-Monthan AFB borders the southeastern edge of the City of Tucson, within the city limits. Residential development is the predominant land use to the east and north of the installation with industrial and open land uses to the west and south of the installation. As part of the scoping process, representatives from various neighborhoods surrounding the installation expressed concerns about noise. These neighborhoods included the following: Broadmoor Broadway Village, La Estancia, Barrio Kroeger Lane, Julia Keen, Sam Hughes, Keeling, Starr Pass, and Arroyo Chico. All of these neighborhoods, except Starr Pass, are located in the AEZ.

Since the 1980s, many of these neighborhoods have incorporated provisions into their neighborhood plans or Planned Area Development plans that account for noise resulting from Davis-Monthan AFB aircraft operations. For example, the Arroyo Chico Area Plan (1986) includes maps of the NCD A and B areas and policies to encourage new residential development and other noise-sensitive uses to incorporate acoustical treatment to reduce interior noise levels to a maximum of 45 dB. Some of the plans include noise and overflight hazard districts into the subdivision plan. Some of the neighborhood plans also include noise attenuation requirements. These plans are publicly available at the following website: <https://www.tucsonaz.gov/pdsd/area-neighborhood-plans>.

In 2001, the Arizona legislature mandated that the Arizona real estate commissioner record, in the office of the Pima county recorder, a document that applies to all property in “territory in the vicinity of a military airport.” The document contains the following disclosure: “This property is located within territory in the vicinity of a military airport and may be subject to increased noise and accident potential.”

Table DM3-33 identifies acres of land exposed to DNL of 65 dB or greater by land use category including all land in the JLUS contour. The JLUS contour represents acreage that current zoning requirements already treat as if the land was in a high-noise environment (i.e., DNL of 65 dB or greater). Baseline conditions represent the noise levels as modeled using the current conditions and operations at Davis-Monthan AFB. Noise from baseline conditions primarily affects industrial, commercial, undesignated, open/agriculture/low density, and public/quasi-public land. All of this land is entirely within the AEZ.

Table DM3-33. Off-Base Acres Currently Exposed to DNL of 65 dB or Greater at Davis-Monthan AFB

Land Use Category ^a	DNL (dB)											
	65–69		70–74		75–79		80–84		≥85		Totals	
	JLUS Contour	Baseline	JLUS Contour	Baseline	JLUS Contour	Baseline	JLUS Contour	Baseline	JLUS Contour	Baseline	JLUS Contour	Baseline
Commercial	569	37	311	0	79	0	24	0	0	0	983	37
Industrial	1,039	36	548	0	135	0	60	0	0	0	1,782	36
Open	2,636	6	1,119	0	365	0	10	0	0	0	4,130	6
Public/Quasi-Public	574	5	22	0	19	0	2	0	0	0	617	5
Recreational	21	0	0	0	0	0	0	0	0	0	21	0
Residential	874	0	91	0	16	0	0	0	0	0	981	0
Undesignated ^b	808	16	278	0	75	0	21	0	0	0	1,182	16
Total	6,521	100	2,369	0	689	0	117	0	0	0	9,696	100

^a All numbers are in units of acres

^b Undesignated land includes roads, retention basins, and other municipal features that might not be shown on Figure DM3-7.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Pima County 2018d

DM3.8.1.2 Recreation

The City of Tucson has a wide variety of recreational facilities including parks, playgrounds, barbeque areas, walking paths, off-leash dog areas, sports fields, golf courses, play courts and recreation and senior centers (Table DM3-34). Schools also provide outdoor playing fields and playgrounds for recreation. The Reid Park Zoo encompasses 24 acres and features more than 500 animals. In addition to the city facilities, Saguaro National Park consists of the Tucson Mountain District to the west and the Rincon Mountain District to the east. The Rincon Mountain District is 14 miles from Davis-Monthan AFB and the Tucson Mountain District is located 21 miles west-northwest of the base (Davis-Monthan 2008). Table DM3-34 shows that none of the nearby recreational facilities are currently exposed to DNL of 65 dB and all of them are compatible with the baseline noise levels. Land use compatibility with noise is based on DoDI 4165.57 and *Guidelines for Considering Noise in Land Use Planning and Control*. Recreational uses are considered compatible up to DNL of 74 dB, with structures in the 70 dB-to-74 dB range needing an additional 25 dB of noise attenuation beyond that of typical construction.

Table DM3-34. Recreation Facilities near Davis-Monthan AFB

ID	Recreational Facility	Activities	DNL (dB)	Compatibility (Y/N)	Within the AEZ
P01	Parkview Park	Playground	55	Y	Y
P02	Swan Park	Playground, picnic area	54	Y	Y
P03	Freedom Park	Ball fields, pool, playground, basketball courts	55	Y	N
P04	Escalante Park	Ball fields, pool	47	Y	N
P05	The Groves Park	Playground, disc golf	<45	Y	N
P06	County Club Annex Park	Playground, picnic area, soccer fields	56	Y	Y
P07	Reid Park Zoo	Animal viewing, walking trails	54	Y	Y

Table DM3-34. Recreation Facilities near Davis-Monthan AFB (Continued)

ID	Recreational Facility	Activities	DNL (dB)	Compatibility (Y/N)	Within the AEZ
P08	Jacobs Park and Ochoa Soccer Complex	Soccer and softball fields, playground, picnic area	46	Y	N
P09	Saguaro National Park (Tucson Mountain District) ^a	Hiking, Biking, animal viewing	<45	Y	N
P10	Arthur Pack Regional Park	Ball fields, golf course, basketball court, soccer fields, picnic area.	<45	Y	N

^a DNL at the Saguaro National Park (Rincon Mountain District) would also be less than 45 dB.
Source: <https://www.tucsonaz.gov/parks/parks>

Davis-Monthan AFB offers a variety of both indoor and outdoor recreational facilities. The Arthur J. Benko Fitness and Sports Center is a premier sports and fitness complex that includes state-of-the-art exercise equipment, an indoor track, a parent exercise room, and a lap pool. The Haeffner Fitness and Sports Center is a well-equipped modern facility with aerobics and weight training areas. Other indoor recreational facilities include a 20-lane bowling center, and an arts and craft center. Outdoor facilities include athletic fields; racquetball and tennis courts; a pool; a golf course and driving range; an archery, skeet, and trap range and a shooting park; and opportunities for hiking, biking, and jogging. In addition, the 280-space Agave Gulch family camp offers opportunities for recreational vehicle (RV) camping. These facilities are available to active duty and retired military and government-employed civilians.

DM3.8.2 Base Environmental Consequences

DM3.8.2.1 Land Use

DM3.8.2.1.1 Physical Development

The physical development associated with the proposed AFRC F-35A mission at Davis-Monthan AFB would primarily occur in previously disturbed areas near the flightline where airfield and aircraft O&M support activities occur on a daily basis. None of the physical development associated with implementation of the proposed mission at Davis-Monthan AFB would impact land use because these activities would occur in land uses designated for the proposed use. Subsequent O&M activities for the proposed mission would conform to current and future land uses on the base and traffic, noise, dust and similar effects from construction equipment would be reduced through construction plans and practices agreed to by contractors. The physical changes and daily activities on the ground would be confined to the base. The proposed on-base development would have no impact to off-base areas.

DM3.8.2.1.2 Aircraft Operations

This analysis includes an evaluation of the potential noise impacts to on- and off-base land uses resulting from the proposed AFRC F-35A airfield operations at Davis-Monthan AFB. Volume II, Appendix B, Section B.2.2, presents the noise compatibility guidelines for noise exposure to various land uses.

During scoping, people submitted comments expressing concern that increased noise would affect property values. As discussed in more detail in Chapter 3, Section 3.9.3, studies have shown a relation between noise and property values. Properties in the AEZ which have changed ownership since 2004, and in some locations earlier, have included notification that the property is located in the AEZ and near a military airport. Notification to the prospective buyer that the property is in

the AEZ is assumed to be reflected in negotiated housing prices. The extent to which the AEZ would affect housing prices depends on a number of factors, including the noise indicators used, thresholds, types of properties evaluated, and other factors. Although noise levels in residential areas would increase from current levels, as explained above, implementation of the AFRC F-35A mission would not expose any land or property outside of the AEZ to DNL of 65 dB or greater.

Scenario A

Implementation of the AFRC F-35A mission would increase the area surrounding Davis-Monthan AFB exposed to DNL of 65 dB or greater by approximately 1,566 acres. The largest increase in acreage exposed to additional noise would be industrial (30 percent), followed by open areas (27 percent), and commercial (19 percent). Six (6) percent (91 acres) of the 1,566 acres exposed to additional noise is classified as residential land. This residential land is currently within the AEZ. Areas within the AEZ are treated by State and local regulations as if they were already exposed to DNL of 65 dB or greater (Table DM3-35 and Figure DM3-7).

Approximately 1,506 off-installation residents who reside in the AEZ are not currently exposed to DNL of 65 dB. These residents would be affected by DNL of 65 dB or greater from Scenario A. All of the 1,566 acres and the off-installation residents are currently located in the AEZ. Per the Pima County and Tucson ordinances, buildings in the AEZ are treated as if they were already exposed to DNL of 65 dB or greater. This includes requirements for acoustical treatment to reduce exposure to high levels of airport noise. However, as noted in the JLUS, unlike similarly situated areas around TUS, there is no program available to retrofit residences in these areas for noise attenuation.

Scenario B

Implementation of Scenario B would increase the area surrounding Davis-Monthan AFB exposed to DNL of 65 dB or greater by approximately 1,679 acres. The largest increase in acreage exposed to additional noise would be industrial (31 percent), followed by open areas (25 percent) and commercial (21 percent). Five (5) percent (85 acres) of the 1,679 acres exposed to additional noise is classified as residential land and is currently located in the AEZ. Compared to Scenario A, implementation of Scenario B would result in approximately 113 more acres of all land use types exposed to DNL of 65 dB or greater. Implementation of Scenario B would result in 85 acres of land exposed to DNL of 65 dB or greater.

As previously described for Scenario A, this residential land is currently in the AEZ (Table DM3-36 and Figure DM3-7). Approximately 1,428 off-installation residents who reside in the AEZ are not currently exposed to DNL of 65 dB. These residents would be affected by DNL of 65 dB or greater from the proposed mission. All of the 1,679 acres and the off-installation residents are currently located in the AEZ. Per the Pima County and Tucson ordinances, acoustical treatment of buildings in the AEZ is already required to reduce exposure to high levels of airport noise. However, as noted in the JLUS, unlike similarly situated areas around TUS, there is no program available to retrofit residences in these areas for noise attenuation.

Table DM3-35. Off-Base Acres Exposed to DNL of 65 dB or Greater at Davis-Monthan AFB under Scenario A

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥85				Totals			
	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b
Commercial	569	37	302	265	311	0	32	32	79	0	0	0	24	0	0	0	0	0	0	0	983	37	334	297
Industrial	1,039	36	401	365	548	0	108	108	135	0	0	0	60	0	0	0	0	0	0	0	1,782	36	509	473
Open	2,636	6	409	403	1,119	0	22	22	365	0	0	0	10	0	0	0	0	0	0	0	4,130	6	431	425
Public/Quasi-Public	574	5	23	18	22	0	21	21	19	0	0	0	2	0	0	0	0	0	0	0	617	5	44	39
Recreational	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0
Residential	874	0	90	90	91	0	1	1	16	0	0	0	0	0	0	0	0	0	0	0	981	0	91	91
Undesignated ^c	808	16	208	192	278	0	49	49	75	0	0	0	21	0	0	0	0	0	0	0	1,182	16	257	241
Total	6,521	100	1,433	1,333	2,369	0	233	233	689	0	0	0	117	0	0	0	0	0	0	0	9,696	100	1,666	1,566

^a All numbers are acres

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission

^c Undesignated land includes roads, retention basins, and other municipal features that might not be shown on Figure DM3-7.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Pima County 2018d

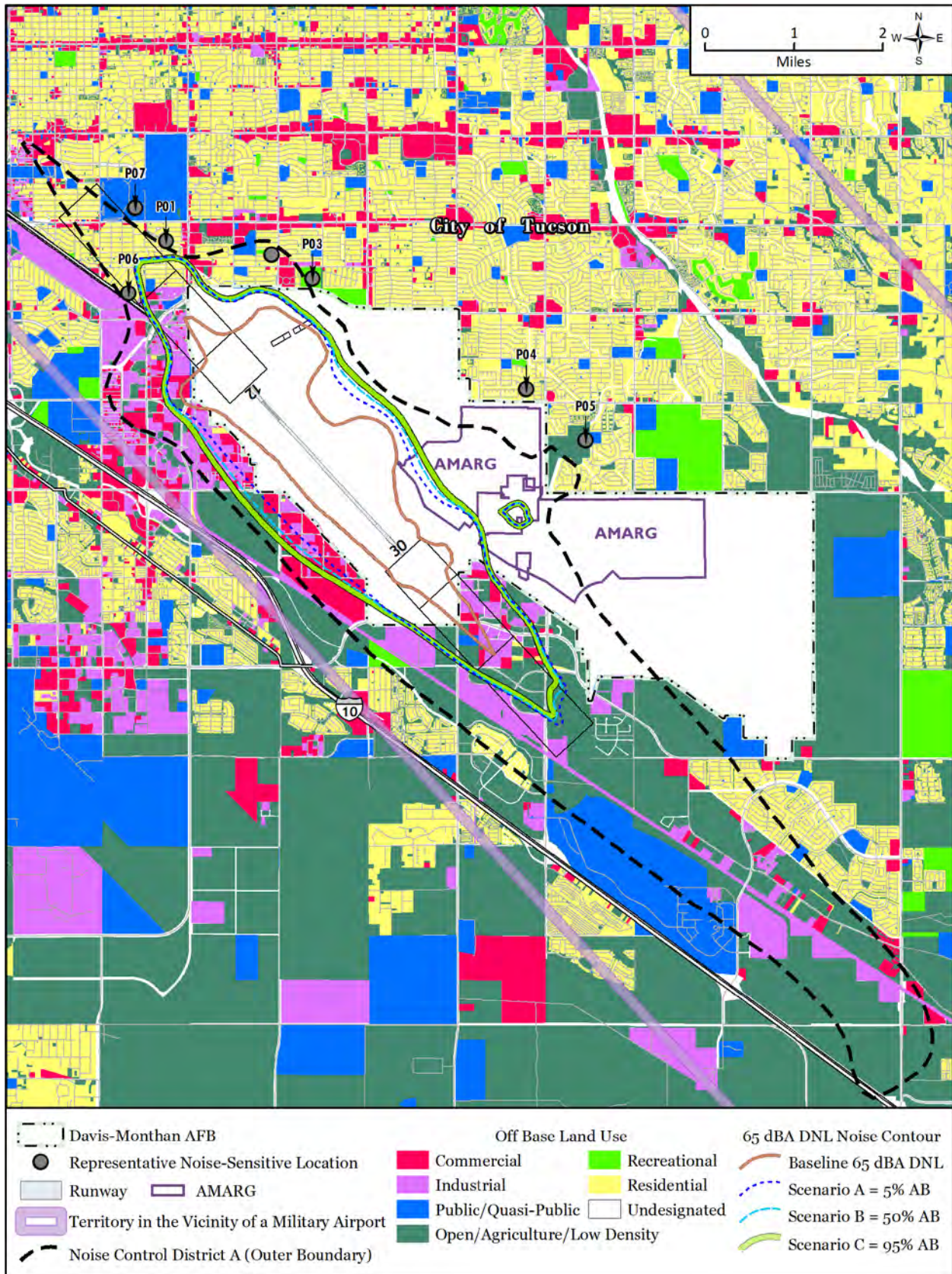


Figure DM3-7. Baseline, JLUS, and AFRC F-35A Mission DNL Contours Relative to Land Use at Davis-Monthan AFB

Table DM3-36. Off-Base Acres Exposed to DNL of 65 dB or Greater at Davis-Monthan AFB under Scenario B

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥85				Totals			
	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b
Commercial	569	37	327	290	311	0	64	64	79	0	0	0	24	0	0	0	0	0	0	0	983	37	391	354
Industrial	1,039	36	441	405	548	0	118	118	135	0	0	0	60	0	0	0	0	0	0	0	1,782	36	559	523
Open	2,636	6	404	398	1,119	0	21	21	365	0	0	0	10	0	0	0	0	0	0	0	4,130	6	425	419
Public/Quasi-Public	574	5	23	18	22	0	21	21	19	0	0	0	2	0	0	0	0	0	0	0	617	5	44	39
Recreational	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0
Residential	874	0	84	84	91	0	1	1	16	0	0	0	0	0	0	0	0	0	0	0	981	0	85	85
Undesignated ^c	808	16	221	205	278	0	54	54	75	0	0	0	21	0	0	0	0	0	0	0	1,182	16	275	259
Total	6,521	100	1,500	1,400	2,369	0	279	279	689	0	0	0	117	0	0	0	0	0	0	0	9,696	100	1,779	1,679

^a All numbers are acres

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission

^c Undesignated land includes roads, retention basins, and other municipal features that might not be shown on Figure DM3-7.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Pima County 2018d

Scenario C

Implementation of Scenario C would increase the area surrounding Davis-Monthan AFB exposed to DNL of 65 dB or greater by approximately 1,762 acres. The largest increase in acreage exposed to additional noise would be industrial (31 percent), followed by open areas (24 percent) and commercial (23 percent). Four (4) percent (79 acres) of the 1,762 acres exposed to additional noise is classified as residential land and is currently located in the AEZ. Compared to Scenario A or B, implementation of Scenario C would result in more acres of all land use types exposed to DNL of 65 dB or greater. Implementation of Scenario C would result in less acres of residential land exposed to DNL of 65 dB or greater than Scenarios A or B.

As previously described for Scenario A, this residential land is currently in the AEZ (Table DM3-37 and Figure DM3-7). Approximately 1,361 off-installation residents who reside in the AEZ are not currently exposed to DNL of 65 dB. These residents would be affected by DNL of 65 dB or greater from the proposed mission. All of the 1,762 acres and the off-installation residents are currently located in the AEZ. Per the Pima County and Tucson ordinances, acoustical treatment of buildings in the AEZ is already required to reduce exposure to high levels of airport noise. However, as noted in the JLUS, unlike similarly situated areas around TUS, there is no program available to retrofit residences in these areas for noise attenuation.

Table DM3-37. Off-Base Acres Exposed to DNL of 65 dB or Greater at Davis-Monthan AFB under Scenario C

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥85				Totals			
	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b	JLUS Contour	Baseline	AFRC F-35A Mission	Change ^b
Commercial	569	37	332	295	311	0	106	106	79	0	0	0	24	0	0	0	0	0	0	0	983	37	438	401
Industrial	1,039	36	464	428	548	0	127	127	135	0	0	0	60	0	0	0	0	0	0	0	1,782	36	591	555
Open	2,636	6	406	400	1,119	0	21	21	365	0	0	0	10	0	0	0	0	0	0	0	4,130	6	427	421
Public/Quasi-Public	574	5	22	17	22	0	21	21	19	0	0	0	2	0	0	0	0	0	0	0	617	5	43	38
Recreational	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0
Residential	874	0	78	78	91	0	1	1	16	0	0	0	0	0	0	0	0	0	0	0	981	0	79	79
Undesignated ^c	808	16	222	206	278	0	62	62	75	0	0	0	21	0	0	0	0	0	0	0	1,182	16	284	268
Total	6,521	100	1,524	1,424	2,369	0	338	338	689	0	0	0	117	0	0	0	0	0	0	0	9,696	100	1,862	1,762

^a All numbers are acres

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission

^c Undesignated land includes roads, retention basins, and other municipal features that might not be shown on Figure DM3-7.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Pima County 2018d

DM3.8.2.2 Recreation

Construction in support of the AFRC F-35A mission would occur in the existing developed portions of the base. Off-base parks, schools, and recreational facilities are too far from the installation to be affected by construction noise. Increased truck traffic to the installation during the 2-year construction period could cause temporary effects on traffic flow on local roads, but this is not anticipated to interfere with access to recreational areas around Tucson. New facilities would not alter any sensitive views that have important recreational value. No land designated as recreational land would be exposed to DNL of 65 dB or greater.

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in a net loss of 30 personnel with dependents as a result of the drawdown of the AFRC A-10 mission as the F-35A aircraft arrive. This change in the number of people would have no discernable effect on recreational resources. Noise impacts to recreational resources from construction and personnel changes would be the same regardless of which afterburner scenario is selected.

Noise-related changes resulting from implementation of the AFRC F-35A mission would be similar under all three afterburner scenarios. The following discussion highlights the areas in which impacts would be different. Implementation of the AFRC F-35A mission (Scenario A, B, or C) would result in an increase of average noise (DNL) at 8 of the 10 recreational facilities evaluated as representative noise-sensitive locations in this EIS. Implementing Scenario B would increase the average noise level (DNL) by 1 dB at Swan and Escalante Parks. Under Scenario C, DNL would increase by 1 dB at Freedom and The Groves Parks. Noise modeling results summarized in Table DM3-38 indicate that implementation of the AFRC F-35A mission (Scenarios A, B, or C) at Davis Monthan AFB would not result in DNL exceeding 65 dB at any of the recreational facilities near Davis-Monthan AFB identified for evaluation in this EIS. However, a DNL increase of 3 dB above baseline conditions would be noticeable.

Table DM3-38. Noise Effects on Recreation Facilities near Davis-Monthan AFB

ID	Recreational Facility	Within the AEZ	DNL (dB)			
			Baseline Conditions	Scenario A	Scenario B	Scenario C
P01	Parkview Park	Y	55	62	62	62
P02	Swan Park	Y	54	58	59	59
P03	Freedom Park	N	55	58	58	59
P04	Escalante Park	N	47	50	51	51
P05	The Groves Park	N	<45	48	48	49
P06	County Club Annex Park	Y	56	63	63	63
P07	Reid Park Zoo	Y	54	60	60	60
P08	Jacobs Park and Ochoa Soccer Complex	N	46	50	50	50
P09	Saguaro National Park (Tucson Mountain District)	N	<45	<45	<45	<45
P10	Arthur Pack Regional Park	N	<45	<45	<45	<45

Source: <https://www.tucsonaz.gov/parks/parks>

The use of outdoor sports fields and ball courts is compatible with DNL below 65 dB, although noise increases could reduce the quality and enjoyment of outdoor activities for some persons. One measure of annoyance is the potential for speech interference. As described in Section DM3.2.2.2, L_{max} of 50 dB is the metric used to determine potential speech interference. As shown in Table DM3-16, under Scenario A P01, P03, P04, P05, P06 and P07 would experience one additional outdoor noise event per hour at L_{max} exceeding 50 dB.

Another noise metric that can be used to evaluate potential impacts to recreational uses is SEL. As shown in Table DM3-9, SEL would not increase at any of the recreational facilities analyzed. Although the SEL noise from a single overflight would not change, certain recreational areas could experience an increase in the number of overflights at existing SEL values and experience an increased average noise level as measured by the DNL.

Saguaro National Park, located in two districts, on the west (Tucson Mountain District) and east (Rincon Mountain District) sides of the City of Tucson, would not be affected by DNL greater than 45 dB. As shown in Table DM3-9, the aircraft and operation type that results in the highest SEL (based C-130 arrival) at the Tucson Mountain District of Saguaro National Park would continue to be the aircraft and operation type resulting in the highest SEL after implementation of the AFRC F-35A mission. Saguaro National Park could be overflowed by AFRC F-35A pilots transiting to and from Davis-Monthan AFB, but overflights would be infrequent. AFRC F-35A pilots operating at Davis-Monthan AFB would use established flight tracks, so areas that have not been directly overflowed in the past would not be overflowed frequently by AFRC F-35A pilots. The noise analysis indicated that no events exceeding L_{max} of 50 dB would occur at P09 or P10.

During scoping, the NPS submitted a comment letter on 10 May 2018 expressing desire to work with the USAF on the analysis of potential impacts to Saguaro National Park resources and values associated with Davis-Monthan AFB. The letter expressed concern over the potential increase in noise produced by the F-35A aircraft relative to the existing A-10 aircraft operations at Davis-Monthan AFB, as the new mission could adversely affect wilderness qualities, wildlife, and park visitor experiences. The NPS indicated that supplemental noise metrics might be appropriate for the assessment of noise impacts to solitude in the Saguaro Wilderness Area.

On 1 October 2018, the USAF hosted a teleconference with the NPS to discuss these concerns and seek any additional information the NPS might want to include in the Draft EIS. During the teleconference, the USAF and NPS discussed the specific noise metrics that would be used to measure the overall noise environment around Saguaro National Park. The NPS and USAF agreed that inclusion of SEL, and L_{max} noise metrics would be the appropriate to use in addition to DNL when assessing the overall sound environment for the AFRC F-35A EIS analysis. Subsequent to the teleconference, the NPS provided the USAF with geographic information system (GIS) files of trails and other areas in Saguaro National Park that are considered sensitive noise areas.

DM3.8.3 Airspace Affected Environment

DM3.8.3.1 Land Use

This section summarizes land ownership and affected Special Use Land Management Areas (SULMAs) under the airspace currently used by pilots based at Davis-Monthan AFB. SULMAs include selected areas managed by federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or wilderness experiences (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of these attributes. Some SULMAs could include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed in Section DM3.8.3.2. Pilots operating from Davis-Monthan AFB use airspace located in Arizona and New Mexico, with most areas in Arizona (see Figure DM3-8). The majority of federal land under this airspace is administered by the U.S. Bureau of Indian Affairs, followed by the U.S. Forest Service (USFS), Bureau of Land Management (BLM), DoD, USFWS, and the NPS. The SULMAs under the airspace currently used by pilots from Davis-Monthan AFB include wilderness

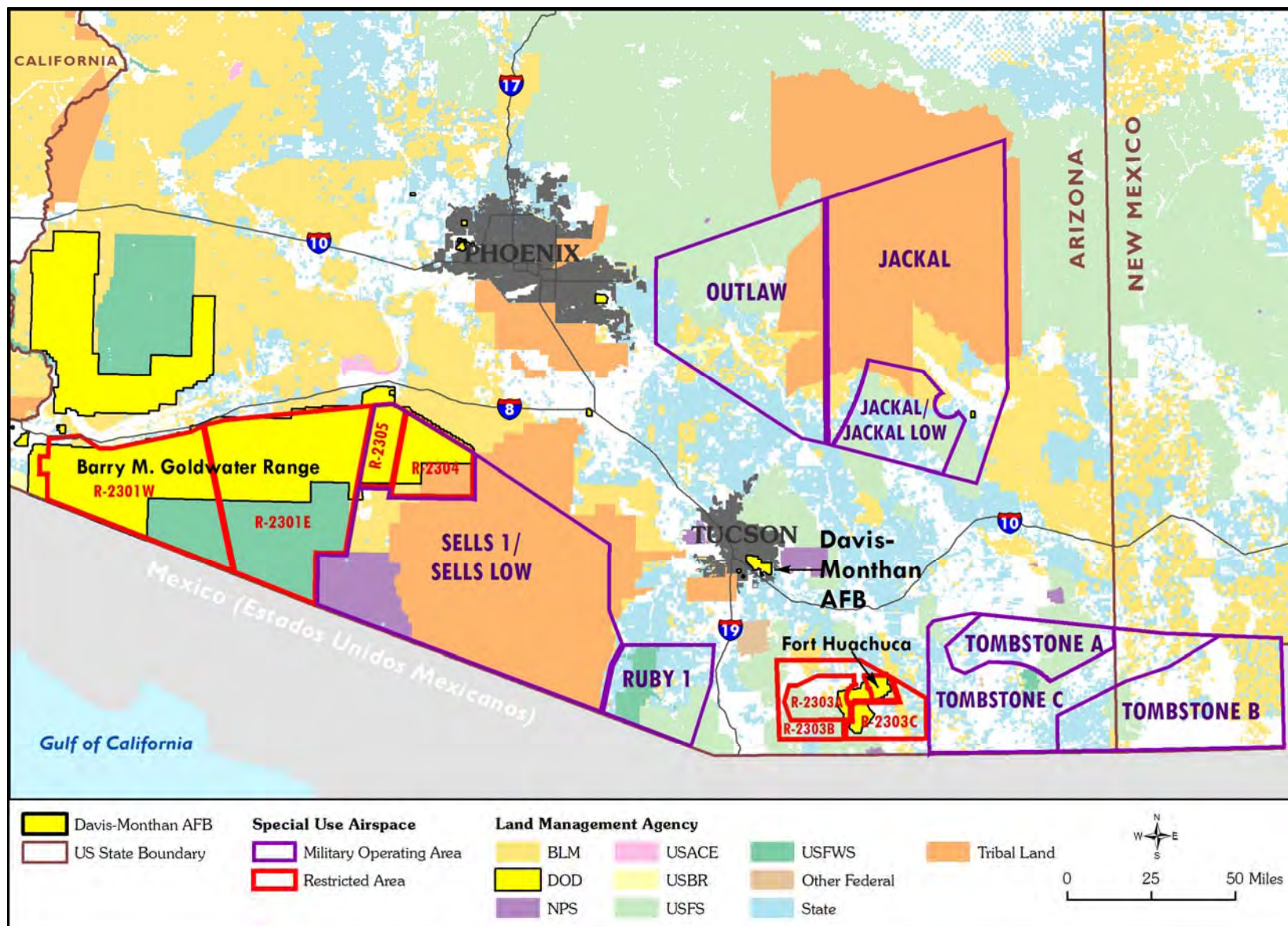


Figure DM3-8. SULMAs Beneath Davis-Monthan AFB Airspace

and wilderness study areas, primitive areas, national forests, national wildlife refuges, national conservation areas, national monuments, Native American reservation lands, and state parks. Figure DM3-8 identifies the airspace currently used along with the SULMAs aggregated by ownership (i.e., USFS, USFWS, state land, etc.).

DM3.8.3.2 Recreation

Recreational opportunities under the airspace used by pilots from Davis-Monthan AFB are similar to those described in Section DM3.8.2.2. The underlying land reflects the same mosaic of federal, state, and private ownership, with a similar range of outdoor recreational activities. The public lands support a spectrum of recreational opportunities and activities, with some areas having particular qualities or recreational purposes.

Southeastern Arizona and southwestern New Mexico hosts habitats that support a wide variety of birds, particularly along waterways and in mountainous areas. These areas are popular for recreational bird watching. Public access is permitted to limited portions of the BMGR for recreation. The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities in the BMGR include camping, driving, hunting, off-highway vehicle uses, and viewing of cultural and natural resources of interest. AZGFD is responsible for conserving recreational opportunities on the BMGR over the long-term and for providing ongoing opportunities to the extent compatible with the military mission. This includes active sports, such as hunting and off-road uses.

DM3.8.4 Airspace Environmental Consequences

DM3.8.4.1 Land Use

Table DM3-39 identifies the SULMAs that occur under the airspace proposed for use by AFRC F-35A pilots operating from Davis-Monthan AFB that would be exposed to noise that would increase by 1-dB L_{dnmr} above baseline. Although SULMAs below some of the airspace proposed for use would not be exposed to 1-dB L_{dnmr} increases above baseline (i.e., Jackal, Outlaw, and Tombstone MOAs), the proposed AFRC F-35A operations would result in changes in subsonic airspace noise of an indiscernible 1 dB L_{dnmr} beneath the Ruby 1 and Fuzzy MOAs. Use of the Ruby 1 and Fuzzy MOAs by AFRC F-35A pilots would result in an indiscernible 1 dB L_{dnmr} increase above baseline at 6 different SULMAs (Table DM3-39).

Table DM3-39. Special Use Areas Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at Davis-Monthan AFB

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L_{dnmr}	L_{dnmr}	Change
Ruby 1 & Fuzzy MOAs					
Arivaca Land and Lake	208	100	46	47	1
Buenos Aires National Wildlife Refuge	117,457	99	46	47	1
Coronado National Forest	1,718,945	7	46	47	1
Pajarita Wilderness	7,499	72	46	47	1
Tohono O'odham Reservation	2,773,453	<1	46	47	1
Tumacacori Roadless Area	44,594	52	46	47	1

Supersonic aircraft operations would occur in BMGR airspace (i.e., R-2301, R-2304, and R-2305) and Sells MOA, which are currently approved for supersonic training. F-35A pilots from Luke AFB (as well as other fighter types) currently conduct supersonic operations in BMGR airspace. Sonic booms generated by AFRC F-35A pilots would be comparable to sonic booms that occur today. The average number of booms per day below the BMGR airspace would increase from 3.1 to 3.5 and CDNL would increase from 56 to 57 dB. The average number of sonic booms per day below the Sells MOA would increase from 2.1 to 2.2 and CDNL would increase from 54 to 56 dB (Table DM3-40). In summary, sonic booms would occur in areas and at intensities that are comparable to what occurs today. Sonic booms would become more common (increasing by as much as one additional sonic boom every other day), and the increase in frequency could be considered annoying to individuals who recognize the increase.

Table DM3-40. Supersonic Noise Levels (CDNL) by Airspace and Associated SULMAS for Davis-Monthan Airspace

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			CDNL	CDNL	Change
Barry M. Goldwater Range R-2301E					
Cabeza Prieta National Wildlife Refuge	855,602	68	56	57	1
Cabeza Prieta Wilderness	791,839	66	56	57	1
Organ Pipe Cactus National Monument	329,138	<1	56	57	1
Organ Pipe Cactus Wilderness	310,661	1	56	57	1
Sells MOA/ATCAA & R-2304 and R-2305					
Baboquivari Peak Area of Critical Environmental Concern	2,060	100	54	56	2
Baboquivari Peak Wilderness	2,060	100	54	56	2
Buenos Aires National Wildlife Refuge	117,457	<1	54	56	2
Cabeza Prieta Wilderness	791,839	<1	54	56	2
Coffeepot Botanical Area of Critical Environmental Concern	8,893	100	54	56	2
Organ Pipe Cactus National Monument	329,138	95	54	56	2
Organ Pipe Cactus Wilderness	310,661	99	54	56	2
Sonoran Desert National Monument	496,513	<1	54	56	2
Tohono O'odham Reservation	2,773,453	81	54	56	2

DM3.8.4.2 Recreation

A synopsis of issues and the methodology for addressing potential impacts resulting from military training on recreational resources under the airspace proposed for use are provided in Chapter 3, Section 3.8. Chapter 3, Section 3.8.2, describes typical recreational impacts that could result from implementation of the AFRC F-35 mission at Davis-Monthan AFB. In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of exposure to military overflight and supersonic events. Increased numbers of sorties in some airspace would indiscernibly affect the noise levels and an increase in supersonic events could result in recreational participants experiencing startle effects from these events. This could continue to result in some degradation in enjoyment for those affected and result in loss of opportunity for quiet recreational environments in the region. Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could affect the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, wilderness study areas, and other remote locations.

During scoping, a comment was received regarding the impact of noise on recreational areas in addition to those identified in Tables DM3-38, DM3-39, and DM3-40, potentially affected by AFRC F-35A aircraft operations. These areas are Picacho Peak State Park, Ironwood Forest National Monument, and Table Top Wilderness Area. Average noise levels under the airspace proposed for use would generally remain the same, except for areas under the Ruby 1 and Fuzzy MOAs. These areas would experience an indiscernible 1 dB L_{dnmr} increase. As shown in Table DM3-1, aircraft sorties in the Tombstone MOAs would increase by approximately 43 percent. The increase in sorties would not detectably change average subsonic noise levels, although the increase in single event overflights could annoy some individuals using the recreational areas below the Tombstone MOAs. Supersonic operations conducted by AFRC F-35A pilots would result in sonic booms, similar to other aircraft using this airspace. The potential for isolated events to be experienced by persons engaging in recreational activities throughout the affected area would continue. Areas supporting recreational uses sensitive to loud, intrusive noise, such as wilderness areas and wildlife refuges could experience one additional sonic boom every other day.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities. This includes maintaining the natural setting and allowing minimal human disturbance and development. Although CDNL would not change more than 2 dB, wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. Increased noise in wilderness areas, recreation areas, and other specially managed lands could also be perceived by some recreational users as affecting their recreation experience.

DM3.8.5 Summary of Impacts to Land Use and Recreation

Land use and recreational resources would not be impacted by any of the construction because all of the construction would be conducted on the base in land use zones compatible with the proposed development. Implementation of Scenarios A, B or C would expose an additional 91, 85, or 79 acres, respectively, of residential land in the AEZ to DNL of 65 to 69 dB. Per the JLUS, the impacted residential land would remain incompatible with these noise levels. Per the Pima County and Tucson ordinances, acoustical treatment of buildings in the AEZ is required to reduce exposure to high levels of airport noise. However, as noted in the JLUS, unlike areas around TUS, there is no program available to retrofit residences in these areas for noise attenuation. None of the recreational areas identified for study around the base would be exposed to DNL greater than 65 dB under any of the afterburner scenarios. However, DNL would increase at these locations from 3 dB to 7 dB and this increase would be noticeable. Regarding impacts to land use and recreation under the airspace proposed for use, DNL would remain below 47 dB below all of the airspace proposed for use but the increase in aircraft operations would be noticeable. In addition, sonic booms below the BMGR and Sells MOA would increase. Impacts to land use and recreational resources would not be considered significant under any of the afterburner scenarios.

DM3.9 SOCIOECONOMICS

Socioeconomics refers to features or characteristics of the social and economic environment. The factors affecting socioeconomic resources are the change in personnel, construction of new facilities, renovations and modifications to existing facilities, and noise from F-35A aircraft at Davis-Monthan AFB. These factors are evaluated relative to the existing population, employment, earnings, housing, education, and public and base services. Davis-Monthan AFB is located in Tucson, Arizona, in Pima County. Impacts to socioeconomic resources would extend beyond the base boundaries. Therefore, for the purposes of this socioeconomic analysis, the ROI for the proposed action and No Action Alternative is Pima County, with an emphasis on Davis-Monthan AFB.

DM3.9.1 Base Affected Environment

DM3.9.1.1 Population

Population estimates for Pima County totaled over 1.02 million persons in 2017 (USCB 2018). Between 2010 and 2017, the county population increased at an average annual rate of 0.7 percent, with a total increase of approximately 42,506 persons over the 7-year period (USCB 2018). The state of Arizona has an estimated population of 7.02 million (USCB 2018). Average annual population growth in the county has been less than the state (Table DM3-41).

Table DM3-41. Population in the ROI for Davis-Monthan AFB

Location	2010 Census	2017 Estimates	Annual Percent Change (2010–2017)
Pima County	980,263	1,022,769	0.6
Arizona	6,392,017	7,016,270	1.3

Source: USCB 2018

As shown in Table DM2-3, the total current authorized personnel at the base is 10,140 persons. Of the total authorized base personnel, 11.38 percent (1,154) are associated with AFRC.

DM3.9.1.2 Economic Activity (Employment and Earnings)

In 2016, employment in Pima County totaled 507,179 jobs (BEA 2017a). The largest employment sector in Pima County was government and government enterprises (17.2 percent), followed by health care and social assistance (13.4 percent), and retail trade (10.3 percent) (BEA 2017a). Construction accounted for 4.4 percent of total employment. Over the last several years, the average annual unemployment rate in the county has steadily declined from 6.8 percent in 2013 to 4.5 percent in 2017 (BLS 2018a). During this same time, the state average annual unemployment rate also declined but remained higher than the county (BLS 2018b). Per capita personal income in Pima County is estimated at \$39,541, which is less than the estimated \$40,415 per capita personal income in the state (BEA 2017b).

Davis-Monthan AFB is an important economic contributor to Southern Arizona and Pima County through employment of military and civilian personnel, and expenditures for goods and services. The total economic impact of the base on the surrounding communities in 2016 was \$1,018 million (without retirees), an increase of \$27 million since 2015 (Davis-Monthan AFB 2016b). Of the total \$253.7 million in expenses during 2016, approximately 21 percent (\$52.2 million) was spent on military construction, non-appropriated funds, and O&M. The total payroll for military, civilians, and other base personnel exceeded \$579 million in 2016 (Davis-Monthan AFB 2016b). Based on the Impact Analysis for Planning (IMPLAN) economic model, the on-base authorized employment of 10,140 personnel supports an estimated additional 4,732 secondary jobs in the community.

DM3.9.1.3 Housing

Military family housing at Davis-Monthan AFB is privatized and owned by Actus Lend Lease/Soaring Heights Communities. Dormitories for permanent party unaccompanied personnel are available on base. The base includes eight buildings with 775 rooms and one building for “pipeline students” (Davis-Monthan AFB 2018).

Table DM3-42 presents census-derived housing data for Pima County. The county has an estimated 450,828 total housing units (houses), of which 12.3 percent (55,438 units) were vacant in 2016 (USCB 2016a). More than half (61.3 percent) of the occupied houses in the county are owner-occupied and the remaining 38.7 percent are renter-occupied. The median value of owner

occupied houses in Pima County is estimated at \$160,800. The median gross rent was \$831 in 2016 (USCB 2016a). As shown in Table DM3-33, although approximately 981 acres of residential land is in the JLUS contour, none of this land is currently exposed to DNL of 65 dB or greater from aircraft operations at Davis-Monthan AFB.

Table DM3-42. Housing Data in the ROI for Davis-Monthan AFB

Location	Houses	Occupied	Vacant
Pima County	450,828	395,390	55,438

Source: USCB 2016a

Table DM3-43 presents the average and median housing sale prices for 2010 through 2016 within the Tucson market area and the results of a study performed by the Tucson Association of Realtors which presented average housing sale prices within a 1-mile radius of Davis-Monthan AFB. Average sale prices are affected by sales of high-end properties and are above the median sale prices which represent the value of one-half of the properties sold. Table DM3-43 demonstrates that housing sale prices recovered to the 2010 sale prices by 2013 and have continued to grow since 2013. The average housing sale prices within a 1-mile radius of Davis Monthan AFB reflect the relatively fewer high-end properties in that area, and the increase in sale prices in the 1-mile radius reflects the high demand for housing in Tucson since the recession bottom experienced in November of 2011. Table DM3-43 demonstrates that average housing sale prices within the 1-mile radius of Davis-Monthan AFB increased by approximately 30 percent during the study period and, within the Tucson market area, average housing sale prices increased by approximately 15 percent in the same time period (MLS 2016). The median home prices in the Tucson market area increased by a total of approximately 6 percent over the same period. In November 2017, the median home price in the Tucson market area was \$174,000, an increase of 8 percent over the 2016 median price of \$161,000 (Zillow 2018).

Table DM3-43. Comparison of Housing Data for Tucson Market Area and Within One-Mile Radius of Davis-Monthan AFB

Year	Market Area within 1-mile Radius of Davis-Monthan AFB Average Sale Price (in Thousands of Dollars)		Tucson Market Area Average Sale Price (in Thousands of Dollars)		Tucson Market Area Median Sale Price (in Thousands of Dollars)	
	Average Sold Price	Year-Over-Year Growth	Average Sold Price	Year-Over-Year Growth	Median Sale Price	Year-Over-Year Growth
2010	\$92	NA	\$189	NA	152	NA
2011	\$71	-23%	\$164	-13%	119	-27%
2012	\$80	13%	\$174	6%	127	7%
2013	\$94	18%	\$191	10%	140	10%
2014	\$103	10%	\$203	6%	146	4%
2015	\$106	3%	\$210	3%	149	2%
2016	\$120	13%	\$217	3%	161	8%
Total Change (%)	30%	NA	15%	NA	6%	NA

Source: MLS 2016; Zillow 2018

NA=Not applicable, does not apply

DM3.9.1.4 Education

Pima County has 17 school districts and 241 non-charter schools. During the 2013 to 2014 school year, approximately 160,000 students were enrolled in Pima County district schools. Fourteen (14) of the school districts are unified and serve kindergarten through 12th-grade students. The remaining three (3) districts include two transportation districts (districts that do not have schools) and one Joint

Technical Education District (Pima County Schools 2018). As described in Section DM3.2, no off-base schools are currently exposed to DNL of 65 dB.

Two schools, the Tucson Unified School District for children attending elementary school and a charter school for children attending middle school, are located on Davis-Monthan AFB. Class size or the teacher-student ratio for regular education is the responsibility of the board and is flexible to accommodate a variety of variables including budget, student needs, and curriculum requirements (Arizona School Board Association 2018). Two child development centers are also located on base and accommodate a combined 512 children, ages infancy to 5 years old (MyBaseGuide 2018). As described in Section DM3.2, no schools on base are known to be currently exposed to DNL of 65 dB.

DM3.9.1.5 Public Services

Nineteen (19) fire districts/fire departments located throughout Pima County provide emergency services, permits and inspections, and fire protection to the county (Tucson Fire Foundation 2009). Law enforcement services in the county include the Pima County Sheriff's Department, the Tucson Police Department, and nine other law enforcement jurisdictions throughout the county (Pima County 2018c). Healthcare in Pima County includes 23 Primary Care Facilities, 7 general hospitals, and 2,702 primary care providers with an average of 369:1 population to provider ratio (Pima County 2015).

DM3.9.1.6 Base Services

Base services at Davis-Monthan AFB include shopping and dining facilities, airman and family services, community activity center, exchange shop, family support building, education and training facilities, and outdoor and indoor recreational facilities (MyBaseGuide 2018).

DM3.9.2 Base Environmental Consequences

DM3.9.2.1 Population

The current personnel at Davis-Monthan AFB and the projected change anticipated to support the AFRC F-35A mission are provided in Table DM2-3. Implementation of the AFRC F-35A mission would result in a net decrease of 30 full-time mission personnel. This would result in a 0.3 percent decline in the existing base population and a less than 0.01 percent decline in the existing county population. Calculation of this potential decrease in the county population is based on the assumption that all 30 personnel would be full-time and be reassigned to other bases, and that the personnel and any dependents would migrate out of the area. The regional economy is expected to be capable of absorbing the estimated decrease of 14 secondary jobs associated with a decrease in 30 on-base positions.

DM3.9.2.2 Economic Activity (Employment and Earnings)

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would decrease the full-time work force assigned to the base by 30 total personnel (Table DM2-3). Using the IMPLAN model, the direct effect of a net decrease of 30 full-time personnel at Davis-Monthan AFB would have an estimated indirect and induced effect of a loss of up to 14 jobs throughout Pima County. This reduction in employment would not be noticed in the dynamic county environment (IMPLAN 2018).

Construction activities provide economic benefits to surrounding areas through the employment of construction workers and the purchase of materials and equipment. Construction activities

would be temporary and provide a limited economic benefit. Noise associated with construction activities would be limited to within the base boundaries and would not impact economic activity. The USAF estimates that a total of \$87.3 million in MILCON expenditures during 2021-2023 would be associated with implementation of the AFRC F-35A mission at Davis-Monthan AFB. The total expenditures could generate approximately 502 jobs during the construction period, primarily in the construction industry or related industries, and to a lesser extent in real estate, architectural, engineering and related services; retail stores; hospitals; full-service and limited-service restaurants; and employment services. With a labor force of 475,622 people and an unemployment rate of 4.5 percent, it is expected that the local labor force in the ROI and in the surrounding areas would be sufficient to fill these new jobs without a migration of workers into the area. Implementation of the AFRC F-35A mission and projected total MILCON expenditures of \$87.3 million at Davis-Monthan AFB would generate an estimated \$44.5 million in direct, indirect and induced labor income in the ROI. The jobs and related income generated would be temporary (i.e., during the construction activity).

DM3.9.2.3 Housing

Military housing is available at Davis-Monthan AFB. Assuming that all 30 full-time personnel reside off-base and would no longer require off-base housing, the reassignment of 30 full-time positions to another location would make approximately 30 rental and/or owner-occupied units available. Real-estate trends in the Tucson area suggest that the economy would be able to absorb an addition to the supply of residential units.

During scoping, people expressed concern about the potential impact of noise on surrounding property values. All of the properties exposed to DNL of 65 dB or greater are within the AEZ. Since 2004, property transactions require owners to notify buyers that their property is within the AEZ and exposed to aircraft noise. As discussed in more detail in Chapter 3, Section 3.9.3, studies have shown a relation between noise and property values. A study conducted by Trojanek et al (2017) summarized the results from 79 studies; the majority of those studies found that housing values decreased in a range from 0.26 to 1.00 percent for every decibel increase in DNL above 65 dB. Some of the studies had values that decreased less than this range and others decreased more. The requirement to notify buyers of that the subject property is within the AEZ would be expected to result in all properties which have changed ownership since 2004 to have values adjusted for noise. Properties which have not changed ownership since 2004 could experience a noise discount on property values. The exact percent of discount would depend upon a number of factors, including the noise indicators used, thresholds, types of properties evaluated, and other factors.

Table DM3-43 demonstrates that prices for homes in the Southern Arizona region have increased over the last several years, particularly homes within a 1-mile radius of Davis-Monthan AFB, due to economic and population growth in the region. The general impact on home pricing would be the same regardless of which afterburner scenario is selected.

Table DM3-44 shows the total estimated number houses that would be newly exposed to DNL of 65 dB or greater from the AFRC F-35A mission, although many of these homes are located in areas zoned for high noise levels. The estimated number of residents exposed to this level of noise is identified in Tables DM3-10, DM3-12, and DM3-14. The JLUS identifies residential land use in areas subject to DNL in excess of 65 dB as incompatible use. This would include all the estimated houses in Table DM3-44. The JLUS notes that attenuation could mitigate the effects of the DNL exposure on residential use, although higher dB SEL noise would not be fully mitigated.

Table DM3-44. Estimated Houses Exposed to DNL of 65 dB or Greater from Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB

DNL (dB)	Estimated Houses							
	AEZ	Baseline	Scenario A	Change	Scenario B	Change	Scenario C	Change
65-69	6,384	0	806	806	751	751	705	705
70-74	422	0	4	4	3	3	6	6
75-79	55	0	0	0	0	0	0	0
80-84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	6,861	0	810	810	754	754	711	711

DM3.9.2.4 Education

As described in Chapter 3, Section 3.9.3, the total number of dependents, including spouse and children, was estimated at 2.5 times 65 percent of full-time active duty and full-time active reserve. The total number of children was estimated at 1.5 times 65 percent of full-time personnel, because it was assumed each military member would be accompanied by a spouse. Thus, it is estimated that up to 30 dependents would be of school age and would no longer attend schools in Pima County. The projected number of students leaving would represent less than a 0.01 percent decrease of the current total enrollment throughout the 17 districts located in Pima County. Based on the number and size of the school districts in the ROI, as well as class size for the state, it is anticipated that the school capacity in the county would not be adversely impacted. This decrease in students would not be noticed in the dynamic Pima County School System.

During scoping, several people submitted comments regarding the potential noise impacts on children and education facilities. Results of recent reviews on how chronic aircraft noise exposure at school or at homes has been associated with children having poorer reading and memory skills (Basner et al., 2018). Studies also suggest that “children exposed to chronic aircraft noise at school have poorer performance on standardized achievement tests compared to children who are not exposed to aircraft noise” (Basner et al., 2018). Implementation of the AFRC F-35A mission would not expose any schools on base to DNL of 65 dB or greater. However, the off-base Griffin Foundation Schools would be exposed to DNL of 65 dB or greater from all afterburner scenarios. Increased noise impacts to students have been identified as interfering with learning (Section DM3.2.1.3). The number of schools and students impacted by increased noise from Scenario A, B, or C would constitute a significant impact. Measures to reduce noise impacts to children while at school include modification of aircraft operations as described in Section DM3.2.2.

DM3.9.2.5 Public Services

Pima County represents a large community with police, fire, and other services. The estimated reduction of 30 full-time USAF related personnel and dependents would represent decrease of less than 0.01 percent of the existing Pima County population. This decrease would have no discernible effect on public services.

A concern raised during scoping is the potential impact that noise from the F-35A aircraft would have on the quality of life and health of residents. Aircraft noise has a variety of effects such as annoyance, speech interference, sleep interference, hearing loss, and non-auditory health effects. Different individuals perceive and experience noise differently and this could affect their perceived quality of life. The increase in noise from baseline conditions, even though all affected properties are within the AEZ, could interfere with speech and sleep (Sections DM3.2.2.2 and DM3.2.2.4).

Potential non-auditory health impacts due to aircraft noise are discussed in more detail in Section DM3.2.1.7 and Volume II, Appendix B. The USAF continually works with local governments and communities to assess and manage aircraft noise in the environment and attempts to reduce, where possible, the potential impacts of noise to people.

DM3.9.2.6 Base Services

A reduction in the number of personnel would have no discernible effect on revenue generating services on base. Populations on military bases are constantly in flux as deployments and mission personnel changes are assigned.

DM3.9.3 Summary of Socioeconomic Impacts

The personnel decreases and community service requirements of the AFRC F-35A mission (Scenario A, B, or C) at Davis-Monthan AFB would not result in significant impacts to population, economic activity, housing availability, or public services. However, as described in Section DM3.2.2, DNL of 65 dB or greater from Scenarios A, B, or C would result in adverse impacts to housing and significant impacts to schools.

DM3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

The environmental justice analysis considers affected populations that meet certain characteristics based on income and age. Analysis of environmental justice and other sensitive receptors is conducted pursuant to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Environmental justice addresses impacts to minority and low-income populations. This analysis focuses on increased noise resulting from the proposed action as the primary impact to these populations. The USAF guidelines for environmental justice analysis use census data (i.e., percentages of populations identifying themselves as minority, low-income, etc.) to determine potential impacts to these populations. The guidelines also address children (under 18) and elderly (65 and older) as additional sensitive populations. (Minority, low-income, children, and elderly populations are henceforth referred to as environmental justice populations). Tables DM3-10, DM3-12, and DM3-14 list the number of people exposed to DNL of 65 dB or greater from baseline and the three afterburner scenario conditions at Davis Monthan AFB.

This analysis is completed to determine if there are existing disproportionate noise impacts to environmental justice populations (i.e., baseline DNL of 65 dB or greater) and if implementation of the proposed action would result in disproportionate noise impacts to environmental justice populations (i.e., AFRC F-35A mission DNL of 65 dB or greater).

Environmental justice analysis overlays the 65 dB DNL contour on the census data polygons. The smallest census data which has the information necessary for analysis of potential impacts to environmental justice populations is used to determine potential impacts. The smallest group of census data which contain the needed information for this analysis is the Census BG. Each BG that is partially or wholly encompassed by the 65 dB DNL contour is defined as an ROI. There could be few or many ROIs for a specific environmental justice analysis, depending on the extent of the noise contour and the size of the BGs. The next higher level of census data is the Census Tract (CT). Each CT contains a number of BGs (ROIs).

In order to identify disproportionate impacts from baseline or proposed action noise levels, a Community of Comparison (COC) is needed. The COC is defined by summing the population in all the CTs which contain any part of an ROI affected by the 65 dB DNL contour. The percentages of minority and low-income persons are calculated for each ROI (i.e., BG). The ROI and COC percentages are then compared. If the percentage of minorities or low-income persons in an ROI is equal to or greater than the percentage of minorities or low-income persons in the COC, there is a disproportionate impact to the environmental justice population in that ROI (USAF 2014). Chapter 3, Section 3.10.3, provides a description of the method applied to calculate the proportion of the population in the ROIs.

Census blocks are the smallest unit for which the USCB collects census information. **Block Groups (BGs)** are comprised of a combination of census blocks and are a subdivision of **census tracts (CTs)**. Census tracts are a small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting census data. This EIS uses **BGs** and **CTs** in the environmental justice analysis. The **BGs** also comprise the **Region of Influence (ROI)** analyzed in the EIS.

For Davis Monthan AFB, there are six CTs containing nine ROIs (BGs) which are partially or wholly exposed to DNL of 65 dB or greater from the AFRC F-35A mission. Figure DM3-9 presents an overlay of the baseline and AFRC F-35A mission 65 dB DNL contour on the ROIs and the COC.

DM3.10.1 Base Affected Environment

Table DM3-45 provides baseline demographic conditions in Pima County, where Davis-Monthan AFB is located. Also shown in Table DM3-45 is the existing proportion of environmental justice populations in the six CTs located in the proposed action affected area at Davis-Monthan AFB. The six CTs are the COC for the environmental justice analysis. As shown in Table DM3-45, the COC has a higher proportion of minority, low-income, and children populations than Pima County, the State of Arizona, or the nation.

Under baseline conditions, no off-base residential areas or other areas in the AEZ are currently exposed to DNL of 65 dB or greater. No on-base or off-base schools or child care facilities are exposed to DNL of 65 dB or greater under baseline conditions at Davis-Monthan AFB. Additionally, no hospitals, parks, or libraries are exposed to DNL of 65 dB or greater under baseline conditions.

Figure DM3-10 maps the census data minority and low-income populations and Figure DM 3-11 maps the children and elderly populations exposed to DNL of 65 dB or greater resulting from the AFRC F-35A mission at Davis-Monthan AFB. Both figures also show the Census BGs and the CTs used for the environmental justice analysis. Under baseline conditions, no minority or low-income populations are exposed to DNL of 65 dB or greater and there is no existing disproportionate effect to minority or low-income persons (see Table DM3-46).

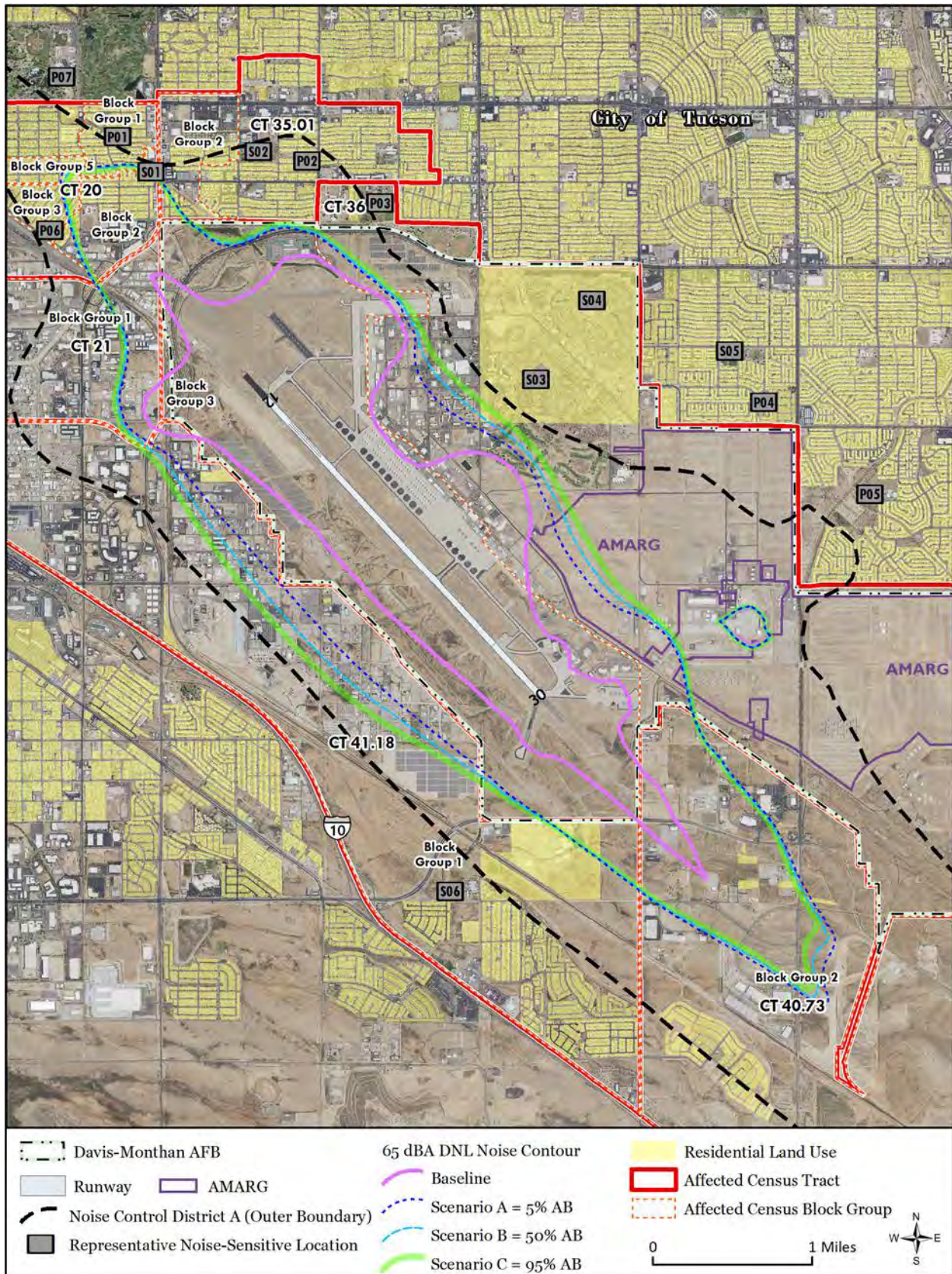


Figure DM3-9. Davis-Monthan AFB Census Tracts and Block Groups Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions

Table DM3-45. Environmental Justice Populations and Demographics for Davis-Monthan AFB

Geographic Unit	Total Population	Population for Whom Poverty is Determined ^a	Minority		Low-Income		Children		Elderly	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
CT 20.00	6,101	6,101	4,387	71.9	600	9.8	1,139	18.7	1,143	18.7
CT 21.00	5,621	5,551	5,120	91.1	1,867	33.6	1,793	31.9	542	9.6
CT 35.01	7,750	7,750	5,477	70.7	2,992	38.6	2,079	26.8	663	8.6
CT 36.00	5,549	4,914	2,571	46.3	756	15.4	2,109	38.0	44	0.1
CT 40.73	4,815	4,767	1,776	36.9	380	8.0	1,318	27.3	402	8.3
CT 41.18	5,032	4,635	3,285	65.3	478	10.3	1,576	31.3	553	11.0
COC	34,868	33,718	22,616	64.9	7,073	21.0	10,014	28.7	3,347	9.6
Pima County	1,007,257	979,062	477,283	47.4	179,569	18.3	218,316	21.7	182,720	18.1
State of Arizona	6,809,946	6,654,096	3,023,528	44.4	1,128,046	17.0	1,622,426	23.8	1,106,362	16.2
United States	321,004,407	313,048,563	123,726,618	38.5	45,650,345	14.6	73,601,279	22.9	47,732,389	14.9

^a Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years of age.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

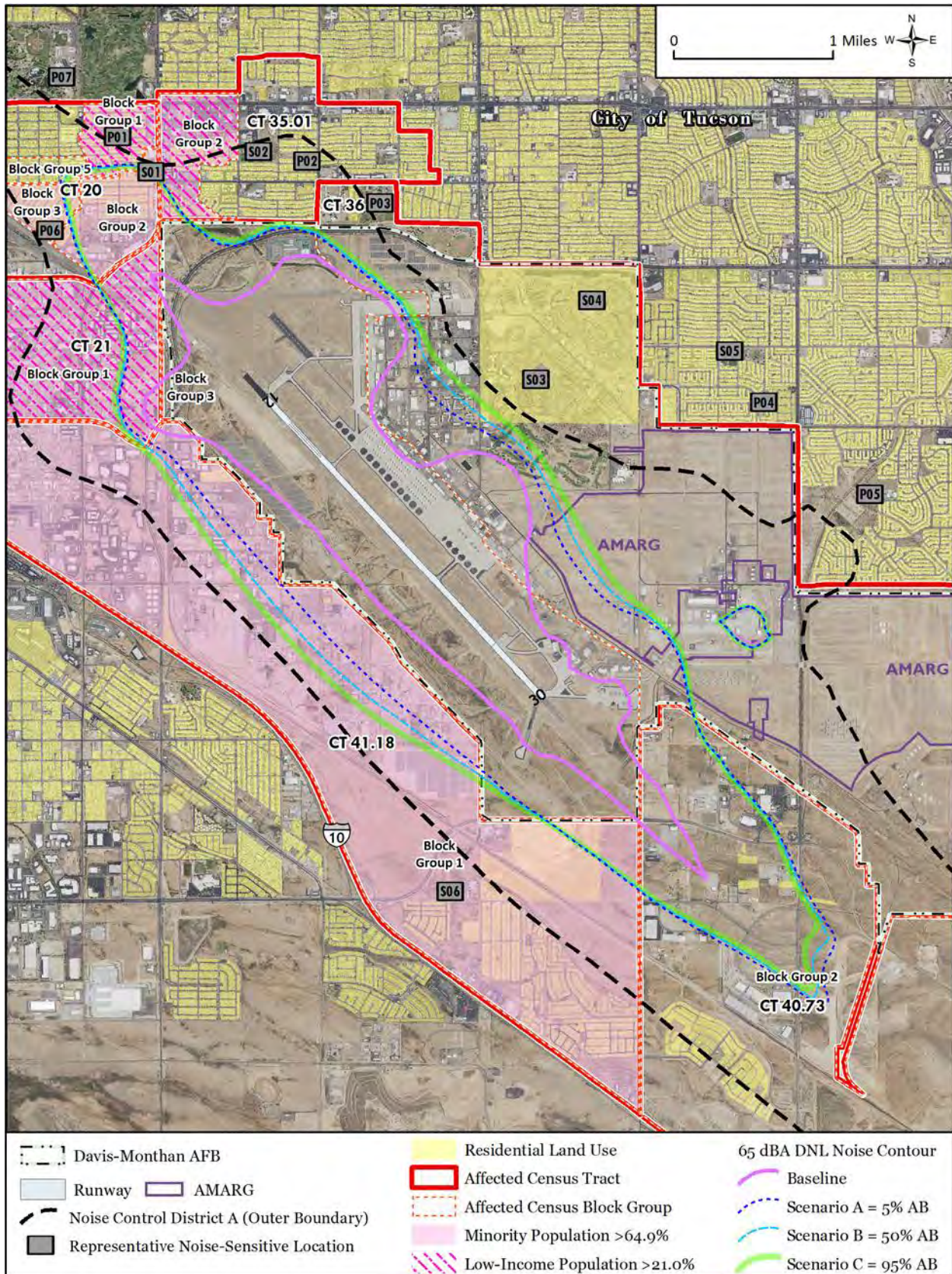


Figure DM3-10. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB

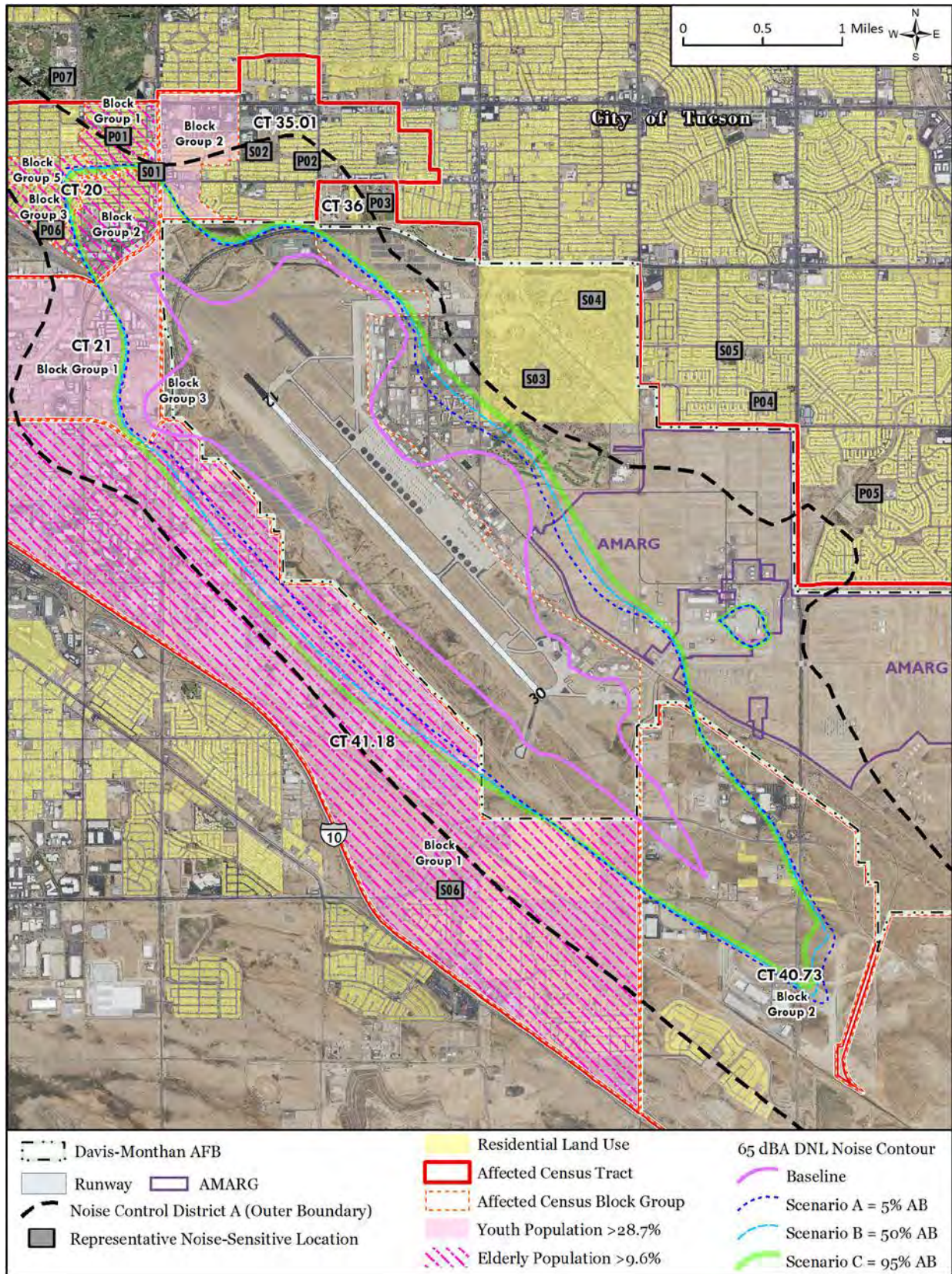


Figure DM3-11. Youth and Elderly Populations and Noise-Sensitive Receptors Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB

DM3.10.2 Base Environmental Consequences

DM3.10.2.1 Scenario A

Based on the analysis results shown in Table DM3-46, implementation of Scenario A would result in disproportionate noise impacts to minority and low-income populations. The proportion of the population that is considered below poverty (low-income) in three of the nine ROIs is greater than the COC (see Table DM3-46). The proportion of the population that identifies themselves as minority in six of the ROIs exceeds the COC. The areas where these populations are located are shown on Figure DM3-10. “If percentages of minority and low-income populations in an ROI are greater than or equal to the corresponding percentages in the COC, then it is presumed that there would be disproportionate impacts to the EJ population” (USAF 2014). “When it is determined that disproportionate impacts on EJ populations will occur,” the EIS is to suggest “potential mitigation for the decision maker.” Mitigations for sound attenuations would have been designed for properties located in the AEZ and constructed or remodeled since 2004. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and Record of Decision (ROD).

The other sensitive populations evaluated in this analysis are children and elderly. Table DM3-47 shows that three of the nine ROIs (BGs) have higher percentages of children than the COC. Five of the ROIs (BGs) have a greater percentage of elderly persons than the COC. Implementation of Scenario A would expose an estimated 281 children and 223 elderly persons to DNL of 65 dB or greater. These children and elderly persons reside in the AEZ and are not currently exposed to DNL of 65 dB or greater. The areas where these populations are located are shown on Figure DM3-11.

Implementation of Scenario A would expose the Griffin Foundation Schools to DNL of 65 dB or greater (Figure DM3-2). During scoping, several people submitted comments regarding the potential noise impacts on children and education facilities. Chronic aircraft noise exposure at school or homes has been associated with children having poorer reading and memory skills (Basner et al., 2018). Studies also suggest that “children exposed to chronic aircraft noise at school have poorer performance on standardized achievement tests compared to children who are not exposed to aircraft noise” (Basner et al. 2018). Section DM3.2.2.3 explains that noise impacts to students have been identified as interfering with learning. Sections DM3.2.2.2 and DM3.2.2.3 describe speech interference and classroom learning disruption associated with increased overflight and noise levels which would adversely impact children and elderly populations. Noise-sensitive locations which would be exposed to DNL of 65 dB or greater are discussed in Section DM3.2.2.1 and Section DM3.8.2.1.1.

Table DM3-46. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario A)

Geographic Units	Population in the Census Area	Baseline					Proposed Action (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 20.00											
1	887	0	69.7	No ^a	21.8	No ^a	101	69.7	Yes	21.8	Yes
2	972	0	84.2	No ^a	20.1	No ^a	877	84.2	Yes	20.1	No
3	493	0	81.3	No ^a	0.0	No ^a	79	81.3	Yes	0.0	No
5	531	0	40.1	No ^a	6.2	No ^a	82	40.1	No	6.2	No
CT 21.00											
1	1,543	0	95.0	No ^a	25.7	No ^a	7	95.0	Yes	25.7	Yes
CT 35.01											
2	1,731	0	85.3	No ^a	38.0	No ^a	198	85.3	Yes	38.0	Yes
CT 36.00											
3	0	0	0.0	No ^a	0.0	No ^a	0	0.0	No	0.0	No
CT 40.73											
2	2,160	0	45.5	No ^a	8.5	No ^a	138	45.5	No	8.5	No
CT 41.18											
1	5,032	0	65.3	No ^a	10.3	No ^a	24	65.3	Yes	10.3	No
ROI Totals	13,349	0	NA	NA	NA	NA	1,506	NA	NA	NA	NA
Community of Comparison	34,868	NA	64.9	NA	21.0	NA	NA	64.9	NA	21.0	NA

^a No disproportionate impacts because this BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI)
3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table DM3-47. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario A)

Geographic Units	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				Proposed Action (Newly Exposed)				
			Children (<18 years)		Elderly (65 years or >)		Children (< 18 years)		Elderly (65 years or >)		
Census BG (ROI)/COC			Percent	Number	Percent	Number	Percent	Number	Percent	Number	
CT 20.00											
1 ^a	887	0	26.9	0	19.4	0	101	26.9	27	19.4	20
2 ^a	972	0	15.1	0	15.9	0	877	15.1	132	15.9	139
3 ^a	493	0	18.9	0	15.0	0	79	18.9	15	15.0	12
5 ^a	531	0	5.6	0	30.1	0	82	5.6	5	30.1	25
CT 21.00											
1 ^a	1,543	0	35.4	0	7.6	0	7	35.4	2	7.6	1
CT 35.01											
2 ^a	1,731	0	29.8	0	4.8	0	198	29.8	59	4.8	10
CT 36.00											
3 ^a	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0
CT 40.73											
2	2,160	0	24.1	0	9.5	0	138	24.1	33	9.5	13
CT 41.18											
1 ^a	5,032	0	31.3	0	11.0	0	24	31.3	8	11.0	3
ROI Totals	13,349	0	NA	0	NA	0	1,506	NA	281	NA	223
COC	34,868	NA	28.7	10,014	9.6	3,347	NA	28.7	10,014	9.6	3,347

^a This BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

DM3.10.2.2 Scenario B

Implementation of Scenario B would result in disproportionate noise impacts to minority populations in six ROIs (BGs) and low-income populations in the three ROIs (BGs) evaluated for this analysis (Table DM3-48 and Figure DM3-10). This scenario would also expose an additional estimated 269 children and 206 elderly persons to DNL of 65 dB or greater (Table DM3-49 and Figure DM3-11). Noise impacts to schools resulting from Scenario B are described in Section DM3.2.2.3.2. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

Table DM3-48. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario B)

Geographic Units	Population in the Census Area	Baseline					Proposed Action (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 20.00											
1	887	0	69.7	No ^a	21.8	No ^a	86	69.7	Yes	21.8	Yes
2	972	0	84.2	No ^a	20.1	No ^a	868	84.2	Yes	20.1	No
3	493	0	81.3	No ^a	0.0	No ^a	68	81.3	Yes	0.0	No
5	531	0	40.1	No ^a	6.2	No ^a	49	40.1	No	6.2	No
CT 21.00											
1	1,543	0	95.0	No ^a	25.7	No ^a	7	95.0	Yes	25.7	Yes
CT 35.01											
2	1,731	0	85.3	No ^a	38.0	No ^a	188	85.3	Yes	38.0	Yes
CT 36.00											
3	0	0	0.0	No ^a	0.0	No ^a	0	0.0	No	0.0	No
CT 40.73											
2	2,160	0	45.5	No ^a	8.5	No ^a	138	45.5	No	8.5	No
CT 41.18											
1	5,032	0	65.3	No ^a	10.3	No ^a	24	65.3	Yes	10.3	No
ROI Totals	13,349	0	NA	NA	NA	NA	1,428	NA	NA	NA	NA
Community of Comparison	34,868	NA	64.9	NA	21.0	NA	NA	64.9	NA	21.0	NA

^a No disproportionate impacts because this BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI)
3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table DM3-49. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario B)

Geographic Units	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				Proposed Action (Newly Exposed)				
			Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 20.00											
1 ^a	887	0	26.9	0	19.4	0	86	26.9	23	19.4	17
2 ^a	972	0	15.1	0	15.9	0	868	15.1	131	15.9	138
3 ^a	493	0	18.9	0	15.0	0	68	18.9	13	15.0	10
5 ^a	531	0	5.6	0	30.1	0	49	5.6	3	30.1	15
CT 21.00											
1 ^a	1,543	0	35.4	0	7.6	0	7	35.4	2	7.6	1
CT 35.01											
2 ^a	1,731	0	29.8	0	4.8	0	188	29.8	56	4.8	9
CT 36.00											
3 ^a	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0
CT 40.73											
2	2,160	0	24.1	0	9.5	0	138	24.1	33	9.5	13
CT 41.18											
1 ^a	5,032	0	31.3	0	11.0	0	24	31.3	8	11.0	3
ROI Totals	13,349	0	NA	0	NA	0	1,428	NA	269	NA	206
COC	34,868	NA	28.7	10,014	9.6	3,347	NA	28.7	10,014	9.6	3,347

^a This BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

DM3.10.2.3 Scenario C

Implementation of Scenario C would result in disproportionate noise impacts to minority populations in six ROIs (BGs) and low-income populations in the three ROIs (BGs) evaluated for this analysis (Table DM3-50 and Figure DM3-10). This scenario would also expose an additional estimated 258 children and 194 elderly persons to DNL of 65 dB or greater (Table DM3-51 and Figure DM3-11). Noise impacts to schools resulting from Scenario C are described in Section DM3.2.2.3.3. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

Table DM3-50. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario C)

Geographic Units	Population in the Census Area	Baseline					Proposed Action (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 20.00											
1	887	0	69.7	No ^a	21.8	No ^a	71	69.7	Yes	21.8	Yes
2	972	0	84.2	No ^a	20.1	No ^a	860	84.2	Yes	20.1	No
3	493	0	81.3	No ^a	0.0	No ^a	57	81.3	Yes	0.0	No
5	531	0	40.1	No ^a	6.2	No ^a	28	40.1	No	6.2	No
CT 21.00											
1	1,543	0	95.0	No ^a	25.7	No ^a	7	95.0	Yes	25.7	Yes
CT 35.01											
2	1,731	0	85.3	No ^a	38.0	No ^a	178	85.3	Yes	38.0	Yes
CT 36.00											
3	0	0	0.0	No ^a	0.0	No ^a	0	0.0	No	0.0	No
CT 40.73											
2	2,160	0	45.5	No ^a	8.5	No ^a	136	45.5	No	8.5	No
CT 41.18											
1	5,032	0	65.3	No ^a	10.3	No ^a	24	65.3	Yes	10.3	No
ROI Totals	13,349	0	NA	NA	NA	NA	1,361	NA	NA	NA	NA
Community of Comparison	34,868	NA	64.9	NA	21.0	NA	NA	64.9	NA	21.0	NA

^a No disproportionate impacts because this BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI)
3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table DM3-51. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Davis-Monthan AFB (Scenario C)

Geographic Units	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				Proposed Action (Newly Exposed)				
			Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
Census BG (ROI)/COC			Percent	Number	Percent	Number			Percent	Number	Percent
CT 20.00											
1 ^a	887	0	26.9	0	19.4	0	71	26.9	19	19.4	14
2 ^a	972	0	15.1	0	15.9	0	860	15.1	130	15.9	137
3 ^a	493	0	18.9	0	15.0	0	57	18.9	11	15.0	9
5 ^a	531	0	5.6	0	30.1	0	28	5.6	2	30.1	8
CT 21.00											
1 ^a	1,543	0	35.4	0	7.6	0	7	35.4	2	7.6	1
CT 35.01											
2 ^a	1,731	0	29.8	0	4.8	0	178	29.8	53	4.8	9
CT 36.00											
3 ^a	0	0	0.0	0	0.0	0	0	0.0	0	0.0	0
CT 40.73											
2	2,160	0	24.1	0	9.5	0	136	24.1	33	9.5	13
CT 41.18											
1 ^a	5,032	0	31.3	0	11.0	0	24	31.3	8	11.0	3
ROI Totals	13,349	0	NA	0	NA	0	1,361	NA	258	NA	194
COC	34,868	NA	28.7	10,014	9.6	3,347	NA	28.7	10,014	9.6	3,347

^a This BG (ROI) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply
2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

DM3.10.3 Summary of Impacts to Environmental Justice and Protection of Children

Based on the analysis described in Section DM3.10.2 and shown in Table DM3-52, implementation of any of the three afterburner scenarios would result in disproportionate impacts to minority and low-income populations. The percentage of the population identifying themselves as minority residing in six ROIs (BGs) that would be exposed to DNL of 65 dB or greater exceeds the percentage of minority populations in the COC. The percentage of the exposed population that is considered below poverty (low-income) residing in three ROIs (BGs) is greater than the percentage of low-income populations in the COC. The estimated number of children and elderly people exposed to DNL of 65 dB or greater from each afterburner scenario are listed in Table DM3-52.

Table DM3-52. Summary of the Minority, Low-Income, Children, and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and the Three Afterburner Scenarios for the AFRC F-35A Mission at Davis-Monthan AFB

Scenario and Baseline/No Action	Disproportionate Impact		Newly Exposed Individuals	
	Minority Populations - Census BGs (ROIs)	Low-Income Populations - Census BGs (ROIs)	Children	Elderly Persons
Baseline/No Action ^a	0 of 9 ^a	0 of 9 ^a	0 ^a	0 ^a
Scenario A	6 of 9	3 of 9	281	223
Scenario B	6 of 9	3 of 9	269	206
Scenario C	6 of 9	3 of 9	258	194

^a Baseline/No Action is the existing conditions and does not include the values for any of the other scenarios.

DM3.11 INFRASTRUCTURE

DM3.11.1 Base Affected Environment

DM3.11.1.1 Potable Water System

Davis-Monthan AFB's potable water demand is met by eight active on-base wells (from a total of 17), which pump water from the Tinaja Beds and the Fort Lowell Formation of the Tucson Basin aquifer. The installation produces, treats, and distributes its own water for consumption and fire protection. Well depths vary between 800 and 1,300 feet deep and operate for 2-3 hours a day to meet demand via a 10-inch-diameter line from the wells to the base (Davis-Monthan AFB 2016c).

Davis-Monthan AFB can supply a maximum of approximately 4.03 million gallons per day (MGD) from the aquifer to meet peak demands. The estimated peak demand is approximately 1.6 MGD and the average demand is approximately 1.18 MGD. The water demand has decreased by greater than 25 percent since 2007 because of substantial investment in landscape xeriscaping and water metering. Reclaimed water use on the base (e.g., golf course) ranges from a summer peak of 9 million gallons per month to winter use of nearly 5 million gallons per month, which equates to approximately 16.7 percent of the total amount of water annually consumed on the base (Davis-Monthan AFB 2016c).

Water storage capacity at Davis-Monthan AFB is handled by a mix of elevated and underground tanks with a capacity of 2.53 million gallons. The potable water distribution system is generally considered adequate to meet existing needs (Davis-Monthan AFB 2016c).

Davis-Monthan AFB's original water distribution system was constructed in the 1950s. Despite the age of the piping, the distribution system and water pressure are in adequate condition, with few leaks or buildup issues. The active wells currently are in good condition, but some could require deeper bore holes to continue operating to full capacity. If water in the Tucson Basin aquifer continues to be consumed without recharge, the base could need to drill additional wells of greater depth to maintain an adequate water supply (Davis-Monthan AFB 2016c).

DM3.11.1.2 Wastewater

The Davis-Monthan AFB sanitary sewer system was installed in the 1960s. This system extends east-west through two 15-inch-diameter pipes and exits in the extreme northwest corner of the installation to the Pima County sanitary sewer system. Most of the sanitary sewer system functions by gravity flow, but the installation does have five lift stations. Pima County treats an average of 0.48 MGD of wastewater discharged from the installation. The peak wastewater demand at Davis-Monthan AFB is 0.72 MGD with the maximum capacity of the Pima County discharge connection

of 3 MGD. The wastewater system is in adequate condition with enough capacity for current and future needs (Davis-Monthan AFB 2016c).

DM3.11.1.3 Stormwater System

Stormwater runoff on Davis-Monthan AFB is managed through a stormwater system consisting of a combination of surface channels and underground infrastructure which currently have adequate capacity to handle most flows. However, during the rainy season from July through September, storms can lead to flooding in portions of the base (Davis-Monthan AFB 2016c). Additional information regarding the stormwater system and associated permits is contained in Section DM3.5.1.2

DM3.11.1.4 Electrical System

Tucson Electric Power provides electricity to the installation via two separate overhead 46-kilovolt (kV) feeder lines that enter on the northeast side of the installation and extend along Wilmot Road to the substation. A single, three-phase, 25 megavolt ampere (MVA) transformer steps the voltage down to 13.8 kV for distribution throughout the base via eight primary circuits. Seven (7) of the 10 transformer switchgears are currently in use and 70 percent of the electrical distribution lines on base are overhead. Davis-Monthan AFB also has 16.4-megawatt (MW) and 6.5-MW solar arrays. The majority of the electrical system is fairly new and in good condition (Davis-Monthan AFB 2016c).

Privatization of the housing electrical system reduced the load on the main transformer and opened a substantial amount of capacity at the substation. The current electrical demand at Davis-Monthan AFB is approximately 16 MVA with the system having a capacity of approximately 25 MVA. The electrical system capacity is considered adequate (Davis-Monthan AFB 2016c).

DM3.11.1.5 Natural Gas System

The natural gas system at Davis-Monthan AFB is supplied by Southwest Gas Corporation through two high-pressure transmission lines connecting to the base at the northwest corner along Valencia Road and the southeast corner along Wilmot Road. Natural gas supplied to installation flows through the utility's regulator and metering station via two 6-inch-diameter, buried, and coated supply lines. All of the main lines are polyethylene plastic, less than 20 years old, and in excellent condition. The natural gas pipeline distribution capacity is 3.4 million cubic feet (MCF) per day with a current demand of approximately 0.36 MCF per day (Davis-Monthan AFB 2016c).

DM3.11.1.6 Solid Waste Management

Municipal solid waste management and compliance at USAF installations is established in AFI 32-7042, *Waste Management*. In general, AFI 32-7042 establishes the requirements for installations to have a solid waste management program to incorporate a solid waste management plan; procedures for handling, storage, collection and disposal of solid waste; record-keeping and reporting; and pollution prevention. Davis-Monthan AFB's Integrated Solid Waste Management Plan (ISWMP) describes the solid waste management and recycling program. The purpose of this program is to maximize the diversion of solid waste from landfills through reuse, donation, and recycling; and to describe Qualified Recycling Program business practices (Davis-Monthan AFB 2015d).

The USAF goal for solid waste reduction is to divert 65 percent of non-hazardous solid waste by 2020 and 60 percent of C&D debris by 2018 (DoD 2012). Davis-Monthan AFB's solid waste and

C&D debris diversion rates in 2014 were 41.38 and 39.30 percent, respectively (Davis-Monthan AFB 2015d).

Municipal solid waste generated at Davis-Monthan AFB that is not recycled is collected by a contractor. The contractor removes and disposes of the refuse in the City of Tucson Los Reales Landfill. No active municipal landfills are located on the installation. Collection of C&D debris generated during contracted facility demolition, renovations, or new construction activity is the responsibility of the contractor performing the work (Davis-Monthan AFB 2015d).

DM3.11.1.7 Transportation

I-10 is located just west of the installation and I-19 is southwest of the installation. I-10 provides east-west access to Phoenix and El Paso, Texas, while I-19 connects Tucson with the Mexican border. Access to the base includes the main gate access on Craycroft Road, additional gate access off Swan, Wilmot, and Irvington Roads.

The City of Tucson does not provide mass transit on Davis-Monthan AFB, although there are nearby bus stops, and there is no direct rail connection to the base. There are officially designated bike paths on base as well as two major pedestrian routes on Kachina and Sixth streets that serve the dormitory area. Additional pedestrian paths are planned for the Airman living areas.

TUS provides air passenger service to several cities where airline hubs provide access worldwide. The airport is located approximately 10 miles from the main gate at Davis-Monthan AFB and can be reached in approximately 15 minutes by car or by airport shuttle bus. Military passenger and military cargo are served by the Military Air Passenger Terminal Building (Building 4819) and the Air Cargo Terminal (Building 4822).

Generally, parking is adequate on Davis-Monthan AFB. However, as is the case with many installations, parking at high use customer-oriented locations can be problematic. The base commissary parking lot experiences parking problems during peak use, especially from 10:30 A.M. to 3:00 P.M. daily. On military paydays and holidays the parking situation is more problematic. An additional 465 spaces are required to address this situation and the expansion of commissary retail space. The base is exploring alternatives to address the parking situation (Davis-Monthan AFB 2008).

DM3.11.1.7.1 Gate Access

Vehicle access to the base is provided through four gates: the main gate access on Craycroft Road, and additional gates off Swan, Wilmot, and Irvington Roads. Current gates meet minimum mission demands. However, throughput for commercial traffic, currently at Swan Gate, needs improvement (Davis-Monthan AFB 2016c).

DM3.11.1.7.2 On-Base Traffic Circulation

Four major, primary roads serve Davis Monthan AFB. Craycroft Road extends generally north/south through the main base, and provides the main entry point to the base. Wilmot Road provides access to the AMARG and the base hospital.

The intersection of Sunglow Road, 5th Street and Yuma Street, begins at the Swan Gate and extends north/south through the base. The Yuma Street extension of these combined arteries intersects with Craycroft Road and Picacho Street. Picacho Street extends east/west and connects with the Yuma Street extension and Wilmot Road.

The major secondary roads on the main base area include: Quijota Road, Arizola Street, Comanche Street, Granite Street Ironwood Street, First Street and Third Street. The AMARG area of Davis-

Monthan AFB is served by Irvington Road, the Wilmot Road extension, Coolidge Street and Wickenburg Streets (Davis-Monthan AFB 2008).

The Davis-Monthan AFB on-base transportation network is sufficient to handle the existing traffic volume. The road system has a good base and requires only minor maintenance repair on its top surface (Davis-Monthan AFB 2016c).

DM3.11.2 Base Environmental Consequences

The projected change in population that would result from implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB is a reduction of 30 base personnel or approximately 0.3 percent of the base population. This projected change in population and development was used to determine the impact on infrastructure. Since the proposed AFRC F-35A mission results in the loss of base personnel, it is assumed that the current demand for the potable water, wastewater, electric, and natural gas systems is sufficient to support the projected change in population. The impact of the proposed AFRC F-35A mission on the transportation infrastructure, would be negligible based on the potential minor reduction of on-base traffic.

DM3.11.2.1 Potable Water System

During scoping, people submitted comments about the potential for the AFRC F-35A mission to increase water use. Implementation of the AFRC F-35A mission would result in a decrease (30 employees) in personnel. Based on the average usage rate of 175 GPD per person, it is anticipated that the decrease in population associated with the proposed mission would lower the water use demand at Davis Monthan AFB by approximately 5,250 GPD (175 GPD x 30). This decrease would have no effect on the ability to supply water, and the overall impacts would not be significant. In addition to water use by on-base personnel, O&M of the F-35A aircraft is not anticipated to have any additional water requirements above and beyond what is currently required for A-10 aircraft. Therefore, significant impacts to potable water would not result from implementation of the AFRC F-35A mission.

DM3.11.2.2 Wastewater

The USEPA estimates that the average person generates approximately 120 GPD of wastewater between showering, toilet use, and general water use (USEPA 2014). Based on this rate, the proposed decrease in population (i.e., 120 people) would lower the wastewater discharge from Davis-Monthan AFB by 3,600 GPD. This decrease would have no effect on the ability to handle and treat wastewater, and the overall impacts would not be significant.

DM3.11.2.3 Stormwater System

The proposed AFRC F-35A mission would require demolition of facilities and construction of new facilities. All of the infrastructure development would occur in the existing developed base flightline and other developed portions of the base. The total disturbed area associated with these projects would be approximately 15.2 acres and impacts would not be significant.

During the short-term construction period, all contractors would be required to comply with applicable statutes, standards, regulations, and procedures regarding stormwater management. During the design phase, a variety of stormwater controls could be incorporated into construction plans. These could include planting vegetation in disturbed areas as soon as possible after construction; constructing retention facilities; and implementing structural controls (e.g.,

interceptor dikes, swales [excavated depressions], silt fences, straw bales, and other storm drain inlet protection), as necessary, to prevent sediment from entering inlet structures.

DM3.11.2.4 Electrical System

The U.S. Energy Information Administration (USEIA) estimates that the average household in Arizona uses 9.826 megawatt hours (MWh) per year (USEIA 2016). The proposed decrease in population would lower the electrical use at Davis Monthan AFB by 2,951 MWh per year. This decrease would have no effect on the power supply limit from Tucson Electric Power and the overall impacts would not be significant.

DM3.11.2.5 Natural Gas System

The natural gas system at Davis Monthan AFB is supplied by Southwest Gas Corporation and has a delivery capacity of 3.4 MCF per day. The current demand is approximately 0.36 MCF per day. A decrease in population of 30 personnel would have no effect on the natural gas supply limit and the overall impacts would not be significant.

DM3.11.2.6 Solid Waste Management

Solid waste would continue to be managed in accordance with AFI 32-7042 and the ISWMP with the implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB. Using methodology developed by the USEPA (USEPA 2009b), it is estimated that implementation of the proposed AFRC F-35A mission would generate approximately 5,559 tons of C&D debris for recycling or removal to landfills. Application of the 60 percent DoD target diversion rate (DoD 2012) for C&D debris would result in approximately 3,335 tons being reused or recycled, and approximately 2,224 tons being placed in a permitted construction debris landfill in the region. C&D debris is the responsibility of the contractor performing the work, and contract documents require disposal in a permitted construction debris landfill. C&D debris is usually disposed of at the Speedway Landfill (a C&D landfill operated by the Fairfax Management Company), although other landfills in the area are permitted to accept C&D debris (Davis-Monthan AFB 2015d). Additionally, solid waste generated from the proposed renovation and repair of the airfield pavement, apron, and ramp projects (see Table DM2-1), would be recycled and reused as aggregate for the concrete and asphalt used in those projects.

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in a reduction of 30 personnel and their associated dependents resulting in a minor decrease in municipal solid waste generation having little effect on the municipal solid program (collection, disposal, etc.). The City of Tucson Los Reales Landfill has an estimated life span of 47 years and would continue to accommodate the municipal solid waste from Davis-Monthan AFB (Davis-Monthan AFB 2015d). The overall impacts would not be significant.

Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the base. C&D debris, including debris contaminated with hazardous waste, ACM, lead-based paint (LBP), or other hazardous components, would be managed in accordance with AFI 32-7042 and the installation's ISWMP.

DM3.11.2.7 Transportation

Implementation of the proposed AFRC F-35A mission would not alter traffic circulation on the base. Haul routes related to C&D have not been established, but would be routed to avoid base housing areas, and other noise-sensitive areas as much as practicable. Truck traffic could lead to the

degradation of road surfaces over an extended period of use. Construction truck traffic and construction workers commuting to the project sites would generate minor increases in vehicle trips per day on base roadways and increase congestion at the gates.

At project sites, temporary lane closures could be necessary during C&D activities. Appropriate signage and detour to maintain access would be provided. These impacts would be short-term and temporary, occurring only for the duration of the construction period.

Implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in a reduction of 30 personnel and their associated dependents, which would result in little to no effect to gate access or on- and off-installation traffic and transportation systems.

DM3.11.3 Summary of Impacts to Infrastructure

Implementation of the AFRC F-35A mission would not result in changes to any of the utility infrastructure (potable water, wastewater, stormwater, electricity, natural gas and solid waste) on Davis-Monthan AFB. In addition, the new mission would also not require any changes to transportation resources including any of the base gates. Therefore, implementation of the new mission would result in negligible impacts to infrastructure.

DM3.12 HAZARDOUS MATERIALS AND WASTE

DM3.12.1 Base Affected Environment

DM3.12.1.1 Hazardous Materials

Hazardous materials used by USAF and contractor personnel at Davis-Monthan AFB are managed in accordance with the Hazardous Materials Management Plan (Davis-Monthan AFB 2015e). This plan is written in accordance with and to aid in the implementation of AFI 32-7086, *Hazardous Materials Management*. Hazardous materials are controlled through the base Hazardous Materials Storage Facility and Enterprise Environmental, Safety, and Occupational Health Management Information System (EESOH-MIS). The purpose of this system is to track the procurement, storage, distribution, use, reuse, recycling, and disposal of hazardous materials at Davis-Monthan AFB.

DM3.12.1.1.1 Aboveground and Underground Storage Tanks

The Davis-Monthan AFB Spill Prevention, Control, and Countermeasures (SPCC) Plan outlines the procedures to prevent, control, and/or mitigate releases of oil and other petroleum substances. Davis-Monthan AFB made a determination under 40 *CFR* 112.20(e), as recorded in the “Certification of Applicability of Substantial Harm Criteria,” that the facility does not pose a risk of substantial harm. Therefore, a Facility Response Plan (FRP) is not required for Davis-Monthan AFB (Davis-Monthan AFB 2018). The SPCC Plan and Installation Emergency Management Plan (IEMP) 10-2 address roles, responsibilities, and response actions for all major spills (Davis-Monthan 2017b).

Davis-Monthan AFB has 11 aboveground storage tanks (ASTs) with capacities greater than 10,000 gallons. These ASTs are located throughout the installation and are used to store Jet-A, diesel, oil and used oil. Davis-Monthan AFB also manages 39 underground storage tanks (USTs). The total Jet-A storage capacity at Davis-Monthan AFB is approximately 8,800,000 gallons (Davis-Monthan AFB 2018). Davis-Monthan AFB used an average of approximately 20,525,000 gallons of Jet-A per year over the last three years. Davis-Monthan AFB receives fuel through a 6-inch commercial pipeline or by commercial tank trucks if the pipeline is inoperative. Jet-A is delivered to the flightline via Type III hydrant system with nine (9) outlets/pits for refueling aircraft and two

loading racks used for issuing fuel to refueling trucks. The 924 FG A-10 aircraft are issued fuel via 11 refueling trucks (R-11) (Davis-Monthan AFB 2018).

DM3.12.1.1.2 Toxic Substances

The Facility Asbestos Plan establishes the responsibilities and procedures for properly managing facilities with ACM at Davis-Monthan AFB (Davis-Monthan AFB 2010). An additional plan, the Asbestos Management Plan for Davis-Monthan AFB, supplements the Facility Asbestos Plan. The Asbestos Management Plan provides documentation for all asbestos management efforts and the procedures for carrying out the asbestos management program. The plan also presents organizational responsibilities and procedures for ensuring base compliance with applicable USEPA and OSHA requirements (Davis-Monthan AFB 2009). The Civil Engineering Squadron maintains a permanent file documenting the amount, status, and condition of ACM in base facilities. Based on these plans, all proposed facility demolition and renovation projects must be reviewed by a USEPA-certified accredited asbestos building inspector to identify the presence of ACM prior to work beginning. PDEQ requires a permit for any demolition of buildings which are 100 square feet or greater as well as a permit for the removal of ACM. Work on all ACM abatement for renovation or demolition projects would only be performed by contractor personnel who will follow all local, state, and federal laws concerning asbestos removal and abatement. ACM wastes are removed by the contractor performing the work and handled and disposed of in accordance with federal, state, and local regulations at a waste disposal site authorized to accept such waste (Davis-Monthan AFB 2009, 2010).

The Davis-Monthan AFB Lead-Based Paint Management and Operations Plan (Davis-Monthan AFB 2007) provides guidance and establishes procedures for the management of LBP and the implementation of the LBP program. This plan also defines management and organizational responsibilities and procedures for ensuring that personnel at Davis-Monthan AFB are not exposed to lead poisoning. The Civil Engineering Squadron maintains an LBP Survey database to document the location of LBP. This database is updated after each abatement project. The design of building alteration projects and requests for self-help projects are reviewed to determine if lead-containing materials are present in the proposed work area. For every project on Davis-Monthan AFB, LBP wastes are removed by the contractor and disposed of in accordance with state and federal regulations at a permitted off-base landfill.

The electrical systems (transformers, light ballasts, etc.) at Davis-Monthan AFB are polychlorinated biphenyl (PCB)-free (Shore 2018). However, transistors from old aircraft at AMARG are routinely found and disposed of in accordance with the Hazardous Waste Management Plan (HWMP) (Davis-Monthan AFB 2017c) and federal and state laws and regulations.

DM3.12.1.2 Hazardous Waste Management

Davis-Monthan AFB is classified as a Large-Quantity Generator. Hazardous waste generated, stored, transported, or disposed of by Davis-Monthan AFB is regulated by the State of Arizona under authority granted to the state by the USEPA. Typical hazardous wastes generated during O&M activities include flammable solvents, contaminated fuels and lubricants, paint/coating, stripping chemicals, waste oils, blast media, waste paint-related materials, and other miscellaneous wastes.

Hazardous wastes at Davis-Monthan AFB are managed in accordance with the HWMP (Davis-Monthan AFB 2017c). This plan covers the management of hazardous wastes from the point the material becomes a hazardous waste to the point of ultimate disposal, as required by federal and

state laws and regulations. In 2016, the base generated approximately 98,851 pounds of hazardous waste, which was disposed of at off-base permitted disposal facilities.

DM3.12.1.3 Environmental Restoration Program

There are 55 Installation Restoration Program (IRP) sites at Davis-Monthan AFB. Of the 55 sites, 43 sites are closed, 8 are no further response action planned, and 4 are active sites. Environmental response actions at Davis-Monthan AFB are planned and executed under the IRP/Environmental Restoration Program (ERP) in a manner consistent with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and other applicable laws. Davis-Monthan AFB is not listed on the USEPA's National Priorities List (Davis-Monthan AFB 2017d).

DM3.12.2 Base Environmental Consequences

DM3.12.2.1 Hazardous Materials Management

Implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would not add any new hazardous materials that would exceed the base's current hazardous waste processes. Existing procedures for the centralized management of the storage, distribution, use, reuse, recycling, and disposal of hazardous materials through the base Hazardous Materials Storage Facility and EESOH-MIS are adequate to accommodate the changes anticipated with the replacement of the A-10 mission with the AFRC F-35A mission.

The F-35A was designed to reduce the quantities and types of hazardous materials needed for maintenance of the aircraft. Unlike the A-10 aircraft, the F-35A aircraft does not use cadmium fasteners, chrome plating, copper-beryllium bushings, or primers containing cadmium and hexavalent chromium. No adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at Davis-Monthan AFB. Long-term environmental benefits from the reduced use of hazardous materials are anticipated.

The F-35A aircraft is composed of composite materials, such as carbon fiber, which could pose a health risk under specific circumstances (e.g., when burned as a result of an aircraft crash). Section DM3.4.2.4.2 discusses composite materials and emergency crash response.

DM3.12.2.1.1 Aboveground and Underground Storage Tanks

New and remodeled facilities would require the addition of new ASTs to support generators, as well as new hazardous material and waste containers. The new and remodeled facilities would be constructed with berms and drains leading to oil-water separators (OWSs), if required, to contain potential uncontrolled releases of petroleum products. No ASTs, USTs, or OWSs would be removed with the proposed construction, demolition, or renovation projects. The Davis-Monthan AFB SPCC Plan and IEMP 10-2 would subsequently need to be revised to incorporate any changes in facility design, construction operation, or maintenance that materially affects the potential for an uncontrolled release of petroleum products (Davis-Monthan AFB 2018, 2017b).

DM3.12.2.1.2 Toxic Substances

Several demolition and renovation projects are planned as part of the proposed AFRC F-35A mission. Any construction, demolition, or renovation project proposed at Davis-Monthan AFB would be reviewed to determine if ACM is present. As shown in Table DM3-53, Buildings 1358, 5111, 5247, and 5251 are proposed for modification and could potentially contain ACM. All

handling and disposal of ACM wastes would be performed in accordance with the Davis-Monthan AFB Facility Asbestos Plan, Asbestos Management Plan (Davis-Monthan AFB 2009, 2010), and in compliance with federal, state, and local regulations. Before initiating any demolition or ACM work, required notifications to the PDEQ would be completed. This notification must be submitted 10 working days before the planned work start date with an Asbestos NESHAP Activity Permit Application and Notification of Demolition and Renovation (if applicable). A PDEQ Activity Permit must be received before work begins. Work on ACM projects would only be conducted by contractor personnel who follow all local, state, and federal laws concerning asbestos removal and abatement. All ACM wastes would be disposed of at an approved landfill.

Table DM3-53. Toxic Substances Associated with Projects for the AFRC F-35A Mission at Davis-Monthan AFB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 5247	1953	a	b	c
Building 5251	1971	a	b	c
Renovation				
Building 5111 addition for hazardous materials storage, renovation for collateral storage	1954	a	b	c
Building 404 medical building addition	2008	d	d	c
Building 1358 renovation for the security forces facility modifications	1980	a	b	c
Refurbish 23 sunshades to hardened tops (change tops of existing structures)	Various	a	b	c

^a Buildings constructed before 1980 are assumed to potentially contain ACM (AFI 32-1052, *Facilities Asbestos Management*).

^b Building assumed to potentially contain LBP. Paints produced prior to 27 February 1978 were lead-based (Davis-Monthan AFB 2007).

^c Base facilities are PCB-free (Shore 2018).

^d Buildings constructed after 1980 are presumed to not contain ACM or LBP.

All construction, demolition, and renovation projects proposed at Davis-Monthan AFB would be reviewed to determine if LBP or lead containing materials are present, and whether such materials would be disturbed. To the extent possible, the presence of lead within the work area would be identified prior to work beginning. Table DM3-53 contains a list of buildings (Buildings 1358, 5111, 5247, and 5251) proposed for modification that have the potential to contain LBP or lead-containing material. If the presence of lead containing material in the project work area is unknown, the shop and real property records would be reviewed to determine the presence of lead. If the presence of lead containing material in the work area is still unknown, sampling and analysis for lead would be conducted. The handling and disposal of lead wastes would be conducted in accordance with the Davis-Monthan AFB Lead-Based Paint Management and Operations Plan and HWMP (Davis-Monthan AFB 2007, 2017c), and in compliance with federal, state, and local requirements and regulations.

Although minor increases in the management requirements for ACM and LBP removal are anticipated, no adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at Davis-Monthan AFB. Long-term environmental benefits from removal of toxic substances are anticipated.

DM3.12.2.2 Hazardous Waste Management

Davis-Monthan AFB would continue to operate as a Large-Quantity Generator and would generate hazardous wastes during various O&M activities associated with the proposed AFRC F-35A mission. Waste-associated maintenance materials include adhesives, sealants, conversion coatings, corrosion prevention compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners,

cleaners, strippers, tapes, and wipes. No new hazardous materials would be added that exceed the base's current hazardous waste processes. The Davis-Monthan AFB HWMP (Davis-Monthan AFB 2017c) would be updated to reflect any changes in disposal procedures or hazardous waste generators and waste accumulation points.

During scoping, several people submitted comments concerning hazardous materials used for O&M of the F-35A aircraft. Implementation of the AFRC F-35A mission at Davis-Monthan AFB would potentially have a beneficial impact on hazardous waste management. Transition from the A-10 to the F-35A would decrease the volume and types of hazardous waste and waste streams because O&M involving cadmium and hexavalent chromium primer and various heavy metals have been eliminated or greatly reduced. All hazardous wastes would be handled and managed in accordance with federal, state, and local regulations.

DM3.12.2.3 Environmental Restoration Program

There are 55 IRP sites at Davis-Monthan AFB. Environmental response actions at these sites are planned and executed under the ERP in a manner consistent with CERCLA, RCRA, and other applicable laws. None of the proposed construction, demolition, or renovation projects associated with the proposed AFRC F-35A mission at Davis-Monthan AFB are on or directly adjacent to active IRP sites. During scoping, people submitted comments regarding contamination and hazardous waste sites. The USAF addresses these matters with both state and federal regulatory agencies. None of the AFRC F-35A construction would affect any of these contaminated sites. However, there is the possibility that undocumented contaminated soils and/or groundwater from historical fuel spills may be present. If encountered during C&D-related excavations, storage/transport/disposal of contaminated groundwater/soils would be conducted in accordance with applicable federal, state, and local regulations; AFIs; and base policies. Should soil or groundwater contaminants be encountered during C&D activities, health and safety precautions, including worker awareness training, would be required.

DM3.12.3 Summary of Impacts to Hazardous Materials and Waste

Implementation of the new mission would not add any new hazardous materials that would exceed the base's current processes. No ASTs, USTs or OWSs would be removed. Four of the buildings proposed for demolition could contain ACM and LBP. Prior to demolition, Davis-Monthan AFB would complete the appropriate notifications and complete the abatement work in accordance with applicable plans and per all local, state and federal requirements. None of the construction would affect ERP sites. Should contaminated media be encountered during construction, storage/transport/disposal of contaminated media would be conducted in accordance with base plans and applicable regulations. Implementation of the new mission would not result in significant impacts to hazardous materials and wastes.

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DM4.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (federal or non-federal) undertakes such other actions” (40 *CFR* 1508.7). In this section, an effort has been made to identify past and present actions in the Davis-Monthan AFB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the AFRC F-35A mission at Davis-Monthan AFB are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the AFRC F-35A mission at Davis-Monthan AFB and in associated airspace.

Davis-Monthan AFB is an active military installation that undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analyses will be conducted, as necessary.

DM4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

In 1976, after 30 years of flying B-29s, B-47s, F-86s, and F-4s under the Strategic Air Command, Davis-Monthan AFB was transferred to the Tactical Air Command. During that same year, the 355 FW received its first group of A-10A Thunderbolts. Since 1979, Davis-Monthan AFB has been the only training location for A-10 pilots in the United States. From 1975 to 2017, the ANG had responsibility for conducting the Operation Snowbird program. In 2002, ACC completed the West Coast Combat Search and Rescue beddown at Davis-Monthan. This beddown involved HH-60 helicopters and HC-130 aircraft and brought 1,095 new personnel to the installation.

Table DM4-1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the beddown of F-35A at Davis-Monthan AFB. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the AFRC F-35A mission at Davis-Monthan AFB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Davis-Monthan AFB and training airspace.

Table DM4-1. Past, Present, and Reasonably Foreseeable Actions at Davis-Monthan AFB and Associated Region

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions				
Davis-Monthan AFB IDP	355 FW Davis-Monthan AFB	Future	The proposed action includes the implementation of 16 representative projects, which include MILCON, additions and renovations, and demolition projects. Implementation of these projects would provide for the continuously evolving mission of the 355 FW and their tenants. Proposed projects meet applicable DoD installation master planning criteria.	Noise, Air Quality, Safety, Soil and Water Resources, Transportation
Angel Thunder	USAF Davis-Monthan AFB	Present and Future	As part of this project, the USAF would conduct biannual personnel recovery (PR) training operations using DoD and non-DoD landing zones, drop zones, ground training sites and aircraft sorties.	Airspace, Noise, Air Quality, Land Use and Recreation
BMGR Land Withdrawal and Projects	USAF and Navy/ Arizona and New Mexico	Future	The BMGR land withdrawal will terminate in October 2024. The USAF and Navy will file an application to extend the land withdrawal to serve the continuing military need for this range. In separate actions, Range 3 has been converted to a helicopter gunnery range. A new taxiway at the Gila Bend Auxiliary Airfield has been approved but not constructed, and the construction of a moving vehicle target range in the North Tactical Range has also been approved but not completed.	Airspace, Noise, Air Quality, Safety, Biological Resources, Land Use and Recreation
SUA Reconfigurations	USAF	Future	Various concepts for a Tombstone MOA redesign are under consideration. These concepts include the possibility of new RA and an expansion of the MOA to the north. In addition, a Regional Airspace Optimization Study is being considered along with a study for the Playas MOA.	Airspace, Noise, Safety, Land Use and Recreation
RA R-2301E	USAF	Future	Lowering the operational floor of R-2301E to 500 feet over the Cabeza Prieta National Wildlife Refuge has been proposed but will not be implemented until an agreement between the Department of Interior and the DoD has been negotiated. Lowering the floor would allow fixed-wing pilots to perform realistic low-level attacks on targets in the South Tactical Range.	Airspace, Noise, Safety, Biological Resources, Land Use and Recreation
EC-130 Rehost	355 FW Davis-Monthan AFB	Future	The current 14 EC-130H aircraft at Davis-Monthan AFB would be replaced with 10 EC-37B aircraft. Pilots would be trained commercially and the aircraft would be maintained by contractors. - Manpower Reduction of 516 (49 Operations, 467 Maintenance: 5 Officers, 467 Enlisted) - 755th Aircraft Maintenance Squadron Flag Stand down - Contract Maintenance Support end state to be determined, expected to be between 125-130 contract personal	Airspace, Noise, Safety, Air Quality, Land Use and Recreation, Transportation, Socioeconomics

Table DM4-1. Past, Present, and Reasonably Foreseeable Actions at Davis-Monthan AFB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions (Continued)				
2009 Solar Power System Environmental Assessment (EA)	355 FW Davis-Monthan AFB	Past, Present, Future	The USAF proposes to allow the construction of a solar power system at Davis-Monthan AFB. The USAF would lease 3 noncontiguous parcels (Chevron Parcel [54 acres], West Airfield Parcel [155 acres], and the Valencia Road Parcel [38 acres]) of land to a private contractor, who would construct and maintain the facility. The solar power system would generate a minimum of 1 MW of electricity for use by Davis-Monthan AFB. This would reduce electricity expenses paid by the base, and also comply with the Energy Policy Act of 2005	Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Cultural Resources, Land Use and Recreation, Transportation
Personnel Recovery (PR) Training	USAF	Present/Future	The proposed action is to provide PR training for regular USAF, Army, Navy, and U.S. Marine Corps (USMC) units; special forces; and other federal and state agencies. The training program would involve ground, water, and flight/airspace activities. The PR Program centered out of Davis-Monthan AFB would utilize unique training environments across four states: Arizona, California, Nevada, and New Mexico. The proposed PR training sites could be located on federal, tribal, state, municipal, or private lands; on sites that have been previously disturbed or are currently disturbed; or on sites previously used for similar activities. An EA is currently being prepared that will include detailed information on this action.	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Cultural Resources, Land Use and Recreation
HH-60 Beddown	ACC	Future	This action would beddown 14 HH-60 Aircraft and 400 personnel from Nellis AFB at Davis-Monthan AFB.	Airspace, Noise, Air Quality, Safety, Land Use and Recreation, Traffic, Socioeconomics
RC-26 Beddown	162 ANG 355 FW Davis-Monthan AFB	Future	This action would relocate one RC-26 aircraft and associated manpower to Davis-Monthan AFB in existing facilities. This project would also consolidate 214th Attack Group assets and operations in a common location. The manpower footprint of the RC-26 program includes 9 aircrew (5-6 full time), 1 full-time administrative support staff, and 3 full-time contract logistics support/maintenance personnel. Operational activities average one 4-5 hour sortie per day (time of day dependent upon customer requirements), 27 sorties per month, and 324 sorties per year.	Airspace, Noise, Air Quality, Safety, Land Use and Recreation, Socioeconomics

Table DM4-1. Past, Present, and Reasonably Foreseeable Actions at Davis-Monthan AFB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions (Continued)				
Future F-35A Beddowns	ACC/ANG/AFRC	Future	During the AFRC F-35A scoping period, a member of the public requested future beddowns of F-35A aircraft be considered in cumulative impacts since the USAF had announced that the F-35A would replace the existing USAF fighter inventory, which includes the A-10. At this time it is unknown how long existing A-10 aircraft would remain at Davis-Monthan AFB and if those A-10 aircraft would be replaced by F-35A aircraft or a different aircraft mission. It is also unknown when or if Davis-Monthan AFB or TUS would be considered in those basing actions. All future beddowns would comply with NEPA and would be evaluated for environmental impacts.	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Cultural Resources, Land Use and Recreation, Socioeconomics, Environmental Justice and Protection of Children, Infrastructure, Hazardous Materials and Waste
Taiwan Air Force (TAF) to TUS Beddown	162 ANG (TUS)	Future	This project involves relocation of 14 TAF F-16 aircraft and associated personnel from their current location to Tucson ANGB. Infrastructure improvements at Tucson ANGB would include the reconfiguration of aircraft sunshades, interior renovations and minor additions to Buildings 1 and 40, construction of a new entry control facility, and in-kind replacement of Aerovation Hangar on Tucson Airport Authority (TAA) property. This relocation would result in an approximate 16 percent increase in F-16 operations from TUS.	Airspace, Noise, Air Quality, Safety, Biological Resources, Land Use and Recreation
Army General Instructional Building	USAF	Present, Future	This project involves the construction of a General Instruction Building across from the North Ramp and the CBP HQ building. The proposed action would add approximately 159 permanent staff and approximately 126 transient students to the base population.	Noise, Air Quality, Safety, Soil and Water Resources, Transportation, Socioeconomics
BMGR Future aircraft and weapons (F-22A, F-18 E/F, MV-22/CV-22, Joint Strike Fighter, Joint Direct Attack Munitions, other stand-off weapons)	USAF		New aircraft and weapons for the USAF, USMC, and Navy are being developed or entering production. These aircraft and weapons will replace those currently in use throughout the armed forces. BMGR is a likely candidate for continued military training using these new aircraft weapon systems. Navy environmental studies evaluating potential home bases for the MV-22 and Joint Strike Fighter are underway and are expected to include training operations within the BMGR (date unknown). The USAF is also evaluating potential home bases for the F-35 adversary air training, to include training operations with the BMGR.	Airspace, Noise, Air Quality, Safety, Biological Resources, Cultural Resources, Land Use and Recreation
Marine Corps Air Station (MCAS) Yuma	USMC	Past	The Navy approved development of the Auxiliary Landing Field complex to support USMC F-35B training in 2010 for West Coast basing of the F-35B. Construction was completed in 2015.	Airspace, Noise, Air Quality, Safety,

Table DM4-1. Past, Present, and Reasonably Foreseeable Actions at Davis-Monthan AFB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions (Continued)				
Libby Army Airfield	U. S. Army - Fort Huachuca	Future	Two projects are proposed for improvements at the Libby Army Airfield. The Airfield North project is an Enhanced Use Lease of 203 acres and uses could include aircraft activity. The Airfield South, Mission Expansion Plan includes 146 acres south of Libby Army Airfield managed to support potential missions requiring proximity to Libby Army Airfield within the base's secure area (USCBP 2015).	Airspace, Noise, Air Quality, Safety,
Non-Military (Federal) Actions				
Border Wall	Department of Homeland Security/ South of Tucson	Future	Increased government spending on border protection could increase aircraft, vehicle and other operations at and near Davis-Monthan AFB.	Noise, Airspace Air Quality, Land Use and Recreation, Transportation
State and Local				
TUS Proposed Safety Enhancement Project	FAA	Present and Future	The FAA is currently preparing an EIS for safety improvements at TUS. These improvements include relocation of Runway 11R/29L, demolition of existing Runway 11R/39L, construction of new center parallel and connecting taxiway system, land acquisition, relocation of navigational aids and development and/or modification of associated arrival departure procedures for the relocated runway, and demolition and replacement of 12 earth-covered magazines.	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Transportation, Land Use and Recreation, Socioeconomics
TUS Part 150 Program Update	TAA	Present	In 2012, the TAA initiated a Part 150 Noise Program Update. On 9 September 2013, the FAA approved the Noise Compatibility Program for TUS.	Noise, Land Use and Recreation, Environmental Justice
Miracle Point Apartment Complex	Arizona Department of Housing/central Tucson area	Present	Construction of 34 one-bedroom and 6 two-bedroom, single-story units in an attached town house configuration	Noise, Air Quality, Land Use and Recreation
Tucson Downtown Links Project	Pinal Regional Transportation Authority	Present and Future	The third and final phase of this project will take drivers from Barraza-Aviation Parkway to I-10 on a new four-lane road that bypasses the frequently congested downtown area.	Noise, Air Quality, Transportation
Private Actions				
20-story Office Tower	Private Developer/Central Tucson	Future	Construction of a 300-foot tall, 250,000 square foot office tower with an associated parking area.	Noise, Air Quality, Land Use and Recreation, Soil and Water Resources, Socioeconomics, Infrastructure
Subdivision Development near Davis-Monthan AFB	Private	Past, Present, Future	Numerous developments are in progress near the installation. These include Rocking K (undeveloped to date), Ranch del Lago (nearly completed), Santa Rita Ranch (approximately 25 percent completed), and Santa Rita Mountain Ranch (approximately 30 percent completed).	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Socioeconomics, Infrastructure

Table DM4-1. Past, Present, and Reasonably Foreseeable Actions at Davis-Monthan AFB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Private Actions (Continued)				
Port of Tucson	Private	Past, Present, Future	420 acres zoned in 1988 and 2009 for industrial uses. Approximately 15 percent complete.	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Socioeconomics, Infrastructure
Verano (Swan Southlands)	Private	Past, Present, Future	This site was originally zoned primarily for residential use but zoning was subsequently amended to include a greater mix of non-residential uses. Although there has been no residential development, a large solar farm is proposed for this site.	Airspace, Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources
Southline Transmission Project	Southline Transmission, LLC	Present	New electric transmission line to be built in 2 sections. The new build Section is construction of approximately 240 miles of new 345-kV, double-circuit lines in New Mexico and Arizona. The Upgrade Section would convert approximately 120 miles of existing single-circuit, 115- kV transmission lines, currently owned by the Western Area Power Administration, to double-circuit 230-kV lines between the existing Apache Substation and the existing Saguaro Substation northwest of Tucson, Arizona. http://www.southlinetransmissionproject.com/location.html	Air Quality, Land Use and Recreation, Infrastructure
Bisbee-Douglas International Airport	Cochise County under the Tombstone MOA	Future	Cochise County is evaluating various expansion options for the Bisbee-Douglas International Airport, including hangar and terminal renovation and water system upgrades.	Airspace, Noise, Air Quality, Safety

DM4.2 CUMULATIVE IMPACTS

The following analysis considers how the impacts of the actions in Table DM4-1 might affect or be affected by the AFRC F-35A mission at Davis-Monthan AFB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the AFRC F-35A mission at Davis-Monthan AFB is considered alone. Table DM4-2 provides a summary of the cumulative effects. As shown in Table DM4-2, safety, cultural resources, infrastructure, and hazardous materials and waste are not anticipated to contribute to cumulative effects. Cumulative effects are described for airspace, noise, air quality, soil and water resources, biological resources, land use and recreation, socioeconomics, and environmental justice and protection of children. Climate change is also described in this section because changes in climate have the potential to cumulatively impact other resource areas.

Table DM4-2. Summary of Cumulative Effects for Davis-Monthan AFB

Resource Area	AFRC F-35A Mission	Past, Present, and Reasonably Foreseeable Actions ^a	Cumulative Effects
Airspace	■	■	■
Noise	●	■	■
Air Quality	○	■	○
Safety	○	○	○
Soil and Water Resources	■	■	■
Biological Resources	■	■	■
Cultural Resources	○	○	○
Land Use and Recreation	■	■	■
Socioeconomics	● ^b	■	■
Environmental Justice and Protection of Children	■	■	■
Infrastructure	○	○	○
Hazardous Materials and Waste	○	○	○

^a When determining the potential for significance, past and ongoing actions in the region were considered as part of the baseline or existing conditions in the region surrounding Davis-Monthan AFB and the airspace (e.g., the cumulative noise impact of past and present missions at Davis-Monthan AFB were modeled under baseline conditions).

^b Significant impacts to socioeconomic resources would result from noise impacts to schools.

Key: ○ = not affected or beneficial impacts

■ = affected but not significant, short to medium term, impacts that range from low to high intensity

● = significant impacts, that are high in intensity or are long-term

DM4.2.1 Airspace

DM4.2.1.1 Airfield Operations

The Davis-Monthan AFB alternative for the AFRC F-35A beddown would generate the operational changes noted in Table DM2-4. Loss of the 11,088 A-10 airfield operations and gaining the projected AFRC F-35A 11,580 operations, while other aircraft operations remain unchanged, would result in an overall 0.7 percent increase in aircraft operations. Therefore, the AFRC F-35A beddown could be accommodated within this Davis-Monthan AFB airfield and Class C airspace environment without adversely affecting the overall use of this airspace. Several projects described in Table DM4-1 would add operations to the surrounding airfield environment. These projects include Angel Thunder, EC-130 Rehost, HH-60 Beddown, RC-26 Beddown, and the Taiwan Air Force (TAF) F-16 Beddown at TUS. In addition to these projects the TUS forecasts positive growth in airfield operations over a 5-year period. The exact operational numbers for several of the proposed military projects is not known at this time but the largest increase would

likely result from the relocation of the TAF F-16 mission from Luke AFB to TUS. Should the TAF F-16 mission be relocated to TUS, it is estimated that they would fly 6,459 operations per year bringing total annual ANG operations to approximately 31,000. TUS has forecasted that annual operations will increase by approximately 6,160 from 2023 to 2028 (FAA 2018) which includes the approximately 31,000 current F-16 operations. The operations anticipated from these projects, in addition to the increase in operations at Davis-Monthan AFB as a result of the AFRC F-35A mission would not present a significant impact to airspace use in an environment that experienced 191,000 air traffic operations in 2017.

Military actions with major changes in aircraft types or operations would undergo additional environmental analysis to determine the exact number of operations and the potential for additional impacts within the airspace.

No present and/or known reasonable foreseeable future actions, when combined with the minor increase in airfield operations from the AFRC F-35A mission, would result in any cumulative impacts to airfield operations or the management and configuration of the Class C airspace surrounding this airfield environment.

DM4.2.1.2 Training Airspace

The primary airspace proposed for use by AFRC F-35A pilots operating from Davis-Monthan AFB is the Tombstone MOA and the associated ATCAA. The primary range proposed for use by AFRC F-35A pilots operating from Davis-Monthan AFB is the BMGR. The airspace and range proposed for use are identified on Figure DM2-2, and the operations proposed in that airspace are described in Table DM2-7.

A number of projects listed in Table DM4-1 would occur under the airspace proposed for use by AFRC F-35A pilots. These include BMGR Land Withdrawal and Projects; SUA Reconfigurations; RA R-2301E, EC-130 Rehost; Personnel Recovery (PR) Training Environmental Assessment (EA); HH-60 Beddown; RC-26 Beddown; TAF to TUS Beddown; Marine Corps Air Station (MCAS) Yuma, Libby Army Airfield, and Bisbee-Douglass International Airport projects.

The operations anticipated from these projects in addition to the increase in sorties at Davis-Monthan AFB as a result of the AFRC F-35A mission would not present a significant impact to airspace use. Any potential conflicts in the use of airspace would be deconflicted by the scheduling agency. Any changes to SUA or charting of new SUA would require separate environmental analysis.

No present and/or known reasonable foreseeable future actions, when combined with the minor increase in airspace sorties that would result from implementation of the AFRC F-35A mission at Davis-Monthan AFB, would result in cumulative impacts to airspace management in the SUAs proposed for use.

DM4.2.2 Noise

Cumulative noise impacts were evaluated for construction related noise and for the impact of aircraft noise resulting from operations in the airfield and airspace environments near Davis-Monthan AFB. C&D projects associated with the proposed AFRC F-35A beddown would occur near other ongoing and future C&D projects (e.g., IDP projects) occurring during the same time periods. C&D projects are a regular occurrence on and near active USAF installations such as Davis-Monthan AFB. C&D noise would be localized and temporary. Construction work is generally limited to normal working hours (i.e., 7:00 A.M. to 5:00 P.M.). Furthermore, the C&D projects are or would be located in an acoustic environment that includes elevated aircraft operations noise levels. In the instance that

multiple C&D projects affect a single area at the same time, construction noise could be a slightly more noticeable component of the acoustic environment.

The noise analysis in this EIS is a cumulative analysis which includes those defined projects listed in Table DM4-1. Actions occurring within the present timeframe (e.g., Angel Thunder PR training exercises) are accounted for in calculated baseline aircraft noise levels to the extent that aircraft operations are defined. The PR Training EA is currently under way, and specific noise impacts associated with the project will be included in that EA. The EC-130 Re-host, HH-60 Beddown, and RC-26 Beddown, identified in Table DM4-1, do not have defined details at this time although the aircraft proposed for replacement beddown are substantially less loud than F-35A aircraft, and would not be expected to cumulatively add to the overall time-averaged noise levels presented in this EIS.

Implementation of one or more of the past, present, and reasonably foreseeable future actions in combination with the proposed action would not be expected to result in cumulative noise impacts beyond the noise impacts identified for the AFRC F-35A mission. As described in Section DM4.2, the proposed AFRC F-35A mission at Davis-Monthan AFB would result in increased noise from the proposed aircraft operations. It was determined that the increase in noise would result in significant impacts to the environment surrounding Davis-Monthan AFB.

Potential future independent projects, for which definition is not available at this time, would be separately environmentally assessed when the details for the projects become available. If there were to be a future proposal to beddown F-35A aircraft (in addition to the currently-proposed F-35A beddown) then that beddown action could have substantial effects on noise levels. At this time, there are no specific plans to beddown additional F-35 units. Environmental impacts of any future beddown action would be assessed in compliance with NEPA. Actions proposed at TUS (i.e., Safety Enhancement Projects, TAF F-16 Beddown) would be expected to have minimal effect on noise levels near Davis-Monthan AFB. Noise impacts associated with these projects would depend on the details of the actions as implemented. Significant impacts associated with any undefined future projects would have their own mitigation measures to reduce or minimize impacts.

Several actions which would occur in the airspace proposed for use (e.g., BMGR Land Withdrawal and Projects, SUA Reconfigurations, Modification of R-2301E, Projects at Libby Army Airfield, and Projects at MCAS Yuma, BMGR Future Aircraft and Weapons) could affect noise levels. Specific noise effects of these actions would depend on the details of the actions as implemented.

Private and state/municipal government-sponsored land development actions could potentially affect noise impacts by increasing the number of noise-sensitive locations in areas exposed to elevated noise levels near Davis-Monthan AFB. The JLUS contains guidance to have land development be compatible with expected noise conditions. Military planners assess such projects for mission compatibility on a case by case basis, and contribute the results of their assessment as part of the civilian development planning process. Noise generated on-site during the construction and operation of privately owned properties is localized and qualitatively consistent with surrounding existing noise environments in adjacent developed areas.

DM4.2.3 Air Quality

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Davis-Monthan AFB. These projects would generate the same types of construction related impacts as described for the proposed AFRC F-35A construction (e.g. fugitive dust emissions, increases in

construction related criteria pollutant emissions). Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on air quality at Davis-Monthan AFB would not be expected to result in exceedance of adopted NAAQS or result in significant cumulative impacts to the air quality.

Implementation of the proposed AFRC F-35A mission at Davis-Monthan AFB would result in a decrease in all air pollutants emissions except CO_{2e}. Because the proposed mission would have a net overall positive impact to the amount of pollutants in the region of Davis-Monthan AFB, no cumulative adverse impacts from the other projects described in Table DM4-1 would occur.

DM4.2.4 Soil and Water Resources

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Davis-Monthan AFB. These construction projects would increase the amount of soil disturbed and have the potential to increase erosion and sedimentation into surface water features. Management practices described in Section DM3.5 would avoid and minimize impacts to soil and water resources. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the soil and water resources at Davis-Monthan AFB would not be significant.

DM4.2.5 Biological Resources

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects, construction from private and state and local development) during the same time periods. Potential cumulative effects to biological resources would be associated with ground disturbance. C&D projects have been and will continue to be a regular occurrence on and near installations such as Davis-Monthan AFB. These construction projects would increase the amount of soil disturbed and have the potential to increase erosion and sedimentation into surface water features. Indirect cumulative impacts can occur from the increased potential for invasive species and wildland fires associated with commercial, residential, and recreational development, as well as military activities. Wildland fires could pose a substantial threat to native vegetation and wildlife species. Increased recreational development in the areas surrounding Davis-Monthan AFB could also impact biological resources. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on biological resources at Davis-Monthan AFB would not be significant.

Operations of the AFRC mission at Davis-Monthan were found to have no significant impacts to wildlife including threatened and endangered species and migratory birds. Projects such as the proposed TAF beddown or the beddown of new missions with aircraft operations would have similar impacts to wildlife as those described in this EIS. Implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions at Davis-Monthan AFB would not have cumulative significant impacts to sensitive biological species or habitats.

No present and/or known reasonable foreseeable future actions, when combined with aircraft operations in the training airspace, would result in environmental consequences to biological

resources under the training airspace beyond those associated with implementation of the AFRC F-35A mission at Davis-Monthan AFB.

DM4.2.6 Land Use and Recreation

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects, construction from private and state and local development) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Davis-Monthan AFB. Construction projects that occur within the AEZ of Davis-Monthan AFB or TUS will still be required to comply with zoning requirements. These zoning requirements have been implemented to minimize adverse impacts to land use from incompatible development. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on land use and recreation at Davis-Monthan AFB would not be significant.

C&D projects and aircraft operations associated with the proposed AFRC F-35A mission at Davis-Monthan would be consistent with established JLUS land use recommendations and would result in no significant impacts to land use and recreation. The noise increase resulting from the AFRC F-35A mission would remain completely within the AEZ and this action combined with other actions would also not be anticipated to result in significant impacts to land use and recreation. However, increased noise would impact some recreational facilities near Tucson and could reduce the enjoyment of those facilities for some persons.

Increases in aircraft operations resulting from the proposed AFRC F-35A mission combined with the TAF F-16 mission could increase noise levels in some recreational areas in Arizona. These increases would occur in areas that are currently exposed to military aircraft noise. Although some users of these recreational areas could be annoyed by these noise increases, use of these recreational areas would not be expected to substantially change and no significant impacts are projected to result from training in the airspace.

DM4.2.7 Socioeconomics

The C&D projects associated with the AFRC F-35A mission would provide short-term economic benefits to surrounding areas through employment of construction workers and through the purchase of materials and equipment. The short-term impact of implementing the proposed mission combined with any or all of the projects listed in Table DM 4-1 would result in negligible cumulative impacts to socioeconomics in the area. In addition, the decrease in personnel associated with the proposed mission, combined with implementation of any or all of the projects listed in Table DM4-1, is also not anticipated to result in cumulative impacts to socioeconomic resources.

DM4.2.8 Environmental Justice and Protection of Children

Noise resulting from the operation of F-35A aircraft would affect people living near the installation. As discussed in Section DM3.10.2, implementation of the AFRC F-35A mission at Davis-Monthan AFB would result in disproportionate impacts to minority and low-income populations. Section DM3.10.2 quantifies the number of children and elderly exposed to DNL of 65 dB or greater. Implementation of the AFRC F-35A mission, when combined with other past, present, or reasonably foreseeable projects, would not be expected to result in an increase to the cumulative impacts to environmental justice and other sensitive populations beyond those described in this EIS for the proposed action. Implementation of the C&D projects on Davis-Monthan AFB would not result in any impacts to environmental justice populations.

DM4.2.9 Climate Change

Arizona and the surrounding region could experience a continuing of recent upward trends in average temperatures and extreme heat, an increase in the frequency of wildfire occurrence and severity, and a decrease in spring precipitation (USGCRP 2017).

Increases in temperature, increases in wildfires, and a decrease in spring precipitation could interact with resource areas such as air quality, water resources, and socioeconomics. Increasing temperatures and wildfires have been shown to increase ground level ozone and particulates (Orru et al. 2017). Decreases in spring precipitation could impact water availability. Potential socioeconomic impacts could include increased costs associated with poor air quality and water availability.

While Davis-Monthan AFB has adapted operations to manage the recent temperature changes, exacerbation of climate conditions in the future could increase the cost of proposed operations and could impede operations during extreme events. Additional measures could be needed to mitigate such impacts over the operational life expectancy of the F-35A.

DM4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretreivable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretreivable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the AFRC F-35A mission at Davis-Monthan AFB, most resource commitments are neither irreversible nor irretreivable. Most impacts would be short-term (e.g., air emissions from construction). Those limited resources that could involve a possible irreversible or irretreivable commitment are discussed below.

Should the AFRC F-35A mission be located at Davis-Monthan AFB, some land in the developed portions of the base would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (e.g., wiring, insulation, windows, and drywall) and exterior construction (e.g., concrete, steel, sand, and brick). Although an undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost, new construction would result in energy savings from energy efficient buildings and appurtenances.

Training operations would continue and involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Privately owned vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase; however, this additional use is not expected to significantly affect the availability of the resources.

CHAPTER 4

BASE ALTERNATIVE: HOMESTEAD AIR RESERVE BASE



HS1.0 HOMESTEAD AIR RESERVE BASE OVERVIEW

Homestead Air Reserve Base (ARB) is located in southern Miami-Dade County, Florida, approximately 25 miles south of Miami. The base is located adjacent to the City of Homestead. The installation encompasses approximately 1,950 acres and is surrounded by agricultural lands and some residential and commercial development (Figure HS1-1). The primary runway at Homestead ARB, Runway 06/24, is 11,202 feet long and 300 feet wide (Figure HS1-2).

Homestead ARB is an Air Force Reserve Command (AFRC) installation and is led by the AFRC 482nd Fighter Wing (482 FW). The primary mission of the 482 FW is to (1) provide ready, trained, and equipped combat air power and agile combat support forces to the joint warfighter; (2) provide ready, on-call, humanitarian support; and (3) provide quality programs, services, and recognition to our Citizen Airmen. As the host wing, the 482 FW supports civil engineering, communications, medical, logistics, aircraft maintenance, mission support, and aerial transportation specialists, and provides a security forces squadron. As part of the 482 FW, the 93rd Fighter Squadron (93 FS) “Makos” fly and maintain 24 F-16C aircraft.

Tenants at Homestead ARB include the 125th Fighter Wing (125 FW) of the Florida Air National Guard (FANG), the Defense Energy Support Center Americas East, the Florida Army National Guard (FLARNG), the U.S. Coast Guard (USCG) Maritime Safety and Security Team Miami, and the U.S. Army Corps of Engineers (USACE). Although the Special Operations Command South and the U.S. Customs and Border Protection (CBP) use support facilities on Homestead ARB, their buildings are not located on U.S. Air Force (USAF)-owned land. The FANG operates F-15C aircraft at Homestead ARB; Special Operations Command South operates C-130 and C-146 aircraft; and the CBP operates DHC-8, UH-60, and AS-350 aircraft.

Refer to Chapter 1 for the purpose and need for the AFRC F-35A mission, a description of the F-35A aircraft characteristics, and information about public involvement and agency coordination. Refer to Chapter 2 for the description of the proposed action and alternatives, and a description of the strategic basing and alternative identification processes. In the base-specific sections that follow, Section HS2 presents the description of the proposed action at Homestead ARB. Section HS3 addresses baseline conditions and environmental consequences that could result from implementation of the proposed action at Homestead ARB. Section HS4 identifies other, unrelated past, present, and reasonably foreseeable future actions in the affected environment and evaluates whether these actions would cause cumulative effects when considered along with the AFRC F-35A beddown. This section also presents the irreversible and irretrievable resources that would be committed should the proposed action be implemented at Homestead ARB.

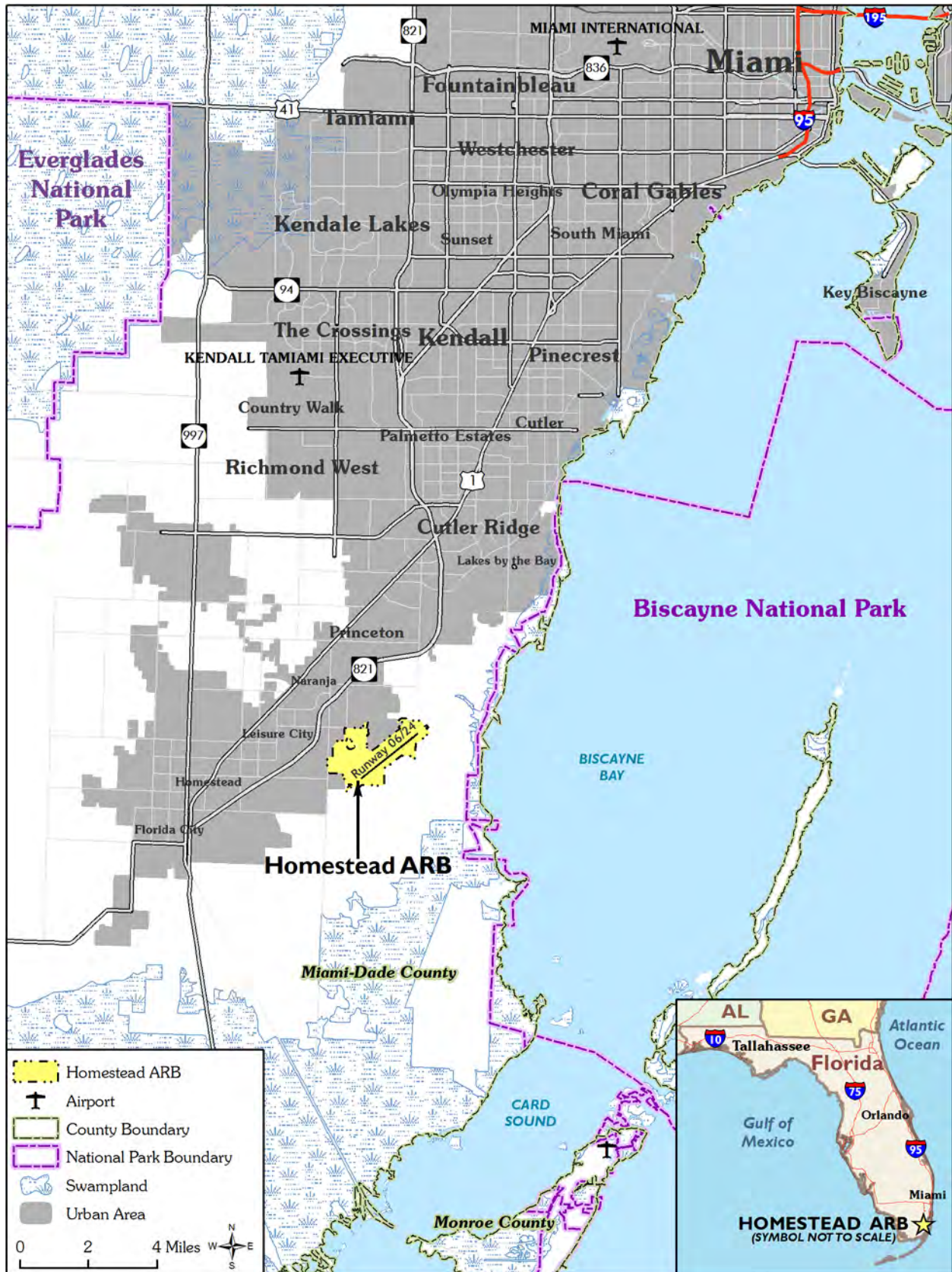


Figure HS1-1. Regional Location of Homestead ARB



Figure HS1-2. Primary Runways at Homestead ARB

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HS2.0 HOMESTEAD AIR RESERVE BASE ALTERNATIVE

This section presents the specifics of the proposed action at Homestead ARB. Four elements of the proposed action have the potential to affect the base and associated airspace: (1) facility and infrastructure projects to support the F-35A beddown; (2) personnel changes necessary to meet F-35A requirements; (3) airfield operations conducted by AFRC F-35A pilots; and (4) airspace and range use by AFRC F-35A pilots. Each element is explained in the following subsections. In addition, this section also presents state and federal consultation efforts and associated permits that would be required should Homestead ARB be selected to receive the AFRC F-35A mission.

Under the proposed action, 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft would start to arrive at Homestead ARB in early 2024. Delivery of the full complement of 24 F-35A aircraft and 2 Backup Aircraft Inventory (BAI) is anticipated to take 2 years. At that time, the F-35A aircraft would completely replace the existing 24 F-16 aircraft assigned to the 482 FW. The F-16 aircraft that would be replaced by the F-35A aircraft would be reassigned or removed from the USAF inventory.

HS2.1 FACILITIES AND INFRASTRUCTURE

To support the AFRC F-35A mission, additional infrastructure and facility modifications would be required at Homestead ARB (Table HS2-1). A total of 10 different improvement projects and 1 demolition project would be implemented in 2021 (Figure HS2-1). The USAF estimates that \$18.6 million in Military Construction (MILCON) expenditures would be required to implement the proposed AFRC F-35A mission at Homestead ARB.

Table HS2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Homestead ARB

Project ^a	Size Area (ft ²) ^b
Demolition	
Building 208 (storage of Aerospace Ground Equipment [AGE])	8,786
Demolition Total	8,786
Renovation	
Building 180 repair egress shop, battery storage	500 ^c
Building 185 repair propulsion shop	500 ^c
Building 191 renovation for flight equipment	3,867 ^c
Building 192 repair vault and replace hoists	763 ^c
Building 193 electrical upgrades	NA ^d
Building 194 electrical upgrades	NA ^d
Building 200 electrical upgrades and new addition for shop and administrative space	5,050
Building 213 construct storage cage	500 ^c
Renovation Total	11,180
New Construction	
Construct an AGE building	9,821
Construct an F-35A flight simulator building	13,650
New Construction Total	23,471

^a Data in this table were obtained from site surveys (Homestead ARB 2017a).

^b Size is the area covered by the footprint of the proposed facilities and consists of the designed limits of the structure, facility, apron, road, access, and/or parking lot.

^c Interior renovation only.

^d Includes minor interior upgrade projects that do not have a square footage.

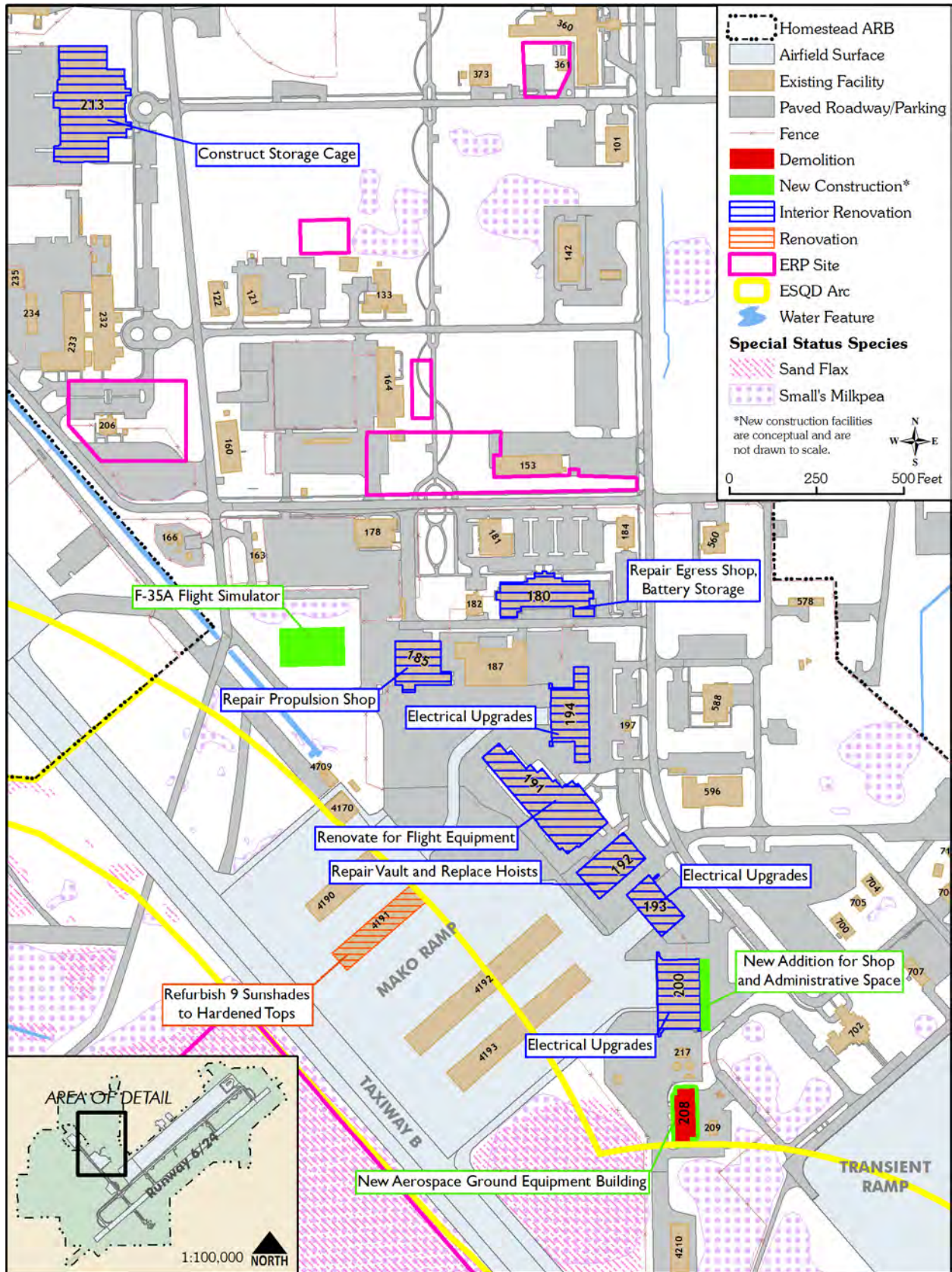


Figure HS2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Homestead ARB

New construction and facility additions would require construction grading, clearing, and equipment laydown space. To account for this disturbance, this analysis also includes disturbance areas in addition to the facility size. These disturbance areas encompass 20 feet adjacent to linear features (e.g., roads, utility extensions, etc.) and 50 feet around the facility footprint for all other facilities. Repairs of existing aircraft aprons or ramps are not included in these calculations because these repairs would occur on paved or concrete surfaces. Interior renovations are also not included in these calculations because these renovations would not create ground disturbance or a change in impervious surfaces.

New construction and facility additions would also result in changes to existing impervious surfaces. It is assumed that any demolition would include demolition of the building slab and result in a reduction in impervious surfaces. In some cases, demolished facilities would be replaced by new construction or pavements. This increase in impervious surfaces is accounted for in the new construction. Table HS2-2 provides a summary of the ground disturbance and changes in impervious surfaces.

Table HS2-2. Summary of Facility and Infrastructure Projects for Homestead ARB

Project Type	Ground Disturbance (Acres)	Change in Impervious Surfaces (Acres)
Demolition	1.0	-0.2
Renovation ^a	0.8	+0.1
New Construction	0.5	+2.1
Total	2.3	+2.0

^a Totals do not include interior renovation projects.

Facility siting on military installations is predominantly functional-use based (i.e., locating facilities with like functional uses adjacent to one another). However, safety and compliance with policies and regulations are also used as planning factors. During the planning phase for a new aircraft mission beddown, military planners consider a variety of alternatives necessary to meet the requirements of the new mission, including the use of existing facilities that can be partially or entirely used to meet mission requirements. Depending on available infrastructure, facilities, and, to some degree, personnel available to support the AFRC F-35A mission, proposed construction, demolition, and renovation projects vary between alternatives. The facility siting analysis for each alternative base considered the functional requirements of the AFRC F-35A mission and compared them with the existing infrastructure and environmental constraints at each alternative base.

New construction siting is a stepwise process that includes identifying suitable sites relative to existing facilities and base infrastructure to provide operational efficiencies and suitable cost-benefit values. Utility siting, including the re-routing of existing utilities or the installation of new utility infrastructure (e.g., power, water, sewer, and communication lines), could also be required to accommodate the new mission. The siting process for utilities focused on using existing conduits and previously disturbed areas or areas that would also be disturbed for facility modifications. Temporary construction laydown areas could also be required to support construction. Construction laydown areas would be located in developed or semi-developed areas, or previously disturbed or paved areas. Construction laydown areas not proposed for permanent disturbance would be returned to their pre-construction state upon completion of construction. All construction contracts would be managed under Unified Facilities Criteria (UFC) 3-101-01, *Best Management Practices*, and attainment of a Leadership in Energy and Environmental Design (LEED) Silver certification.

Construction and renovation projects within the 65-decibel (dB) noise contour would include acoustical design considerations for façade elements and interior design requirements per UFC 3-101-01. Land use would be consistent with Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*, and Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager’s Guide*.

HS2.2 PERSONNEL

Implementation of the AFRC F-35A mission at Homestead ARB would require sufficient and appropriately skilled military and civilian personnel to operate and maintain the F-35A aircraft and to provide other necessary support services. Implementation of the AFRC F-35A mission at Homestead ARB would result in a decrease of 91 positions. This would constitute a 2.7 percent decrease in base staffing (Table HS2-3).

Table HS2-3. Personnel Changes for the AFRC F-35A Mission at Homestead ARB

Baseline Personnel			Proposed F-35A Authorized Personnel			Percent Change to Total Personnel
Total Authorized Personnel	AFRC Authorized Personnel	Percent of Total Authorized Based Personnel	AFRC F-35A	Change to AFRC Unit Personnel Positions	Percent Change to AFRC Unit Personnel	
3,430	1,735	50.58%	1,644	-91	-5.24%	-2.7%

HS2.3 AIRFIELD OPERATIONS

The 482 FW is an integral part of the Combat Air Forces (CAF). The CAF defends the homeland of the United States and deploys forces worldwide to meet threats and ensure the security of the nation. To fulfill this role, the 482 FW must train as it would fight.

The USAF anticipates that once the full complement of aircraft is received, the total of 24 F-35A aircraft would be used to fly 11,580 operations per year from the airfield. Based on the proposed requirements and deployment patterns, AFRC F-35A pilots would fly additional operations during deployments, or at other locations for exercises or in preparation for deployments. In addition, AFRC F-35A pilots stationed at Homestead ARB could participate in remote training exercises. Some of these missions could involve ordnance delivery training or missile firing exercises (within the scope of existing National Environmental Policy Act [NEPA] documentation) at ranges approved for such ordnance use (e.g. Eglin Air Force Base’s [AFB’s] offshore ranges in the Gulf of Mexico).

Conducting 11,580 operations per year would represent an increase of 1,152 annual airfield operations compared to current F-16 aircraft operations (Table HS2-4). Of the 38,518 total airfield operations currently conducted at Homestead ARB, 27 percent are conducted by the 482 FW. Implementation of the AFRC F-35A mission at Homestead ARB would result in a 3.0 percent increase in annual total airfield operations.

Table HS2-4. Homestead ARB Baseline F-16 and Proposed F-35A Annual Airfield Operations

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
Based F-16	10,428	0
Proposed F-35A	0	11,580
Other Aircraft	28,090	28,090
Total Airfield Operations	38,518	39,670
Percent Change		3.0%

^a Total baseline operations is for the last year. Data in this table were collected from the operations staff at Homestead ARB in 2017 (Homestead ARB 2017a).

AFRC F-35A pilots would perform departure and landing procedures similar to those currently conducted by the F-16 pilots at the installation. Due to differences in aircraft characteristics and performance, the flight profiles and tracks used by the AFRC F-35A pilots would slightly vary from those currently used by F-16 pilots. F-16 pilots from the 482 FW average 260 flying days per year. For the purposes of this analysis and to compare the alternatives on an equal basis, the total number of possible flying days for AFRC F-35A pilots is also assumed to be 260, including both Saturday and Sunday (on Unit Training Assembly [UTA] weekends).

Afterburners are used on occasion by F-16 pilots at Homestead ARB when additional power is needed. As described in Chapter 2, Section 2.3.3, the USAF evaluated three different scenarios for afterburner use. Scenario A is afterburner use on 5 percent of takeoffs. Scenario B is afterburner use on 50 percent of takeoffs. Scenario C is afterburner use on 95 percent of takeoffs.

AFRC F-35A pilots would operate similar to the F-16 pilots. Currently, F-16 operations primarily begin at 7:00 A.M. and conclude by 10:00 P.M. on weekdays and on UTA weekends (except when weather contingencies or special exercises cause operations to occur after 10:00 P.M). After-dark training is normally scheduled to be completed before 10:00 P.M. After-dark training for AFRC F-35A pilots would also be scheduled to be completed before 10:00 P.M. Because of the capabilities and expected tactics of the F-35A aircraft, AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC F-16 pilots depending on weather or special exercises.

HS2.4 AIRSPACE AND RANGE USE

Table HS2-5 identifies the Federal Aviation Administration (FAA)-designated airspace currently used by Homestead ARB F-16 pilots that is also proposed for use by AFRC F-35A pilots. Implementation of the AFRC F-35A mission would not require any new airspace or changes to existing airspace boundaries, and the type and number of ordnance used at the any of the ranges approved for such use could decrease.

Table HS2-5. Homestead ARB Training Airspace

Airspace	FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges)	Palatka 1 & 2 MOAs	3,000	UTBNI 18,000
	R-2907A	Surface	23,000
	R-2907B	2,000	23,000
	R-2907C	500	UTBNI 2,000
	R-2910A	Surface	23,000
	R-2910B & C	Surface	6,000
	R-2910D	2,000	23,000
	R-2910E	500	UTBNI 2,000
Avon Park Air Force Range (APAFR)	R-2906	Surface	14,000
	Avon East MOA	500 AGL	UTBNI 14,000
	Avon East High MOA	14,000	UTBNI 18,000
	Basinger MOA	500 AGL	5,000
	Lake Placid N, E & W MOAs	7,000	UTBNI 18,000
	Marian MOA	500 AGL	5,000
	R-2901A	Surface	UTBNI 4,000
	R-2901B	14,000	UTBNI 18,000
	R-2901C	Surface	UTBNI 14,000
	R-2901D ^c	500	UTBNI 4,000
	R-2901D ^d	1,000 AGL	UTBNI 4,000
R-2901E	1,000 AGL	UTBNI 4,000	
R-2901F	4,000	UTBNI 5,000	

Table HS2-5. Homestead ARB Training Airspace (Continued)

Airspace	FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Avon Park Air Force Range (APAFR) (Continued)	R-2901G	Surface	UTBNI 5,000
	R-2901H	1,000	UTBNI 4,000
	R-2901I	1,500	UTBNI 4,000
	R-2901J	18,000	UTBNI 23,000
	R-2901K	23,000	UTBNI 31,000
	R-2901L	31,000	40,000
	R-2901M	4,000	UTBNI 14,000
	R-2901N ^c	5,000	UTBNI 14,000
	R-2901N ^f	4,000	UTBNI 14,000
Warning Areas	W-168	Surface	Unlimited
	W-174 A, B, C, F & G	Surface	70,000
	W-174 E	Surface	70,000
	W-465A, B & D	Surface	70,000

^a Airspace used by F-35A pilots would include Air Traffic Control Assigned Airspaces (ATCAAs) that occur over the Military Operations Areas (MOAs) included in the table. The ATCAAs will accommodate training above 18,000 feet mean sea level (MSL).

^b Floor altitudes could exclude certain areas. See FAA Sectional Charts or exclusions.

^c This portion of R-2901D is located east of line 81°21'00"W.

^d This portion of R-2901D is located west of line 81°21'00"W.

^e This portion of R-2901N is located north of line 27°24'46"N, 81°10'59"W to 27°29'31"N, 81°05'27"W.

^f This portion of R-2901N is located south of line 27°24'46"N, 81°10'59"W to 27°29'31"N, 81°05'27"W.

Note: MSL is the elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level. The elevation of a mountain, for example, is marked by its highest point and is typically illustrated as a small circle on a topographic map with the MSL height shown in either feet or meters or both. Because aircraft fly across vast landscapes, where points above the ground can and do vary, MSL is used to denote the "plane" on which the floors and ceilings of Special Use Airspace (SUA) are established and the altitude at which aircraft must operate within that SUA.

Key: AGL = above ground level; UTBNI = Up To But Not Including

Source: FAA Jacksonville 2018 and Miami 2018 Sectional Charts

HS2.4.1 Airspace Use

AFRC F-35A pilots would conduct missions and training activities necessary to fulfill the multi-role responsibility of this aircraft. All F-35A flight activities would occur in existing airspace. AFRC F-35A pilots would operate in the same airspace used by F-16 pilots from the 482 FW, but at higher altitudes. F-16 pilots from the 482 FW use Military Operations Areas (MOAs), Restricted Areas (RAs), and Air Traffic Control Assigned Airspace (ATCAAs), as well as offshore Warning Areas (Table HS2-5 and Figure HS2-2). To support realistic training, F-16 pilots schedule and use multiple adjacent airspaces together.

The FAA-designated airspace identified in Table HS2-5 is also used by Navy pilots operating F-18 aircraft and other USAF pilots operating A-10, F-15, and F-16 aircraft. F-16 pilots from the 482 FW conduct approximately 10 percent of the total sorties flown in the airspace identified in Table HS2-5. Although AFRC F-35A pilots would conduct missions similar to those of F-16 pilots, the capabilities of the F-35A aircraft allow for supersonic and higher altitude flight. Regardless of the altitude structure and percent use indicated in Table HS2-6, AFRC F-35A pilots (as do existing military aircraft pilots) would adhere to all established floors and ceilings of existing FAA-designated airspace. For example, the floor of the Lake Placid North MOA is 7,000 feet mean sea level (MSL). While in this MOA, AFRC F-35A pilots would not fly below that altitude. Rather, AFRC F-35A pilots would adapt training to this and other airspace with lower floors.

MSL is the elevation (on the ground) or altitude (in the air) of an object relative to the average sea level. AGL is the height as measured from ground level. In this EIS, the term MSL is assumed to mean feet above MSL

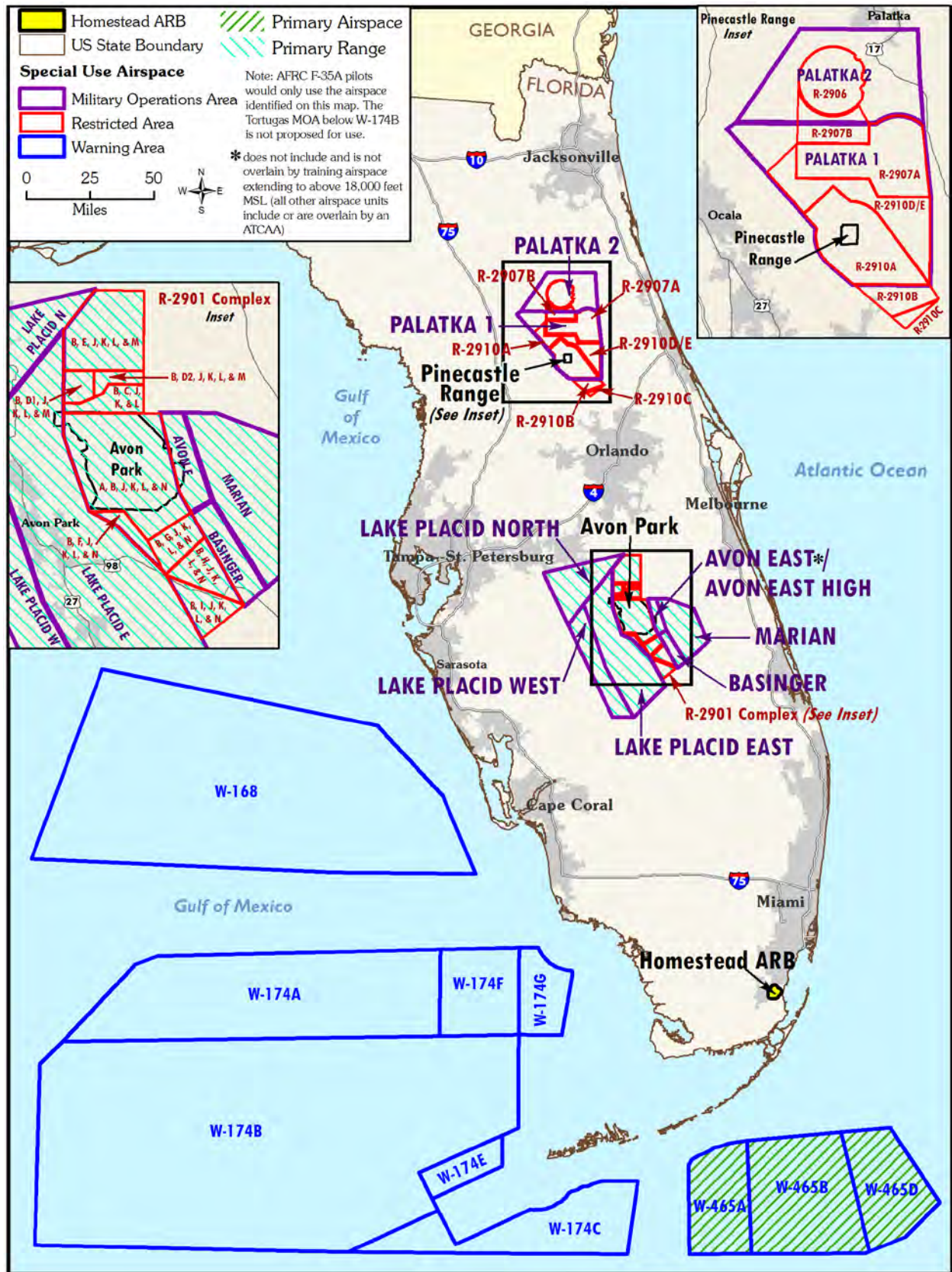


Figure HS2-2. Airspace Associated with Homestead ARB

Table HS2-6. Current and Proposed Aircraft Altitude Distribution in the Airspace

Altitude (feet)	Percentage of Use	
	F-16	AFRC F-35A
100 – 500 AGL	0%	0%
500 AGL – 2,000 AGL	2%	1%
2,000 – 5,000 AGL	4%	0%
5,000 AGL – 10,000 MSL	10%	5%
10,000 – 18,000 MSL	68%	23%
18,000 – 30,000 MSL	11%	60%
+30,000 MSL	5%	11%

F-16 pilots from the 482 FW generally operate 84 percent of the time at or below 18,000 feet MSL, depending on mission type. In contrast, AFRC F-35A pilots would operate 71 percent of the time at or above 18,000 feet MSL, with 11 percent of the flight time above 30,000 feet MSL.

By 2030, total annual sorties would decrease 0.2 percent from baseline levels (Table HS2-7). In the most heavily used airspace, like the Avon Park Air Force Range (APAFR) Complex, AFRC F-35A sorties would account for 31 percent of total airspace sorties. Similar proportions would apply to the other airspace. The total percent of use by AFRC F-35A pilots would not significantly vary from baseline.

Table HS2-7. AFRC F-35A Airspace Sorties Flown from Homestead ARB

Airspace ^a	Total Baseline	F-16 Baseline	AFRC F-35A Sorties	Net Change (Total)	Percent Change Total
U.S. Navy Pinemcastle Range Complex ^b	2,314	237	923	686	29.6%
APAFR Complex	6,285	1,422	2,156	734	11.7%
Warning Areas	36,552	3,081	1,553	-1,528	-4.2%
Total	45,151	4,740	4,632	-108	-0.2%

^a Includes all airspace identified in Table HS2-5.

^b Includes Rodman and Lake George Ranges

To train with the full capabilities of the aircraft, AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities. Due to the capability of the F-35A aircraft, the USAF anticipates that approximately 10 percent of the time spent in air combat training would involve supersonic flight.

AFRC F-35A missions would last approximately 45 to 115 minutes, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, AFRC F-35A pilots would fly approximately 20 to 60 minutes in the training airspace. Occasionally, AFRC F-35A pilots could fly up to 90-minute long missions. AFRC F-35A pilots would not fly in Special Use Airspace (SUA) during environmental night (10:00 P.M. to 7:00 A.M.), except for rare contingencies and special mission training.

HS2.4.2 Range Use

AFRC F-35A pilots would only use existing ranges. AFRC F-35A pilots stationed at Homestead ARB, would use the APAFR and U.S. Navy Pinemcastle Range Complex (to include the Rodman and Lake George Ranges) in Florida.

Most air-to-ground training would be simulated (i.e., nothing is released from the aircraft and electronic scoring is used). However, as described in Chapter 2, Section 2.3.4.2, the F-35A (like the F-16) is capable of carrying and using several types of air-to-air and air-to-ground ordnance, and

pilots would require training in their use. The type and number of ordnance used by AFRC F-35A pilots could decrease from that currently used by F-16 pilots. The U.S. Navy Pinecastle Range Complex, to include the Rodman and Lake George Ranges, located in Florida, does not currently include F-35A air-to-ground ordnance training. However, the U.S. Navy Pinecastle Range Complex does support both high-explosive and inert training conducted by AFRC F-16 pilots. AFRC F-35A training proposed to be conducted at the U.S. Navy Pinecastle Range Complex would be conducted at the same training tempo and type as training currently conducted by AFRC F-16 pilots. Prior to the use of F-35A ordnance profiles and training actions, the USAF would coordinate with the Navy to ensure that the proposed F-35A ordnance profiles have been approved for use at the U.S. Navy Pinecastle Range Complex. Should additional analysis or planning be required for range safety actions, they would be completed as applicable. In addition, for ordnance use at Navy ranges, Weapons Danger Zones (WDZs) would be developed and approved in accordance with Commander United States Fleet Forces Command Instruction 3550.1, *Weapon Danger Zone Approval for Air-to-Ground Training Ranges*. If in the future the USAF identifies weapon systems that are either new or could exceed currently approved levels, appropriate NEPA documentation would be completed prior to their use.

Similar to F-16 pilots, AFRC F-35A pilots would use flares as defensive countermeasures in training. Flares are one of the defensive mechanisms dispensed by military aircraft to avoid attack by enemy aircraft and air defense systems. For the purposes of this analysis, it is estimated that flare use by AFRC F-35A pilots would be less than or equal to that of F-16 pilots. Chapter 2, Section 2.3.4.2.1, provides details on the composition and characteristics of flares. Flares would only be used in areas currently approved for such use. Current restrictions on the altitude of flare use would also apply. Approximately 70 percent of F-35A flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete combustion of each flare.

HS2.5 PUBLIC, AGENCY, AND TRIBAL INVOLVEMENT

HS2.5.1 Scoping Process

The public scoping period for the AFRC F-35A Environmental Impact Statement (EIS) began on 22 March 2018 with publication of the Notice of Intent (NOI) in the *Federal Register*. During the following weeks, notification letters were mailed to federal, state, and local agencies; elected officials; federally recognized tribes (tribes)¹; nongovernmental organizations; and interested individuals as a part of an interagency/intergovernmental coordination process. Through this process, concerned federal, state, and local agencies are notified and allowed sufficient time to evaluate potential environmental impacts of a proposed action.

Volume II, Appendix A, provides sample notification letters, the notification mailing lists, and the agency comments and concerns received by the USAF during the public scoping period. For the Homestead ARB alternative, newspaper advertisements announcing the intent to prepare an EIS and hold a public scoping meeting were published in four different local newspapers, including one Spanish language newspaper. These advertisements were published in the weeks preceding the scheduled public scoping meeting.

¹ Per DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*, “tribe” refers to a federally recognized Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges (DoDI 4710.02, Section 3.5). Although not included as federally recognized tribes in the list, the USAF similarly must consult with Native Hawaiian organizations in accordance with DoDI 4710.03, *Consultation with Native Hawaiian Organizations (NHOs)*.

For the Homestead ARB alternative, one public scoping meeting was held on 17 April 2018 at the William F. Dickenson Community Center (1601 North Krome Avenue, Homestead, Florida 33030). This meeting was held in an open-house format where attendees could sign in, if desired, review display boards about the proposed AFRC F-35A mission, and provide written comments on the project. During this meeting, USAF personnel presented information on the project through the use of display boards and fact sheets. The Homestead ARB scoping meeting was attended by 27 people, including residents, elected officials, local business leaders, military affairs committee members, congressional staffers, base employees, local media, and others.

Throughout the public scoping period, the USAF offered multiple ways in which comments could be submitted. Comments were submitted at the public scoping meeting and through the project website, via email, and via regular mail or courier. The public scoping period closed on 11 May 2018, and six comments were received regarding the Homestead ARB alternative. Some comments were received after the scoping period closed but were still considered during development of the Draft EIS.

After the public scoping period closed, the USAF was made aware that the address provided for submittal of courier-delivered (e.g., Federal Express or United Parcel Service) public scoping comments was incorrect. Consequently, the USAF provided the correct address and an additional 10 working days to resubmit scoping comments from the time resubmittal instructions were published in the *Federal Register* on 13 August 2018 and in four different local newspapers. During this second public scoping period, no additional comments were received regarding the Homestead ARB alternative.

The majority of comments received for the Homestead ARB alternative were generally supportive of the proposed mission. Some people expressed concerns about airspace and noise.

HS2.5.1.1 Airspace Management and Use

Comments related to airspace included those that requested the EIS analyze any changes in airspace use, creation of new airspace, or alterations in flight paths. One comment requested analysis of impacts on flights paths to existing airports and with existing and future aircraft operations to public service airports. It was recommended that the USAF develop Area Navigation arrival and departure procedures to and from Homestead ARB.

HS2.5.1.2 Noise

The Miami International Airport (MIA) submitted a comment letter recommending an analysis and comparison of the existing conditions 2017 noise contours with the proposed action (2020) contours along with a comparison to the No Action Alternative. The letter went on to recommend analysis and comparison of the 2017 contours with the future proposed action contours in 2025 and 2030 and to recommend that the EIS should list any significant increase of day-night average sound level (DNL) of 1.5 dB or greater over noise-sensitive land uses within the 65 dB DNL and higher and list the proposed mitigation for these areas. The letter also recommended adding a section on the noise footprint of the F-35A compared to the F-16.

HS2.5.1.3 Biological Resources

The U.S. Fish and Wildlife Service (USFWS) provided comments on species that should be evaluated in the EIS.

HS2.5.1.4 Socioeconomics

One commenter noted that the economic benefits of the new mission would be beneficial to the community.

HS2.5.2 Draft EIS Public and Agency Review

HS2.5.3 Consultation

HS2.5.3.1 Government-to-Government Consultation

In January 2012 the U.S. Department of Defense (DoD) updated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. This policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective DoD services. In an ongoing effort to identify significant cultural resources, tribal resources, or other issues of interest to tribes, and as part of the NEPA scoping process, combined notification and Section 106 consultation letters were submitted to the federally-recognized American Indian tribes associated with Homestead ARB.

Following standard USAF practice for government-to-government correspondence, tribal consultation was initiated by base Commanders who represent key leadership points of contact. Homestead ARB initiated Section 106 government-to-government consultation with five tribes to identify traditional cultural properties. All five tribes have provided initial responses to the USAF. These tribes along with a record of consultations are listed in Volume II, Appendix A, Section A.3. All communications with tribes will be completed in accordance with 54 *United States Code (USC)* 300101 *et seq.*, *National Historic Preservation Act of 1966, as amended* (NHPA); 36 *Code of Federal Regulations (CFR)* § 800, *Protection of Historic Properties*; Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*; and DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*.

HS2.5.3.2 State Historic Preservation Officer Consultation

Homestead ARB has determined that no historic properties would be affected by implementing the AFRC F-35A mission at the installation. The Florida State Historic Preservation Officer (SHPO) concurred with these findings in a letter dated 27 November 2018 (Volume II, Appendix A, Section A.2.5.3).

HS2.5.3.3 U.S. Fish and Wildlife Service Consultation

On 2 July 2018, the USFWS responded to the USAF's request for coordination and recognized the potential for adverse effects to the Florida bonneted bat (*Eumops floridanus*) from proposed renovation and demolition activities. The USFWS referred to minimization measures that could be implemented to assist in determining impacts to the Florida bonneted bat. Those minimization efforts would be incorporated should Homestead ARB be selected for the AFRC F-35A mission.

The USFWS also requested additional evaluation for federally listed plant species depending upon the location of proposed construction and renovation projects (Volume II, Appendix A, Section A.2.5.4).

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HS3.0 HOMESTEAD ARB AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

HS3.1 AIRSPACE MANAGEMENT AND USE

HS3.1.1 Base Affected Environment

HS3.1.1.1 Airfield Operations

Baseline annual airfield operations at Homestead ARB are described in Section HS2.3 and shown in Table HS2-4. The primary runway at Homestead ARB, Runway 06/24, is described in Section HS1.0 and shown on Figure HS1-2. Runway 06 is used for takeoffs/landings to the northeast and is the primary runway for numerous reasons (e.g., noise abatement, wind conditions, air traffic flows, and other factors). The Homestead ARB air traffic control (ATC) tower is responsible for all airfield operations within a Class D airspace area surrounding the base out to 5.5 nautical miles (NM) from the ground surface (field elevation 5.6 feet MSL) to 2,500 feet MSL.

The FAA Miami Air Route Traffic Control Center (ARTCC) has overall responsibility for managing the airspace throughout the greater Florida region and has delegated responsibility to the FAA Miami Terminal Radar Approach Control (TRACON) facility for providing radar ATC services within 30 NM of MIA from the surface to 7,000 feet MSL. This is a high-density air traffic environment with several public and private airports supporting military, commercial, and general aviation needs. The FAA Miami TRACON facility oversaw approximately 413,000 total operations in 2017. For that reason, the FAA established the more highly regulated Class B airspace around MIA, as depicted on the FAA Miami Sectional Aeronautical Chart. The Class B airspace is segmented into eight areas (A-H), two of which (D and G) overlie the northern portion of the Homestead ARB Class D airspace. Both areas are within a 15-NM radius of MIA, with the D and G altitudes extending, respectively, from 3,000 and 5,000 feet MSL up to and including 7,000 feet MSL above the Homestead ARB Class D airspace. The Homestead ARB Class D airspace has a 2,500 feet MSL ceiling. The Homestead ARB Radar Approach Control (RAPCON) provides basic radar services to aircraft transiting within this area at 3,000 feet MSL and below.

The Tactical Air Navigation (TACAN) and Instrument Landing System (ILS) navigational aids on this airfield, as well as global positioning system (GPS), provide seven instrument approaches and ten Standard Terminal Arrival Route (STAR) procedures to the runway environment. These procedures, along with ATC direction, provide pilots with standard means for safely navigating to the Homestead ARB airfield/runway while being separated from other instrument flight rules (IFR) aircraft around this high-density area.

HS3.1.2 Base Environmental Consequences

HS3.1.2.1 Airfield Operations

The Homestead ARB alternative for the AFRC F-35A mission would replace 10,428 F-16 operations with a projected 11,580 F-35A operations. This would result in a 3.0 percent increase in the overall operations conducted at Homestead ARB (Table HS2-4). Other based and transient aircraft operations would remain constant. The percentage of operations flown during environmental night by AFRC F-35A pilots would be less than the percentage currently conducted by F-16 pilots. The AFRC F-35A mission at Homestead ARB could be effectively accommodated by ATC within the Homestead ARB Class D and Miami Class B airspace in the same manner current operations are managed without adversely affecting other airspace uses. This increase of 1,152 operations is a small

percentage of the 413,000 operations conducted via the FAA Miami TRACON in 2017. No modifications would be required for this airspace structure or those local operating procedures that dictate how military operations are conducted while flying to and from this airfield.

HS3.1.3 Airspace Affected Environment

HS3.1.3.1 Airspace and Range Use

The MOAs, ATCAAs, RAs, and ranges currently used by pilots from Homestead ARB and projected for AFRC F-35A pilots for training activities are identified in Table HS2-5. The published floor and ceiling altitudes within which these activities are conducted are also shown in Table HS2-5. Depending upon the location of the different training airspace areas, either the FAA Miami or Jacksonville ARTCC has control over the respective MOA, RA, and Warning Area within their area of jurisdiction.

Table HS3-1 identifies the baseline and projected AFRC F-35A sorties for each airspace complex as well as the military agency responsible for coordinating and scheduling the use airspace with the different users. The number of annual sorties would increase in both the U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges) and APAFR Complexes. The Warning Areas are located off the southern Florida coast within about 50 NM of Homestead ARB.

Table HS3-1. Baseline and AFRC F-35A Annual Sorties

Training Airspace/Ranges ^b	Using/Scheduling Agency	Baseline Total	AFRC F-16	AFRC F-35A	Proposed Total	Percent Change
U.S. Navy Pinecastle Range Complex ^c	FACSFAC ^a Jacksonville	2,314	-237	923	3,000	29.6
APAFR Complex	23rd WG, MacDill AFB	6,285	-1,422	2,156	7,019	11.7
W-168	96th TW, Eglin AFB	2,858	-1,185	614	2,287	-20.0
W-174 A, B, C, E, F & G	Naval Air Station (NAS)	4,614	-1,185	233	3,662	-20.6
W-465 A, B & D	Key West	29,080	-711	706	29,075	0.0
Total		45,151	-4,740	4,632	45,043	-0.2

^a U.S. Navy, Fleet Area Control and Surveillance Facility, Jacksonville.

^b AFRC F-35A training airspace and ranges also includes the high altitude air traffic control airspace overlying the MOAs. Airspace areas in this table have been grouped due to similarity of training use and for noise modeling purposes.

^c Includes Rodman and Lake George Ranges.

HS3.1.4 Airspace Environmental Consequences

HS3.1.4.1 Airspace and Range Use

As shown in Table HS3-1, replacement of the F-16 sorties with the projected AFRC F-35A sorties would result in a decrease (0.2 percent) in overall sorties. While most of the training airspace and ranges would experience decreases or no change in sorties, sorties would increase in the U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges) and APAFR Complexes. The U.S. Navy Pinecastle Range Complex would experience an increase of 686 annual sorties and the APAFR Complex would experience an increase of 734 sorties. The U.S. Navy Pinecastle Range Complex has been previously analyzed for 10,216 annual operations (Brock 2018) and the increase in F-35A sorties would have no impact on the usage of that airspace.

AFRC F-35A sorties would require deconfliction with existing Navy sorties at the U.S. Navy Pinecastle Range Complex and USAF sorties within the APAFR Complex. Priority scheduling at the U.S. Navy Pinecastle Range Complex is given to Navy exercises. Scheduling coordination between the Navy and USAF and within the USAF would avoid conflicts within the airspace.

Implementation of the AFRC F-35A mission would not result in the creation of new SUA or change the boundaries of existing SUA. Therefore, no major changes to civilian operations are anticipated. The FAA would control the airspace when the MOA/ATCAA is activated, ensuring that there are no conflicts with the use of the jet routes and airways. Minor rerouting of flights along these routes and/or scheduling of specific portions of the MOA/ATCAA could alleviate potential conflicts.

HS3.1.5 Summary of Impacts to Airspace Management and Use

Implementation of the AFRC F-35A mission would involve a one-for-one exchange of F-16 aircraft with F-35A aircraft, and would not require any changes to airspace or to how the airfield is managed. Eventual replacement of F-16 aircraft at Homestead ARB with F-35A aircraft would result in a 3.0 percent increase in airfield operations. This minor operational increase would not affect how local air traffic is managed. In addition, the AFRC F-35A sorties proposed for the airspace could be accommodated in the training airspace, ranges, and while en route to/from these areas without adversely affecting other airspace uses throughout the affected region. Therefore, impacts to airspace around Homestead ARB and the airspace proposed for use would not be significant.

HS3.2 NOISE

Although noise can affect several resource areas, this section describes potential noise impacts on human annoyance and health, physical effects on structures, and potential impacts to animals in the care of humans. Noise impacts on biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomics (e.g., property values), and environmental justice/protection of children are discussed in sections dedicated to those resources. Chapter 3, Section 3.2, defines terms used to describe the noise environment as well as methods used to calculate noise levels and assess potential noise impacts. These terms and analytical methods are uniformly applied to all four bases. A summary of noise metrics used in this EIS is also provided in Table HS3-2.

For consistency, the dB unit is used throughout this EIS. However, all subsonic aircraft noise levels described in this EIS are measured in A-weighted decibels (dBA). In compliance with current DoD Noise Working Group guidance, the overall noise environment is described in this EIS using the DNL metric. During scoping, people submitted comments expressing concern about use of the DNL metric. The DNL metric is used because it is the preferred noise metric of the U.S. Department of Housing and Urban Development (HUD), FAA, U.S. Environmental Protection Agency (USEPA), and DoD. Studies of community annoyance in response to numerous types of environmental noise show that there is a correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise. In addition to the DNL metric, supplemental noise metrics are used to provide a more complete picture of noise and particular types of noise impacts (Table HS3-2). Operations occurring during environmental nighttime hours are assessed a 10-dB penalty applied in calculation of DNL (refer to Chapter 3, Section 3.2.3, for more detailed resource definition and methodology used to evaluate impacts).

Comments received during the scoping indicated a broad range of concerns and requested a comprehensive presentation of noise impacts. Therefore, this analysis covers a wide variety of potential noise impact categories. Additional details are provided in Volume II, Appendix B.

Table HS3-2. Summary of Noise Metrics Used in this EIS

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- The A-weighted decibel (dBA) is used to reflect a weighting process applied to noise measurements to filter out very low and very high frequencies of sound in order to replicate human sensitivity to different frequencies of sound and reflect those frequencies at which human hearing is most sensitive. Environmental noise is typically measured in dBA.
- Day-Night Average Sound Level (DNL) combines the levels and durations of noise events, the number of events over a 24-hour period, and more intrusive nighttime noise to calculate an average noise exposure.
- Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.
- C-Weighted Day-Night Average Sound Level (CDNL) is a day-night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of impulsive noise.
- Sound Exposure Level (SEL) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- Maximum Noise Level (L_{max}) is the highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight).
- Equivalent Noise Level (L_{eq}) represents aircraft noise levels decibel-averaged over a specified time period and is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$) and measured from 8:00 A.M. to 4:00 P.M.).

In this EIS, multiple noise metrics are used to describe the noise environment at each alternative base. This approach, which is in accordance with DoD policy, provides a more complete picture of the current and expected noise experience than can be provided by any one noise metric alone.

HS3.2.1 Base Affected Environment

This section discusses noise impacts near the installation. Noise generated in the training airspace and during transit to and from the training airspace is discussed in Section HS3.2.3.

Under baseline conditions, 38,518 airfield operations are conducted annually at Homestead ARB (operational information was collected from Homestead ARB personnel) (Homestead ARB 2017a). This includes 10,428 operations by AFRC F-16 pilots. CBP pilots fly 7,622 operations per year in DHC-8, AS-350, and UH-60 aircraft. Special Operations Command South pilots fly 788 operations annually in propeller-driven aircraft. Pilots from the Golden Knights fly 4,608 operations annually in F-27 and DHC-6 aircraft. Transient aircraft pilots use the airfield for a variety of purposes (e.g., stop-over during cross country flights, unfamiliar airfield for practice approaches, divert landing location during severe weather), and transient aircraft could potentially include any aircraft type. Approximately 8 percent of total airfield operations are conducted between 10:00 P.M. and 7:00 A.M. Approximately 3 percent of 482 FW F-16 airfield operations are conducted between 10:00 P.M. and 7:00 A.M.

HS3.2.1.1 Noise Exposure

Several comments received during scoping requested the USAF provide individual overflight noise levels quantified using the sound exposure level (SEL) noise metric. The information on SELs shown in Table HS3-3 was calculated based on local flying procedures and conditions using methods described in Chapter 3, Section 3.2.3.1. Specifically, Table HS3-3 lists only the highest SEL generated by any flight procedure (e.g., arrival, departure, or closed pattern) by any based or transient

aircraft type. The table also states the number of times per year that the flight procedure occurs during “acoustic day” (i.e., 7:00 A.M. to 10:00 P.M.) and “acoustic night” (10:00 P.M. to 7:00 A.M.). It is worth noting that the noise environment at a particular location is complex and the highest SEL is only one descriptor of this complex situation. In addition, actual flight paths vary, due to weather, winds, aircrew technique, and other factors, from the most-frequently followed (representative) flight paths used in noise modeling. Therefore, individual flight events could be closer to, or be farther away from, the representative noise-sensitive location, resulting in noise levels being slightly higher or lower than indicated in Table HS3-3.

Table HS3-3. Highest SEL at Representative Noise-Sensitive Locations near Homestead ARB Under Baseline Conditions

Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{a,b}
Type	ID	Description	Aircraft Group	Aircraft	Operation Type	Annual Ops at this SEL		
						7:00 A.M. to 10:00 P.M.	10:00 P.M. to 7:00 A.M.	
Park	P01	Biscayne National Park Offshore	B	F-16C	Departure	4,414	0	95
	P02	Everglades National Park Ernest F. Coe Visitor Center	B	F-15E	Arrival	62	7	93
	P03	Biscayne Bay Visitor Center	B	F-15E	Departure	2	0	88
	P04	Audubon Park	B	F-15E	Arrival	32	4	93
	P05	Cutler Ridge Park	B	F-15E	Arrival	1	0	88
Residential	R01	Verde Gardens	B	F-15E	Departure	61	6	101
School ^c	S01	Mandarin Lakes K-8 Academy	B	F-15E	Departure	61	6	100
	S02	De La Salle Education Center	T	F/A-18A/C	Departure	3	0	106
	S03	Keys Gate Charter School	T	F/A-18A/C	Arrival	52	3	110
	S04	The Charter School at Waterstone	B	F-16C	Arrival	19	0	100
	S05	Miami Arts Charter School	T	F/A-18A/C	Arrival	52	3	98

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c For the purposes of this noise analysis, noise levels at schools are described throughout this EIS using representative schools; discussion of noise at schools may not include all schools in the area.

Key: T = Transient aircraft or non-Homestead ARB-based aircraft involved in training exercise; B = Based aircraft

Several factors, including, but not limited to, weather conditions, the precise flight path followed, and whether the aircraft is flying in formation, affect the noise level of individual overflights (Chapter 3, Section 3.2.3). Formation flights involve multiple aircraft, usually of the same type, flying together. The maximum noise level experienced during a formation overflight depends on the spacing and arrangement of the formation’s member aircraft. If the aircraft are spaced close together, then doubling the number of aircraft would add as much as 3 dB to the maximum noise level (L_{max}) of the event. Since the SEL metric is an exposure-based metric, doubling the number of aircraft of a single aircraft type adds 3 dB to the event noise level.

Figure HS3-1 shows baseline DNL contours in 5-dB increments. Areas with the highest DNL are located along the runway, beneath the most heavily-used flight paths and in areas near the airfield

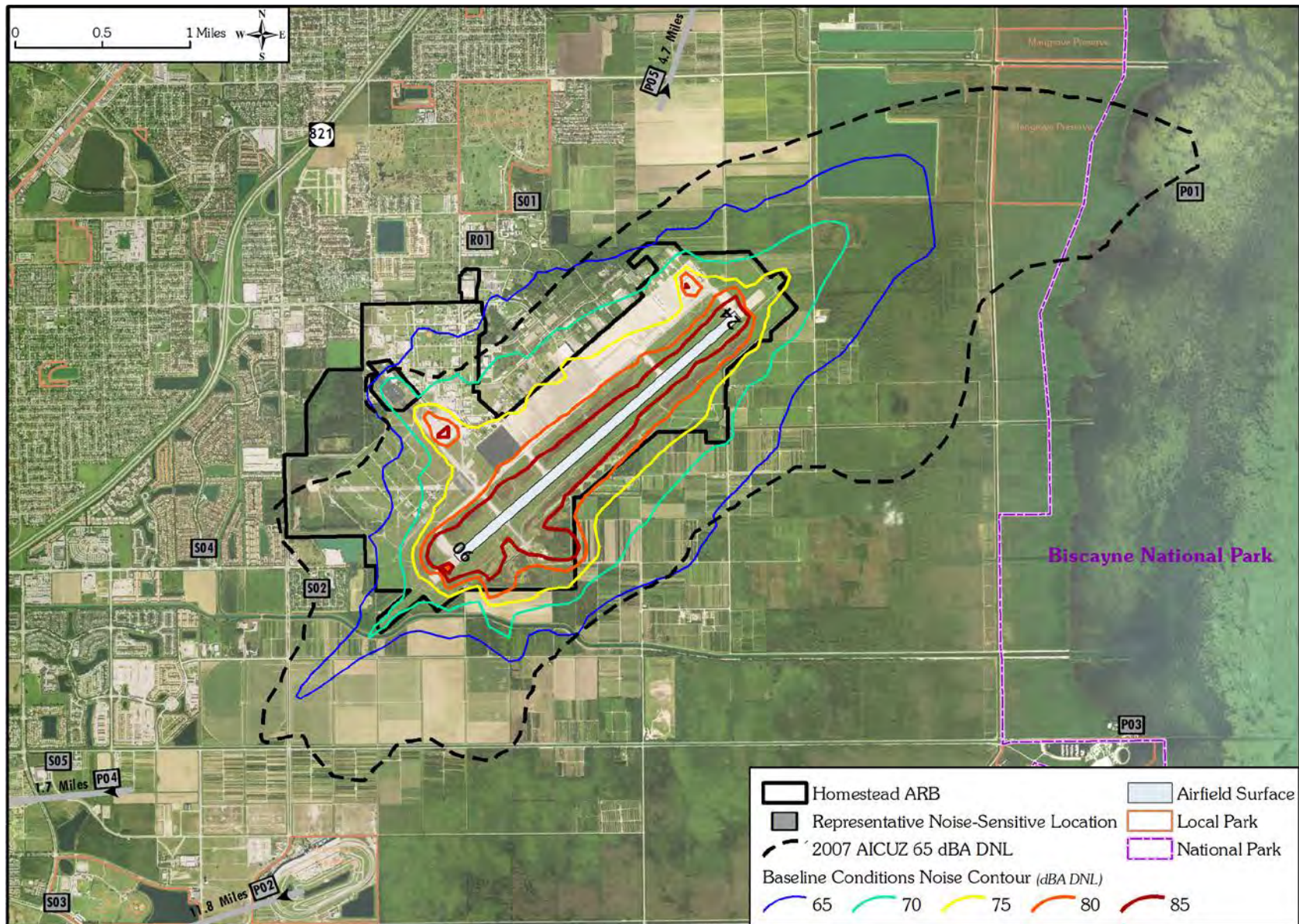


Figure HS3-1. Baseline DNL Contours at Homestead ARB

where aircraft static engine runs are conducted. Noise contours generated for baseline conditions represent the most current estimate of operations derived from interviews with Homestead ARB personnel. The fact that baseline noise contours are smaller than those included in the 2007 AICUZ reflects a decrease in the tempo of operations relative to the number modeled in the 2007 AICUZ.

The off-base land areas exposed to DNL of 65 dB or greater are agricultural. Although a total of 1,692 acres are currently exposed to DNL greater than 65 dB, the estimated population of the affected area is zero (Table HS3-4). Agricultural land is considered to be generally compatible at all noise levels according to USAF land use guidelines. People living outside of the 65 dB DNL contour also sometimes experience potentially disturbing aircraft overflights and can become annoyed by the noise. As noted in Chapter 3, Section 3.2.3, and Volume II, Appendix B, a person’s reaction to noise is dependent on several non-acoustic factors, including the person’s perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Additional details on annoyance are contained in Chapter 3, Section 3.2.3, and Volume II, Appendix B.

Table HS3-4. Off-Base Acres and Population Exposed to DNL of 65 dB or Greater Under Baseline Conditions at Homestead ARB

DNL (dB)	Acres	Estimated Population
65-69	1,156	0
70-74	437	0
75-79	86	0
80-84	12	0
≥85	1	0
Total	1,692	0

Table HS3-5 lists baseline DNL at several representative noise-sensitive locations around the base. These include a point off the coast in Biscayne National Park, a residential area, and several schools. Baseline DNLs at the representative noise-sensitive locations are similar to and indicative of DNL in any nearby residential areas. DNLs at the locations studied range from less than 45 to 62 dB.

Table HS3-5. DNL at Representative Noise-Sensitive Locations near Homestead ARB Under Baseline Conditions

Type	ID	Description	DNL (dB)
Park	P01	Biscayne National Park Offshore	57
	P02	Everglades National Park Ernest F. Coe Visitor Center	<45
	P03	Biscayne Bay Visitor Center	50
	P04	Audubon Park	<45
	P05	Cutler Ridge Park	<45
Residential	R01	Verde Gardens	62
School	S01	Mandarin Lakes K-8 Academy	60
	S02	De La Salle Education Center	60
	S03	Keys Gate Charter School	58
	S04	The Charter School at Waterstone	54
	S05	Miami Arts Charter School	51

Areas outside the 65 dB DNL contour line could also experience noise that can be disturbing at times. Although noise events are less frequent and/or less intense in locations exposed to DNL less than 65 dB than in locations exposed to DNL greater than 65 dB, loud and potentially disturbing noise events do occur. Some people are more noise-sensitive than others as a result of physical, psychological, and emotional factors. People with autism and people afflicted with post-traumatic

stress disorder (PTSD) may be particularly sensitive to sudden loud noises such as those that occur near an airbase. The DNL metric is useful for describing the noise environment at a location with a single number, but it does not provide a complete description of the noise environment. In accordance with current DoD policy, this EIS uses several supplemental noise metrics (e.g., SEL, L_{max} , number of events exceeding dB threshold) to provide a more complete description of the noise experience.

HS3.2.1.2 Speech Interference

Speech interference is possible when noise levels exceed 50 dB. For the purposes of this analysis, any change to normal speech patterns is counted as an interference event. Table HS3-6 lists the number of events exceeding L_{max} of 50 dB in buildings with windows open, in buildings with windows closed, and outdoors. Predictions of indoor speech interference events account for standard values of 15 dB or 25 dB of noise attenuation provided by buildings with windows open or closed, respectively. Many of the parks listed in Table HS3-6 are near residential areas, and noise levels are similar. Flight paths are variable and speech interference events sometimes occur far from standard Homestead ARB flight patterns.

Table HS3-6. Potential Speech Interference Under Baseline Conditions at Homestead ARB

Representative Noise-Sensitive Location			Annual Average Daily Daytime Events per Hour (7:00 A.M. to 10:00 P.M.)		
Type	ID	Description	Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Biscayne National Park Offshore	1	1	3
	P02	Everglades National Park Ernest F. Coe Visitor Center ^b	<<1	<<1	<<1
	P03	Biscayne Bay Visitor Center	1	<<1	2
	P04	Audubon Park	1	<<1	3
	P05	Cutler Ridge Park	<<1	<<1	1
Residential	R01	Verde Gardens	1	1	3

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB of noise level reductions for windows open and closed, respectively.

Key: Locations where the hourly disruption events round to zero are listed using the symbol <<1.

HS3.2.1.3 Interference with Classroom Learning

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. When considering intermittent noise caused by aircraft overflights, guidelines for classroom interference indicate that an appropriate criterion is a limit of 35 to 40 dB (depending on classroom size) on indoor background equivalent noise levels during the school day ($L_{eq(SD)}$) and a 50 dB L_{max} limit on single events. Table HS3-7 lists $L_{eq(SD)}$ and the average number of events per hour that exceed 50 dB L_{max} at several schools near Homestead ARB when windows are open and when windows are closed. Indoor $L_{eq(SD)}$ exceed 40 dB at four of the five schools studied when windows are open, but $L_{eq(SD)}$ do not exceed 40 dB with windows closed at any of these schools. Between one and two events per hour during the school day exceed L_{max} of 50 dB if windows are closed and one or less event per hour exceeds L_{max} of 50 dB when windows are closed. The number of outdoor events per hour with potential to interfere with speech between 7:00 A.M. and 10:00 P.M. is not directly related to classroom noise level but is relevant during recess and to other activities that could occur outside the school building.

Table HS3-7. Indoor Classroom Learning Disruption Under Baseline Conditions at Homestead ARB

ID	Description	Windows Open		Windows Closed		Outdoor
		L _{eq(SD)} (dB)	Events per Hour ^a	L _{eq(SD)} (dB)	Events per Hour ^a	Events per Hour ^b
S01	Mandarin Lakes K-8 Academy	47	1	37	1	3
S02	De La Salle Education Center ^c	47	2	37	1	4
S03	Keys Gate Charter School	43	2	<35	1	3
S04	The Charter School at Waterstone	40	1	<35	1	3
S05	Miami Arts Charter School	36	1	<35	<<1	3

^a Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^b Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

^c The De La Salle Education Center is used for afterschool tutoring and nighttime adult education.

Key: L_{eq(SD)} is the equivalent noise level during a school day (defined as 8:00 A.M. to 4:00 P.M.); Locations where the hourly disruption events round to zero are listed using the symbol <<1.

HS3.2.1.4 Sleep Disturbance

Nighttime flying, which is required as part of training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (ANSI) (ANSI 2008). The method first predicts the probability of awakening associated with each type of flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects all flying events that occur between 10:00 P.M. and 7:00 A.M., when most people sleep (Table HS3-8). The analysis also accounts for standard building attenuation of 15 dB and 25 dB with windows open and closed, respectively. Sleep disturbance probabilities listed for parks and schools are not intended to imply that people regularly sleep in parks or schools, but instead are indicative of impacts in nearby residential areas.

Table HS3-8. Average Probability of Awakening Under Baseline Conditions at Homestead ARB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)	
			Windows Open ^a	Windows Closed ^a
Park ^b	P01	Biscayne National Park Offshore	3	1
	P02	Everglades National Park Ernest F. Coe Visitor Center	0	0
	P03	Biscayne Bay Visitor Center	2	1
	P04	Audubon Park	1	0
	P05	Cutler Ridge Park	0	0
Residential	R01	Verde Gardens	4	1
School ^b	S01	Mandarin Lakes K-8 Academy	3	1
	S02	De La Salle Education Center	6	3
	S03	Keys Gate Charter School	4	1
	S04	The Charter School at Waterstone	2	1
	S05	Miami Arts Charter School	3	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Parks and schools listed in this table serve as representative geographic areas by which surrounding neighborhoods can estimate their potential noise exposure. None of the above-listed parks or schools are open from 10:00 P.M. to 7:00 A.M.

HS3.2.1.5 *Potential for Hearing Loss*

Potential for Hearing Loss (PHL) applies to people living in high noise environments where they can experience long-term (40 years) hearing effects resulting from DNL greater than 80 dB (USD 2009). PHL is not an issue of concern because there are no residences exposed to DNL greater than 80 dB.

HS3.2.1.6 *Occupational Noise*

In on-base areas with high noise levels, existing USAF occupational noise exposure prevention procedures, such as hearing protection and monitoring, are implemented to comply with all applicable Occupational Safety and Health Administration (OSHA) and USAF occupational noise exposure regulations.

HS3.2.1.7 *Non-auditory Health Impact*

During scoping, the question of the potential for non-auditory health effects from noise was raised. Several studies have been performed to see whether noise can cause health effects other than hearing loss. The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. Cantrell (1974) confirmed that noise can provoke stress, but noted that results on cardiovascular health have been contradictory. Some studies have found a connection between aircraft noise and blood pressure (e.g., Michalak *et al.* 1990; Rosenlund *et al.* 2001), while others have not (e.g., Pulles *et al.* 1990).

Kryter and Poza (1980) noted, “It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body.”

The connection from annoyance to stress to health issues requires careful experimental design and the resulting data are subject to different interpretations. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods under the approach path to Los Angeles International Airport. When the same data were subsequently analyzed by others (Frerichs *et al.* 1980), no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhood. But when the Centers For Disease Control performed a more thorough study near Hartsfield-Jackson Atlanta International Airport, no relationships were found for levels greater than 65 dB (Edmonds *et al.* 1979).

A carefully designed study, Hypertension and Exposure to Noise near Airports (HYENA), was conducted around six European airports from 2002 through 2006 (Jarup *et al.* 2005, 2008). There were 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires administered for health, socioeconomic, and lifestyle factors, including diet and physical exercise. Hypertension was defined by World Health Organization blood pressure thresholds (WHO 2003). Noise from aircraft and highways was predicted from models.

The HYENA results were presented as an odds ratio (OR). An OR of 1 would mean no added risk exists, while an OR of 2 would mean risk doubles. An OR of 1.14 was found for nighttime aircraft noise, measured by the equivalent noise level during nighttime hours (L_{night}). For daytime aircraft noise, measured by 16-hour equivalent noise level (L_{eq16}), the OR was 0.93. For road traffic noise, measured by 24-hour equivalent noise level (L_{eq24}), the OR was 1.1.

Note that OR is a statistical measure of change, not the actual risk. Risk itself and the measured effects were small, and not necessarily distinct from other events. Haralabidis *et al.* (2008) reported

an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise, and an increase of 7.4 mmHg for other indoor noises such as snoring. For the purpose of this EIS analysis, it is interesting to note that the studies demonstrated aircraft noise was a factor at night, while traffic noise was a factor for the full day.

Two recent studies examined the correlation of aircraft noise with hospital admissions for cardiovascular disease. Hansell *et al.* (2013) examined neighborhoods around London’s Heathrow Airport. Correia *et al.* (2013) examined neighborhoods around 89 airports in the United States. Both studies included areas of various noise levels. They found associations that were consistent with the HYENA results that found nighttime noise to have a higher OR (greater impact) than daytime noise.

The current state of scientific knowledge cannot yet support inference of a causal or consistent relationship between aircraft noise exposure and non-auditory health consequences for exposed residents. The large-scale HYENA study (Jarup *et al.* 2005, 2008) and the recent studies by Hansell *et al.* (2013) and Correia *et al.* (2013) offer indications, but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

HS3.2.1.8 Structural Damage

Noise that does not exceed 130 dB in any 1/3-octave frequency band or last for more than 1 second does not typically have the potential to damage structures in good repair (CHABA 1977). The term “frequency bands” refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Noise exceeding 130 dB in any 1/3-octave frequency band and lasting for more than 1 second of that intensity and duration does not occur except on the flightline immediately adjacent to jet aircraft. The installation has not received any claims for noise-induced property damage.

Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects within structures can occur during loud overflights. Rattling of objects such as dishes, hanging pictures, and loose window panes can cause residents to fear damage. Rattling objects have the potential to contribute to annoyance along with other potential noise effects (e.g., speech interference, sleep disturbance).

HS3.2.1.9 Animals in the Care of Humans

Potential noise impacts on wildlife are discussed in Section HS3.6. However, pets, other domesticated animals, and animals kept in zoos live in different circumstances than wild animals and often react differently to human-generated noises, particularly when enclosed in small spaces. Negative reactions to loud overflights are possible under baseline conditions.

HS3.2.2 Base Environmental Consequences

Implementation of the AFRC F-35A mission would replace the 24 F-16 aircraft currently assigned to the 482 FW with 24 F-35A aircraft. The number of airfield operations flown annually by the 482 FW would change from 10,428 to 11,580, increasing the total number of airfield operations flown by all aircraft at Homestead ARB by 3 percent.

AFRC F-35A pilots would fly approximately 2 percent of initial approaches to the runway during the late-night time period between 10:00 P.M. and 7:00 A.M. This is the same percentage of initial approaches that are conducted by 482 FW F-16 pilots late at night. As is currently the case with

F-16 pilots, AFRC F-35A pilots would not typically conduct departures or closed patterns (i.e., multiple practice approaches) between 10:00 P.M. and 7:00 A.M.

Based on context and intensity, noise impacts resulting from implementation of the proposed AFRC F-35A mission at Homestead ARB would be considered adverse but not significant. The intensity of noise impacts in several impact categories (e.g., speech interference, sleep disturbance, etc.) are described in Sections HS3.2.2.1 through HS3.2.2.9.

Construction and demolition (C&D) projects in support of the proposed AFRC F-35A mission would generate short-term, localized increases in noise. However, the installation is currently exposed to elevated aircraft noise levels as well as noise generated by the day-to-day operation and maintenance (O&M) of vehicles and equipment. Construction would occur during normal working hours (i.e., 7:00 A.M. to 5:00 P.M.), and construction equipment would be equipped with mufflers. Workers would wear hearing protection in accordance with applicable regulations. Transportation of materials and equipment to and from the construction sites would generate noise similar to heavy trucks currently operating on base and along local roadways. In the context of ongoing frequent and intense aircraft noise events on an active military installation, construction noise generated by the AFRC F-35A mission would not result in significant impacts.

HS3.2.2.1 Noise Exposure

HS3.2.2.1.1 Scenario A

Table HS3-9 compares F-16 and F-35A individual overflight noise levels at a representative noise-sensitive location southwest of the runway (i.e., De La Salle Education Center [S02]). The noise levels listed in Table HS3-9 reflect flight procedures at Homestead ARB (e.g., pattern altitudes) and are not directly applicable to other installations. The specific types of flight departure, arrival, or closed pattern procedures listed in the table were selected because they generate the highest dB SEL of any departure, arrival, or closed pattern procedure flown by that aircraft at the location studied. The same set of Homestead ARB-specific flight procedures used to calculate DNL contours was also used to calculate noise levels in Table HS3-9.

Table HS3-9. Comparison of F-16 and F-35A Noise Levels at the De La Salle Education Center (S02) near Homestead ARB

Aircraft	Operation Type	Engine Power	Airspeed (knots)	Altitude (feet AGL)	Slant Distance (feet)	SEL (dB) ^a	L _{max} (dB) ^a
F-35A (Military Power)	Departure	100% ETR	300	685	3,625	103	95
F-35A (Afterburner Power) ^a		100% ETR	300	766	3,641	104	95
F-16C (Military Power)		104% NC	300	1,156	3,744	96	87
F-16C (Afterburner Power)		104% NC	300	1,519	3,873	98	90
F-35A (Overhead Break)	Arrival	40% ETR	170	211	2,092	98	87
F-16C (Straight-in)		85% NC	180	230	2,094	78	69
F-35A (PFO Pattern)	Closed	100% ETR	300	1,253	3,300	104	96
F-16C (VFR Low Approach)	Pattern	104% NC	350	555	2,098	105	96

Notes: Noise levels presented were calculated at Homestead Housing Authority (De La Salle Education Center) for the departure, arrival, and closed pattern flight that has the highest SEL at this location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^a For a detailed explanation of why F-35A afterburner departures might have lower SEL and L_{max} values than military power departures, see Chapter 3, Section 3.2.3.1. Essentially, during afterburner takeoffs, the aircraft reaches the required takeoff speed and leaves the ground sooner, and is at a slightly higher altitude throughout the flight profile. As a result, the aircraft altitude and slant distance at the location studied are both typically higher for the afterburner departure. Typically, the afterburner is turned off at approximately 10,000 feet from brake release, which occurs before the aircraft is over the location studied. The engine power (i.e., ETR) setting of the aircraft when it is above the location studied is the same for both the military power and the afterburner departure.

ETR = Engine Thrust Request. NC = core engine speed

AFRC F-35A pilots conducting afterburner departures would only use the afterburner for a short period of time (see Chapter 3, Figure 3-1), and then continue their climb in military power (i.e., the same power setting used throughout the departure during non-afterburner departures). During afterburner departures, the afterburner would be de-selected long before the aircraft overfly the De La Salle Education Center (S02). Because afterburner and non-afterburner power departures are at the same power setting as they pass near the school, overflight noise levels generated by the two types of departures are similar at the school.

As noted in Chapter 3, Section 3.2.3, computer noise modeling was conducted in compliance with current USAF and DoD-approved methods. The modeling accounted for the effects of terrain relief (e.g. hills and valleys, coastal plains, etc.) as well as surface type (land or water) on the propagation of noise. In accordance with standard modeling procedures, noise modeling at Homestead ARB used median atmospheric conditions for sound propagation based on local climate records. The modeling does not reflect possible future climates in part because the degree to which the climate will change and the timeframe in which change will occur are not known at this time. Noise levels were calculated for an average annual day, which is a day with 1/365th of annual total operations. The computer noise model NOISEMAP references a database of field-measured sound levels for aircraft in various flight configurations. The model also uses data on flight procedures for current and proposed aircraft operations (e.g., where, how often, what time of day, and what configurations are used) based on recent inputs provided by Homestead ARB pilots and Air Traffic Control. Application of noise results generated for another airfield would be inappropriate because flight procedures, terrain, and several other factors are different at other airfields. F-35A flight parameters (e.g., altitude, airspeed, and engine power setting) that are expected to be used at Homestead ARB were developed based on information provided by F-35A pilots at bases where the aircraft is operating currently, such as Luke, Hill, and Eglin AFBs. These flight parameters were used to generate results specific to Homestead ARB.

Several comments received during scoping requested that the USAF provide individual overflight noise levels using the SEL noise metric. Information is provided on the flight procedure with the highest SEL at several representative noise-sensitive locations in Table HS3-10. A flight procedure is a specific type of operation (e.g., afterburner departure) on a specific flight path, by a specific aircraft type. Actual flight paths vary as a result of weather, winds, aircrew technique, and other factors, and individual flights would deviate in position and noise level from those listed in Table HS3-10. In addition, the flight procedure with the highest SEL is one aspect of a complex sound environment which includes many other flight procedures (e.g., flaps or gear position) as well as other noise sources. At all of the representative noise-sensitive locations except the Biscayne Bay Visitor Center, the highest SEL would remain the same or decrease by 1 dB under the AFRC F-35A mission relative to baseline conditions. At the Biscayne Bay Visitor Center, the highest SEL would increase by 4 dB, from 88 to 92 dB. In many locations where the highest SEL would not change, transient F/A-18A/C aircraft or based F-15 aircraft generate the highest SEL under baseline conditions, and would continue to do so under the proposed action. At the Charter School at Waterstone, a based F-16 arrival procedure that had generated the highest SEL would stop occurring, and a based F-15 departure procedure which generates a lower SEL would replace it as the generator of the highest SEL.

Table HS3-10. Highest SEL at Representative Noise-Sensitive Locations near Homestead ARB Under Baseline and AFRC F-35A Mission Conditions

Scenario	Point of Interest			Operation with the Highest SEL					SEL (dB) ^{a,b}
	Type	ID	Description	Aircraft Group	Aircraft	Operation Type	Annual Operations at this SEL		
							7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
Baseline	Park ^c	P01	Biscayne National Park Offshore	B	F-16C	Departure	4,414	0	95
		P02	Everglades National Park Ernest F. Coe Visitor Center	B	F-15E	Arrival	62	7	93
		P03	Biscayne Bay Visitor Center	B	F-15E	Departure	2	0	88
		P04	Audubon Park	B	F-15E	Arrival	32	4	93
		P05	Cutler Ridge Park	B	F-15E	Arrival	1	0	88
	Residential	R01	Verde Gardens	B	F-15E	Departure	61	6	101
	School ^c	S01	Mandarin Lakes K-8 Academy	B	F-15E	Departure	61	6	100
		S02	De La Salle Education Center	T	F/A-18A/C	Departure	3	0	106
		S03	Keys Gate Charter School	T	F/A-18A/C	Arrival	52	3	110
		S04	The Charter School at Waterstone	B	F-16C	Arrival	19	0	100
S05		Miami Arts Charter School	T	F/A-18A/C	Arrival	52	3	98	
AFRC F-35A Mission ^d	Park ^c	P01	Biscayne National Park Offshore	B	F-35A	Departure	4,400	0	95
		P02	Everglades National Park Ernest F. Coe Visitor Center	B	F-15E	Arrival	62	7	93
		P03	Biscayne Bay Visitor Center	B	F-35A	Departure	4400	0	92
		P04	Audubon Park	B	F-15E	Arrival	32	4	93
		P05	Cutler Ridge Park	B	F-15E	Arrival	1	0	88
	Residential	R01	Verde Gardens	B	F-15E	Departure	61	6	101
	School ^c	S01	Mandarin Lakes K-8 Academy	B	F-15E	Departure	61	6	100
		S02	De La Salle Education Center	T	F/A-18A/C	Departure	3	0	106
		S03	Keys Gate Charter School	T	F/A-18A/C	Arrival	52	3	110
		S04	The Charter School at Waterstone	B	F-15E	Departure	30	3	99
S05		Miami Arts Charter School	T	F/A-18A/C	Arrival	52	3	98	

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c Parks and schools listed in this table serve as representative geographic areas by which surrounding neighborhoods can estimate their potential noise exposure. None of the above-listed parks or schools are open from 10:00 P.M. to 7:00 A.M.

^d Military power and afterburner power departure SELs at the noise-sensitive locations are within 1 dB of each other and the numbers of annual operations include all three afterburner scenarios.

Key: B = Based aircraft; T = Transient or non-Homestead ARB aircraft involved in training exercise

Figure HS3-2 shows the DNL contours in 5-dB increments that would result from Scenario A overlain on the baseline noise contours for comparison. Much of the 2,926 acres that would be newly exposed to DNL of 65 dB or greater consists of agricultural land or open space, and the estimated number of off-base residents exposed to DNL of 65 dB or greater would increase from zero to 62 (Table HS3-11). No residents would be exposed to DNL greater than 69 dB. As described in Chapter 3, Section 3.2.3, the affected population was estimated based on U.S. Census data at the Block Group (BG) level with adjustments to remove non-residential areas from calculations.

Table HS3-11. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario A at Homestead ARB

DNL (dB)	Acres			Estimated Population ^a		
	Baseline	Scenario A	Change	Baseline	Scenario A	Change
65-69	1,156	2,865	1,709	0	62	62
70-74	437	1,298	861	0	0	0
75-79	86	414	328	0	0	0
80-84	12	40	28	0	0	0
≥85	1	1	0	0	0	0
Total	1,692	4,618	2,926	0	62	62

^aAll of the estimated population affected by DNL greater than 65 dB are located at the South Dade Center (S02).

As noted in Chapter 3, Section 3.2.3, the probability that an individual will become annoyed by noise is impossible to predict with confidence because of differing physical and emotional variables between individuals (Newman and Beattie 1985). These variables include, but are not limited to, the person's feeling about the necessity or preventability of the noise, the person's attitude about the environment, and any feelings of fear the person might have about the noise source. It can be said with confidence that people in communities exposed to increased DNL would be more likely to become highly annoyed by the noise (Schultz 1978, Finegold et al. 1994, Meidema and Vos 1998). Studies conducted by Schultz in 1978 and Finegold et al. in 1994 indicated that approximately 12 percent of people exposed to DNL of 65 dB and 36 percent of people exposed to DNL of 75 dB could be expected to be highly annoyed by the noise (Schultz 1978, Finegold et al. 1994). More recent studies suggest that the percentage of people highly annoyed by noise—and aircraft noise in particular—might be higher than previously thought. A study conducted by Meidema and Vos in 1998 indicated that 28 percent of people could be expected to be annoyed by DNL of 65 dB, and 48 percent of people could be expected to be highly annoyed by DNL of 75 dB (Meidema and Vos 1998). Additional details on the prevalence of annoyance in high noise communities are contained in Volume II, Appendix B.

USAF land use compatibility guidelines classify residential land uses as incompatible with DNL greater than 65 dB unless the residences meet minimum structural noise reduction goals. Residential land uses are considered to be compatible if measures are incorporated which achieve outdoor-to-indoor noise level reduction of at least 25 dB in areas exposed to DNL of 65 to 69 dB. Structural elements with better-than-average temperature insulation properties (e.g., double-paned windows) tend to also provide better-than-average noise level reduction. A more detailed discussion of land use compatibility is contained in Section HS3.8.

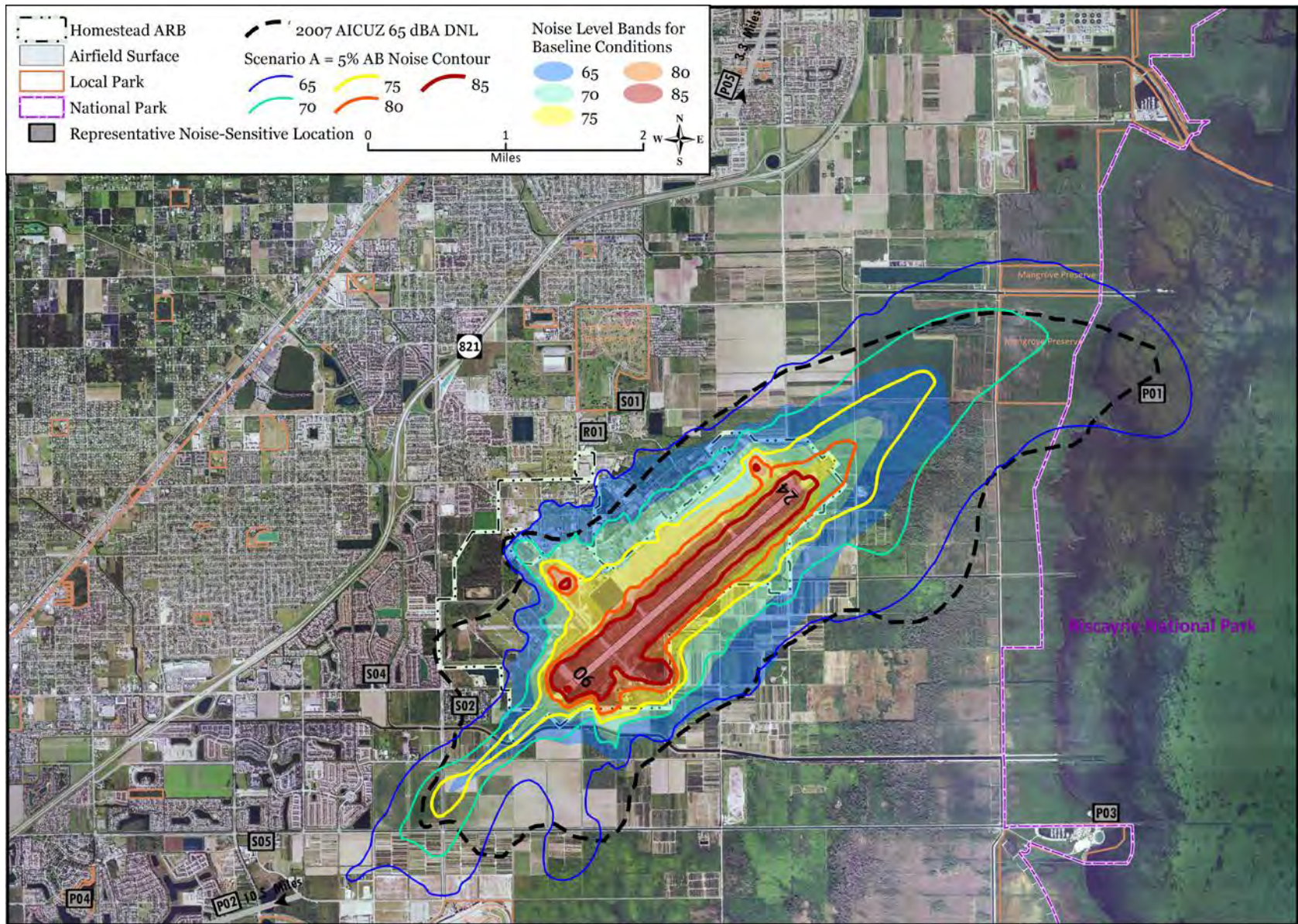


Figure HS3-2. AFRC F-35A Scenario A DNL Contours at Homestead ARB

The DNL changes that would result from the implementation of Scenario A are shown in Table HS3-12. Noise levels at non-residential locations listed are similar to noise levels in any nearby residential areas. The DNL at Biscayne National Park Offshore would increase by 10 dB to 67 dB. The DNL at Audubon Park would increase by 8 dB. The DNL at the Biscayne Bay Visitor Center and Keys Gate Charter School would increase by 4 dB. DNL at the De La Salle Education Center and Miami Arts Charter School would increase by 3 dB. The DNL at the Verde Gardens residential area and Charter School at Waterstone would increase by 1 dB. The whole number DNL at the Everglades National Park Visitor Center, Cutler Ridge Park, and Mandarin Lakes K-8 Academy would not increase.

Table HS3-12. DNL at Representative Noise-Sensitive Locations near Homestead ARB under Baseline and Scenario A Conditions

Type	ID	Description	DNL (dB)		
			Baseline	Scenario A	Change
Park	P01	Biscayne National Park Offshore	57	67	10
	P02	Everglades National Park Ernest F. Coe Visitor Center	<45	<45	0
	P03	Biscayne Bay Visitor Center	50	54	4
	P04	Audubon Park	<45	51	8
	P05	Cutler Ridge Park	<45	<45	0
Residential	R01	Verde Gardens	62	63	1
School	S01	Mandarin Lakes K-8 Academy	60	60	0
	S02	De La Salle Education Center	60	63	3
	S03	Keys Gate Charter School	58	62	4
	S04	The Charter School at Waterstone	54	55	1
	S05	Miami Arts Charter School	51	54	3

HS3.2.2.1.2 Scenario B

The only difference between Scenario B and Scenario A is that 50 percent rather than 5 percent of departures would be conducted using afterburner power.

The flight procedures used by F-35A aircraft would be the same under Scenario B as Scenario A, and there would be no difference in the highest SEL experienced at representative noise-sensitive locations (see Table HS3-10). The noise levels generated by afterburner and military power departures would differ by less than 1 dB, and the numbers of annual operations in Table HS3-10 include all three afterburner scenarios.

As discussed in Section HS3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. The Scenario B 65 dB DNL contour is slightly larger than the Scenario A contour in areas to the right and left of the runway but slightly smaller in areas farther out along departure flight paths (Figure HS3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-22 in Appendix B, Section B.4. Differences in DNL under Scenarios A and B reflect the separate areas in which afterburner power departures are louder than or less loud than military power departures. Much of the land area exposed to DNL greater than 65 dB under Scenario B but not under Scenario A is open or agricultural. Implementation of Scenario B would expose an additional 3,088 acres to DNL of 65 dB or greater (162 more acres than Scenario A), and an estimated 17 additional people would be exposed to these noise levels (see Table HS3-13). As was the case under Scenario A, no people would be exposed to DNL greater than 69 dB.

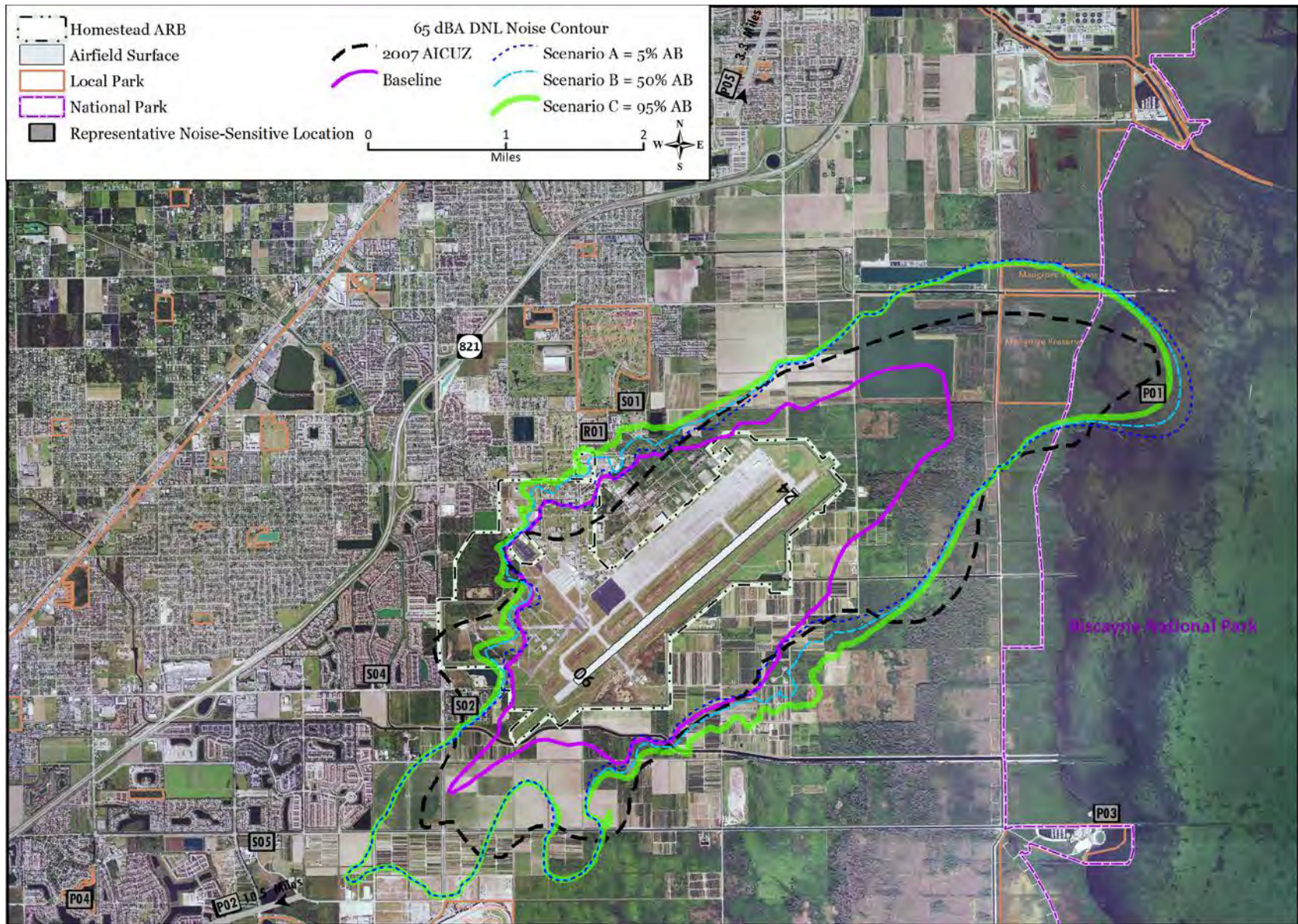


Figure HS3-3. AFRC F-35A Mission 65 dB DNL Contours (Scenarios A, B, and C) at Homestead ARB

Table HS3-13. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario B at Homestead ARB

DNL (dB)	Acres			Estimated Population ^a		
	Baseline	Scenario B	Change	Baseline	Scenario B	Change
65-69	1,156	2,901	1,745	0	79	79
70-74	437	1,364	927	0	0	0
75-79	86	459	373	0	0	0
80-84	12	55	43	0	0	0
≥85	1	1	0	0	0	0
Total	1,692	4,780	3,088	0	79	79

^aAll of the estimated population affected by DNL greater than 65 dB are located at the South Dade Center (S02).

Table HS3-14 lists changes in DNL under Scenario B. The DNL at Biscayne National Park Offshore would decrease by 1 dB relative to Scenario A while the DNL at Verde Gardens residential area and the Mandarin Lakes K-8 Academy would be 1 dB higher than under Scenario A.

Table HS3-14. DNL at Representative Noise-Sensitive Locations near Homestead ARB under Baseline and Scenario B Conditions

Type	ID	Description	DNL (dB)		
			Baseline	Scenario B	Change
Park	P01	Biscayne National Park Offshore	57	66	9
	P02	Everglades National Park Ernest F. Coe Visitor Center	<45	<45	0
	P03	Biscayne Bay Visitor Center	50	54	4
	P04	Audubon Park	<45	51	8
	P05	Cutler Ridge Park	<45	<45	0
Residential	R01	Verde Gardens	62	64	2
School	S01	Mandarin Lakes K-8 Academy	60	61	1
	S02	De La Salle Education Center	60	63	3
	S03	Keys Gate Charter School	58	62	4
	S04	The Charter School at Waterstone	54	55	1
	S05	Miami Arts Charter School	51	54	3

HS3.2.2.1.3 Scenario C

Under Scenario C, 95 percent of F-35A departures would be conducted using afterburner power, but all other aspects of the proposed AFRC F-35A mission would be identical to Scenarios A and B. There would be no difference between Scenarios A, B, and C in the highest SEL experienced at representative noise-sensitive locations (see Table HS3-10).

As discussed in Section HS3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. Noise levels, as measured in DNL, would be slightly higher to the right and left of the runway under Scenario C than Scenarios A or B, but would not be as high off the ends of the runway along the departure flight paths. These relative differences in noise levels are reflected in the locations of the 65 dB DNL contours shown on Figure HS3-3. The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-23 in Appendix B, Section B.4. Implementation of Scenario C would expose an additional 3,263 acres and an estimated 104 people to DNL of 65 dB or greater (Table HS3-15). Because a large fraction of the land encompassed by the Scenario C 65 dB DNL contour would be open or agricultural, the estimated population exposed to this level of noise would increase by 42 while the affected land area would increase by 337 acres relative to Scenario A.

Table HS3-15. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario C at Homestead ARB

DNL (dB)	Acres			Estimated Population ^a		
	Baseline	Scenario C	Change	Baseline	Scenario C	Change
65-69	1,156	2,968	1,812	0	104	104
70-74	437	1,413	976	0	0	0
75-79	86	503	417	0	0	0
80-84	12	70	58	0	0	0
≥85	1	1	0	0	0	0
Total	1,692	4,955	3,263	0	104	104

^aAll of the estimated population affected by DNL greater than 65 dB are located at the South Dade Center (S02).

Table HS3-16 presents changes in DNL under Scenario C. The DNL at Biscayne National Park Offshore would be 1 dB lower than under Scenario B, while the DNL at the Verde gardens residential area, Mandarin Lakes K-8 Academy, and De La Salle Education center would be 1 dB higher than under Scenario B. Noise level increases at the other locations would be the same as under Scenario B.

Table HS3-16. DNL at Representative Noise-Sensitive Locations near Homestead ARB under Baseline and Scenario C Conditions

Type	ID	Description	DNL (dB)		
			Baseline	Scenario C	Change
Park	P01	Biscayne National Park Offshore	57	65	8
	P02	Everglades National Park Ernest F. Coe Visitor Center	<45	<45	0
	P03	Biscayne Bay Visitor Center	50	54	4
	P04	Audubon Park	<45	51	8
	P05	Cutler Ridge Park	<45	<45	0
Residential	R01	Verde Gardens	62	65	3
School	S01	Mandarin Lakes K-8 Academy	60	62	2
	S02	De La Salle Education Center	60	64	4
	S03	Keys Gate Charter School	58	62	4
	S04	The Charter School at Waterstone	54	55	1
	S05	Miami Arts Charter School	51	54	3

HS3.2.2.2 Speech Interference

HS3.2.2.2.1 Scenario A

The number of daytime (7:00 A.M. to 10:00 A.M.) events per hour that could potentially interfere with speech are listed in Table HS3-17. Calculations with windows closed and with windows open assume standard values of 25 dB and 15 dB of noise attenuation provided by buildings, respectively. Noise levels at non-residential locations listed are similar to noise levels in nearby residential areas. The number of indoor events per hour with windows open, indoor events with windows closed, and outdoor events would increase by one event or less. Any increases in the frequency of disruptions in communication have a high likelihood of being annoying.

Table HS3-17. Potential Speech Interference Resulting from Scenario A at Homestead ARB

Type	ID	Description	Annual Average Daily Indoor Daytime Events per Hour (7:00 A.M. to 10:00 P.M.)					
			Scenario A			Change		
			Windows Open ^a	Windows Closed ^a	Outdoor	Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Biscayne National Park Offshore	1	1	3	0	0	0
	P02	Everglades National Park Ernest F. Coe Visitor Center	0	0	0	0	0	0
	P03	Biscayne Bay Visitor Center	1	1	3	0	1	1
	P04	Audubon Park	1	0	3	0	0	0
	P05	Cutler Ridge Park	0	0	2	0	0	1
Residential	R01	Verde Gardens	2	1	4	1	0	1

^a Number of events per average hour with an indoor L_{max} of 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

The average number of potential speech interference events per hour would be the same under Scenario B as under Scenario A. Under Scenario C, the average number of potential speech interference events per hour would be the same as under Scenarios A and B except at Audubon Park, where it would be two rather than one.

HS3.2.2.3 Interference with Classroom Learning

HS3.2.2.3.1 Scenario A

Table HS3-18 presents changes in classroom noise levels with windows open and closed. As described in Section HS3.2.1.3, indoor L_{eq(SD)} currently exceed 40 dB at four of the five schools evaluated when windows are open. No additional schools would be exposed to L_{eq(SD)} greater than 40 dB when windows are open. With windows closed, indoor background L_{eq(SD)} would not exceed recommended levels at any of the schools. The number of events per hour with potential to interrupt speech indoors with windows closed, indoors with windows open, and outdoors would increase by one event or less.

Table HS3-18. Indoor Classroom Learning Disruption Resulting from Scenario A at Homestead ARB

ID	Description	Scenario A					Change				
		Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
		L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
S01	Mandarin Lakes K-8 Academy	47	1	37	1	4	0	0	0	0	1
S02	De La Salle Education Center ^d	49	3	39	2	4	2	1	2	1	0
S03	Keys Gate Charter School	47	2	37	1	4	4	0	2	0	1
S04	The Charter School at Waterstone	40	2	<35	1	3	0	1	0	0	0
S05	Miami Arts Charter School	39	1	<35	1	3	3	0	0	1	0

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

^d The De La Salle Education Center is used for afterschool tutoring and nighttime adult education.

HS3.2.2.3.2 Scenario B

Changes in classroom noise levels with windows open and closed are listed in Table HS3-19. Schools that are not already exposed to $L_{eq(SD)}$ greater than 40 dB when windows are open under baseline conditions would not exceed this threshold under Scenario B. With windows closed, indoor background $L_{eq(SD)}$ would not exceed 40 dB at any of the schools. The number of events per hour with potential to interrupt speech indoors with windows closed, indoors with windows open, and outdoors would increase by one event or less.

Table HS3-19. Indoor Classroom Learning Disruption Resulting from Scenario B at Homestead ARB

ID	Description	Scenario B					Change				
		Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
		$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c	$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c
S01	Mandarin Lakes K-8 Academy	48	1	38	1	4	1	0	1	0	1
S02	De La Salle Education Center ^d	49	3	39	2	4	3	1	3	1	0
S03	Keys Gate Charter School	47	2	37	1	4	4	0	2	0	1
S04	The Charter School at Waterstone	40	2	<35	1	3	1	1	0	0	0
S05	Miami Arts Charter School	39	2	<35	1	3	3	1	0	1	0

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

^d The De La Salle Education Center is used for afterschool tutoring and nighttime adult education.

HS3.2.2.3.3 Scenario C

Table HS3-20 shows changes in classroom noise levels under Scenario C. The $L_{eq(SD)}$ with windows open would increase by up to 4 dB, but would not exceed 40 dB at any school not already exposed to greater than 40 dB $L_{eq(SD)}$ under baseline conditions. With windows closed, the $L_{eq(SD)}$ at all five schools would remain below 40 dB. The number of events per hour with potential to interfere with speech would increase by one or less at all of the schools studied with windows open or closed.

Table HS3-20. Indoor Classroom Learning Disruption Resulting from Scenario C at Homestead ARB

ID	Description	Scenario C					Change				
		Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
		L _{eq} (SD) (dB)	Events per Hour ^b	L _{eq} (SD) (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq} (SD) (dB)	Events per Hour ^b	L _{eq} (SD) (dB)	Events per Hour ^b	Events per Hour ^c
S01	Mandarin Lakes K-8 Academy	49	1	39	1	4	2	0	2	0	1
S02	De La Salle Education Center ^d	49	3	39	2	4	3	1	3	1	0
S03	Keys Gate Charter School	47	2	37	1	4	4	0	2	0	1
S04	The Charter School at Waterstone	41	2	<35	1	3	1	1	0	0	0
S05	Miami Arts Charter School	39	2	<35	1	3	3	1	0	1	0

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

^d The De La Salle Education Center is used for afterschool tutoring and nighttime adult education.

HS3.2.2.4 Sleep Disturbance

As noted in Chapter 3, Section 3.2.3, the probability of sleep being disturbed at least once per night is estimated based on the number of overflight events and the SEL of each event. Although AFRC F-35A pilots would continue to conduct only initial approaches between 10:00 P.M. and 7:00 A.M., the noise level generated by the approaches would be higher and the number of sorties would increase. The probability of awakening would increase by 1 percent or less at the locations studied and in any residential areas near the locations studied (Table HS3-21). Impacts to sleep disturbance resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table HS3-21. Average Probability of Awakening Resulting from the AFRC F-35A Mission at Homestead ARB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)			
			AFRC F-35A Mission		Change	
			Windows Open ^a	Windows Closed ^a	Windows Open ^a	Windows Closed ^a
Park ^b	P01	Biscayne National Park Offshore	3	1	0	0
	P02	Everglades National Park Ernest F. Coe Visitor Center	0	0	0	0
	P03	Biscayne Bay Visitor Center	3	1	1	0
	P04	Audubon Park	2	1	1	1
	P05	Cutler Ridge Park	1	0	1	0
Residential	R01	Verde Gardens	5	1	1	0
School ^b	S01	Mandarin Lakes K-8 Academy	4	1	1	0
	S02	De La Salle Education Center	7	3	1	0
	S03	Keys Gate Charter School	5	2	1	1
	S04	The Charter School at Waterstone	4	2	2	1
	S05	Miami Arts Charter School	4	2	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Parks and schools listed in this table serve as representative geographic areas by which surrounding neighborhoods can estimate their potential noise exposure. None of the above-listed parks or schools are open from 10:00 P.M. to 7:00 A.M.

HS3.2.2.5 Potential for Hearing Loss

Implementation of the AFRC-F-35A mission (with any of the three afterburner scenarios selected) would not expose any on-base or off-base residences to DNL greater than 80 dB. Therefore, PHL would not result from implementation of the AFRC F-35A mission.

HS3.2.2.6 Occupational Noise

USAF occupational noise exposure prevention procedures (e.g., hearing protection and monitoring) would be implemented under the AFRC F-35A mission, regardless of which afterburner scenario is selected. These procedures would comply with all applicable OSHA and USAF occupational noise exposure regulations.

HS3.2.2.7 Non-auditory Health Impacts

As noted in Section HS3.2.1.7, the current state of scientific knowledge does not yet support a consistent causal relationship between exposure to aircraft noise and non-auditory health impacts (i.e., impacts other than hearing loss). Several types of potential health impacts have been investigated in multiple studies with contradictory results (Meecham and Shaw 1979, Frericks *et al.* 1980, Jones and Tauscher 1978, Edmonds *et al.* 1979). The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. The connection from annoyance to stress to health issues requires careful experimental design, and the resulting data are subject to different interpretations. A recent, large-scale study indicated that nighttime aircraft noise could be linked to increases in the likelihood of hypertension (Jarup *et al.* 2005, 2008), but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

HS3.2.2.8 Structural Damage

Damage to structures is not anticipated to result from AFRC F-35A subsonic noise because noise resulting from implementation of the AFRC F-35A mission would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet (CHABA 1977).

Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating noise levels similar to those that result from operation of the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels (Battis 1983). Additional discussion of the effects of noise on cultural resources is contained in Section HS3.7. Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects in structures would continue to occur. Induced vibrations do not normally result in structural damage, but the rattling of objects does have the potential to contribute to annoyance. Although the risk posed to structures by noise would be minimal, a process exists for dealing with any such damage. Any claims from USAF-related damage would begin by contacting the Homestead ARB Public Affairs Office with details of the claim. The USAF would then investigate the claim to establish the exact nature and extent of the damage.

HS3.2.2.9 Animals in the Care of Humans

The reactions of animals in the care of humans (e.g., pets, other domesticated animals, and animals kept in zoos) to an increased number of loud overflight events was a concern raised in several scoping comments. An animal’s reaction to noise depends on several factors including the animal’s temperament, training, and past experiences associated with the noise. Certain domesticated animal species (e.g., horses) are more likely to have strong reactions to noise than others. Potential noise impacts on wildlife are described in Section HS3.6.

In the airfield environment, aircraft typically operate at slower speeds than are used in training airspace. Although these slower speeds mean that elevated overflight sound levels last longer, they also mean that there is a time lag between when the aircraft is first heard and maximum overflight noise level. Sounds with slow rise-times are less likely to induce panic than sudden onset noise (USAF 1994). Because F-35 and F-16 aircraft operate at similar speeds in the airfield environment, the rise times of noise generated by the two aircraft are similar.

One of the most important factors affecting an animal's reaction to noise is the level of familiarity with the noise source. As described in Section HS2.0, the replacement of F-16 aircraft with F-35A aircraft would occur over approximately 2 years, and the tempo of F-35A operations would increase slowly as the new airframe gets established at the base. Around the base, AFRC F-35A pilots would use similar flight paths and altitudes to those currently used by F-16 pilots. For the purposes of this analysis, all noise impacts show the full impact of 24 aircraft. Because the reactions of domestic animals depends on several factors (e.g., species, situation, predisposition), there is no single noise level below which animals will never react negatively to noise. However, if it is assumed that noise events with the potential to interfere with human conversation could also be bothersome to animals, then the number of noise events per hour with potential to interfere with speech (Table HS3-17) could be an indicator of how frequently animals could be bothered by noise. It is recognized that this metric of noise events per hour with potential to interfere with speech is an arbitrary metric for determining how frequently animals would be bothered by noise. The metric is used purely as a measure of relative change between the No Action Alternative and proposed action.

HS3.2.3 Airspace Affected Environment

This section presents noise levels in training airspace and ranges that would be used by AFRC F-35A pilots. As described in Section HS2.4.1, Homestead ARB-based AFRC F-35A pilots would operate in existing MOAs, RAs, Warning Areas and ATCAAs performing combat training missions similar to those currently conducted by Homestead ARB-based F-16 pilots. The noise analysis accounts for subsonic and supersonic flight noise generated in locations where supersonic flight is authorized. As noted in Chapter 3, Section 3.2.1.1, subsonic noise in training airspace is quantified using the onset-rate adjusted day-night average sound level (L_{dnmr}). Supersonic noise levels were not quantified for AFRC F-35A pilots operating from Homestead ARB because supersonic operations would only occur offshore and over water. The location, types and number of munitions used during AFRC F-35A training would be similar to that used during F-16 training. Therefore, munitions noise levels would remain approximately the same as under baseline conditions.

HS3.2.3.1 Subsonic Noise

Figure HS3-4 shows baseline subsonic noise levels beneath airspace proposed for use by AFRC F-35A pilots from Homestead ARB. L_{dnmr} beneath the MOAs and RAs within the Region of Influence (ROI) ranges from less than 45 to 55 dB. Noise generated by training in offshore Warning Areas affects primarily transient receptors (i.e., people on boats). Therefore, long-term, time-averaged noise levels were not calculated for Warning Areas.

HS3.2.3.2 Supersonic Noise

Supersonic flight would only be conducted in areas authorized for supersonic activities. Designated supersonic areas are W-174A through G and W-465A/B. Sonic booms could affect fishermen and other people on the water beneath the training airspace while supersonic training is underway. However, impacts to transient receptors such as these would be isolated and momentary. Long-term supersonic noise levels were not calculated for Warning Areas.

Restrictions on supersonic flight in W-174B that are recorded in the air operations manual for Naval Air Station (NAS) Key West ensure that sonic booms generated do not pose any risk to Fort Jefferson. The restrictions disallow supersonic flight within 12 NM of the Fort unless the aircraft is flying straight and level at greater than 20,000 feet MSL. A study conducted in 2009 found that there was no risk of structural damage associated with sonic booms generated at these distances and flight conditions (Blue Ridge Research and Consulting 2009).

HS3.2.4 **Airspace Environmental Consequences**

HS3.2.4.1 Subsonic Noise

Changes in sortie tempo under the proposed action are discussed in Chapter 2, Section 2.3.4.1, and Section HS2.4.1. Late-night training (10:00 P.M. to 7:00 A.M.) by AFRC F-35A pilots would only be conducted in rare contingencies and special mission training. Individual overflight noise levels (SEL) generated by F-16 and F-35A aircraft are listed in Chapter 3, Table 3-4. As shown on Figure HS3-4, L_{dnmr} would increase by as much as 6 dB beneath training airspace.

Overflight noise events have the potential to interfere with activities. An increase in the number of loud events, as reflected in increased L_{dnmr} , would be expected to increase the percentage of the population that is highly annoyed by noise. The proposed AFRC F-35A training sorties would occur in several large training airspace areas. Because training operations would be spread over a very large area, overflights of any particular location would be infrequent. As shown in Table HS2-6, approximately 94 percent of F-35A training time is spent at altitudes above 10,000 feet MSL. Because training would occur across a very large area, and because most of the training would be at high altitudes, the loudest of the overflights (i.e., overhead at low altitudes) would be rare.

During scoping, several commenters expressed concerns about overflight noise while the aircraft are transiting from the airfield to and from the airspace proposed for use. Aircrews transiting from the installation to training airspace and back again typically use a set of existing prescribed routes. Actual ground tracks of transiting aircraft vary based on several factors, and non-standard routing can be used, as needed, in response to air traffic, weather, or other time-varying conditions. F-35A pilots would typically transit at high altitudes and in cruise configuration using lowered engine power settings to reduce noise impacts and improve fuel efficiency. In addition, flight at these altitudes allows the aircraft to arrive at the training airspace at an appropriate altitude to begin training. Single overflight event noise levels generated by F-35A aircraft in cruise configuration are listed in Chapter 3, Tables 3-3 and 3-4.

Although AFRC F-35A pilots would implement measures to reduce noise, the noise generated by transiting aircraft can be disturbing, particularly when overflight noise affects national parks and other noise-sensitive places where ambient noise levels are low. Detailed discussion of recreation impacts is contained in Section HS3.8.

HS3.2.4.2 Supersonic Noise

AFRC F-35A pilots would conduct supersonic training in offshore Warning Areas where supersonic flight is authorized. Sonic booms would primarily affect transient receptors (e.g., people in boats). Because a smaller percent of total training sorties would be conducted over water, the number of sonic booms would slightly decrease. Existing restrictions on flights near Fort Jefferson would continue to minimize the risk of damage to the Fort from sonic booms.

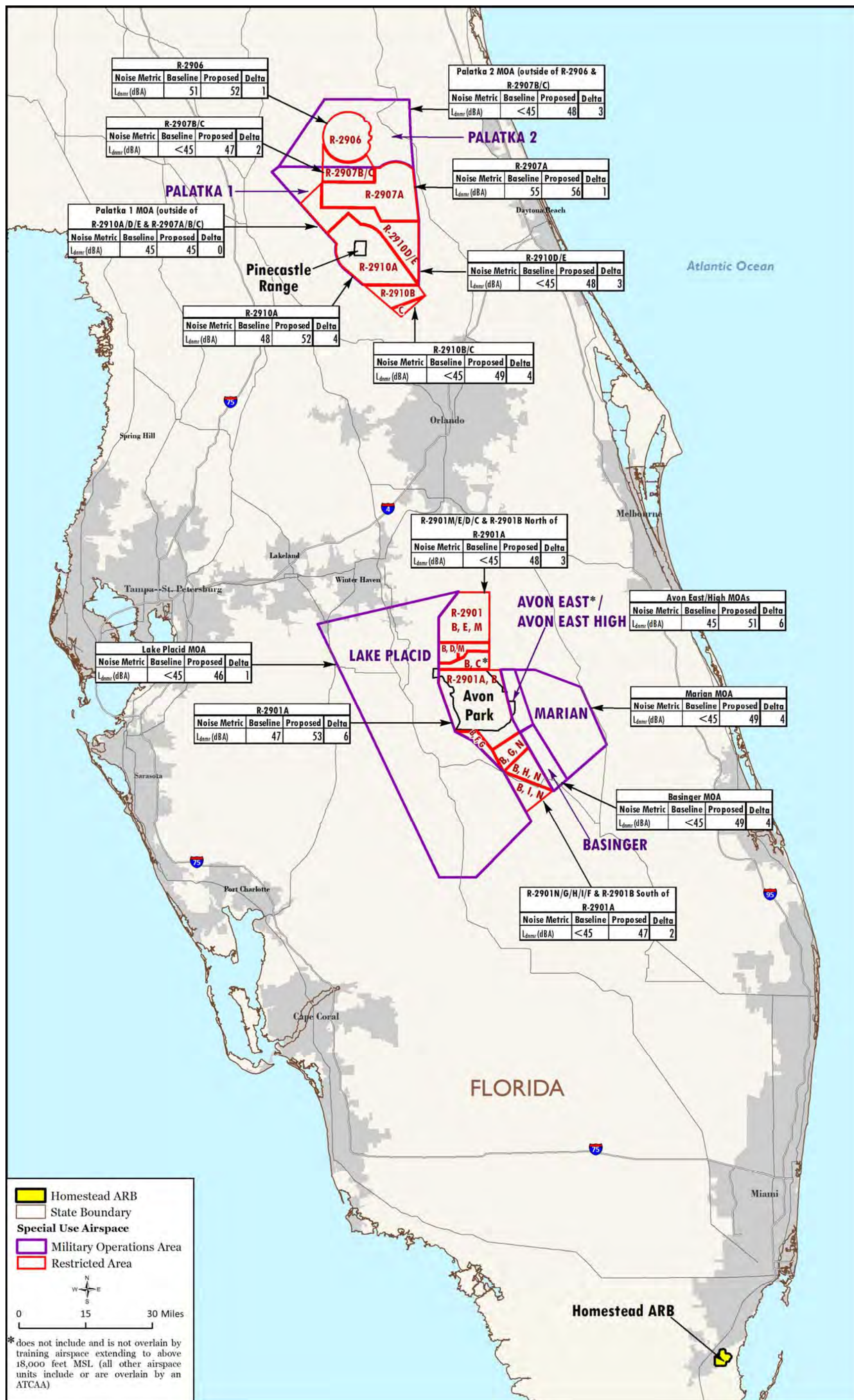


Figure HS3-4. Noise Levels in Training Airspace used by Homestead ARB Pilots

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HS3.2.5 Summary of Noise Impacts

Implementation of the AFRC F-35A mission would expose an additional 2,962 acres, 3,088 acres, and 3,263 acres of off-installation land to DNL of 65 dB or greater, respectively, under Scenarios A, B and C. The estimated number of people exposed to DNL of 65 dB or greater would be 62 under Scenario A, 79 under Scenario B, and 104 under Scenario C, all of which would be located at the South Dade Center (S02). The Biscayne Bay Visitor Center would experience the highest SEL increase (from 88 to 92 dB) and a DNL increase from 50 to 54 dB under all three scenarios. The DNLs at Biscayne Bay National Park (Offshore) and at the Audubon Park would increase by 10 dB and 8 dB, respectively, under Scenario A. The increase in DNL at Biscayne Bay National Park (Offshore) would be 9 dB under Scenario B and 8 dB under Scenario C. The DNLs at four schools would increase by 1 to 4 dB but remain below 65 dB under Scenario A. Under Scenario B, all five schools studied would experience DNL increases of 1 to 4 dB, while still remaining below 65 dB. No residents would be exposed to DNL greater than 69 dB under any scenario.

Regarding noise under the airspace proposed for use, L_{dnmr} would not exceed 56 dB beneath all of the airspace proposed for use. Supersonic flight would only occur in offshore Warning Areas where supersonic flight is permitted. The number of sonic booms would decrease slightly.

Based on context and intensity, noise impacts to the area surrounding Homestead ARB and areas below the airspace and ranges proposed for use would be considered adverse but not significant.

HS3.3 AIR QUALITY

The proposed AFRC F-35A mission at Homestead ARB would result in net changes in air emissions due to the replacement of existing aircraft operations with operations from the proposed mission in the base region and associated airspace. The following section describes the air quality affected environment and estimates of impacts due to proposed construction and operational activities within these project regions.

HS3.3.1 Base Affected Environment

Air emissions resulting from implementation of the proposed AFRC F-35A mission at Homestead ARB would affect air quality within Miami-Dade County. The Florida Department of Environmental Protection (FDEP) Division of Air Resource Management has adopted the National Ambient Air Quality Standards (NAAQS) and promulgated state standards for the purposes of regulating criteria air pollutant levels within Florida. Table 3-6 in Chapter 3, Section 3.3, presents the NAAQS.

HS3.3.1.1 Region of Influence and Existing Air Quality

Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as carbon monoxide [CO] and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as ozone (O_3) can extend much farther downwind than for inert pollutants. Ozone is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant

concentration remains below the standard value, as defined by the annual to tri-annual metrics described in Chapter 3, Section 3.3.1. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, Miami-Dade County is in attainment of the NAAQS for all pollutants (USEPA 2018a).

Homestead ARB is within 10 miles of the Everglades National Park pristine Class I area. Therefore, this EIS provides a qualitative analysis of the potential for projected emissions from aircraft operations to affect air quality within this area.

HS3.3.1.2 Regional Air Emissions

Table HS3-22 summarizes estimates of annual emissions generated by activities in Miami-Dade County for 2014. Emissions for Miami-Dade County were obtained from the National Emissions Inventory (NEI) process (USEPA 2018b). The majority of emissions within these regions occur from (1) on-road and nonroad mobile sources (VOCs, CO, NO_x, sulfur oxides [SO_x], and carbon dioxide equivalent [CO_{2e}]), (2) fuel combustion by industrial sources (SO_x), (3) solvent/surface coating usages (VOCs), and (4) combustion of biomass and dust from mining and paved/unpaved roads (particulate matter less than or equal to 10 micrometers in diameter [PM₁₀]/particulate matter less than or equal to 2.5 micrometers in diameter [PM_{2.5}]).

Table HS3-22. Annual Emissions for Miami-Dade County, Florida, 2014

Source Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Stationary Sources	29,009	29,443	7,156	1,185	29,419	8,477	NA
Mobile Sources	23,053	296,522	42,094	2,457	3,572	2,015	12,444,531
Total Emissions^a	52,062	325,965	49,250	3,642	32,991	10,492	12,444,531

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not available

Source: USEPA 2018b

HS3.3.1.3 Homestead ARB Emissions

The AFRC F-35A mission at Homestead ARB would replace activities associated with the 482 FW. This unit operates 24 F-16 aircraft at Homestead ARB. The proposed F-35A aircraft replacement action at Homestead ARB would primarily affect existing emissions from (1) F-16 operations, (2) F-16 engine maintenance and testing, and (3) Aerospace Ground Equipment (AGE). While the decrease of 91 personnel that would result from implementation of the AFRC F-35A mission at Homestead ARB would result in virtually inconsequential changes in emissions from other base sources associated with the 482 FW (e.g., onsite government motor vehicles or privately owned vehicles), those reductions have been calculated as part of the build-out emission calculations for the action. Nonetheless, the main focus of the air quality analysis remains emissions from existing and proposed aircraft-specific source categories to determine the net changes in emissions from the AFRC F-35A mission.

To estimate emissions from F-16 aircraft operations and AGE use associated with the 482 FW mission at Homestead ARB, the analysis employed the USAF Air Conformity Applicability Model (ACAM) version 5.0.13a (Solutio Environmental, Inc.2019). Table HS3-23 summarizes the annual emissions estimated for the existing F-16 operations of the 482 FW. Volume II, Appendix C, presents details of the emission calculations presented in Table HS3-23. The net emissions change from the decrease of 91 personnel (e.g., emissions from government and privately owned vehicle miles traveled by those 91 personnel) were calculated as a net reduction in the build-out emission calculations for the action.

Table HS3-23. Annual Emissions of Existing 482 FW F-16 Operations at Homestead ARB

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Flight Operations and Engine Trim Tests - F-16Cs	17.55	57.31	39.65	3.77	6.46	5.62	10,522
Aircraft Engine Test Cells – F-16C	0.23	0.46	1.22	0.08	0.13	0.12	224
Aerospace Ground Equipment	8.39	14.73	24.15	1.69	2.49	2.42	1,156
Total Emissions^a	26.17	72.50	65.03	5.54	9.08	8.15	11,902

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons

HS3.3.1.4 Regional Climate

Meteorological data collected at Homestead ARB are used to describe the climate of the Homestead ARB project region (Homestead ARB 2016a).

Temperature. Miami-Dade County is known for hot and humid summer months, and warm conditions during the winter. The average high and low temperatures during the summer months at Homestead ARB range from about 89 to 75 degrees Fahrenheit (°F). The average high and low temperatures during the winter months range from 78 to 60 °F.

Precipitation. Average annual precipitation for Homestead ARB is 58.4 inches. Annual precipitation in the region peaks in the summer months (June through September) due to persistent humid flow from the Atlantic and occasional tropical storms. The peak monthly average rainfall of 9.3 inches occurs in June. The region experiences thunderstorms on an average of 90 days per year. Winter is the driest season, as the lowest monthly average of 1.8 inches occurs in January. Snowfalls in the region are extremely rare.

Prevailing Winds. The annual average wind speed at Homestead ARB is 6.4 miles per hour. March through May is the windiest time of year, with monthly average speeds of approximately 9 miles per hour. However, the strongest instantaneous winds occur during the hurricane season (the core months of August through October) in association with tropical storms. From 1900 to 2010, 25 hurricanes have hit Miami-Dade County (National Hurricane Center 2018). The winds prevail from the east during each month of the year.

HS3.3.1.5 Applicable Regulations and Standards

The Division of Air Resource Management is responsible for enforcing air pollution regulations in Florida. The Division of Air Resource Management enforces the NAAQS by monitoring air quality and developing rules to regulate and to permit stationary sources of air emissions. The FDEP air quality regulations are found in Title 62 of the Florida Administrative Code.

HS3.3.2 Base Environmental Consequences

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the proposed AFRC F-35A mission at Homestead ARB. The estimation of operational impacts is based on the net change in emissions due to the replacement of existing F-16 aircraft operations with those of the proposed AFRC F-35A mission. Volume II, Appendix C, of this Draft EIS presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources at Homestead ARB.

The air quality analysis for the AFRC mission at Homestead ARB evaluates F-35A takeoff operations based on the three afterburner scenarios. Activity levels and resulting emissions for all other proposed operational activities would remain the same under each afterburner scenario. The

area surrounding Homestead ARB within Miami-Dade County currently attains all of the NAAQS. Therefore, the analysis compares the annual net change in emissions to the 250 tons per year prevention of significant deterioration permitting threshold. The prevention of significant deterioration permitting threshold represents the level of potential new emissions below which a new or existing minor, non-listed, stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for a project alternative is below 250 tons per year in the context of an attainment criteria pollutant, the indication is the air quality impacts would be insignificant for that pollutant.

HS3.3.2.1 Construction

The AFRC F-35A mission at Homestead ARB would require C&D and/or renovation of airfield facilities such as training facilities and maintenance and storage facilities. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM₁₀/PM_{2.5}) from the operation of equipment on exposed soil.

Construction activity data were developed to estimate construction equipment use and areas of disturbed ground due to the proposed mission. These data were used as inputs to ACAM, which was used to estimate air emissions from proposed construction activities at Homestead ARB. The air quality analysis assumed that all construction activities for the proposed AFRC F-35A mission would begin in 2021 and be completed in 2023.

Inclusion of standard construction practices and LEED Silver certification into proposed construction activities would potentially reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. Chapter 3, Section 3.3.3.1, of this Draft EIS describes the standard construction practices that would control fugitive dust.

Table HS3-24 presents estimates of emissions from the infrastructure improvements for the AFRC F-35A mission at Homestead ARB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, temporary construction emissions associated with the proposed AFRC F-35A mission would not result in significant air quality impacts.

Table HS3-24. Total Construction Emissions from the AFRC F-35A Mission at Homestead ARB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Demolish Buildings	0.01	0.10	0.08	0.00	0.04	0.00	18
Renovate/Construct Buildings	0.65	3.65	3.18	0.01	0.34	0.15	690
Total Emissions^a	0.66	3.75	3.26	0.01	0.38	0.15	708
Annual Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable

HS3.3.2.2 Operations

The proposed AFRC F-35A mission at Homestead ARB would primarily generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, and (3) AGE. The analysis also includes emissions that would occur from the net change in commuting activities between the proposed F-35A and existing F-16 missions at Homestead ARB. Because the mission would result in a net reduction of 91 personnel, this would produce a net reduction in emissions from commuting activities. To estimate emissions from the AFRC F-35A mission at Homestead ARB,

the analysis employed the ACAM. The air quality analysis assumed that the proposed mission would reach full operations and resulting emissions in 2024 after the completion of all required infrastructure improvements.

The analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer, where the release of aircraft emissions would affect ground level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground level air quality. During scoping, people submitted comments regarding the pollutant impacts that could result from implementation of the proposed AFRC F-35A mission. Table HS3-25 summarizes the annual operational emissions that would result from implementation of the proposed AFRC F-35A mission at Homestead ARB. The data in Table HS3-25 show that the replacement of existing F-16 aircraft operations with the proposed F-35A operations would result in increases in all pollutant emissions except VOCs for the three afterburner scenarios. The data in Table HS3-25 also show that scenario emissions would increase with increasing afterburner use rates. Implementation of Scenario C would result in the most emissions, but the emissions would increase by less than 6 percent for any criteria pollutant compared to Scenario A. These emission increases would not exceed any indicator threshold. Therefore, operational emissions associated with the proposed AFRC F-35A mission at Homestead ARB would not result in significant air quality impacts.

Table HS3-25. Projected Annual Emissions from AFRC F-35A Mission Operations at Homestead ARB, 2024 – All Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Scenario A							
Flight Operations and Engine Trim Tests - F-35A	0.14	60.41	53.16	5.87	9.37	8.42	16,252
Aircraft Engine Test Cells – F-35A	0.00	0.41	1.95	0.13	0.17	0.15	375
Aerospace Ground Equipment	8.20	14.39	23.60	1.65	2.43	2.36	1,130
Net Commuting Activities (F-35A - F-16 staff)	(0.16)	(1.87)	(0.13)	0.00	0.00	0.00	(153)
Total AFRC F-35A Mission Emissions	8.18	73.34	78.58	7.65	11.98	10.93	17,603
Existing 482 FW Emissions	26.17	72.50	65.03	5.54	9.08	8.15	11,902
AFRC F-35A Mission Minus 482 FW Emissions	(17.99)	0.84	13.56	2.11	2.90	2.77	5,701
Scenario B							
Total F-35A Mission Emissions	8.18	75.47	79.00	7.76	12.07	11.03	17,560
F-35A Mission Minus 482 FW Emissions	(17.99)	2.97	13.98	2.22	2.99	2.87	5,658
Scenario C							
Total F-35A Mission Emissions	8.19	77.58	79.15	7.85	12.16	11.10	17,477
F-35A Mission Minus 482 FW Emissions	(17.98)	5.08	14.13	2.31	3.08	2.94	5,575
Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e}(mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

The increases in CO, NO_x, SO_x, PM₁₀, PM_{2.5}, and CO_{2e} emissions that would result from implementation of the AFRC F-35A mission at Homestead ARB would have the potential to impact the Everglades National Park pristine Class I area. Emission increases generated by this mission would occur intermittently, primarily from mobile sources that would operate across the larger Homestead ARB flightline and runway and from ground level to a height of 3,000 feet in the atmosphere. These operational characteristics would substantially reduce the ambient concentrations of proposed emissions downwind of Homestead ARB. Homestead ARB is also at least 10 miles away

from the nearest border of Everglades National Park. This travel distance from Homestead ARB would further dilute emissions generated by the AFRC F-35A mission to the point that they would not result in any appreciable increases in pollutant concentrations within this pristine Class I area. Therefore, the proposed AFRC F-35A mission at Homestead ARB would not result in significant air quality impacts to the Everglades National Park pristine Class I area.

HS3.3.3 Airspace Affected Environment

Projected AFRC F-35A aircraft operations in the airspace proposed for use and the flight routes between these locations and Homestead ARB would affect air quality in these portions of southern and central Florida and the nearby offshore waters. All of the regions below and adjacent to these areas currently attain all of the NAAQS.

HS3.3.4 Airspace Environmental Consequences

AFRC F-35A pilots operating from Homestead ARB would operate in the same airspace and training areas as existing 482 FW pilots, but at higher altitudes. The proposed AFRC F-35A operations in these areas would occur above 3,000 feet above ground level (AGL) approximately 99 percent of the time (Table HS2-6) and therefore these operations would not appreciably affect ground level air quality. Compared to existing 482 FW operations, F-16 operations occur below 3,000 feet AGL from 6 to 42 percent of the time, depending on the airspace. AFRC F-35A pilots would fly about 0.2 percent fewer sorties compared to existing 482 FW F-16 aircraft.

To quantify the air quality effects of the F-35A mission within the Homestead ARB airspaces and training areas, the analysis employed the ACAM to estimate the net change in emissions between the replacement of existing F-16 aircraft operations with proposed F-35A aircraft operations within these areas. The analysis used aircraft flight profiles developed by the project noise analyses as inputs to the ACAM. The analysis focused on operations within the lowest 3,000 feet of the atmosphere.

Table HS3-26 presents the annual operational emissions that would result from implementation of the F-35A mission within the Homestead ARB airspaces and training areas. These data show that the proposed changes in aircraft operations within these areas would result in net reductions in all air pollutant emissions within 3,000 feet AGL. Therefore, the proposed AFRC F-35A mission would result in a net improvement to ground level air quality in the airspace and training areas. This also would be the case for projected impacts within the Everglades National Park pristine Class I area. Therefore, implementing the proposed AFRC F-35A mission in existing airspaces and training areas would not result in significant air quality impacts.

Table HS3-26. Projected Annual Emissions from the AFRC F-35A Mission Operations within Homestead ARB Airspaces and Training Areas - 2024

Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Existing 482 FW Flight Operations - F-16	(1.48)	(0.71)	(24.17)	(0.88)	(1.10)	(0.99)	(2,667)
AFRC Mission Flight Operations – F-35A	0.00	0.22	11.89	0.58	0.63	0.57	1,748
F-35A Mission Minus 482 FW Emissions	(1.48)	(0.50)	(12.28)	(0.30)	(0.46)	(0.42)	(919)
Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

HS3.3.5 Summary of Impacts to Air Quality

Miami-Dade County is in attainment for all criteria pollutants. As shown in Table HS3-27, calendar year annual emissions from construction activities and the net change in aircraft operations around the base would not exceed indicator threshold levels. Emissions would decrease in training airspace. Impacts to air quality resulting from the AFRC F-35A mission would not be significant.

Table HS3-27. Summary of Calendar Year Annual Emissions from the AFRC F-35A Mission at Homestead ARB

Activity/Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Construction – Year 2021	0.22	1.48	1.32	0.00	0.24	0.06	344
Construction – Year 2022	0.44	2.27	1.94	0.01	0.14	0.09	424
Construction – Year 2023	0.00	0.00	0.00	0.00	0.00	0.00	0
Net Change in Operations – Most Emissive Afterburner Scenario C -Year 2024+	(17.98)	5.08	14.13	2.31	3.08	2.94	5,575
Annual Indicator Threshold	250	250	250	250	250	250	NA

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions.

HS3.4 SAFETY

Air Force Instruction (AFI) 90-801, *Environment, Safety, and Occupational Health Councils*, implements the risk management guidance within Air Force Policy Directive (AFPD) 90-8, *Environment, Safety, and Occupational Health Management and Risk Management*. All USAF missions and daily routines involve risk. Requirements outlined in this document provide for a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety analysis contained in the following sections addresses issues related to the health and well-being of both military personnel and civilians living on or near Homestead ARB and under the training airspace.

Specifically, this section provides information on explosive safety; fire risk and management; hazards associated with aviation safety (Accident Potential Zones [APZs]); aircraft mishaps; and Bird/Wildlife Aircraft Strike Hazard [BASH]).

The FAA is responsible for ensuring safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. To fulfill these requirements, the FAA has established safety regulations, airspace management guidelines, a civil-military common system, and cooperative activities with the DoD. The primary safety concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird-aircraft strikes.

HS3.4.1 Base Affected Environment

HS3.4.1.1 Explosive Safety

Facilities/activities with explosive safety quantity-distance (ESQD) arcs at Homestead ARB include the munitions storage area, hot cargo pad, and the FANG mission. The ESQD arc near the proposed action area is shown on Figure HS2-1.

HS3.4.1.2 Fire Risk and Management

Day-to-day O&M activities conducted at the base are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders (TOs), and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements including AFI 91-202, *The US Air Force Mishap Prevention Program*. Aircraft Rescue Firefighting services are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services.

The Homestead Fire Emergency Services Flight provides 24-hour crash, structural, and emergency medical first response; technical rescue; hazardous material and weapons-of-mass-destruction incident response; and fire prevention, safety, and training/education services to Homestead ARB. The base is equipped with two engine companies, three aircraft rescue and firefighting units, one 5,000-gallon water tanker, a portable mobile air unit, one rescue company, a confined space rescue trailer, and a hazardous materials response trailer. The Fire Emergency Services Flight also has a local mutual-aid and training agreement with the Miami-Dade County Fire Rescue Department.

Homestead ARB adheres to specific emergency-response procedures contained in TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, for aircraft mishaps involving composite materials (USAF 2018). TO 00-105E-9 contains a section (Chapter 3) on Mishap Composite Awareness.

HS3.4.1.3 Accident Potential Zones

In accordance with DoDI 4165.57, APZs are established at military airfields to delineate recommended compatible land uses for the protection of people and property on the ground. APZs define the areas of a military airfield that would have the highest potential to be affected if an aircraft mishap were to occur. Air Installations Compatible Use Zones (AICUZ) guidelines identify three types of APZs for airfields based on aircraft mishap patterns: the Clear Zone (CZ), APZ I, and APZ II. The standard USAF CZ for Class B runways such as Runway 06/24 at Homestead ARB is a rectangle area that extends 3,000 feet from the end of a runway, is 3,000 feet wide, and identifies the area with the highest probability for mishaps. APZ I, which typically extends 5,000 feet from the end of the CZ, has a lower mishap probability, and APZ II, which typically extends 7,000 feet from the end of APZ I, has the lowest mishap probability of the three zones. If needed, to reflect different departure and arrival patterns, both the shape and size of APZs can be modified.

Most of the land use in the CZs and APZs consists of agricultural and infrastructure uses and is considered compatible with the APZs. Incompatible land uses on the south end of the runway consist of residential development (South Dade Center) in APZ I (9 acres). A potentially incompatible land use on the north end of the runway consists of an inactive industrial-mining area (72 acres) in APZ I. Homestead ARB Flight Safety Officer Todd Possemato and USDA Wildlife Biologist Josh Friers agree that, “although the inactive industrial-mining area is a visually attractive body of water, it is not an attractant for bird life. The steep sides offer no loafing or feeding area for wading birds. Additionally, alligators and crocodiles are present in adjacent areas which is a deterrent for birds, such as gulls and terns, to roost or loaf on the water body at night. Furthermore, approximately 7-10 miles to the north is a waste-water treatment facility, Black Point Marina and Miami-Dade County Landfill. All of these areas provide much more attractive habitat for feeding, loafing, and daily use from birds. Due to the abundance of suitable habitat in the area, the inactive industrial-mining area will rarely be used by [birds]” (Hayenga 2019).

No incompatible development currently exists in APZ II at the south end of the runway. Figure HS3-5 depicts the CZs and APZs at Homestead ARB.

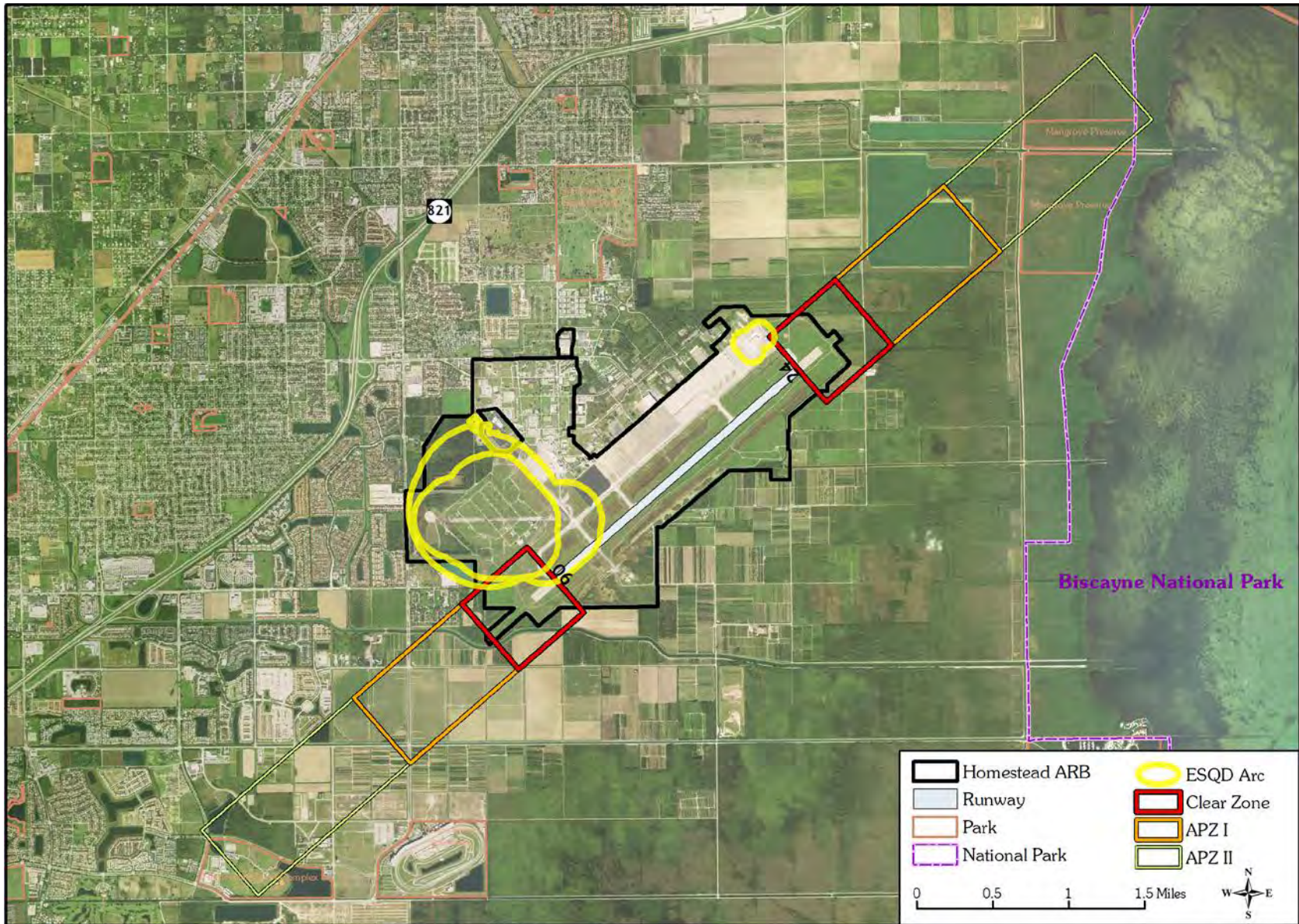


Figure HS3-5. CZs and APZs at Homestead ARB

HS3.4.1.4 Aircraft Mishaps

Mishaps are defined as any damage that occurs on the ground or in flight. As shown in Table HS3-28, mishaps are classified into four categories, based on the severity of the mishap relative to property damage or personnel injury. Class A mishaps are the most severe with total property damage of \$2 million or more or a fatality and/or permanent total disability. Comparison of Class A mishap rates for various engine types, as calculated per 100,000 flying hours provide the basis for evaluating risks among different aircraft and levels of operations. This safety section analyzes existing and projected Class A mishap potentials based on flying hours and aircraft types.

Table HS3-28. Aircraft Class Mishaps

Mishap Class	Total Property Damage	Fatality/Injury
A	\$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	\$500,000 or more but less than \$2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	\$50,000 or more but less than \$500,000	Nonfatal injury resulting in loss of one or more days from work beyond day/shift when injury occurred
D	\$20,000 or more but less than \$50,000	Recordable injury or illness not otherwise classified as A, B, or C

Aircraft flight operations at Homestead ARB are governed by standard flight rules. Aircrews ensure flight safety when operating at the airfield by complying with all safety and aircraft operating requirements. One Class A and no Class B mishaps have occurred during the past 3 years at Homestead ARB. The Class A mishap resulted when a 482 FW F-16 aborted takeoff and departed the runway surface. The mishap did not result in injuries and was contained on the installation. The F-16 has a lifetime Class A mishap rate of 3.43 (10,889,468 cumulative hours through 2017) (USAF 2018).

HS3.4.1.5 Bird/Wildlife-Aircraft Strike Hazard

Bird and wildlife-aircraft strikes and the hazards they present form another safety concern for aircraft operations. Bird/wildlife-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area.

According to the Air Force Safety Center BASH statistics, from 1995 to 2016, where altitude at time of strike was known, more than 50 percent of the strikes occurred below 400 feet AGL, and 90 percent occurred below 2,000 feet AGL (USAF 2017). Waterfowl generally present the greatest BASH potential due to their flocking flight patterns and because, when migrating, they can be encountered at altitudes up to 20,000 feet AGL. Raptors also present a substantial hazard due to their size and soaring flight patterns. In general, the threat of bird-aircraft strikes increases during March and April and from August through November due to migratory activities. The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 20 years indicates that 11 USAF aircraft have been destroyed and five fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2016 (USAF 2017).

The USAF BASH program was established to minimize the risk for collisions of birds and aircraft and the subsequent loss of life and property. AFI 91-202 requires each flying unit in the USAF to develop a BASH plan to reduce hazardous bird/animal activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard

abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined in the plan include monitoring the airfield for bird activity, issuing bird hazard warnings, initiating bird avoidance procedures when potentially hazardous bird activities are reported, and submitting BASH reports for all incidents. The 482 FW BASH Plan, which also provides BASH guidelines to 93 FS aircrews, provides specific guidance and assigns responsibilities in developing an effective BASH reduction program for Homestead ARB (Homestead ARB 2011).

From 2013 to 2017, Homestead ARB personnel recorded 72 bird strikes in the airfield and airspace. The concentration of birds at and around Homestead ARB poses a risk to flying operations. The terrain, bodies of water, and climate are ideal living conditions for birds year-round, as well as migratory species. Several features of the surrounding area are conducive to bird habitation. The base is bordered by large tracts of farmland. There is a large Miami-Dade County landfill located approximately 5 miles north of the base. Birds are attracted to landfills just as they are to any source of food. Homestead ARB is drained by several man-made canals and drainage ditches. These canals and drainage ditches provide habitat for water birds.

The BASH Plan establishes implementation procedures and actions to minimize the potential of bird-aircraft strikes. Such measures include operating aircraft according to current Bird Watch Conditions (Low, Moderate, Severe), maintaining grass heights between 7 and 14 inches, controlling broad-leaf weeds, and steepening and removal of vegetation in ditches and ponds to reduce accessibility to food sources for wading birds. BASH reduction techniques currently employed by the base include taped distress calls (bioacoustics), pyrotechnics, propane cannons, depredation when necessary, and novel methods (e.g., radio-controlled model aircraft, falconry, hawk kites, etc.) (Homestead ARB 2011).

HS3.4.2 Base Environmental Consequences

O&M activities conducted on Homestead ARB would continue to be performed in accordance with all applicable safety directives. No specific aspects of F-35A O&M would create any unique or extraordinary safety issues. Refer to Chapter 2, Section 2.3.4.2, for a discussion of the types of defensive countermeasures and ordnance that would be used by AFRC F-35A pilots. Only approved weapons systems would be used by AFRC F-35A pilots on the impact training ranges and pilots would adhere to all flare and live-fire use restrictions.

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All renovation and construction activities would be completed in compliance with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with antiterrorism/force protection requirements and explosives safety requirements. The USAF does not anticipate any significant safety impacts to result from construction, demolition, or renovation if all applicable AFOSH and OSHA requirements are implemented. In addition, O&M of the new munitions buildings would not result in significant safety impacts.

Although emergency and mishap response plans would be updated, the proposed AFRC F-35A mission at Homestead ARB is not expected to create new or unique ground safety issues. Emergency and mishap response plans would be updated to include procedures and response actions necessary to address a mishap involving AFRC F-35A aircraft and associated equipment. With this update, airfield safety conditions would remain similar to baseline conditions. As indicated in Section HS3.4.2.2, base Fire and Emergency Services would continue to participate in mutual-aid support agreements with nearby communities.

HS3.4.2.1 Explosive Safety

The construction and operation of the proposed facilities would comply with Department of Defense Explosives Safety Board (DDESB) Standard 6055.09, *DoD Ammunition and Explosives Safety Standards* (DoD 2008), Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards* and AFMAN 32-1084, *Facility Requirements*. No new requirements for ESQD arcs are anticipated. No changes to explosive safety would result from the construction and operation of the proposed facilities at Homestead ARB.

HS3.4.2.2 Fire Risk and Management

Fire and crash response would continue to be provided by Homestead ARB Fire and Emergency Services. TO 00-105E-9 provides guidance on fire response to aircraft containing composite materials, including the F-35A. Firefighters would continue to be fully trained and appropriately equipped for crash and rescue response and the proposed AFRC F-35A beddown would not change these abilities. Aircraft pre-incident plans would be developed for the F-35A. Aircraft pre-incident plans are required to be reviewed, validated and/or updated annually or anytime there is a change to TO 00-105E-9 for the applicable aircraft. Equipment and training specific to addressing F-35A mishaps would be obtained and conducted prior to beddown. Additionally, Homestead ARB would keep local firefighting departments informed about any new information or firefighting techniques associated with composite materials should an accident occur.

HS3.4.2.3 Accident Potential Zones

No changes to existing APZs or CZs would be required to accommodate AFRC F-35A operations. As documented in Section HS3.4.1.3, there is incompatible development within the northern and southern APZ I. For the reasons described in Section HS3.4.2, implementation of the AFRC F-35A mission would not increase the safety risk to these or other off-base areas. Homestead ARB would continue to work with communities and developers to apply the AICUZ guidelines.

HS3.4.2.4 Aircraft Mishaps

Implementation of the proposed AFRC F-35A mission at Homestead ARB would replace the existing F-16 mission operated by the 482 FW. During public scoping, several commenters were concerned with the flight safety of the single-engine F-35A, as well as the increased use of composite aerospace materials in the construction of the F-35A. Approximately 13 percent of the F-16, by weight, is comprised of composite materials, while approximately 42 percent of the F-35A, by weight, is comprised of composite materials (Air Force Research Laboratory 2015).

HS3.4.2.4.1 Flight Safety

As of March 2019, the F-35A has amassed more than 76,000 hours of flight time with three Class A mishaps, resulting in a mishap rate of 3.94 (Table HS3-29). These mishaps included an engine failure during takeoff preparation (the aircraft was safely brought to a halt), an aborted takeoff with damage confined to the engine, and a hydraulic failure resulting in collapsed nose landing gear that occurred after landing and parking. No injuries occurred during these events. Because the F-35A has not yet reached 100,000 hours, this mishap rate is not directly comparable to other aircraft (Chapter 3, Section 3.4.3) with more flying hours. However, this rate does provide some indication of the overall safety of the F-35A aircraft. For example, this rate is much lower than the 18.65 rate of the F-16 after a comparable amount of hours.

Table HS3-29. F-35A Class A Flight Mishap History

Fiscal Year	Class A		Destroyed		Fatal		Hours Flown Per Year	Cumulative Flight Hours
	Number of Mishaps	Rate	Aircraft	Rate	Pilot	All		
2010	0	0.00	0	0.00	0	0	0	0
2011	0	0.00	0	0.00	0	0	0	0
2012	0	0.00	0	0.00	0	0	215	215
2013	0	0.00	0	0.00	0	0	1,283	1,498
2014	1	37.54	0	0.00	0	0	2,664	4,162
2015	0	0.00	0	0.00	0	0	7,467	11,629
2016	0	0.00	0	0.00	0	0	11,343	22,972
2017	0	0.00	0	0.00	0	0	22,714	45,686
2018	2	11.90	0	0.00	0	0	30,514	76,200
Lifetime	3	3.94	0	0.00	0	0	-	76,200

Note: Flight “rates” are number of mishaps per 100,000 flight hours. Only Aviation “Flight” mishaps are reported here. An aviation “Flight” mishap is any mishap in which there is intent for flight and reportable damage to a DoD aircraft.
 Source: USAF 2019

Historical trends of USAF aircraft show that mishaps of all types decrease the longer an aircraft is operational. For example, when the last single-engine fighter fielded by the USAF (F-16) surpassed 100,000 hours in 1982, its Class A rate was 15.83 with four fatal mishaps (USAF 2018). Since then, the mishap rate for the F-16 has decreased substantially. In 2017, the F-16 had a lifetime Class A mishap rate of 3.39, and its rate for the last 10 years is 1.83 (USAF 2019). Similarly, in 1979, when the A-10 surpassed 100,000 hours, its Class A rate was 9.24 with four fatalities recorded (USAF 2019). The A-10 has a lifetime Class A mishap rate of 1.90, and its rate for the last 10 years is 0.55 (USAF 2019). The mishap rate for the F-35A is expected to decline as the aircraft becomes operationally mature. The Pratt & Whitney F135 engine used in the F-35A was derived from the F119 engine, which is used in the F-22 Raptor. The F-22 features a 0.54 lifetime engine-related Class A flight mishap rate.

In addition, aircraft with newer engines and designs generally have fewer mishaps than aircraft with older engines and designs. Table HS3-30 shows the decreases in engine-related and lifetime mishap rates for 11 historic and active single-engine aircraft.

Table HS3-30. Class A Flight Mishap Rates

Decade Introduced	Aircraft/Engine	Engine-Related Cumulative Class A Mishap Rate	Engine-Related Class A Mishap Rate Last 6 Quarters	Lifetime Class A Mishap Rate
1950s	F-100/ J57	5.61	No longer in service	21.22
	F-102/ J57	3.41	No longer in service	Not available
	F-104/ J79	9.48	No longer in service	Not available
	F-105/ J75	4.56	No longer in service	12.15
	F-106/ J75	2.04	No longer in service	Not available
	A-7/TF41	1.73	No longer in service	5.71
1970s	F-16/ F100-200	1.84	No longer in service	3.43
1980s	F-16/ F110-100	1.06	0.76	
	F-16/ F100-220	0.96	0	
1990s	F-16/ F110-129	0.85	0	
	F-16/ F100-229	0	0	

During scoping, some comments were received regarding safety deficiencies of the F-35A aircraft. In a review of the production program for all models of the F-35 (A, B, and C), the Government Accountability Office, has noted various deficiencies as this advanced aircraft is developed and

brought into production (GAO 2018). These deficiencies are being addressed as full-rate production is approached. The USAF recognizes that certain components have yet to reach full capability. The USAF would not operate any aircraft should safety-of-flight concerns be present.

HS3.4.2.4.2 Composite Aerospace Materials

Advanced composites have been used in aircraft construction since the late 1960s, when a boron-epoxy rudder was installed on the F-4 jet. As composite technology has advanced, the percentage of composite material used in modern aircraft has increased. Types of composites include carbon fiber (e.g., graphite used in sporting equipment), metal-matrix composites (e.g., materials used on spacecraft and racing bicycles), and ceramic-matrix composites (e.g., medical implants). As noted by members of the public during scoping, one disadvantage of certain composites is that these materials can degrade under extreme temperatures, resulting in the production of toxic fumes and airborne fibers. Because of these characteristics, composite aerospace materials present unique hazards to mishap responders. A burning aircraft could release toxic products, exposing personnel and the environment. Individuals exposed to a crash site could experience dermatological and respiratory problems. Exposure to these hazards would not necessarily end when a fire is extinguished; exposure to recovery crews, site security, the surrounding population, and others could continue (Navy 2016). Sampling at mishap sites of aircraft containing composite materials indicated the presence of respirable fibers/dusts in the air. In addition, laboratory studies have identified respirable fiber products and toxic gases (including high levels of CO, NO_x, and hydrogen cyanide) from burning composite materials (Navy 2016).

Due to the rarity of mishaps involving composite aerospace materials, no epidemiological data are available on personnel exposure to burning composites. Similarly, no studies have assessed the toxicology of carbon fibers generated in a fire scenario with extended post-exposure duration. Synergistic interactions between the solid, vapor, and gaseous combustion products have also not been determined. However, research and experience during several crash responses do indicate that composite fiber release is relatively low (Air Force Research Laboratory 2015).

In the event of a crash of an aircraft containing composite materials, the USAF would follow the guidance contained in the *Mishap Response Checklist for Advanced Aerospace Materials/Composites* (USAF Advanced Composites Program Office 1993).

- Areas in the immediate vicinity of the mishap site affected by direct and dense fallout from the fire/explosion-generated smoke plume would be evacuated, along with easily mobile critical equipment. Aircraft and flight operations exposed to the immediate fallout area would be altered or moved. All unprotected personnel would be restricted from assembling downwind of the crash site.
- The fire would be extinguished and composites cooled to below 300°F. Only firefighters equipped with a self-contained breathing apparatus would be authorized in the immediate vicinity of a burning/smoking mishap site until the fire chief declares the area safe. If possible, high-pressure water break-up and dispersal of composite structures would be avoided.
- The mishap site would be roped or cordoned off and a single entry/exit point would be established upwind of the wreckage. Only sufficiently protected individuals would be authorized in the immediate mishap site and peripheral areas.
- Should personnel other than those at the accident site be directly and substantially exposed to adverse material hazards, the medical staff would be consulted for evaluation and tracking. Time permitting, the otherwise un-threatened populace in affected or fallout areas would be advised to do the following:

- Remain indoors;
 - Shut external doors and windows;
 - Turn off forced air intakes; and
 - Await further notification.
- Specific aircraft hazards would be identified by inspection and consultation with the crew chief or aircraft specialists. Composite and other hazardous materials would be identified to mishap response personnel. The On-Scene Commander would be advised of all findings and recommendations.
 - When exiting the crash site, personnel would use a high-efficiency particulate air-filtered vacuum, if available, to remove asbestos-containing materials (ACM) from their outer clothing, work gloves, boots, headgear, and equipment. If unavailable, efforts would be made to wipe or brush off as much contamination as possible. Clean sites (i.e., tent or trailer) would be set up for donning/removal of personal protective equipment if practical.
 - Non-disposable clothing involved with crash/fire-damaged composite parts would be removed and laundered as determined by the base environmental engineer. Personnel should shower (in cool water) prior to going off-duty to preclude injury from loose fibers. Portable showers would be provided, if necessary.
 - Burned/mobile composite fragments and loose ash/particulate residue would be secured with firefighting foam or a fine water mist until a hold-down fixant material is applied to immobilize the fibers. Initial actions should concentrate on debris containment. Investigators, specific aircraft authority, and the base environmental engineer would be consulted before applying any fixant.

HS3.4.2.4.3 Aircraft Mishap Summary

Aviation in all forms has inherent risk and it is not possible to guarantee the future flight-safety risk of any aircraft. However, due to the current F-35A record, the increasing safety trend for single-engine fighter aircraft, and increases in safety as an airframe matures operationally, it is reasonable to expect nominal changes in flight-safety risk to result from implementation of the AFRC F-35 mission at Homestead ARB.

HS3.4.2.5 *Bird/Wildlife-Aircraft Strike Hazards*

The 3 percent increase in airfield operations resulting from the AFRC F-35A mission could negligibly increase the risk of bird/wildlife-aircraft strikes at Homestead ARB. The BASH plan would remain in place to reduce these risks.

HS3.4.3 Airspace Affected Environment

The airspace proposed for use by AFRC F-35A pilots from Homestead ARB RAs, MOAs, and ATCAAs (Table HS2-5 and Figure HS2-2). Aircraft flight operations are governed by standard flight rules. The volume of airspace encompassed by the combination of airspace elements constitutes the ROI for airspace safety. These training areas allow military flight operations to occur without exposing civil aviation users, military aircrews, or the general public to hazards associated with military training and operations. This section describes the existing safety procedures in the airspace proposed for use and the following section evaluates changes that would occur with the introduction of the F-35A.

HS3.4.3.1 Fire Risk and Management

Fires attributable to flares are rare for three reasons. First, the altitude and other restrictions on flare use minimize the possibility for burning material to contact the ground. Second, to start a fire, burning flare material must contact vegetation that is susceptible to burning at the time. The probability of a flare igniting vegetation is expected to be equally minimal. Third, the amount and density of vegetation, as well as climate conditions, must be capable of supporting the continuation and spread of fire.

Aircraft based at Homestead ARB utilize two live fire ranges, the U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges) and APAFR. The U.S. Forest Service (USFS) monitors fire conditions at the Ocala National Forest, where the U.S. Navy Pinecastle Range Complex is located. Occasionally, the USFS denies a Burn/Drought Index Waiver Notification, if the conditions exceed the established limits; however, the USFS works with the range users to ensure that planned training is not adversely impacted. The USFS conducts controlled burns at the U.S. Navy Pinecastle Range Complex in accordance with the USFS Land Resource Management Plan. The controlled burns are coordinated with U.S. Navy Pinecastle Range Complex personnel (Navy 2017).

APAFR manages fires in accordance with a Wildland Fire Management Plan. The primary goal of the plan is to protect the mission. APAFR conducts at least 33,000 acres of prescribed fire per year to reduce risks to the military mission, including the prevention of munitions related fires (APAFR 2014).

HS3.4.3.2 Aircraft Mishaps

Aircraft flight operations are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (482 FW Instruction 11-2, *F-16 Flying Operations*, February 2012) to ensure flight safety.

HS3.4.3.3 Bird/Wildlife-Aircraft Strike Hazard

The primary threat to military aircraft operating in the airspace is migratory birds. The exact number of birds struck in the airspace areas is difficult to assess because small birds are not detected until post-flight maintenance checks and the location of such strikes cannot be determined. Refer to Section HS3.4.1.5 for more information regarding BASH and the actions that are implemented to minimize bird strikes.

HS3.4.4 Airspace Environmental Consequences

The addition of F-35A aircraft to the airspace would not require changes to the management or structure of the airspace. AFRC F-35A pilots would fly mission profiles similar to those flown by F-16 pilots currently operating from Homestead ARB, only at higher average altitudes, including air-to-ground ordnance delivery and air combat training operations. Implementation of the AFRC F-35A mission would result in a 0.2 percent decrease in overall airspace sorties in the existing airspace proposed for use. As described in Section HS3.1.4.1, total sorties would remain within the capability and capacity of the airspace and ranges proposed for use.

HS3.4.4.1 Fire Risk and Management

Flare and ordnance deployment in authorized ranges and airspace is governed by a series of regulations based on safety and environmental considerations and limitations. These regulations establish procedures governing the use of flares over ranges, other government-owned

and -controlled lands, and nongovernment-owned or -controlled areas. Chapter 2, Section 2.3.4.2, details the flares and ordnance proposed for use by AFRC F-35A pilots.

The frequency of flare use would remain the same or slightly decrease from baseline conditions. AFRC F-35A pilots would only use flares in compliance with existing airspace altitude and seasonal restrictions to ensure fire safety. Based on the emphasis of flight at higher altitudes, roughly 90 percent of F-35A flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires. Lands surrounding the air-to-ground training impact areas underlying airspace ensure public protection by restricting access to areas associated with laser use, emitters, and ordnance delivery. All guidance, regulations, and instructions for ordnance delivery at the ranges would be adhered to by AFRC F-35A pilots. Mutual fire response and suppression agreements would continue.

HS3.4.4.2 Aircraft Mishaps

Continued maintenance of situational awareness and use of available communications for tracking the scheduled and near real-time status of the SUAs would help maintain a safe flying environment for all concerned. Any changes to those capabilities and the current or future areas in which this service is provided would be appropriately addressed and communicated through those same venues. The majority of flight operations would be conducted over remote areas; however, in the unlikely event that an aircraft accident occurs, existing response, investigation, and follow-on procedures would be enforced to ensure the health and safety of underlying populations and lands. Implementation of flight safety procedures and compliance with all flight safety requirements would minimize the chances for aircraft mishaps.

HS3.4.4.3 Bird/Wildlife-Aircraft Strike Hazards

AFRC F-35A pilots would operate the aircraft in the same airspace environment as other pilots from Homestead ARB, albeit at a higher altitude than current aircraft. Therefore, the overall potential for bird-aircraft strikes would be reduced following the beddown of the F-35A. When BASH risk increases due to time of year, limits are and would continue to be placed on low-altitude flights. Briefings are provided to pilots when the potential exists for greater bird-strike risks within the airspace; AFRC F-35A pilots would also be subject to these procedures. Implementation of the AFRC F-35A mission would not result in significant BASH risks in the airspace proposed for use.

HS3.4.5 Summary of Impacts to Safety

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All new construction would incorporate antiterrorism/force protection requirements. All construction would be conducted in compliance with DDESB Standard 6055.09, AFMAN 91-201, and AFMAN 32-1084, and the ESQD arcs would not change. As of September 2017, the F-35A has amassed more than 36,000 hours of flight time with one Class A mishap resulting in a mishap rate of 2.73. Since the F-35A has not yet reached 100,000 hours, this rate is not directly comparable to other aircraft. As the F-35A becomes operationally mature, the F-35 mishap rate would be expected to continue to decline, as supported by the documented decline in mishap rates for the F-16 and A-10. Homestead ARB has an active BASH program, but the 3.0 percent increase in aircraft operations at Homestead ARB and the 0.2 percent decrease in sorties in the airspace proposed for use could increase the overall BASH incidents. However, this increase is not anticipated to be significant. With regard to airspace, AFRC F-35A pilots would use the same airspace used by 482 FW pilots. Impacts to safety resulting from implementation of the new mission are not anticipated to be significant.

HS3.5 SOIL AND WATER RESOURCES

HS3.5.1 Base Affected Environment

HS3.5.1.1 Soil Resources

Homestead ARB is located in the Coastal Plains physiographic province, Floridian section. This section is characterized by extremely flat topography with soils that are composed of sedimentary rock and unlithified sediments (Stone et al. 1992). Urban land is the most common soil classification at Homestead ARB. Other common soils include Udorthents, limestone substratum-Urban land complex, and Biscayne marl (both drained and undrained). The Udorthents, limestone substratum-Urban land complex is a moderately deep soil that is somewhat poorly drained. Biscayne marl is a shallow soil that is naturally poorly drained (Soil Survey Staff 2018). All these soils have a slight susceptibility to wind and water erosion. More detailed descriptions of the soils types on the base are available from the Web Soil Survey (Soil Survey Staff 2018).

HS3.5.1.2 Water Resources

HS3.5.1.2.1 Surface Water

The base is located in the South Atlantic-Gulf Region and the Southern Florida Subregion. Natural drainage on the installation is poor due to the flat terrain and a high water table. Stormwater runoff is collected in a drainage system of canals, swales, ditches, and pipes, most of which eventually discharge into the Boundary Canal. A stormwater reservoir is located on the east side of the base and receives flow from the Boundary Canal system. During periods of heavy rainfall, water from the reservoir can be discharged to Biscayne Bay through the Military Canal (Homestead ARB 2017b). Three manmade lakes are located on Homestead ARB (Phantom Lake and the Twin Lakes).

Homestead ARB has a general stormwater National Pollutant Discharge Elimination System (NPDES) permit issued to the installation under FLR05A352-004 – NPDES Stormwater by the State of Florida. This permit is the Multi-Sector Generic Stormwater Discharge Associated with Industrial Activity and was issued under the provisions of Sections 403.0885, Florida Statutes, and the applicable rules of the Florida Administrative Code. To satisfy the requirements of the NPDES permit the USAF has prepared and currently implements a Stormwater Pollution Prevention Plan (SWPPP) (Homestead ARB 2017b). The plan is annually reviewed and revised as necessary. The Homestead ARB SWPPP references the need for a land disturbance permit that applies, in part, to construction or other projects that will have a land disturbance greater than one acre. The SWPPP also recognizes that the Metropolitan Miami-Dade County Department of Environmental Resources Management requires a permit for the construction of surface water management systems that overflow into the Boundary Canal.

HS3.5.1.2.2 Groundwater

Homestead ARB is located above the Biscayne aquifer. In the Homestead ARB area, this aquifer extends from land surface to depths of approximately 80 to 100 feet below the ground surface. The Biscayne aquifer is designated by the USEPA as a sole-source aquifer for Broward, Miami-Dade, Monroe, and Palm Beach Counties (Homestead ARB 2017b). Two other aquifers, the Intermediate Confining Unit and the Floridan Aquifer system, are located below Homestead ARB but are not used as a primary source for potable water (Homestead ARB 2017b).

HS3.5.1.2.3 Floodplains

Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) indicate that the northeastern portion of the base and a portion of the base located along the southern base boundary

are within the 100-year floodzone (Figure HS1-2). Flooding within the base is typically caused by periods of heavy rainfall and not from coastal flooding or storm surges (Homestead ARB 2017b).

HS3.5.2 Base Environmental Consequences

HS3.5.2.1 Soil Resources

Implementation of the projects identified in Table HS2-1 would disturb approximately 2.3 acres of land, most of which has been previously disturbed. Impacts to soil resources near each of the project sites would result from ground disturbance (e.g., compaction; vegetation removal; and excavation for foundations, footings or utilities). Onsite soils (predominantly Urban land) have a slight potential for wind and water erosion (Soil Survey Staff 2018). Implementation of management practices would minimize impacts to soil resources. These actions could include, but would not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, as appropriate. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would result from implementation of the AFRC F-35A mission.

HS3.5.2.2 Water Resources

HS3.5.2.2.1 Surface Water

Impacts to surface water can result from land clearing, grading, and moving soil resulting in localized increases in stormwater runoff volume and intensity. Approximately 2 acres of new impervious surfaces would be created and pollutants have the potential to be introduced into construction areas. However, in accordance with UFC 3-210-10, *Low Impact Development (LID)* (as amended, 2016) and the Emergency Independence and Security Act (EISA) Section 438 (42 USC §17094), any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features (i.e., use of porous materials, directing runoff to permeable areas, and use of detention basins to release runoff over time). The integration of LID design concepts incorporates site design and stormwater management principles to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

Prior to construction, the contractor would be required to obtain coverage under NPDES Generic Permit for Stormwater Discharge from Large and Small Construction Activities by filing an NOI with the FDEP and preparing a site-specific SWPPP to manage stormwater discharges during and after construction until the area is revegetated. Upon revegetation, the contractor would file the Notice of Termination with the FDEP to terminate permit coverage. The USAF would specify compliance with the stormwater discharge permit in all of the contractor construction requirements. Other management practices to include in the plan could include the use of water sprays during construction to keep soil from becoming airborne, use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials and revegetating the site in a timely manner.

The existing Homestead ARB SWPPP also identifies control practices to be followed for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. As part of the SWPPP, the base has identified individuals to be part of the Stormwater Pollution Prevention Team (SWPPT). The SWPPT meets annually, is responsible for all aspects of the SWPPP and provides recommendations to the Environment, Safety, and Occupational Health Leadership Committee regarding the SWPPP status, any deficiencies, deicing usage data and outfall monitoring data.

HS3.5.2.2.2 Groundwater

Implementation of the AFRC F-35A mission would result in an overall decrease of 91 people (i.e., a 2.7 percent decrease in base staffing). This slight decrease in personnel would result in no additional demand for groundwater. Implementation of the AFRC F-35A mission would not require any additional groundwater to be supplied by Miami-Dade County. The USAF has an active spill management program in place to minimize the potential for spills and allow the USAF to quickly respond to any spills that occur to minimize the potential for contamination of groundwater. Significant impacts to groundwater would not result from implementation of the AFRC F-35A mission.

HS3.5.2.2.3 Floodplains

No floodplains are located near any of the areas proposed for infrastructure development on Homestead ARB. Therefore, no impacts to floodplains would result from implementation of the proposed AFRC F-35A mission.

HS3.5.3 Summary of Impacts to Soil and Water Resources

Implementation of the proposed action would disturb approximately 2.3 acres of land. Less than 2 acres of new impervious surface would be added resulting in less than a 1 percent increase in impervious surface in this drainage area. No floodplains would be impacted and a SWPPP would be prepared for the proposed construction. Implementation of management practices would minimize impacts to soil resources and projects would be designed and implemented in accordance with LID and EISA to minimize impacts to soil and water resources. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would result from implementation of the proposed action.

HS3.6 BIOLOGICAL RESOURCES

HS3.6.1 Base Affected Environment

The ROI for biological resources is defined as the land and aquatic (habitats) that could be affected by the infrastructure and construction projects on the base, and the primary airspace where AFRC F-35A pilots would predominantly fly. For the purposes of this biological resources analysis, the ROI for the proposed action and No Action Alternative includes Miami-Dade County, Florida.

The USAF recently completed the formal Section 7 consultation process with the USFWS for current base operations at Homestead ARB. On 7 May 2018 the USAF submitted a Programmatic Biological Assessment (PBA) for potential impacts to federally listed species resulting from ongoing and future military and non-military operations at Homestead ARB. On 24 September 2019, the USFWS issued a Biological Opinion (BO) to identify the effects of military and non-military operations and activities, including aircraft operations, on federally listed species known to occur or with potential to occur at Homestead ARB (USFWS 2019).

HS3.6.1.1 Vegetation

Homestead ARB is located in the Southern Florida Coastal Plain ecoregion. Historic land cover associated with the region consisted of flat plains with wet soils, marshland and swamp land cover (USGS 2009). Little remains of these original vegetation communities within Homestead ARB, and the areas that do remain have been altered by development and changed in hydrology.

Land cover at Homestead ARB consists of either improved or semi-improved grounds. These include primarily turf and landscaped areas or unimproved grounds consisting of remnant pine rockland, open grasslands, wetland marsh and fringe areas, and small monotypic stands of exotic plant species. Vegetation management at Homestead ARB is guided by the Integrated Natural Resources Management Plan (INRMP), the wildland fire management program, and the BASH Plan (Homestead ARB 2018a, 2011, 2018b). Homestead ARB is currently in the process of preparing a Landscape Management Plan that will include specific parameters to maintain unique vegetation communities and rare plant species on Homestead ARB (Andrejko 2018).

HS3.6.1.2 Wildlife

Information on wildlife occurring on Homestead ARB is provided in the INRMP and U.S. Department of Agriculture (USDA) Wildlife Management Program Reports (Homestead ARB 2018, USDA 2016). Homestead ARB supports a diversity of wildlife species. Common mammal species observed include coyotes (*Canis latrans*), red-phased gray fox (*Urocyon cinereoargenteus*), river otters (*Lontra canadensis*), opossum (*Didelphis virginiana*), marsh rabbit (*Sylvilagus palustris*), cotton rat (*Sigmodon hispidus*), cotton mouse (*Peromyscus gossypinus*), raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), and bobcat (*Lynx rufus*). Avian species known to occur on base include waterfowl such as egrets (*Egretta rufescens*, *Ardea alba*, *Bubulcus ibis*), herons (*A. herodias*, *E. tricolor*), white ibis (*Eudocimus albus*), American white pelican (*Pelecanus erythrorhynchos*), mottled duck (*Anas fulvigula*), black-bellied whistling-duck (*Dendrocygna autumnalis*), and blue-winged teal (*Anas discors*). Other birds include double-crested cormorant (*Phalacrocorax auritus*), red-shouldered hawk (*Buteo lineatus*), and pine warbler (*Dendroica pinus*). Reptile and amphibian species include rough grass snake (*Opheodrys aestivus*), corn snake (*Elaphe guttata*), checkered garter snake (*Thamnophis marcianus*), Florida slider (*Trachemys scripta*), Florida soft shell turtle (*Apalone ferox*), snapping turtle (*Chelydra serpentina*), Florida chorus frog (*Pseudacris nigrita verrucosa*), tree frogs (*Hyla* sp.), and two-toed amphiuma (*Amphiuma means*), southeastern five-lined skink (*Eumeces inexpectatus*), ringneck snake (*Diadophis punctatus*), and pygmy rattlesnake (*Sistrurus miliarius*). Wetlands and lakes provide habitat for fish species including largemouth bass (*Micropterus salmoides*), warmouth (*Lepomis gulosus*), bluegill (*Lepomis macrochirus*), striped mullet (*Mugil cephalus*), and Florida gar (*Lepisosteus platyrhincus*).

HS3.6.1.3 Threatened, Endangered, and Special Status Species

HS3.6.1.3.1 Federally Listed Species

The USFWS's Information for Planning and Consultation (IPaC) online system was accessed on 9 February 2018 to identify current USFWS trust resources (e.g., migratory birds, species proposed or listed under the Endangered Species Act (ESA), inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands) with potential to occur in the ROI for biological resources at Homestead ARB.

On 9 February 2018, the USFWS provided an automated *Official Species List* via a letter that identified 48 threatened or endangered species protected under the ESA (16 USC § 1531 et seq.) and 9 critical habitats that could occur in Miami-Dade County, Florida. Although 48 species were identified under the IPaC Trust Resource Report, only 21 species are known to occur or have potential to occur near Homestead ARB and will be carried forward for analysis in the Draft EIS (Homestead ARB 2018c). Table HS3-31 presents these species.

Table HS3-31. Federally Listed Species with Potential to Occur in Miami-Dade County, Florida

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Homestead ARB?
Mammals				
Florida Bonneted Bat	<i>Eumops floridanus</i>	FE	The Florida bonneted bat roosts in rock crevices, old trees with suitable cavities, buildings, and Spanish tile roofs. The species feeds in very open areas and at high altitudes.	Yes
West Indian Manatee	<i>Trichechus manatus</i>	FT	West Indian manatees require access to aquatic vegetation, freshwater sources, and at least 2 meters of water depth. The species feeds along grass bed margins with access to deep water channels, where they flee when threatened.	No ^a
Birds				
Wood Stork	<i>Mycteria americana</i>	FT	Wood storks occur in shallow wetland areas where fish are plentiful. The species has been observed in the wetland areas on Homestead ARB near Twin Lakes.	Yes
Least Tern	<i>Sterna antillarum</i>	FE	Least terns occur along waterways, including reservoirs, refuges, and rivers. During migration the species is found on open flat beach areas. Least terns nest on the ground in open areas and near appropriate feeding habitat.	Yes
Everglade Snail Kite	<i>Rostrhamus sociabilis plumbeus</i>	FE	Habitat includes freshwater marshes and shallow vegetated edges of natural or man-made lakes where apple snails can be found. Because of its specific dietary and hydrological requirements, the Everglade snail kite is restricted to the watersheds of the Everglades, Lake Okeechobee, Lake Kissimmee, and the upper St. Johns River.	Yes
Rufa Red Knot	<i>Calidris canutus rufa</i>	FT	Rufa red knots winter in Florida from December to February, but could be present in some wintering areas as early as September or as late as May. Habitat includes intertidal, marine habitats, especially near coastal inlets, estuaries, and bays during the non-breeding season.	Yes
Piping Plover	<i>Charadrius melodus</i>	FT	Piping plovers winter in Florida and use coastal beaches, sandflats, and mudflats.	No
Roseate Tern	<i>Sterna dougallii</i>	FT	The roseate tern is a migratory, marine bird that could occur at Biscayne Bay. Preferred nesting habitat is open, sandy beach isolated from human activity and predators, although rooftops are also used.	No
Reptiles				
American Alligator	<i>Alligator mississippiensis</i>	FT	American alligators and crocodiles inhabit fresh and brackish marshes, ponds, lakes, rivers, swamps bayous, canals and large spring runs. Basking occurs on partially submerged logs or on land next to the water. Alligators dig dens in river or lake margins or in marshes.	Yes
American Crocodile	<i>Crocodylus acutus</i>	FT		Yes
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	FT	Eastern indigo snakes frequent a variety of habitat types including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats.	Yes

Table HS3-31. Federally Listed Species with Potential to Occur in Miami-Dade County, Florida (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Homestead ARB?
Insects				
Bartram's Scrub Hairstreak Butterfly	<i>Strymon acis bartrami</i>	FE	Both butterflies are endemic to the pine rockland habitat of south Florida and are closely tied to their larval host plant, pineland croton (<i>Croton cascarilla</i>). Pineland croton populations are restricted to pine rockland forests.	No
Florida Leafwing Butterfly	<i>Anaea troglodyta floridalis</i>	FE		No
Flowering Plants				
Florida Brickell-bush	<i>Brickellia mosieri</i>	FE	Florida Brickell-bush occurs in low moist limestone areas near margins, along the edges and gaps of pine rocklands, rockland hammocks, and coastal berms.	No
Blodgett's Silverbush	<i>Argythamnia blodgettii</i>	FT	Blodgett's silverbush occurs in low moist limestone areas near margins, along the edges and gaps of pine rocklands, rockland hammocks, and coastal berms.	No
Everglades Bully	<i>Sideroxylon reclinatum ssp. austrofloridense</i>	FT	Everglades bully occurs in fragmented pine rocklands with a tropical understory on limestone rock.	No
Carter's Small-flowered Flax	<i>Linum carteri</i>	FE	Carter's small-flowered flax occurs in disturbed edges of pine rockland habitat.	No
Florida Prairie-clover	<i>Dalea carthagenensis floridana</i>	FE	Florida prairie-clover occurs in pine rocklands, edges of rockland hammocks, coastal uplands, and marl prairie.	No
Tiny Polygala	<i>Polygala smallii</i>	FE	Tiny polygala occurs in four distinct habitats with similar characteristics: pine rockland, scrub, high pine, and open coastal spoil. All of these habitats are pyrogenic (i.e., extremely dry and prone to periodic natural fire).	No
Sand Flax	<i>Polygala smallii</i>	FE	Sand flax habitat includes pine rockland, marl prairie, and adjacent disturbed areas. The species grows on oolitic limestone formations in pine rockland, marl prairie, and disturbed areas. Preferred habitat is characterized by slash pine canopy with a shrub understory of saw palmetto, wax myrtle, poisonwood, and willow bustic shrub layer.	Yes
Small's Milkpea	<i>Galactia smallii</i>	FE	Habitat includes pine rockland characterized by a slash pine canopy with a saw palmetto, wax myrtle, poisonwood, and willow bustic shrub layer. Small's milkpea can also be found with crimson bluestem, wire bluestem, scaleleaf aster, and copperleaf. The species is more abundant in Cardsound rock outcrop complex soils with little quartz sand and prefers open sun with little shade.	Yes

^a Manatees have been observed in and near Black Creek (approximately 3 miles north of Homestead ARB's Military and Mowry Canals) and Convoy Point (approximately 2 miles south of Military Canal). Between 1984 and 1989, there were three manatee sightings near Military Canal (Homestead ARB 2018a). Manatees have been observed in Military Canal and travel as far as the Homestead ARB stormwater pump structure during the winter. However, the stormwater pump structure prevents manatees from accessing the base (Homestead ARB 2018a).

Key: FE = federally endangered; FT = federally threatened

Source: Andrejko 2018; FNAI 2000a-c; Homestead ARB 2015, 2017, 2018a, 2018c, NatureServe 2018a, b; USFWS 1999, 2001, 2010a, b, 2013, 2014, 2017a, b, 2018

Of the 21 species identified, only 10 have been observed at Homestead ARB. These species include the following: American alligator (*Alligator mississippiensis*), rufa red knot (*Calidris canutus rufa*), American crocodile (*Crocodylus acutus*), Eastern indigo snake (*Drymarchon corais couperi*), Florida bonneted bat, Small's milkpea (*Galactia smallii*), wood stork (*Mycteria americana*), sand flax (*Polygala smallii*), Everglade snail kite (*Rostrhamus sociabilis plumbeus*), and least tern (*Sterna antillarum*). Recorded species documentation is based on targeted surveys and subsequent historical survey work conducted in part of the INRMP (Homestead ARB 2018a). Additionally, no critical habitat occurs on Homestead ARB (USFWS 2018c). Although pine rockland habitat located within a few miles of Homestead ARB is designated as critical habitat, none of the pine rockland habitat on the base has been designated as critical habitat because Homestead ARB manages that habitat through an active INRMP.

HS3.6.1.3.2 Migratory Birds

Migratory bird species protected under the Migratory Bird Treaty Act (MBTA) (16 USC §§ 703–712) could occur as residents or migrants near Homestead ARB. Migratory birds, including waterfowl, raptors, and neo-tropical migrants, have been observed on base (Homestead ARB 2018a). Under AFI 91-202 and AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*, Homestead ARB maintains a BASH Plan that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes. The BASH Plan delineates responsibilities for minimizing potential hazards in the areas where tasked units assigned to Homestead ARB conduct flying operations. A USDA wildlife biologist employed at Homestead ARB manages potential wildlife hazards by removal, dispersal, and wildlife control methods to avoid any BASH incidents. Commonly controlled avian species include turkey vultures, laughing gulls (*Leucophaeus atricilla*), and cattle egrets (USDA 2016).

HS3.6.1.3.3 Bald and Golden Eagles

Bald eagles protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668-668c) have been observed as occasional migrants at Homestead ARB, stopping over to feed during the winter months. However, there are no known nesting sites (as documented by the Eagle Nest Locator) on or near the installation (FWC 2016a). Bald eagles are also known to frequent Everglades National Park, located to the west of the installation (Andrejko 2018). Golden eagles have not been observed at Homestead ARB, but could utilize nearby habitat in Everglades National Park.

HS3.6.1.3.4 State-Listed Species

The Florida Fish and Wildlife Conservation Commission (FWC) works in partnership with USFWS to help conserve imperiled species. State-listed imperiled species documented at Homestead ARB include Florida burrowing owl (*Athene cunicularia floridana*), gopher tortoise (*Gopherus polyphemus*), and the rim rock crowned snake (*Tantilla ooltica*) (Homestead ARB 2018a, FWC 2016b).

HS3.6.1.4 Wetlands

Federal and state jurisdictional wetland surveys were conducted on Homestead ARB in 2001 and 2012 (Homestead ARB 2018a). Approximately 233.5 acres of wetlands occur on Homestead ARB (Homestead ARB 2018a). Wetlands occurring on the base include wet marsh and wet prairie. The wetland areas are primarily located within the runway infield and southeast of the runway extending in a southwest to northeast direction (Homestead ARB 2018a).

HS3.6.2 Base Environmental Consequences

HS3.6.2.1 Vegetation

Activities associated with construction, demolition, and renovation projects would occur in developed or disturbed areas of Homestead ARB. Revegetation of temporarily disturbed areas would be conducted as directed by the base natural resource manager to minimize the potential for erosion and dust generation. Potential impacts to protected vegetation species are described in Section HS3.6.2.3.1. No significant impacts to vegetation are anticipated to result from implementation of the AFRC F-35A mission at Homestead ARB.

HS3.6.2.2 Wildlife

Potential impacts to wildlife could include ground disturbance and construction noise from the associated facility and infrastructure projects. In addition, airfield operations can result in bird/wildlife-aircraft strikes and noise impacts.

The areas planned for development for the proposed AFRC F-35A mission at Homestead ARB are highly disturbed and provide limited habitat for some urban adapted wildlife species. This habitat would be lost with construction of the proposed facilities and infrastructure projects.

Noise resulting from the proposed construction, demolition, and renovation activities would be localized, short-term, and only occur during daylight hours. Areas proposed for construction are in a military industrial land use with frequent elevated noise levels. Impacts to wildlife from construction noise would be minimal.

Annual airfield operations are anticipated to increase by approximately 3 percent (Section HS2.3). Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Homestead ARB would continue to adhere to the installation's BASH Plan and implement wildlife controls as necessary to minimize the risk of strikes.

Impacts to wildlife and domestic animals that could result from aircraft noise are summarized below and discussed in more detail in Volume II, Appendix B. As described in Section HS3.2.2, the number of acres exposed to DNL greater than 65 dB would increase. Because additional land would be exposed to DNL greater than 65 dB, additional animals would also be exposed to this noise. Animals hear noise at different levels, in different frequency ranges, and tolerate noise differently than humans. These differences make comparing the noise metrics created for evaluating human impacts to animal impacts difficult. However, the number of noise events per hour with potential to interfere with speech (Table HS3-17) can be used as an indicator of changing frequency noise events that could affect animals. For example, under baseline conditions animals off the coast of Biscayne National Park would experience three events per hour that are at a sufficient level to interfere with human speech. Although implementation of the new mission would not increase the number of events per hour at this location, animals in the residential area of Verde Gardens would be exposed to one additional event per hour.

Volume II, Appendix B, summarizes a number of scientific studies that have been conducted on the effects of aircraft noise on animals. These studies have shown that animal species have a wide range of responses to aircraft noise. One conclusion of these studies is that a general response to noise by domestic animals and wildlife is a startle response. These responses vary from flight, trampling, stampeding, jumping, or running to the movement of the head in the directions of the noise. These studies report that the intensity and duration of the startle response decreases with time, suggesting no long-term, adverse effects. The majority of the studies suggest that domestic animal species and wildlife show behaviors characteristic of adaptation, acclimation, and habituation to repeated aircraft

noise (Volume II, Appendix B). Therefore, significant impacts to wildlife in the ROI would not result from implementation of the AFRC F-35A mission at Homestead ARB.

HS3.6.2.3 *Threatened, Endangered, and Special Status Species*

HS3.6.2.3.1 Federally Listed Species

Minimal impacts to federally listed species are anticipated to result from implementation of the proposed AFRC F-35A mission at Homestead ARB. Under the proposed action, federally listed species would continue to be managed and monitored under the installation INRMP and annual coordination with the USFWS would continue. Potential impacts to federally listed species from the proposed action would be similar to those described in Section HS3.6.2.2. The effects determinations for the 10 federally listed species known to occur at Homestead ARB are analyzed further below.

Florida Bonneted Bat (*Eumops floridanus*). Potential impacts to the Florida bonneted bat from the proposed action at Homestead ARB could include aircraft strikes, or take, in the form of mortality resulting from aircraft operations conducted during morning, evening, and night when bats are active onsite. On 7 May 2018 the USAF submitted a PBA for potential impacts to federally listed species resulting from current base operations at Homestead ARB (Homestead ARB 2018c). On 24 September 2019, the USFWS issued a BO to identify the effects of military and non-military operations and activities, including aircraft operations, on federally listed species known to occur or with potential to occur at Homestead ARB (Volume II, Appendix A, Section A.2.5.4). The BO determined that current and ongoing base operations *May Affect*, and are *Likely to Adversely Affect* the Florida bonneted bat. The BO included an incidental take statement for the Florida bonneted bat. The incidental take statement allows for no more than two Florida bonneted bats to be incidentally taken per year as a result of base operations.

The BO identified buildings 208, 700 and 702 as having metal roofs that could potentially provide roosting habitat for this species. As part of the proposed action, building 208 is proposed for demolition. Per the BO, the USAF, in accordance with Conservation Measure 1, shall visually inspect the potential roost cavities associated with the metal roof prior to initiation of demolition. If roosting bats are identified, Homestead ARB will coordinate with the USFWS on how to proceed with demolition.

Implementation of the AFRC F-35A mission at Homestead ARB would increase annual total airfield operations by approximately 3 percent, potentially increasing the number of BASH incidents. Any increase in operations could result in an increased opportunity for aircraft strikes to occur. The greatest risk to the Florida bonneted bat is within an hour after sunset, at the northeast corner of the runway (near the triple hangars), Phantom Lake, former Homestead AFB property and the Air Base K-8 Center for International Education (Homestead ARB 2018c). The majority (75 percent) of aircraft operations at Homestead ARB occur during the day. AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC F-16 pilots depending on weather or special exercises. There would be no increase in the percentage of night flight activity (Section HS2.3). Additionally, adherence to the existing installation BASH program would minimize the risk of potential bat strikes. Bat strikes by aircraft at Homestead ARB are not common. If Florida bonneted bat strikes were to occur in the future, they would be comparably rare and are not anticipated to result in population-level, direct, adverse impacts. Implementation of studies and monitoring surveys for Florida bonneted bat are currently proposed and also identified under the INRMP's management goals (Homestead ARB 2018a). These studies and

surveys will document areas of highest use on the installation in order for the AFRC to minimize and avoid adverse impacts to this species.

If foraging habitat or roosts are disturbed, direct, adverse impacts (e.g. mortality, loss of habitat) to the Florida bonneted bat could result from construction, demolition, or renovation activities associated with the proposed action at Homestead ARB. Surveys for bats would be conducted prior to any demolitions and/or facility modification or new construction that occurs in areas with potential roosting habitat. Extensive acoustic surveys using simultaneous multiple song meters, combined with roost surveys at sunset would be conducted on the base and adjacent areas northward toward Mystic Lake. Surveys would be conducted to locate roosts and any removal of occupied habitat would be coordinated with the USFWS and be mitigated. Should Florida bonneted bats be identified in a facility proposed for modification or demolition, the Homestead ARB natural resource manager would contact the USFWS to develop the appropriate plans prior to any construction. Homestead ARB would continue to employ measures outlined in the Florida Bonneted Bat Management Plan to avoid impacts to local populations near the installation. As a result, the USAF has determined that the proposed action *May Affect but is Not Likely to Adversely Affect* the Florida bonneted bat. Consultation with the USFWS regarding the proposed action is complete (USFWS 2019).

Wood Stork (*Mycteria americana*). At Homestead ARB, wood storks (up to 10) have been regularly observed foraging near Twin Lakes in the winter. Additionally, flyover groups (of about 10 to 20) of wood storks have been observed annually passing through to nearby off-base shallow canals (Homestead ARB 2018a). Although the base is located in the USFWS-designated consultation area for this species, no nesting has been reported on the base.

All shallow wetland areas would be avoided during construction, demolition, and renovation activities associated with facility and infrastructure projects. Impacts could occur from aircraft strikes. However, proactive management of BASH issues would continue and the installation BASH Plan would be followed to minimize and avoid direct, adverse impacts. No strikes of the wood stork have been recorded at Homestead ARB (Andrejko 2018). As a result, the USAF has determined that the proposed action *May Affect but is Not Likely to Adversely Affect* the wood stork.

Everglade Snail Kite (*Rostrhamus sociabilis plumbeus*). Historical observations of the Everglade snail kite at Homestead ARB are rare. Homestead ARB is not located in the USFWS-designated Everglade snail kite consultation area. Additionally, no suitable habitat for this federally listed bird species is present within the proposed action area. Direct adverse impacts (mortality) to the Everglade snail kite could result from aircraft strikes. Proactive management of BASH issues would continue on Homestead ARB and the BASH Plan would be followed to minimize and avoid direct adverse impacts to Everglade snail kite. No strikes of the Everglade snail kite have been recorded and there have been infrequent occurrences at Homestead ARB (Andrejko 2018). As a result, USAF determined that the proposed action *May Affect but is Not Likely to Adversely Affect* the Everglades snail kite.

Least Tern (*Sterna antillarum*). The least tern is known to occasionally stopover at Homestead ARB near some of the standing water areas along Perimeter Road. Nesting was historically reported, although no details are available at this time. The AFRC F-35A mission would avoid all wetland areas. Impacts could occur from aircraft strikes. However, proactive management of BASH issues would continue and the installation BASH Plan would be followed to minimize and avoid direct, adverse impacts. No strikes of the least tern have been recorded at Homestead ARB (Andrejko 2018). As a result, the USAF has determined that implementation of the AFRC F-35A mission *May Affect but is Not Likely to Adversely Affect* the least tern.

Rufa Red Knot (*Calidris canutus rufa*). Historical observations of the rufa red knot at Homestead ARB are extremely rare. No suitable habitat for this federally listed bird species is present in the proposed action area. Impacts could occur from aircraft strikes. However, proactive management of BASH issues would continue and the installation BASH Plan would be followed to minimize and avoid direct, adverse impacts. No strikes of the rufa red knot have been recorded at Homestead ARB (Andrejko 2018). As a result, the USAF has determined that implementation of the AFRC F-35A mission *May Affect but is Not Likely to Adversely Affect* the rufa red knot.

American Alligator (*Alligator mississippiensis*). The American alligator has been observed in the lakes and canals on Homestead ARB. Reduced water quality from facility and infrastructure project activities that could affect the waterways could result in indirect impacts to this species. However, implementation of the SWPPP and Best Management Practices (BMPs), implementation of the Integrated Pest Management Plan (IPMP), and minimizing disturbance to alligator habitat would reduce the overall potential for direct, adverse impacts. Should this species be observed during construction, demolition, or renovation activities associated with the proposed action, activities would be stopped and AFRC biologists would safely capture the animal and relocate it outside of the project footprint as authorized by the FWC (Homestead ARB 2018b). Therefore, the USAF has determined that implementation of the AFRC F-35A mission would have *No Effect* on the American alligator.

American Crocodile (*Crocodylus acutus*). The canals and lakes on Homestead ARB provide habitat for the American crocodile and they can access the installation over land areas to gain access to waterbodies on Homestead ARB. Reduced water quality from facility and infrastructure project activities that could affect the waterways could result in indirect impacts to this species. However, implementation of the SWPPP and BMPs, implementation of the IPMP, and minimizing disturbance to crocodile habitat would reduce the overall potential for direct, adverse impacts. Should this species be observed during construction, demolition, or renovation activities associated with the proposed action, activities would be stopped and AFRC biologists would safely capture the animal and relocate it outside of the project footprint as authorized by the USFWS (Homestead ARB 2018c). Therefore, the USAF has determined that implementation of the AFRC F-35A mission would have *No Effect* on the American crocodile.

Eastern Indigo Snake (*Drymarchon corais couperi*). Over most of its range, the eastern indigo snake frequents a variety of habitat types, including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats (Homestead ARB 2018c). No preferred suitable habitat for the eastern indigo snake is present in the proposed action area at Homestead ARB. Eastern indigo snakes would likely avoid areas of high human activity. Should an eastern indigo snake be observed in the proposed action area, the Homestead ARB natural resource manager would be contacted to assess the potential for direct, adverse impacts. Coordination with the USFWS would continue through the installation INRMP program. As a result, the USAF has determined that implementation of the AFRC F-35A mission would have *No Effect* on the eastern indigo snake.

Sand Flax (*Polygala smallii*). Various populations of sand flax have been identified throughout Homestead ARB (Homestead ARB 2018a). Populations are concentrated in the west-central portion of the base, primarily in the munitions area, which is less disturbed and has a higher quality of habitat than most other areas on the base. Populations are also known to occur in the Northeast Grasslands and along the edge of remnant pineland tract on the base (Andrejko 2018, Homestead ARB 2018a). Suitable habitats and known populations of sand flax occur near the proposed action area (Figure HS2-1). All construction, demolition, and renovation activities associated with facility and infrastructure projects would avoid these areas to prevent any direct

“take” of the species. Homestead ARB would continue to adhere to the Protected Plant Management Plan (PPMP) that employs management actions to promote the preservation and maintenance of suitable habitats for rare plants at the base (Homestead ARB 2018a). Prior to any construction, demolition, or renovation actions, Homestead ARB would coordinate with the USFWS to determine potential direct, adverse impacts to federally listed plant species. If sand flax plants are identified to be impacted by construction, the BO specifies a replanting ratio of 5:1 (number of plants replaced: number of plants affected). Additionally, coordination with the USFWS would continue through the installation INRMP program. As a result, the USAF has determined that implementation of the AFRC F-35A mission would have *No Effect* on suitable habitats and known populations of sand flax at Homestead ARB.

Small’s Milkpea (*Galactia smallii*). Various populations of Small’s milkpea have been identified throughout Homestead ARB (Homestead ARB 2018a). Suitable habitats and known populations of Small’s milkpea occur near the proposed action area (Figure HS2-1). All construction, demolition, and renovation activities associated with facility and infrastructure projects would avoid these areas to prevent any direct “take” of the species. Homestead ARB would continue to adhere to the PPMP that employs management actions to promote the preservation and maintenance of suitable habitats for rare plants at the installation (Homestead ARB 2018a). Prior to any construction, demolition, or renovation actions, Homestead ARB would coordinate with the USFWS to determine potential direct, adverse impacts to federally listed plant species. If Small’s milkpea plants are identified to be impacted by construction, the BO specifies a replanting ratio of 3:1 (number of plants replaced: number of plants affected). Additionally, coordination with the USFWS would continue through the installation INRMP program. As a result, the USAF has determined that implementation of the AFRC F-35A mission would have *No Effect* on suitable habitats and known populations of Small’s milkpea at Homestead ARB.

HS3.6.2.3.2 USFWS Correspondence

On 2 July 2018, the USFWS responded to the USAF’s request for coordination and recognized the potential for adverse effects to the Florida bonneted bat from proposed renovation and demolition activities. The USFWS referred to minimization measures that could be implemented to assist in determining impacts to the Florida bonneted bat. Those minimization efforts are described above under **Florida Bonneted Bat** and would be incorporated into construction plans should Homestead ARB be selected for the AFRC F-35A mission. The USFWS also requested additional preconstruction evaluation for federally listed plant species depending upon the location of proposed construction and renovation projects. As described above, the BO includes guidelines on replanting ratios for impacted plants and monitoring and reporting requirements. Consultation with the USFWS regarding the proposed action is complete (USFWS 2019).

HS3.6.2.3.3 Migratory Birds

Implementation of the AFRC F-35A mission at Homestead ARB would result in a 3 percent increase in annual total airfield operations. The slight increase in operations could result in an increased opportunity for bird-aircraft strikes to occur. Adherence to the existing BASH program would minimize the risk of bird-aircraft strikes including those for migratory birds to negligible levels (Section HS3.4.1.5). Noise-related impacts to migratory birds nesting near Homestead ARB would be the same as those described for other wildlife. Minimal impacts to migratory birds protected under the MBTA would result from implementation of the proposed AFRC F-35A mission at Homestead ARB.

HS3.6.2.3.4 Bald and Golden Eagles

No bald or golden eagle nesting is known to occur at Homestead ARB, or in the immediate vicinity of the installation; therefore, impacts to sensitive nesting habitat would not occur. Bald eagles are known to forage near the installation and noise-related impacts to these bald eagles would be similar to that described for other wildlife. No significant impacts to eagles are anticipated to result from implementation of the proposed AFRC F-35A mission in the ROI near Homestead ARB.

HS3.6.2.3.5 State-Listed Species

Under the INRMP program and USDA Wildlife Management Program, Homestead ARB would continue to manage and monitor populations of state-listed species (Homestead ARB 2018, Andrejko 2018). Habitats for Florida burrowing owl, gopher tortoise, and the rim rock crowned snake would not be impacted by facility and infrastructure projects associated with the proposed action because no suitable habitats for these species are present within the proposed project areas. No impacts to state-listed species would result from implementation of the proposed AFRC F-35A mission at Homestead ARB.

HS3.6.2.4 Wetlands

Construction, demolition, and renovation projects associated with the proposed action would not occur within or near any wetland areas. Therefore, there would be no impacts to wetlands at Homestead ARB.

HS3.6.3 Airspace Affected Environment

The ROI for biological resources under airspace is defined as the primary airspace and ranges where AFRC F-35A pilots would predominantly fly.

HS3.6.3.1 Vegetation

The airspace proposed for use by AFRC F-35A pilots from Homestead ARB covers approximately 3,317 square miles of land over Florida and 35,760 square miles of water over the Gulf of Mexico and Atlantic Ocean. The primary range area proposed for use covers approximately 2,278 square miles of land over Florida and the primary airspace proposed for use covers approximately 4,050 square miles over the Gulf of Mexico and Atlantic Ocean (Figure HS2-2). No vegetation communities are located under the primary airspace proposed for use because it occurs entirely over open water. Vegetation communities under the primary range area include those of the Southern Florida Coastal Plain ecoregion's four distinct subregion; Everglades, Big Cypress, Miami Ridge and Atlantic Coastal Strip, and the Southern Coast and Islands. Each subregion has distinctive physical and biological characteristics that influence the type and spatial distribution of vegetation and land cover (USGS 2009).

HS3.6.3.2 Wildlife

The Southern Florida Coastal Plain ecoregion supports a wide diversity of terrestrial and aquatic plant and animal habitats (USGS 2009). Native animals include alligators, crocodiles, manatees, and an expansive variety of birds, fish, and turtles.

Because operations associated with the proposed action at Homestead ARB would occur in existing airspace over the Gulf of Mexico and Atlantic Ocean, species protected under the U.S. Marine Mammal Protection Act (MMPA) were considered. Twenty-eight (28) different species of marine mammals are known to occur in the Gulf of Mexico and 24 are known to occur

in the Atlantic Ocean. All of these species are protected under the MMPA and 11 are also listed as threatened, endangered, or previously endangered under the ESA (NOAA 2012, 2018a,b).

HS3.6.3.3 Threatened, Endangered, and Special Status Species

HS3.6.3.3.1 Federally Listed Species

Federally listed threatened, endangered, and/or candidate species that could occur within the six counties included in the analysis of primary airspace and range areas proposed for use are presented in Table HS3-32. Due to the limited nature of ground disturbance in the areas under the primary airspace, plant, invertebrate, and fish species were excluded from further analysis. Critical habitat for the West Indian manatee (*Trichechus manatus*) is present under the primary airspace proposed for use (USFWS 2018c).

Table HS3-32. Federally Listed Species with Potential to Occur Under the Primary Airspace and the Primary Range Associated with the Proposed Action at Homestead ARB

Common Name	Scientific Name	Federal Listing Status	Habitat
Mammals			
Florida Bonneted Bat	<i>Eumops floridanus</i>	FE	The Florida bonneted bat roosts in rock crevices, old trees with suitable cavities, buildings, and Spanish tile roofs. The species feeds in very open areas and at high altitudes.
West Indian Manatee	<i>Trichechus manatus</i>	FT	West Indian manatees require access to aquatic vegetation, freshwater sources, and at least 2 meters of water depth. The species feeds along grass bed margins with access to deep water channels, where they flee when threatened.
Florida Panther	<i>Puma (=Felis) concolor coryi</i>	FE	The Florida panther occurs in forested areas, marsh shrub swamps, and prairie grasslands, with agricultural lands and other habitat types used in proportion to their availability. Large contiguous areas of suitable habitat are needed to meet the social, reproductive, and energetic needs of the species.
Puma	<i>Puma concolor</i> (all subsp. except <i>coryi</i>)	FT	Pumas have an extensive range and can be found from Canada to Argentina.
Southeastern Beach Mouse	<i>Peromyscus polionotus niveiventris</i>	FT	Habitat includes the sea oats (<i>Uniola paniculata</i>) zone of primary coastal dunes. This subspecies has also been reported from sandy areas of adjoining coastal strand vegetation which refers to a transition zone between the foredune and the inland plant community.
Birds			
Wood Stork	<i>Mycteria americana</i>	FT	Wood storks occur in shallow wetland areas where fish are plentiful. The species has been observed in the wetland areas on Homestead ARB near Twin Lakes.
Least Tern	<i>Sterna antillarum</i>	FE	Least terns occur along waterways, including reservoirs, refuges, and rivers. During migration the species is found on open flat beach areas. Least terns nest on the ground in open areas and near appropriate feeding habitat.
Everglade Snail Kite	<i>Rostrhamus sociabilis plumbeus</i>	FE	Habitat includes freshwater marshes and shallow vegetated edges of natural or man-made lakes where apple snails can be found. Because of its specific dietary and hydrological requirements, the Everglade snail kite is restricted to the watersheds of the Everglades, Lake Okeechobee, Lake Kissimmee, and the upper St. Johns River.

Table HS3-32. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Homestead ARB (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat
Birds (Continued)			
Rufa Red Knot	<i>Calidris canutus rufa</i>	FT	Rufa red knots winter in Florida from December to February, but could be present in some wintering areas as early as September or as late as May. Habitat includes intertidal, marine habitats, especially near coastal inlets, estuaries, and bays during the non-breeding season.
Piping Plover	<i>Charadrius melodus</i>	FT	Piping plovers winter in Florida and use coastal beaches, sandflats, and mudflats.
Roseate Tern	<i>Sterna dougallii</i>	FT	The roseate tern is a migratory, marine bird that could occur at Biscayne Bay. Preferred nesting habitat is open, sandy beach isolated from human activity and predators, although rooftops are also used.
Audubon's Crested Caracara	<i>Polyborus plancus audubonii</i>	FT	Open country, including dry prairie and pasture lands with cabbage palm, cabbage palm/live oak hammocks, and shallow ponds and sloughs. Preferred nest trees are cabbage palms, followed by live oaks.
Florida Grasshopper Sparrow	<i>Ammodramus savannarum floridanus</i>	FE	The Florida grasshopper sparrow is non-migratory and limited to the prairie region of south-central Florida. Habitat consists of large (greater than 50 hectares), treeless areas of frequently burned dry prairie habitat, with patchy open areas sufficient for foraging.
Florida Scrub-jay	<i>Aphelocoma coerulescens</i>	FT	The Florida scrub-jay inhabits scrub and scrubby flatwoods along the coastlines, high central ridges, and ancient shorelines of the Florida Peninsula. The species also occurs inland on scattered alluvial deposits bordering several major rivers. Habitat is dominated by several evergreen oaks (<i>Quercus ilex</i>).
Ivory-billed Woodpecker	<i>Campephilus principalis</i>	FE	The ivory-billed woodpecker was historically described as a resident of large, contiguous forests with numerous large trees. In Florida, bald cypress was noted as an important component of the forest used by this species, especially in conjunction with an adjacent pine forest.
Red-cockaded Woodpecker	<i>Picoides borealis</i>	FE	The red-cockaded woodpecker inhabits open, mature pine woodlands that have a diversity of grass, forb, and shrub species. The species generally occupies longleaf pine flatwoods in north and central Florida, mixed longleaf pine and slash pine in south-central Florida, and slash pine in south Florida outside the range of longleaf pine. Red-cockaded woodpeckers forage in several forested habitat types that include pines of various ages, but the species prefers more mature pines.
Reptiles			
American Alligator	<i>Alligator mississippiensis</i>	FT	American alligators and crocodiles inhabit fresh and brackish marshes, ponds, lakes, rivers, swamps, bayous, canals, and large spring runs. Basking occurs on partially submerged logs or on land next to the water. Alligators dig dens in river or lake margins or in marshes.
American Crocodile	<i>Crocodylus acutus</i>	FT	
Eastern Indigo Snake	<i>Drymarchon corais couperi</i>	FT	Eastern indigo snakes frequent a variety of habitat types including pine flatwoods, scrubby flatwoods, high pine, dry prairie, tropical hardwood hammocks, edges of freshwater marshes, agricultural fields, coastal dunes, and human-altered habitats.

Table HS3-32. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Homestead ARB (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat
<i>Reptiles (Continued)</i>			
Bluetail Mole Skink	<i>Eumeces egregius lividus</i>	FT	Bluetail mole skinks require loose sand for burrowing. Inhabit sandhill and xeric hammocks, oak and sand pine scrubs, and turkey oak barrens in Florida.
Sand Skink	<i>Neoseps reynoldsi</i>	FT	Sand skins occur in woodlands or mixed woodlands and have been documented on Central Florida's sand ridges.

Key: FE = federally endangered; FT = federally threatened

Source: Andrejko 2018; FNAI 2001a-d; 2018a-c; Homestead ARB 2011, 2017, 2018a,b, NatureServe 2018a, b; USDA 2018; USFWS 1999, 2008a, 2009, 2010a, b, 2013, 2014, 2016, 2017a, b, 2018

HS3.6.3.3.2 Migratory Birds

The primary airspace and range areas proposed for use are located in the USFWS-designated Bird Conservation Region 31 Peninsular Florida under the Atlantic Flyway (USFWS 2008b). Under AFI 91-202 and AFI 91-212, Homestead ARB employs a BASH Plan that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes.

HS3.6.3.3.3 Bald and Golden Eagles

Florida has one of the highest concentrations of nesting bald eagles in the lower 48 states. An estimated 1,499 nesting pairs were recorded in Florida in 2014, compared to 88 active nests in 1973. Nesting territories are concentrated around inland lake and river systems in peninsular Florida, such as the Kissimmee Chain of Lakes, and along the Gulf coast. Bald eagles use forested habitats for nesting and roosting, and expanses of shallow fresh or salt water for foraging. According to the FWC Eagle Nest Locator, three bald eagle nests are located under the primary airspace and range areas proposed for use. All three nests are located within the Everglades and Francis S. Taylor Wildlife Management Area. Of the three nests, only two have been documented active within the last 5 years (FWC 2016a).

HS3.6.4 Airspace Environmental Consequences

Impacts to biological resources occurring under the airspace proposed for use by AFRC F-35A pilots could result from overflights and associated noise, the use of munitions and flares, and bird-aircraft collisions. However, aircraft sorties in the airspace proposed for use would decrease by approximately 0.2 percent from baseline sorties. A review of current literature evaluating potential noise effects on wildlife is presented in Volume II, Appendix B.

HS3.6.4.1 Vegetation

Ground disturbance beneath the airspace proposed for use would be limited to the use of flares and munitions, which would be less than or the same as what is currently being used by F-16 pilots from Homestead ARB and would only occur in areas that are currently approved for such use. No significant impacts to vegetation would result from implementation of the AFRC F-35A mission in the areas under the airspace proposed for use by AFRC F-35A pilots stationed at Homestead ARB.

HS3.6.4.2 Wildlife

All airspace proposed for use by AFRC F-35A pilots is currently used as active military airspace by military jet aircraft; therefore, no new types of impact would be introduced into these areas as

a result of introducing the F-35A aircraft. Potential impacts are described below for overflights and associated noise, munitions and flares, and bird-aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Volume II, Appendix B.

As shown on Figure HS3-4, L_{dnmr} would increase by as much as 6 dB beneath the training airspace. Wildlife that are under the path of training overflights would be exposed to short, but intense noise events from overflights.

Some physiological/behavioral responses (from both subsonic and supersonic noise) 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 could be more sensitive than other species and/or could exhibit different forms or intensities of behavioral responses. For instance, the results of one study indicate that wood ducks appear to be more sensitive to noise and more resistant to acclimation to jet aircraft noise than Canada geese (Edwards et al. 1979). Similarly, wild ungulates (e.g., deer) seem to be more easily disturbed than domestic animals.

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. Other factors influencing response to jet aircraft noise could 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. Proposed AFRC F-35A training would primarily occur at high altitudes, with 94 percent of total training time being spent at altitudes above 10,000 feet MSL. The higher flight profile could reduce the response of wildlife to aircraft noise.

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.

In summary, adverse behavioral responses ranging from mild to severe could occur in individual animals as a result of loud overflights. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate responses could include nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Volume II, Appendix B).

AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities. Because no airspace over land is approved for supersonic flight, AFRC F-35A pilots would not conduct supersonic training in any airspace located over land. Supersonic flights are currently authorized over water in W-168, W-174, and W-465. Supersonic flights are not authorized within 12 NM of Fort Jefferson in Dry Tortugas National Park unless flight paths are straight, level, and higher than 20,000 feet MSL. Supersonic flights would only be conducted over

open ocean and more than 15 NM from any land area. Only about 10 percent of the time spent in air combat training would involve supersonic flight. Additionally, 90 percent of supersonic flight would occur at altitudes above 10,000 feet. Overall sorties in the airspace are anticipated to decrease slightly under the proposed action, and the number of sonic booms would decrease proportionally. Therefore, no additional impacts related to supersonic noise are anticipated.

Flares would be used as a defensive countermeasure by AFRC F-35A pilots during training operations. Flares would only be used in airspace areas currently approved for such use. Flare use by AFRC F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires or adverse impacts to underlying land areas and habitats. Ordnance delivery would only occur in ranges authorized for use. AFRC F-35A pilots would use less than or the same amount of flares and ordnance as the current F-16 mission, resulting in no change to the potential for adverse impacts to wildlife under the training airspace.

AFRC F-35A pilots would fly at higher altitudes than F-16 pilots, with the majority (99 percent) of sorties occurring above 5,000 feet AGL (sorties under 5,000 feet AGL would occur less frequently than baseline sorties). Most birds fly below 500 feet, except during migration. No F-35A low-level flight training is expected to occur below 500 feet AGL and the potential for bird-aircraft collisions is anticipated to be minor.

The proposed AFRC F-35A operations would occur in existing airspace and ranges over the Gulf of Mexico and Atlantic Ocean where various protected species of marine wildlife occur. The number of sorties would remain the same (under airspace areas W-465 A, B, D) or substantially decrease (under W-168 and W-174 A, B, C, E, F, G) (Table HS3-1). The USAF has determined that the implementation of the AFRC F-35A mission would not result in reasonably foreseeable takes of a marine wildlife species (including marine mammals, sea turtles, fish, and birds) by harassment, injury, or mortality, as defined under the MMPA.

HS3.6.4.3 Threatened, Endangered, and Special Status Species

HS3.6.4.3.1 Federally Listed Species

No adverse impacts to federally listed species are anticipated to result from implementation of the proposed AFRC F-35A mission at Homestead ARB.

HS3.6.4.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at Homestead ARB would result in a slight decrease (0.2 percent) in aircraft sorties. A slight decrease in sorties could result in a decreased opportunity for bird-aircraft strikes. Current procedures for avoiding flight operations during periods of high concentrations of migratory birds (both in space and time) would continue. Adherence to the existing BASH program would minimize the risk of bird-aircraft strikes, including those for migratory birds, to negligible levels (Section HS3.4). Due to the predominant use of higher altitudes, implementation of the proposed AFRC F-35A mission would result in minimal impacts to migratory birds protected under the MBTA.

HS3.6.4.3.3 Bald and Golden Eagles

Potential impacts to eagles and habitats that occur in areas under the primary airspace and range areas would be similar to those described in Section HS3.6.4.2. AFRC F-35A pilots would fly at higher altitudes than A-10, F-15, F-16, and F-18 pilots, reducing the potential for BASH. As such,

no impacts to eagles would result from implementation of the proposed AFRC F-35A mission at Homestead ARB.

HS3.6.5 Summary of Impacts to Biological Resources

Construction activities on the base would occur in previously disturbed areas. Impacts to wetlands and protected species would not result from implementation of the proposed action. Noise resulting from construction activities would have minimal impacts to wildlife. Aircraft operations near Homestead ARB and in the airspace proposed for use would expose some animal species to increased levels of noise. The 3.0 percent increase in aircraft operations at Homestead ARB and the 0.2 percent decrease in sorties in the airspace proposed for use could result in slight increases in bird-aircraft strikes. Impacts to biological resources are not anticipated to be significant.

HS3.7 CULTURAL RESOURCES

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, architectural/engineering resources, and traditional resources. Cultural resources that are eligible for listing on the National Register of Historic Places (NRHP) are known as historic properties.

HS3.7.1 Base Affected Environment

HS3.7.1.1 Architectural Resources

Historical building inventories at Homestead ARB (Mariah Associates, Inc. 1994, NPS 1995, URS 2013, Homestead ARB 2018d) have identified one resource that is eligible for listing in the NRHP. A K-9 cemetery is located near the southwest end of the runway. The cemetery was started sometime in the 1950s and used throughout the Vietnam War-era for security dogs that patrolled Homestead AFB. No other NRHP-eligible resources are present on the installation.

HS3.7.1.2 Archaeological Resources

The National Park Service (NPS) conducted an archaeological survey at Homestead AFB (NPS 1995). This survey concluded that no archaeological sites are located in the developed portions of the base and almost no potential exists for the discovery of sites in the future. The Florida SHPO concurred with the findings of this report in a letter dated 9 January 1998. While the NPS survey did not locate any archaeological sites, the 2017 Integrated Cultural Resources Management Plan (ICRMP) indicates that the undeveloped pine rockland habitat along the western boundary of the base could possibly contain archaeological resources (Homestead ARB 2018d).

HS3.7.1.3 Traditional Resources

Homestead ARB has identified five tribes potentially affiliated with the installation. These tribes, listed in Table A-1 in Volume II, Appendix A, Section A.2.5.2, were asked to provide information on any properties to which they attach religious or cultural significance. No known tribal sacred sites or properties of traditional religious and cultural importance are located on Homestead ARB.

HS3.7.2 Base Environmental Consequences

Implementation of the proposed AFRC F-35A mission at Homestead ARB would include the construction of two new facilities, demolition of one building, and eight renovation projects (Table HS2-1 and Figure HS2-1). All buildings within the Area of Potential Effects (APE) have been

evaluated for NRHP eligibility and determined non-eligible. The Florida SHPO concurred with these findings in a letter dated 27 November 2018 (Volume II, Appendix A, Section A.2.5.3).

No impacts to known archaeological resources would result from implementation of the proposed AFRC F-35A mission at Homestead ARB. All areas of the base proposed for construction are either in areas that have already been disturbed by previous construction or have been inventoried for archaeological resources. No NRHP-eligible archaeological resources have been identified in the APE. Because ground-disturbing activities would occur in previously disturbed and inventoried areas, it is extremely unlikely that any previously undocumented archaeological resources would be encountered during facility demolition, renovation, addition, or construction. In the case of unanticipated or inadvertent discoveries, the USAF would comply with NHPA and Native American Graves Protection and Repatriation Act (NAGPRA) regulations.

The single NRHP-eligible facility located on the installation (K-9 Cemetery) is located outside the APE and there would be no direct impact to historic properties. Indirect impacts on this facility from population changes, noise, or visual intrusions would be extremely unlikely. The total authorized personnel for Homestead ARB would decrease (2.7 percent) with the proposed action. This small population change would not have an indirect impact on cultural resources at the installation. Noise levels at the K-9 Cemetery are not anticipated to change and there would be no noise-related impacts to this resource as a result of implementing the proposed action. Visual intrusion from the proposed action would not be a significant issue. New construction would occur in the context of an active USAF base, where changes in the infrastructure are common. The viewshed of remaining historic properties would not be affected by the proposed construction.

No Section 106 impacts to tribal resources or traditional cultural properties are anticipated to result from implementation of the AFRC F-35A mission. As required by Sections 101(d)(6)(B) and 106 of the NHPA; implementing regulations prescribed in 36 *CFR* Section 800.2(c)(2); EO 13175, *Consultation and Coordination with Indian Tribal Governments*; DoDI 4710.02; and AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes*, Homestead ARB initiated Section 106 government-to-government consultation with five tribes to identify traditional cultural properties. Volume II, Appendix A, Section A.2.5.2, contains a record of these consultations. The consultation correspondence included an invitation to participate in the NEPA process, and an invitation to consult directly with the Homestead ARB Commander regarding any comments, concerns, and suggestions. All five tribes responded to the request for consultation. Two tribes, the Muscogee (Creek) Nation and the Poarch Band of Creek Indians, indicated that the APE is outside of their historic area or that no known resources are located in the APE. The Miccosukee Tribe of Indians of Florida did not indicate any known resources in the APE and asked to receive future project information. The Seminole Tribe of Florida had no objections to the project. The Seminole Nation of Oklahoma requested additional information from Homestead ARB. Homestead ARB has responded to that request for information and consultation is ongoing with the Seminole Nation of Oklahoma.

HS3.7.3 Airspace Affected Environment

Table HS3-33 presents the NRHP-listed sites and Native American Reservation lands under the training airspace proposed for use by AFRC F-35A pilots operating at Homestead ARB. The Homestead ARB training airspace overlies at least part of 11 Florida counties (Desoto, Glades, Hardee, Highlands, Lake, Marion, Okeechobee, Osceola, Polk, Putnam, and Volusia) as well as several overwater areas in the Gulf of Mexico and Atlantic Ocean.

Fifty (50) NRHP-listed properties have been identified under Homestead ARB airspace. Forty-two (42) of these are located under the primary airspace and range proposed for use. One Native

American tribe is known to own land under the proposed airspace (Miccosukee Tribe of Indians of Florida). No known traditional cultural resources have been identified under the airspace. It is possible that such resources could exist in the area as the exact location of some traditional cultural resources is confidential.

Table HS3-33. NRHP-Listed Sites and Native American Reservation Lands Under Homestead ARB Training Airspace

Airspace Designations	Number of NRHP Properties Under Airspace ^a	Native American Reservation Lands Under Airspace ^a
Lake Placid MOA	44	Miccosukee Tribe of Indians of Florida
R-2901A	1	None
R-2907B/C	2	None
W-174B/F	3	None

^a Due to the sensitivity of the locations, archaeological sites are not included in this table or shown on any figures.

HS3.7.4 Airspace Environmental Consequences

Implementation of the proposed action would result in a minor decrease (0.2 percent) in the annual sorties conducted in the airspace proposed for use. As described in Section HS3.2, L_{dnmr} under the training airspace would remain the same or increase by up to 6 dB. The highest increase in noise levels would occur around the APAFR Complex (R-2901B, Avon East MOA). L_{dnmr} under the training airspace would not exceed 56 dB. Supersonic flights would not occur in airspace over mainland Florida, but could occur offshore in W-174A through G and W-465A/B. Supersonic flights are not authorized within 12 NM of Fort Jefferson in Dry Tortugas National Park unless flight paths are straight, level, and higher than 20,000 feet MSL. Should the AFRC F-35A mission be located at Homestead ARB, the F-35A pilots would follow the existing restrictions for supersonic flight.

No impacts on historic properties under the Homestead ARB training airspace are expected. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (see Volume II, Appendix B, Section B.2.10).

Use of ordnance and flares would continue in areas already used for these activities. No additional ground disturbance would occur. Flare and ordnance use is not expected to impact historic properties under the airspace. Existing use of flares and ordnance is not known to have impacted these resources; therefore, the continued use of flares and ordnance from F-35A aircraft is not expected to result in any new impacts.

HS3.7.4.1 Native American Concerns

During scoping, the USAF contacted five federally affiliated Native American tribes to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at Homestead ARB. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional cultural resources or traditional cultural properties were received.

In accordance with Section 106 of the NHPA and EO 13175, USAF also has contacted the five tribes to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and traditional cultural properties under the airspace associated with Homestead ARB. All five tribes have responded and USAF consultation with interested tribes is ongoing.

HS3.7.5 Summary of Impacts to Cultural Resources

No archaeological sites are located in any of the proposed construction footprints at Homestead ARB. In the case of unanticipated or inadvertent discoveries, the USAF would comply with Section 106 of the NHPA. All buildings within the APE at Homestead ARB have been evaluated for NRHP eligibility and determined non-eligible. The Florida SHPO concurred with this determination and the determination of no adverse effects in a letter dated 27 November 2018 (see Volume II, Appendix A, Section A.2.5.3). Homestead ARB has completed Section 106 consultation with four tribes and is conducting ongoing consultation with one tribe. Coordination with interested tribes will continue throughout the EIS process. No impacts to historic properties under the airspace proposed for use are expected. Implementation of the AFRC F-35A mission is not anticipated to result in significant impacts to cultural resources.

HS3.8 LAND USE AND RECREATION

HS3.8.1 Base Affected Environment

HS3.8.1.1 Land Use

On-base construction would be consistent with established base land uses. Because potential land use consequences would primarily be noise-related, the discussion in this section focuses on noise-related land use regulations and compatibility constraints. The following paragraphs address federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Homestead ARB and the surrounding areas.

Florida Statutes. Chapter 163 of the Florida Statutes guides compatible land-use planning by requiring each local government to adopt a comprehensive plan and establishing minimum criteria which identify required elements of a comprehensive plan. Additionally, Chapter 163 requires local governments near Homestead ARB to address compatibility of land development and to transmit to Homestead ARB any information relating to proposed changes to comprehensive plans, plan amendments, and proposed changes to land development regulations which, if approved, would affect the intensity, density, or use of the land near Homestead ARB. Furthermore, local governments are required to take into consideration any comments and accompanying data provided by Homestead ARB as they relate to the strategic mission of the base, public safety, and the economic vitality associated with the base's operations. Chapter 163 of the Florida Statutes also allows for a representative of Homestead ARB to serve ex officio as a nonvoting member of the county's or affected local government's land planning or zoning board. Homestead ARB has ex officio representation on both the Miami-Dade County Planning Advisory Board and the City of Homestead Planning and Zoning Board.

Miami-Dade County Comprehensive Development Master Plan (CDMP). The Miami-Dade County CDMP expresses the County's general objectives and policies, addressing where and how it intends development and the conservation of land and natural resources to occur during the next 10 to 20 years (Miami-Dade County 2017). The purpose of Miami-Dade County Code of Ordinances Chapter 33, Article XXXV, *Homestead Air Reserve Base Zoning*, is to enhance and promote the compatibility of adjacent land uses and development with Homestead ARB, and to protect Homestead ARB operations and activities. Additionally, Article XXXV identifies all land within the installation's FAA Part 77 imaginary surfaces as the "airport hazard area" and establishes limitations on heights, land uses, and permitting. Height limitations apply to any structure or tree that would penetrate the imaginary surface. Furthermore, Article XXXV defines the "Airport Land Use Restriction Area" as consisting of the APZs and the Noise Contour Zones. Within the Airport Land

Use Restriction Area, land cannot be used in a manner that would create electrical interference or visual impairments that could interfere with aircraft operations. Additionally, landfills are prohibited within 10,000 feet of the nearest point of the runway; all outdoor lighting designs must incorporate shielding to prevent light from projecting upward; and schools, hospitals, barracks, apartment buildings, religious facilities, and other buildings of public assembly are prohibited in the APZs and within the 75 dB DNL and greater Noise Contour Zones. Residential uses in excess of one dwelling unit per 5 acres are also prohibited in the 75 dB DNL and greater Noise Contour Zones and all new uses within the 65 dB DNL and greater Noise Contour Zones shall incorporate at least a 25-dB outdoor-to-indoor noise level reduction into the design and construction of the structure.

City of Homestead Comprehensive Plan. The comprehensive plan for the City of Homestead describes planning goals and objectives for this area of Miami-Dade County, including areas near Homestead ARB (City of Homestead 2011). The plan addresses compatibility with Homestead ARB in several areas, with a primary objective of maintaining land uses that are compatible with current and future Homestead ARB missions.

City of Homestead Ordinances and Regulations. The City of Homestead has regulations and ordinances that ensure land use and zoning that is compatible with Homestead ARB operations. Specifically, Section 30-6 of the City of Homestead Code of Ordinances (City of Homestead 2019), also known as the Homestead Airport Zoning Ordinance, establishes standards for airport obstructions, noise impacts, and land use compatibility to promote the public health, safety, and welfare of residents, as well as protect the utility and capacity of Homestead ARB. Additionally, the Homestead Airport Zoning Ordinance creates specific zones of differing height restrictions and noise level reductions; establishes certain land use limitations by zone; and establishes procedures for their orderly administration and enforcement. The Homestead Airport Zoning Ordinance also establishes a “Height and Hazard Zone”, which includes all of the land and air within the approach/departure, primary, transitional, inner and outer horizontal, CZ, and conical surfaces as they apply to Homestead ARB and the land beneath these surfaces (City of Homestead 2019). Land-use restrictions within the Height and Hazard Zone closely emulate those listed in AFI 32-7063, *Air Installations Compatible Use Zones Program*, to the extent that a detailed Land Use Compatibility Standards Chart is provided to delineate compatibility between land use type and the Accident, Hazard, and Noise zones. In addition, any land sold or developed around Homestead ARB must include a disclosure to the buyer that the land is located in the Homestead ARB military zone.

Surrounding Land Use. Land use around Homestead ARB is a mixture of commercial, residential and agricultural. To the east and south, land use is primarily agricultural. Most of the urban development near the base is to the north and west and within the Miami-Dade County Urban Development Boundary (UDB). The UDB, as defined in the CDMP, includes portions of the county where urban development is acceptable. The Urban Expansion Area (UEA), as defined in the CDMP, is where development is planned over the next 10-20 years. Two UEAs, UEA Number 3 and UEA Number 4, are located near Homestead ARB. UEA Number 3 is comprised of 3,124 acres located northeast of Homestead ARB; UEA Number 4 is comprised of 460 acres located southwest of Homestead ARB and contains portions of APZ I and APZ II. In May 2017, Miami-Dade County Mayor Carlos Gimenez created the Miami-Dade County UEA Task Force with the purpose of providing recommendations on the following topics:

- Changes to the current boundaries of the UEAs;
- Creation of new UEAs; and
- Changes to the criteria that should be considered for applications requesting expansion of the UDB.

The Task Force members represented a variety of interests, including environmental, agricultural, development, property owners, rock mining, and Homestead ARB. Eighty-five (85) percent of the Task Force recommended that Homestead ARB APZs remain classified as areas that “shall not be considered” for UDB expansion. Additionally, in the cases of both UEA Number 3 and UEA Number 4, 75 percent of respondents recommended either eliminating the UEAs entirely or contracting them to exclude restrained areas (including APZs). Furthermore, the Task Force included the need to “ensure compatibility with HARB [Homestead ARB]” as a priority. The 2015 and 2025 land use plan for Miami-Dade County identifies all areas directly north, south, and east of the base as agricultural or open land use types. Areas adjacent to the western boundary of the base, away from the flightline, are zoned primarily as residential. In 2017, Miami-Dade County modified the Miami-Dade County Code to establish the Homestead ARB zoning regulations to enhance and promote the compatibility of adjacent land uses and development with the base and protection of base operations and activities (Article XXXV Miami-Dade County, Florida Code). As identified in Table HS3-34, under baseline conditions, land uses exposed to DNL of 65 dB or greater primarily consist of open areas, followed by recreational areas and water.

Table HS3-34. Off-Base Acres Currently Exposed to DNL of 65 dB or Greater at Homestead ARB

Land Use Category ^a	DNL (dB)					Total
	65–69	70–74	75–79	80–84	≥ 85	
Commercial	0	6	14	2	0	22
Industrial	67	18	4	0	0	89
Open	701	293	67	10	1	1,072
Public/Quasi-Public	148	114	1	0	0	263
Recreational	128	0	0	0	0	128
Residential	0	0	0	0	0	0
Water	113	5	0	0	0	118
Total	1,157	436	86	12	1	1,692

^a All numbers are in units of acres

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Miami-Dade County e-Maps 2018

Homestead Air Reserve Base/City of Homestead Joint Land Use Study (JLUS). The JLUS for Homestead ARB, the City of Homestead, and Miami-Dade County was published in 2007 as part of a cooperative land use planning process used by the USAF and surrounding communities. The JLUS was developed to facilitate implementation of compatible land uses around the base through a cooperative program between the USAF, the City of Homestead, and Miami-Dade County. The JLUS focused on Homestead ARB and the surrounding communities in Miami-Dade County, the City of Homestead, and the City of Florida City. This area focused on the CZ, APZs, and Noise Zones. The JLUS compatible land use plan defines recommended compatible uses and performance standards to be used by the City of Homestead and Miami-Dade County to guide development in order to protect the mission of Homestead ARB and its economic benefits, while increasing the economic diversity and viability of the community. The JLUS assists USAF and municipal planners by facilitating the development of other key sectors in ways that are compatible with the base’s mission.

Installation Development Plan (IDP). The Homestead ARB IDP guides future development and land use decisions at Homestead ARB (Homestead ARB 2016b).

On-Base Land Use. Homestead ARB occupies approximately 1,950 total acres of land. Approximately 1,559 acres are developed and the remaining land is open and undeveloped. Land

uses on the base are consolidated and not heavily mixed, and are divided into five planning districts. These districts include flightline, airfield, munitions, mission support, and industrial. The flightline and airfield districts are the largest and encompass the runway, taxiways, aprons, and aircraft parking and hangar areas.

HS3.8.1.2 Recreation

Recreation on Homestead ARB is limited because of the amount of land dedicated to missions and lands restricted due to safety and security, including ESQD arcs, the airfield, and other lands restricted for training. Hunting and fishing are not allowed on base and no recreational areas are available for all-terrain vehicle use. Homestead ARB does have tennis courts and baseball, softball, and multipurpose fields available for use. The Sam Johnson Fitness Center on the base offers racquetball and basketball courts, workout rooms, and a variety of fitness equipment. The area surrounding Homestead ARB offers substantial recreational opportunities, including several national parks (Table HS3-35).

Table HS3-35. Recreation Facilities near Homestead ARB

ID	Recreational Facility	Activities	Current DNL (dB)	Compatibility (Y/N)
P01	Biscayne National Park Offshore	Snorkeling, scuba diving, fishing, boating	67	Y
P02	Everglades National Park Ernest F. Coe Visitor Center	Hiking, camping, wildlife viewing, boating, fishing.	40	Y
P03	Biscayne National Park Visitor Center	Hiking, camping, wildlife viewing, boating, fishing.	54	Y
P04	Audubon Park	Playground, picnic areas	51	Y
P05	Cutler Ridge Park	Soccer fields, swimming pool, playground, picnic area	39	Y

Biscayne National Park is a shallow estuary established to protect historical and natural features that support the subtropical marine ecosystem. This park is home to many different fish and wildlife species and offers boating, diving, fishing, and other water activities (e.g., snorkeling).

The Everglades National Park is located approximately 10 miles west of Homestead ARB. The Everglades National Park was established in 1947 to protect 1.5 million acres of southern Florida. The park has elevated boardwalks, miles of surfaced trails, and visitor centers, and offers camping, fishing, wildlife viewing, and other recreational opportunities.

Big Cypress National Preserve is approximately 80 miles northwest of the base. The preserve was established to protect water quality and the integrity of the Big Cypress Swamp. The preserve offers wildlife viewing and hiking.

The City of Homestead has a wide variety of different parks and fields that include playgrounds, ball fields, barbeque areas, walking paths, play courts, and recreation and community centers. The Homestead-Miami Speedway is located south of the installation and offers opportunities for visitors to attend a variety of car races, including NASCAR and various championship series races.

HS3.8.2 Base Environmental Consequences

HS3.8.2.1 Land Use

HS3.8.2.1.1 Physical Development

The physical development associated with the proposed AFRC F-35A mission at Homestead ARB would primarily occur in previously disturbed areas near the flightline where airfield and aircraft

O&M support activities occur on a daily basis. None of the physical development associated with implementation of the proposed mission at Homestead ARB would impact land use because the proposed construction and renovation would occur in land uses designated for the proposed use. Subsequent O&M activities for the proposed mission would conform to current and future land uses on the base and traffic, noise, dust, and similar effects from construction equipment would be reduced through construction plans and practices agreed to by contractors. The physical changes and daily activities on the ground would be confined to the base. The proposed on-base development would have no impact to off-base areas. Impacts associated with physical development would be the same regardless of which afterburner scenario is selected.

HS3.8.2.1.2 Aircraft Operations

This analysis includes an evaluation of the potential noise impacts to on- and off-base land uses resulting from the proposed AFRC F-35A mission at Homestead ARB. Volume II, Appendix B, Section B.2.2, presents the noise compatibility guidelines for noise exposure to various land uses.

Scenario A

Implementation of Scenario A would increase the area surrounding Homestead ARB exposed to DNL of 65 dB or greater by approximately 2,926 acres (Table HS3-36 and Figure HS3-6). This would result in an increase of an estimated 62 off-installation residents exposed to DNL of 65 dB or greater. All of the estimated residents exposed to this level of noise would be located at the South Dade Center (S02).

Table HS3-36. Off-Base Acres Exposed to DNL of 65 dB or Greater at Homestead ARB under Scenario A

Land Use Category ^a	DNL (dB)																	
	65–69			70–74			75–79			80–84			≥ 85			Total		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b
Commercial	0	0	0	6	7	1	14	13	-1	2	1	-1	0	0	0	22	21	-1
Industrial	67	195	128	18	100	82	4	38	34	0	3	3	0	0	0	89	336	247
Open	701	1,306	605	293	634	341	67	300	233	10	36	26	1	1	0	1,072	2,277	1,205
Public/Quasi-Public	148	121	-27	114	143	29	1	6	5	0	0	0	0	0	0	263	270	7
Recreational	128	731	603	0	231	231	0	18	18	0	0	0	0	0	0	128	980	852
Residential	0	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
Water	113	506	393	5	183	178	0	39	39	0	0	0	0	0	0	118	728	610
Total	1,157	2,865	1,708	436	1,298	862	86	414	328	12	40	28	1	1	0	1,692	4,618	2,926

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Miami-Dade County e-Maps 2018

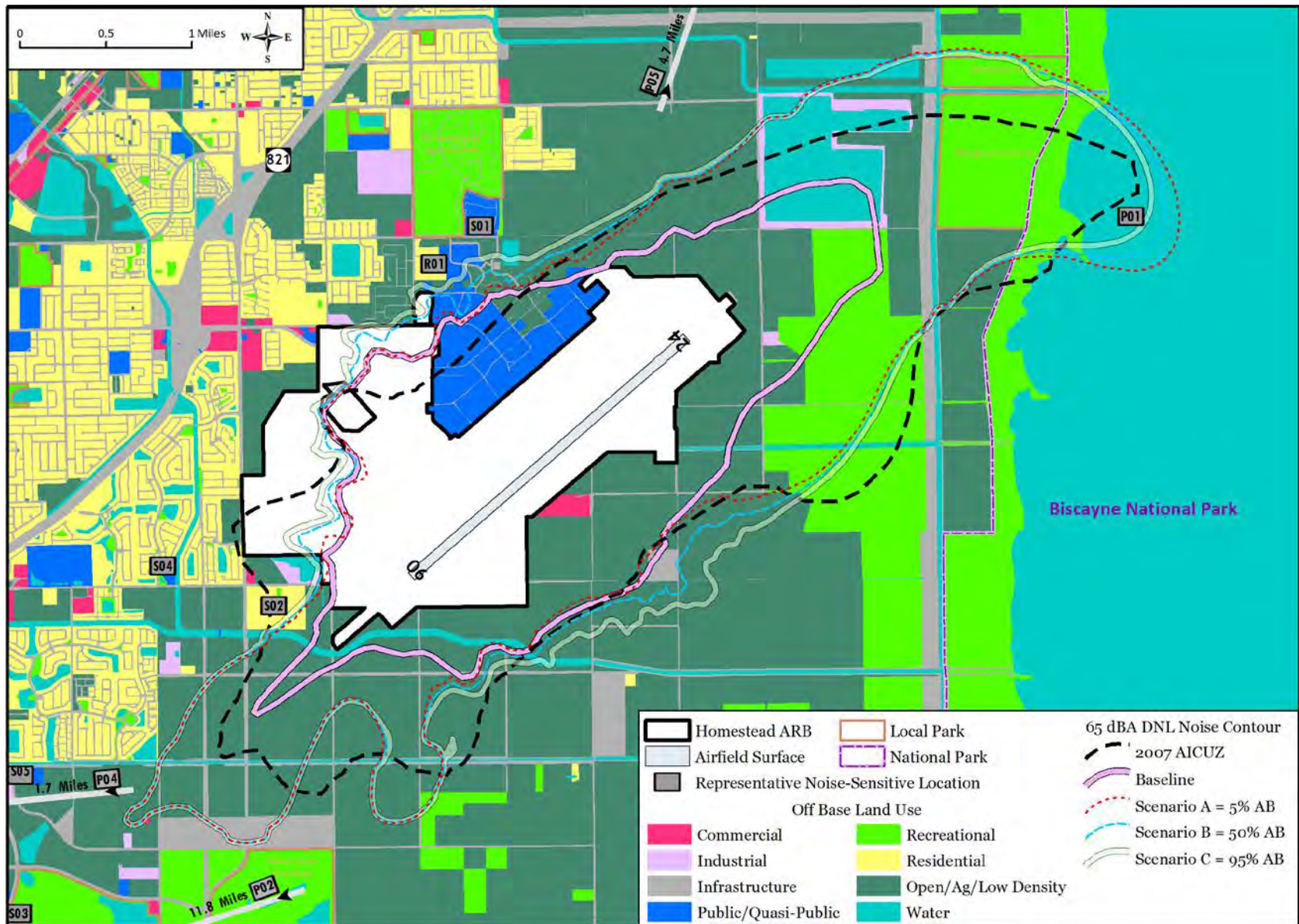


Figure HS3-6. Baseline, JLUS, and AFRC F-35A Mission DNL Contours Relative to Land Use at Homestead ARB

Acres of industrial, open, public/quasi-public, recreational, and residential land uses exposed to DNL of 65 dB or greater would increase. The largest increase in acres exposed to DNL of 65 dB or greater would be open areas, followed by recreational land uses. Six (6) additional acres of residential land would be newly exposed to DNL of 65 dB or greater. These 6 acres of residential land are located inside the 65 dB DNL contour as identified in the 2007 JLUS. This residential land is occupied by the South Dade Center (S02), which is a migrant housing and after school and adult education center funded by the state and federal governments. Zoning regulations adopted on 24 January 2017 require new residential construction in the 65 dB or greater DNL area to incorporate noise attenuation into each construction project. Section 33-295 of Miami-Dade Article XXXV prohibits certain buildings in the APZs and areas in the 75 dB or greater DNL contour zone. In addition, all new uses in the 65 dB or greater DNL contour zones shall incorporate at least a 25-dB outdoor-to-indoor noise level reduction into the design and construction of the structure. The increased water area exposed to DNL of 65 dB or greater would extend into Biscayne National Park.

Scenario B

Implementation of Scenario B would increase the area surrounding Homestead ARB exposed to DNL of 65 dB or greater by approximately 3,088 acres, 8 of which would be residential (Table HS3-37 and Figure HS3-6). This would result in an increase of an estimated 79 off-installation residents exposed to DNL of 65 dB or greater. All of the estimated residents exposed to this level of noise would be located at the South Dade Center (S02).

Table HS3-37. Off-Base Acres Exposed to DNL of 65 dB or Greater at Homestead ARB under Scenario B

Land Use Category ^a	DNL (dB)																	
	65–69			70–74			75–79			80–84			≥ 85			Total		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b
Commercial	0	0	0	6	1	-5	14	15	1	2	5	3	0	0	0	22	21	-1
Industrial	67	217	150	18	100	82	4	38	34	0	3	3	0	0	0	89	358	269
Open	701	1,369	668	293	701	408	67	335	268	10	48	38	1	1	0	1,072	2,454	1,382
Public/Quasi-Public	148	107	-41	114	156	42	1	28	27	0	0	0	0	0	0	263	291	28
Recreational	128	750	622	0	217	217	0	16	16	0	0	0	0	0	0	128	983	855
Residential	0	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	8	8
Water	113	449	336	5	189	184	0	27	27	0	0	0	0	0	0	118	665	547
Total	1,157	2,900	1,743	436	1,364	928	86	459	373	12	56	44	1	1	0	1,692	4,780	3,088

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Miami-Dade County e-Maps 2018

Scenario C

Implementation of Scenario C would increase the area surrounding Homestead ARB exposed to DNL of 65 dB or greater by approximately 3,263 acres, 10 of which would be residential (Table HS3-38

and Figure HS3-6). This would result in an increase of an estimated 104 off-installation residents exposed to DNL of 65 dB or greater. All of the estimated residents exposed to this level of noise would be located at the South Dade Center (S02).

Table HS3-38. Off-Base Acres Exposed to DNL of 65 dB or Greater at Homestead ARB under Scenario C

Land Use Category ^a	DNL (dB)																	
	65–69			70–74			75–79			80–84			≥ 85			Total		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b
Commercial	0	0	0	6	0	-6	14	13	-1	2	8	6	0	0	0	22	21	-1
Industrial	67	227	160	18	101	83	4	38	34	0	3	3	0	0	0	89	369	280
Open	701	1,475	774	293	757	464	67	366	299	10	59	49	1	1	0	1,072	2,658	1,586
Public/Quasi-Public	148	95	-53	114	155	41	1	56	55	0	0	0	0	0	0	263	306	43
Recreational	128	760	632	0	205	205	0	13	13	0	0	0	0	0	0	128	978	850
Residential	0	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10
Water	113	401	288	5	195	190	0	17	17	0	0	0	0	0	0	118	613	495
Total	1,157	2,968	1,811	436	1,413	977	86	503	417	12	70	58	1	1	0	1,692	4,955	3,263

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw acreage numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: Miami-Dade County e-Maps 2018

HS3.8.2.2 Recreation

Construction in support of the AFRC F-35A mission would occur in the existing cantonment area. Surrounding parks, schools, and recreational facilities are too far from the installation to be affected by construction noise. Increased truck traffic to the installation during the 2-year construction period could cause temporary effects to traffic flow on local roads, but this is not anticipated to interfere with access to recreational areas near Homestead ARB. New facilities would not alter any sensitive views that have important recreational value.

Implementation of the AFRC F-35A mission at Homestead ARB would result in a net loss of 91 personnel with dependents as a result of the drawdown of the AFRC F-16 mission as the F-35A aircraft arrive. This change in the number of people would have no discernable effect on recreational resources.

Depending on the location of the recreational facility, average noise levels would remain the same or increase at recreational facilities in the areas surrounding Homestead ARB.

Scenarios A, B, or C would expose approximately 18, 16, or 13 acres, respectively, of recreational land to DNL of 75 dB or greater. The JLUS identifies neighborhood parks with outdoor recreation activities as incompatible at DNL in excess of 75 dB. This area is currently overflowed by F-16 pilots transiting to and from Homestead ARB and would continue to be overflowed by AFRC F-35A pilots. Noise modeling results summarized in Table HS3-39 show the baseline DNL at various

recreational facilities near Homestead ARB and the DNL that would result from implementation of the three afterburner scenarios at Homestead ARB.

Table HS3-39. Noise Effects on Recreation Facilities near Homestead ARB

ID	Recreational Facility	DNL (dB)			
		Baseline Conditions	Scenario A	Scenario B	Scenario C
P01	Biscayne National Park Offshore	57	67	66	65
P02	Everglades National Park Ernest F. Coe Visitor Center	<45	<45	<45	<45
P03	Biscayne National Park Visitor Center	50	54	54	54
P04	Audubon Park	<45	51	51	51
P05	Cutler Ridge Park	<45	<45	<45	<45

The Biscayne National Park is located directly east of the installation. The Biscayne National Park Visitor Center would be exposed to increased DNL from the AFRC F-35A mission at Homestead ARB and a small portion of the park located offshore and northeast of the base would be exposed to a DNL increase of 10 dB (from 57 to 67 dB) from Scenario A. AFRC F-35A pilots stationed at Homestead ARB would continue to use the existing and established flight tracks.

Everglades National Park is located directly west of Homestead ARB and would not be exposed to increased DNL as a result of the proposed mission. Although AFRC F-35A pilots stationed at Homestead ARB could occasionally fly over Everglades National Park, the park would not be exposed to increased DNL above the current ambient noise levels.

One measure of annoyance is the potential for speech interference. As described in Section HS3.2.2.2, 50 dB L_{max} is the metric used to determine potential speech interference. As shown in Table HS3-17, P03 and P05 would experience one additional outdoor noise event per hour at L_{max} greater than 50 dB regardless of which afterburner scenario is selected.

Another noise metric that can be used to evaluate potential impacts to recreational uses is SEL. As shown in Table HS3-10, the SEL of the loudest overflight event experienced regularly at the Biscayne National Park Visitor Center would increase by 3 dB.

Although the SEL from a single overflight would not change at the other four recreational facilities, certain recreational areas could experience an increase in the number of overflights at existing SEL values and experience an increased average noise level as measured by the DNL.

HS3.8.3 Airspace Affected Environment

HS3.8.3.1 Land Use

This section summarizes land ownership and Special Use Land Management Areas (SULMAs) under the airspace currently used by pilots from Homestead ARB. A description of the primary airspace used by pilots from Homestead ARB can be found in Section HS2.2.1. SULMAs include selected areas managed by federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or wilderness experiences (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of these attributes. Some SULMAs could include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed separately in Section HS3.8.3.2. Pilots from Homestead ARB use airspace located in Florida and offshore in the Gulf of Mexico. Figure HS3-7 identifies the airspace currently used along with the SULMAs aggregated by ownership (i.e., NPS, USFS, USFWS, state land, etc.).

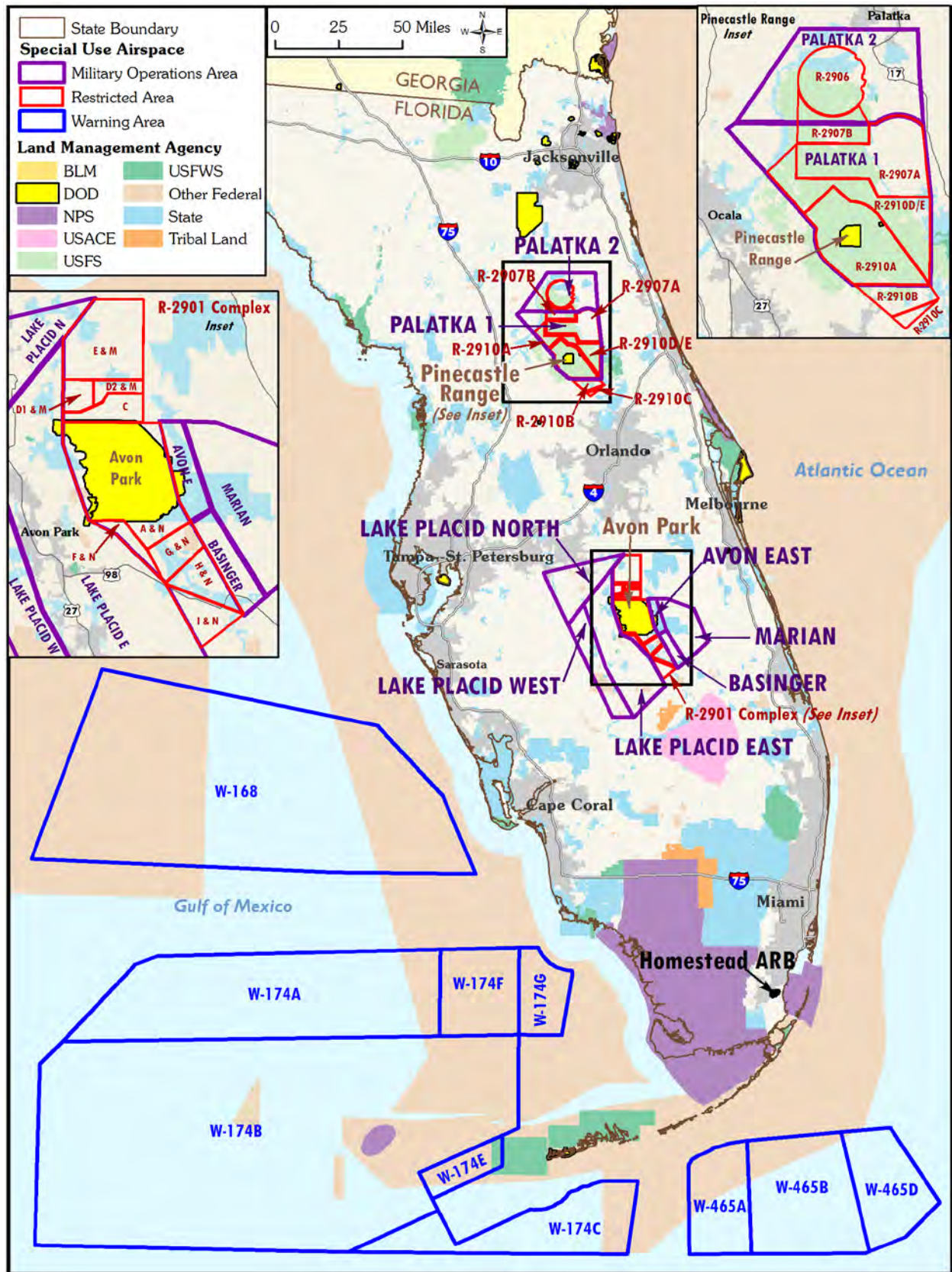


Figure HS3-7. SULMAs Beneath Homestead ARB Airspace

HS3.8.3.2 Recreation

Recreational opportunities under the airspace currently used by F-16 pilots from Homestead ARB are similar to those described in Section HS3.8.1.2. The underlying land reflects the same mosaic of federal, state, and private ownership, with a similar range of outdoor recreational activities. The public lands support a spectrum of recreational opportunities and activities, with some areas having particular qualities or recreational purposes.

Southern Florida hosts habitats that support a wide variety of birds, particularly in the Everglades along inland waterways and the coastline. These areas are popular for recreational bird watching. Public access is permitted to limited portions of the APAFR and U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges). The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities within these areas include camping, driving, fishing, hunting, and many other activities.

HS3.8.4 Airspace Environmental Consequences

HS3.8.4.1 Land Use

The APAFR complex would be the primary range used by AFRC F-35A pilots operating from Homestead ARB. The APAFR complex is owned and managed by the USAF with a mission to provide a training infrastructure that allows U.S. air and ground forces to practice the latest combat training. The land area under the APAFR airspace is owned by a variety of different entities, including DoD, state, local, and private owners.

The U.S. Navy Pinecastle Range Complex (to include Rodman and Lake George Ranges) would also be used but not as the primary range complex. The majority of federal land under the U.S. Navy Pinecastle Range Complex airspace is owned by the USFS. The Ocala National Forest is the oldest national forest east of the Mississippi River and is known for large areas of sand pine and scrub forest. The U.S. Navy Pinecastle Range Complex is located in the Ocala National Forest and primarily managed for Atlantic Fleet Carrier Strike Groups. The Ocala National Forest has high annual visitation rates and offers hiking, hunting, camping, and utilization of the Florida National Scenic Trail. The U.S. Navy Pinecastle Range Complex is managed under the Range Air Installations Compatible Use Zone (RAICUZ) Program. The RAICUZ Program classifies range and adjacent lands into Range Compatibility Zones (RCZs) and provides various land use recommendations for these areas. The 2010 Supplemental EIS for the renewal of authorization to use the range identified that 11,365 acres of previously unencumbered, off-range, forested land would be in the new RCZ-I boundary and subject to the land use recommendations as identified in Chief of Naval Operations Instruction (OPNAVINST) 3550.1A, *Range Air Installations Compatible Use Zones (RAICUZ) Program* (Navy 2010).

The offshore Warning Areas would be the primary airspace for AFRC F-35A pilots stationed at Homestead ARB. Although the majority of these areas are located over water, W-174B is located over Dry Tortugas National Park. Aircraft operations in W-174B are restricted around Dry Tortugas National Park.

Table HS3-40 identifies SULMAs that occur under the airspace proposed for use by AFRC F-35A pilots operating from Homestead ARB. These SULMAs would be exposed to subsonic noise that would increase L_{dnmr} 1 to 6 dB above baseline. Examples of these include one National Forest (Ocala); four wilderness areas; and numerous state parks, forests, and conservation areas. Table HS3-40 also presents the SULMA total acres along with the percentage of each SULMA

covered by the respective airspace. Average noise levels would increase below all of the airspace proposed for use except the Palatka 1 MOA. Subsonic L_{dnmr} below all of the airspace proposed for use would remain below 65 dB.

Table HS3-40. Special Use Areas Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at Homestead ARB

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L_{dnmr}	L_{dnmr}	Change
Avon East MOA					
Kissimmee Prairie Preserve State Park	53,739	26	45	50	6
Basinger MOA					
Kissimmee Prairie Preserve State Park	53,739	5	<45	49	4
Lake Placid MOA					
Allen David Broussard Catfish Creek Preserve State Park	8,329	56.9	<45	46	1
Everglades Headwaters National Wildlife Refuge And Conservation Area	407	97.5	<45	46	1
Highlands Hammock State Park	9,238	100.0	<45	46	1
Lake June-in-Winter Scrub State Park	846	100.0	<45	46	1
Lake Kissimmee State Park	5,893	14.3	<45	46	1
Lake Wales Ridge National Wildlife Refuge	1,894	90.0	<45	46	1
Lake Wales Ridge State Forest	2,6840	71.3	<45	46	1
Marian MOA					
Kissimmee Prairie Preserve State Park	53,739	61	<45	49	4
Palatka 2 MOA (Outside of R-2906 & R-2907 B and C)					
Caravelle Ranch Conservation Area	6,596	<1	<45	48	3
Caravelle Ranch Wildlife Management Area	5,652	<1	<45	48	3
Carl Duval Moore State Forest and Park	335	26	<45	48	3
Dunns Creek Conservation Area	3,158	100	<45	48	3
Dunns Creek State Park	6,319	100	<45	48	3
Horseshoe Point Conservation Area	2,749	29	<45	48	3
Lake George Conservation Area	1,1750	14	<45	48	3
Little Lake George Wilderness	2,827	<1	<45	48	3
Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	71,269	24.5	<45	48	3
Palatka 2 MOA (Outside of R-2906 & R-2907 B and C)					
Murphy Creek Conservation Area	1,718	100	<45	48	3
Seven Sisters Conservation Area	270	100	<45	48	3
Welaka State Forest	2,253	100	<45	48	3
R-2901 A and B					
Kissimmee Prairie Preserve State Park	53,739	9	47	53	6
Lake Wales Ridge State Forest	26,840	11	47	53	6
R-2901 C, D, E and M (and R-2901B North of R-2901A)					
Lake Kissimmee State Park	5,893	86	<45	48	3
Lake Wales Ridge State Forest	26,840	18	<45	48	3
R-2901 F, G, H and I (and R-2901B South of R-2901A)					
Kissimmee Prairie Preserve State Park	53,739	6	<45	47	2

Table HS3-40. Special Use Areas Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at Homestead ARB (Continued)

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L _{dnmr}	L _{dnmr}	Change
R-2906					
Caravelle Ranch Conservation Area	6,596	100	51	52	1
Caravelle Ranch Wildlife Management Area	5,652	100	51	52	1
Little Lake George Wilderness	2,827	100	51	52	1
Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	71,269	100	51	52	1
Ocala National Forest	1,197,826	100	51	52	1
R-2907A					
Juniper Prairie Wilderness	14,298	6	55	56	1
Lake George Conservation Area	11,750	86	55	56	1
Lake George State Forest	21,262	8	55	56	1
Ocala National Game Refuge	68,284	15	55	56	1
Ocala National Forest	1,197,826	4	55	56	1
R-2907 B and C					
Ocala National Forest	1,197,826	3	<45	47	2
R-2910A					
Alexander Springs Creek	2,954	32	48	52	4
Billies Bay Wilderness	3,064	77	48	52	4
Farles Prairie	1,901	100	48	52	4
Juniper Prairie Wilderness	14,298	20	48	52	4
Ocala National Forest	1,197,826	9	48	52	4
Ocala National Game Refuge	68,284	60	48	52	4
Seminole State Forest	29,027	2	48	52	4
R-2910 B and C					
Lake Norris Conservation Area	2,357	94	<45	49	4
Ocala National Forest	1,197,826	<1	<45	49	4
Seminole State Forest	29,027	14	<45	49	4
R-2910 D and E					
Alexander Springs Creek	2,954	68	<45	48	3
Alexander Springs Wilderness	7,888	25	<45	48	3
Billies Bay Wilderness	3,064	23	<45	48	3
Juniper Prairie Wilderness	14,298	74	<45	48	3
Lake George State Forest	21,262	20	<45	48	3
Lake Woodruff National Wildlife Refuge	19,274	<1	<45	48	3
Lake Woodruff Wilderness Area	970	<1	<45	48	3
Marjorie Harris Carr Cross Florida Greenway State Recreation and Conservation Area	71,269	1	<45	48	3
R-2910 D and E					
Ocala National Forest	1,197,826	6.4	<45	48	3
Ocala National Game Refuge	68,284	25	<45	48	3

Supersonic operations are not authorized in any of the airspace located over land. Restrictions on supersonic flight in W-174B are recorded in the air operations manual for NAS Key West. Supersonic flights are not authorized within 12 NM of Fort Jefferson in Dry Tortugas National Park unless flight paths are straight, level, and higher than 20,000 feet MSL.

HS3.8.4.2 Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources under the airspace proposed for use are provided in Chapter 3, Section 3.8. Chapter 3, Section 3.8.2, describes typical recreational impacts. In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased numbers of sorties in some airspace would discernibly affect the noise levels and could result in recreational participants experiencing startle effects from these events. This could continue to result in some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments under the airspace. Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could affect the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, wilderness study areas, and other remote locations.

Table HS3-40 lists SULMAs with high recreational value or opportunity underlying military training airspace where subsonic noise would increase L_{dnmr} by 1 to 6 dB above baseline. DNL increases would be noticeable under the airspace proposed for use and could affect recreational experiences. DNL increases are not expected to result in changes in recreational choices.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities. This includes maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. Increased noise in wilderness areas, recreation areas, and other specially managed lands could also be perceived by some recreational users as affecting their recreation experience.

HS3.8.5 Summary of Impacts to Land Use and Recreation

Land use and recreational resources would not be impacted by any of the construction because all of the construction would be conducted on the base in land use zones compatible with proposed development. Implementation of Scenarios A, B or C would expose an additional 2,926, 3,088, or 3,263 acres, respectively, of off-installation land to DNL of 65 to 69 dB. All of the newly exposed residential land is in the JLUS contour and is occupied by the South Dade Center. Zoning regulations adopted on 24 January 2017 require new residential construction in the 65 dB or greater DNL area to incorporate noise attenuation into each construction project. Biscayne National Park and Audubon Park would be exposed to increased noise. Implementation of Scenarios A, B, or C would expose an additional 18, 16, or 13 acres, respectively, of recreational land to DNL of 75 dB or greater. The JLUS identifies neighborhood parks with outdoor recreation activities as incompatible at DNL in excess of 75 dB. Subsonic noise levels in the training areas would remain below 65 dB and supersonic operations would only occur in areas authorized for these activities (i.e., W-174A through G and W-465A/B). Supersonic flights are not authorized within 12 NM of Fort Jefferson in Dry Tortugas National Park unless flight paths are straight, level, and higher than 20,000 feet MSL. Impacts to land use and recreation would not be considered significant under any of the afterburner scenarios.

HS3.9 SOCIOECONOMICS

Socioeconomics refers to features or characteristics of the social and economic environment. The factors affecting socioeconomic resources are the change in personnel, construction of new facilities, renovations and modifications to existing facilities, and noise from F-35A aircraft at Homestead ARB. These factors are evaluated relative to the existing population, employment, earnings, housing,

education, and public and base services. Homestead ARB is located adjacent to the City of Homestead, Florida, and approximately 25 miles south of Miami in Miami-Dade County. Impacts to socioeconomic resources would extend beyond the base boundaries. Therefore, for the purposes of this socioeconomic analysis, the ROI for the proposed action and No Action Alternative is Miami-Dade County, with an emphasis on Homestead ARB.

HS3.9.1 Base Affected Environment

HS3.9.1.1 Population

Population estimates for Miami-Dade County totaled more than 2.75 million persons in 2017 (USCB 2018). Between 2010 and 2017, the county population increased at an average annual rate of 1.4 percent, with a total increase of approximately 255,361 persons over the 7-year period (USCB 2018). The State of Florida has an estimated population of 20.98 million (USCB 2018). Average annual population growth in the county has been less than the state (Table HS3-41).

Table HS3-41. Population in the ROI for Homestead ARB

Location	2010 Census	2017 Estimates	Annual Percent Change (2010–2017)
Miami-Dade County	2,496,435	2,751,796	1.4
Florida	18,801,310	20,984,400	1.6

Source: USCB 2018

As shown in Table HS2-3, the total current authorized personnel at the base is 3,430 persons. Of the total authorized base personnel, 50.58 percent (1,735 persons) are associated with AFRC.

HS3.9.1.2 Economic Activity (Employment and Earnings)

In 2016, employment in Miami-Dade County totaled 1,753,507 jobs (BEA 2017a). The largest employment sector in Miami-Dade County was healthcare and social assistance (10.5 percent), followed by retail trade (9.9 percent), and other services that do not include government (8.5 percent) (BEA 2017a). Construction accounted for 4.4 percent of total employment. Over the last several years, the average annual unemployment rate in the county has steadily declined from 7.4 percent in 2013 to 4.8 percent in 2017 (BLS 2018a). During this same time, the state average annual unemployment rate also declined but remained lower than the county (BLS 2018b). Per capita personal income in Miami-Dade County is estimated at \$45,440, which is less than the estimated \$45,953 per capita personal income in the state (BEA 2017b).

Homestead ARB is an important economic contributor to southern Miami-Dade County through employment of military and civilian personnel, and expenditures for goods and services. The total economic impact of the base on the surrounding communities in 2017 was \$313 million, an increase of \$21 million since 2016 (Homestead AFRC 2018). The majority of this work was awarded to local businesses (Homestead ARFC 2018). Construction, services, and materials contracts accounted for approximately 53 percent of the economic impact generated by Homestead ARB. The total payroll for military, civilians, and other base personnel exceeded \$98 million in 2017 (Homestead AFRC 2018). Based on the Impact Analysis for Planning (IMPLAN) economic model, the on-base authorized employment of 3,430 personnel supports an estimated additional 980 secondary jobs in the community.

HS3.9.1.3 Housing

No military housing is available at Homestead ARB. Table HS3-42 presents census-derived housing data for Miami-Dade County. The county has an estimated 1,004,835 total housing units (houses), of which 15 percent (151,211 units) were vacant in 2016 (USCB 2016). Nearly half

(47.4 percent) of the occupied houses in the county are renter-occupied and the remaining 52.6 percent are owner-occupied. The median value of owner-occupied houses in Miami-Dade County is estimated at \$221,100. The median gross rent was \$1,143 in 2016 (USCB 2016). As described in Section HS3.2.1.1, no residents or houses in Miami-Dade County are currently exposed to DNL of 65 dB or greater from aircraft operations at Homestead ARB.

Table HS3-42. Housing Data in the ROI for Homestead ARB

Location	Houses	Occupied	Vacant
Miami-Dade County	1,004,835	853,624	151,211

Source: USCB 2016

Housing in the Miami-Dade County area is experiencing strong growth and a surge in property values, leading to signs of sustainable growth. Property values in the county increased from 2015 to 2016 by an average of 9.1 percent, with a high of 16.5 percent in North Miami Beach City and a low of 4.3 percent in Bal Harbour. In 2016, property values in the City of Homestead increased by 8.3 percent from the previous year (Miami Herald 2016). Over the 5 years between the depressed market in 2013 and 2018, the average sale price of housing in Homestead increased from \$130,000 to \$240,000 (in current dollars). Most recent reports still indicate a strong real estate market in the county, with increased sales in residential properties and a lower number of days on the market (47 days in 2018 compared to 61 days in 2017). As a result of increased sales, the area is also experiencing a shortage of properties for sale (Miami Herald 2018). One reason cited for the strong growth is the migration of residents and retirees from northern states moving to Florida for the weather and to reduce their costs of living since Florida has no state income tax (Miami Herald 2018).

HS3.9.1.4 Education

The Miami-Dade Public School (M-DCPS) District serves the county. The M-DCPS District encompasses more than 2,000 square miles and includes 392 schools with 345,000 students and more than 40,000 employees. The district is ranked as the fourth largest school district in the United States (M-DCPS 2018). No schools or child development centers are located on Homestead ARB. As described in Section HS3.2, no off-base schools are known to be currently exposed to DNL of 65 dB or greater from aircraft operations at Homestead ARB.

HS3.9.1.5 Public Services

The Miami-Dade Fire Rescue (MDFR) provides emergency services, permits and inspections, and fire protection to the unincorporated parts of Miami-Dade County. MDFR maintains 69 fire rescue stations and is staffed by 2,429 employees with an operating budget of \$361 million and a \$54 million, 5-year capital plan (Miami-Dade County Government 2018). A number of municipalities within Miami-Dade County do not have their own fire rescue services and rely on the county for support. Law enforcement services are provided by the Miami-Dade Police Department, which is charged with the safety of more than 2.5 million residents. The department has approximately 2,900 sworn officers and 1,700 personnel (Miami-Dade County Government 2017). All incorporated areas (i.e., towns, cities, etc.) in the county have their own police departments. Thirty (30) hospitals are located in the Miami-Dade County region (Miami Dade Government 2018) and approximately 31.0 to 55.2 physicians per 10,000 population in the county (FDH 2014).

HS3.9.1.6 Base Services

Base services at Homestead ARB include a lodging office (Homestead Inn), community activity center, exchange shop, family support building, visitor control center, outdoor recreation services, base chapel, retiree activities office, and a sports and fitness building (Homestead AFRC 2016).

HS3.9.2 Base Environmental Consequences

HS3.9.2.1 Population

The current personnel at Homestead ARB and the projected change anticipated to support the AFRC F-35A mission are provided in Table HS2-3. Implementation of the AFRC F-35A mission would result in a net decrease of 91 full-time mission personnel. This would result in a 2.7 percent decline in the existing base assigned personnel and a less than 0.01 percent decline in the existing county population. The reduction in base personnel would not be noticed in the large and dynamic county. Calculation of this potential decrease in the county population is based on the assumption that all 91 personnel would be full-time and be reassigned to other bases, and that the personnel and any dependents would migrate out of the area. Employment opportunities in the greater Homestead ARB area would be expected to absorb any reduction in secondary jobs.

HS3.9.2.2 Economic Activity (Employment and Earnings)

As shown in Table HS2-3, implementation of the AFRC F-35A mission at Homestead ARB would decrease the full-time work force assigned to the base by 91 total personnel. Using the IMPLAN model, the direct effect of a net decrease of 91 full-time personnel at Homestead ARB would have a negative estimated indirect and induced effect of a loss of up to 26 jobs throughout Miami-Dade County (IMPLAN 2018). This number would not affect regional economic activity.

Construction activities provide economic benefits to the surrounding areas through the employment of construction workers and the purchase of materials and equipment. Construction activities would be temporary and provide a limited amount of economic benefit. Noise associated with construction activities would be limited to within the base boundaries and would not impact economic activity. The USAF estimates that a total of \$18.6 million in MILCON expenditures during 2021-2023 would be associated with implementation of the AFRC F-35A mission at Homestead ARB. The total expenditures could generate up to 102 jobs during facility construction, primarily within the construction industry or related industries, and to a lesser extent in wholesale trade, real estate, architectural, engineering and related services, retail stores, hospitals, truck transportation, and full-service restaurants. With a labor force of more than 1.3 million people and an unemployment rate of 4.8 percent, it is expected that the local labor force in the ROI and in the surrounding areas would be sufficient to fill these new jobs without a migration of workers into the area. Implementation of the AFRC F-35A mission and projected total MILCON expenditures of \$18.6 million at Homestead ARB would generate an estimated \$9.8 million in direct, indirect, and induced labor income in the ROI. The jobs and related income generated would be temporary (i.e., during the construction activity).

HS3.9.2.3 Housing

Military housing is not available at Homestead ARB and any reassigned full-time personnel would no longer require off-base housing. Assuming that the 91 personnel represented individual houses, the reduction in personnel would make 91 rental and/or owner-occupied units available in the market. Recent real-estate trends in Miami-Dade County and Homestead suggest that an additional supply of residential units would be absorbed in the area, which is seeing a shortage of residential properties. These impacts would be the same regardless of which afterburner scenario is selected.

During scoping, people raised concerns about the potential impact of noise on surrounding property values. As discussed in more detail in Chapter 3, Section 3.9.3, studies have shown a relationship between noise and property values. A study conducted by Trojanek et al (2017) summarized the results from 79 studies; the majority of those studies found that housing values

decreased from 0.26 to 1.00 percent for every decibel increase in DNL above 65 dB. Some of the studies had values that decreased less than this range and others decreased more. The exact percent decrease is dependent upon a number of factors, including the noise indicators used, thresholds, types of properties evaluated, and other factors. The Homestead JLUS, adopted by Miami-Dade County on 24 January 2017, includes the recommendation that housing exposed to DNL of 65 dB or greater be constructed with sound attenuation features.

Prices for homes in the Miami-Dade County region have been increasing over the last several years due to economic and population growth in the region. These recent upward price trends in the local real estate market are expected to continue into the near future. Noise increases could cause some decrease in housing prices for the affected areas. The general impact on home pricing would be the same regardless of which afterburner scenario is selected.

Table HS3-43 shows the total estimated number houses that would be newly exposed to DNL of 65 dB or greater compared to the existing conditions. The estimated numbers of residents exposed to this level of noise from the three afterburner scenarios are listed in Tables HS3-11, HS3-13, and HS3-15. The JLUS and local zoning require that all new residential units within the 65 dB DNL and greater noise contours incorporate at least a 25-dB noise level reduction in the unit's design and construction.

Table HS3-43. Estimated Houses Exposed to DNL of 65 dB or Greater from Baseline and AFRC F-35A Mission Conditions at Homestead ARB

DNL (dB)	Estimated Houses ^a						
	Baseline	Scenario A	Change	Scenario B	Change	Scenario C	Change
65-69	0	22	22	28	28	37	37
70-74	0	0	0	0	0	0	0
75-79	0	0	0	0	0	0	0
80-84	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0
Total	0	22	22	28	28	37	37

^aAll of the estimated houses that would be impacted by DNL of 65 dB or greater are located at the South Dade Center (S02)

HS3.9.2.4 Education

As described in Chapter 3, Section 3.9.3, the total number of dependents, including spouse and children, was estimated at 2.5 times 65 percent of full-time active duty and full-time active reserve. The total number of children was estimated at 1.5 times 65 percent of full-time personnel, because it was assumed each military member would be accompanied by a spouse. Thus, it is estimated that 89 dependents would be of school age and would no longer attend schools in the M-DCPS District. The projected number of students leaving would represent less than a 0.01 percent decrease of the current total enrollment in the district. Based on the size of the school district in the ROI, as well as class size for the state, it is anticipated that school capacity in the county would not be adversely impacted. A reduction in school enrollment could have a small, local impact on revenue and expenses per pupil but would not be anticipated to significantly affect funding for schools in the M-DCPS District.

During scoping, several people expressed concern about the impacts of noise on children and educational facilities. The Homestead JLUS prohibits schools within the 75 dB DNL or greater noise contour. No schools would be exposed to DNL of 65 dB or greater. Implementation of Scenarios A, B, or C would expose students at De La Salle Education Center (Red West) and Miami Arts Charter School to an increase in overflight events per hour (see Section HS2.2.3), which would disrupt classroom learning.

HS3.9.2.5 Public Services

Miami-Dade County represents a large community with police, fire, and other services. The estimated reduction of 91 full-time, USAF-related personnel and dependents would represent a decrease of less than 0.01 percent of the existing Miami-Dade County population. The decrease in population would have no discernible effect on public services.

During scoping, people submitted comments regarding the potential impact that noise from the F-35A aircraft would have on the quality of life and health of residents. Aircraft noise has the potential to cause a variety of effects such as annoyance, speech interference, sleep interference, hearing loss, and non-auditory health effects (Section HS3.2.2). Potential non-auditory health impacts due to aircraft noise are discussed in more detail in Section HS3.2.2.7 and Volume II, Appendix B. The USAF continually works with local governments and communities to assess and manage aircraft noise in the environment and attempts to reduce, where possible, the potential impacts of noise to people. When possible, the AFRC F-35A pilots would intentionally avoid overflying identified noise-sensitive locations.

HS3.9.2.6 Base Services

A reduction in the number of personnel would not be expected to have a noticeable effect on base services. Populations on military bases are constantly in flux as deployments and mission personnel changes are assigned.

HS3.9.3 Summary of Impacts to Socioeconomics

The personnel decreases and community service requirements of the AFRC F-35A mission (Scenario A, B, or C) at Homestead ARB would not result in significant impacts to population, economic activity, housing availability, education, or public services. However, DNL greater than 65 dB resulting from AFRC F-35A aircraft operations would affect an estimated 22 houses under Scenario A, an estimated 28 houses under Scenario B, or an estimated 37 houses under Scenario C. All of the estimated houses that would be impacted by DNL of 65 dB or greater are located at the South Dade Center (S02). The JLUS and local zoning require that all new residential units within the 65 dB DNL and greater noise contours incorporate at least a 25-dB noise level reduction in the unit's design and construction.

HS3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

The environmental justice analysis considers affected populations that meet certain characteristics based on income and age. Analysis of environmental justice and other sensitive receptors is conducted pursuant to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Environmental justice addresses impacts to minority and low-income populations. This analysis focuses on increased noise resulting from the proposed action as the primary impact to these populations. The USAF guidelines for environmental justice analysis use census data (i.e., percentages of populations identifying themselves as minority, low-income, etc.) to determine potential impacts to these populations. The guidelines also address children (under 18) and elderly (65 and older) as additional sensitive populations. (Minority, low-income, children, and elderly populations are henceforth referred to as environmental justice populations). Tables HS3-11, HS3-13, and HS3-15 list the number of people exposed to DNL of 65 dB or greater from baseline and the three afterburner scenario conditions at Homestead ARB.

This analysis is completed to determine if there are existing disproportionate noise impacts to environmental justice populations (i.e., baseline DNL of 65 dB or greater) and if implementation of the proposed action would result in disproportionate noise impacts to environmental justice populations (i.e., AFRC F-35A mission DNL of 65 dB or greater).

Environmental justice analysis overlays the 65 dB DNL contour on the census data polygons. The smallest census data which has the information necessary for analysis of potential impacts to environmental justice populations is used to determine potential impacts. The smallest group of census data which contain the needed information for this analysis is the Census BG. Each BG that is partially or wholly encompassed by the 65 dB DNL contour is defined as an ROI. There could be few or many ROIs for a specific environmental justice analysis, depending on the extent of the noise contour and the size of the BGs. The next higher level of census data is the Census Tract (CT). Each CT contains a number of BGs (ROIs).

In order to identify disproportionate impacts from baseline or proposed action noise levels, a Community of Comparison (COC) is needed. The COC is defined by summing the population in all the CTs which contain any part of an ROI affected by the 65 dB DNL contour. The percentages of minority and low-income persons are calculated for each ROI (i.e., BG). The ROI and COC percentages are then compared. If the percentage of minorities or low-income persons in an ROI is equal to or greater

Census blocks are the smallest unit for which the USCB collects census information. **Block Groups (BGs)** are comprised of a combination of census blocks and are a subdivision of **census tracts (CTs)**. Census tracts are a small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting census data. This EIS uses **BGs** and **CTs** in the environmental justice analysis. The **BGs** also comprise the **Region of Influence (ROI)** analyzed in the EIS.

than the percentage of minorities or low-income persons in the COC, there is a disproportionate impact to the environmental justice population in that ROI (USAF 2014). Chapter 3, Section 3.10.3, provides a description of the method applied to calculate the proportion of the population in the ROIs.

For Homestead ARB, there is one CT containing one ROI (BG) which is partially or wholly exposed to DNL of 65 dB or greater resulting from the AFRC F-35A mission. Figure HS3-8 presents an overlay of the baseline and AFRC F-35A mission 65 dB DNL contour on the ROIs and the COC.

HS3.10.1 Base Affected Environment

Table HS3-44 provides baseline demographic conditions (USBC 2017a-e) in Miami-Dade County, where Homestead ARB is located. Also shown in Table HS3-44 is the existing proportion of environmental justice populations in the one CT (CT 107.04) located in the proposed action affected area near Homestead ARB. The CT 107.04 is the COC for the environmental justice analysis. As shown in Table HS3-44, the COC has a higher proportion of minority, low-income, and child populations than Miami-Dade County, the State of Florida, or the nation. As shown on Figure HS3-8, this estimated population is limited to the residential area (South Dade Center) in the southwest portion of CT 107.04.

Under baseline conditions, no off-base residential areas are currently exposed to DNL of 65 dB or greater. No schools or child care facilities are exposed to DNL of 65 dB or greater under baseline conditions at Homestead ARB. Additionally, no hospitals, parks, or libraries are exposed to DNL of 65 dB or greater under baseline conditions.

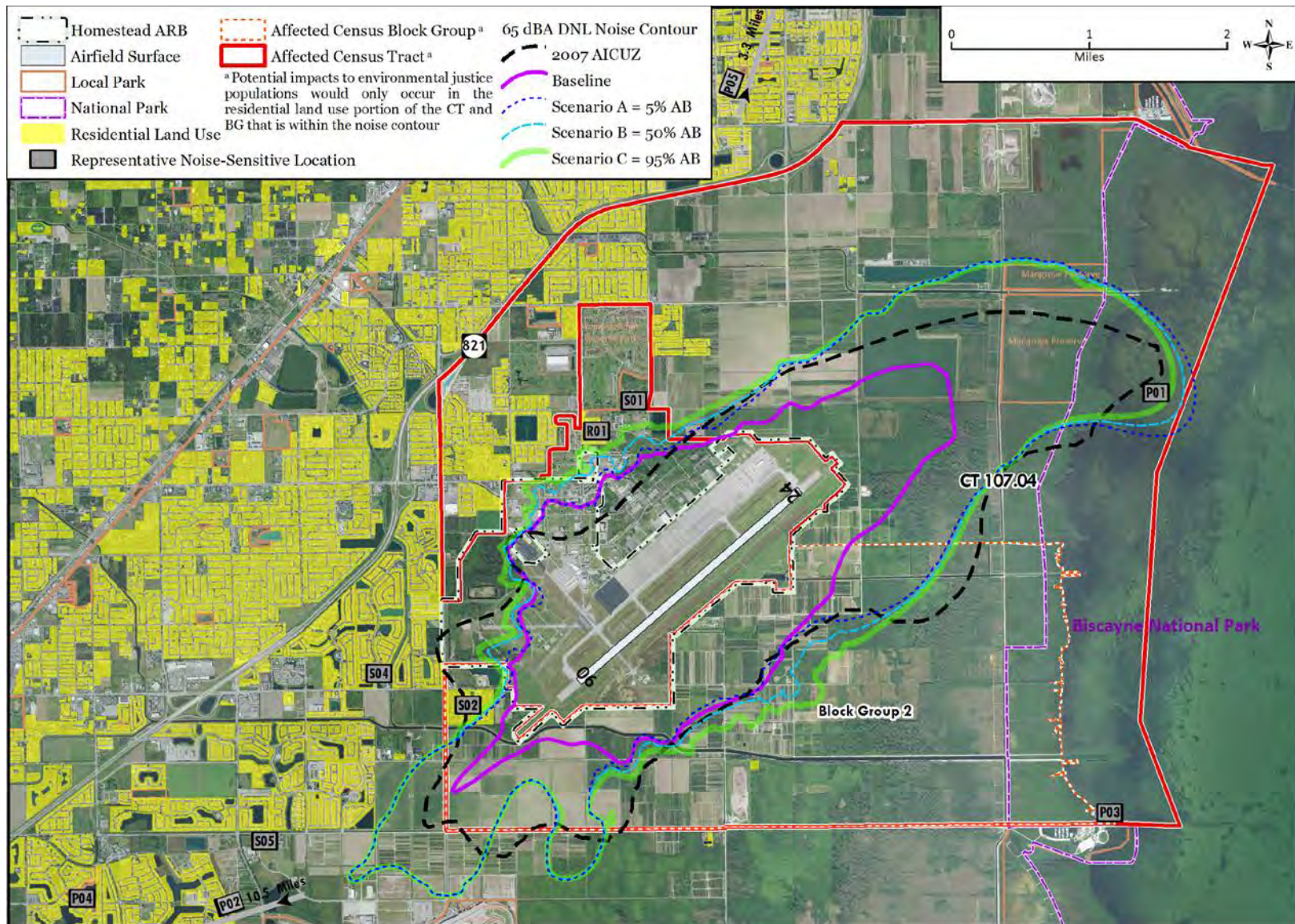


Figure HS3-8. Homestead ARB Census Tract and Block Group Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions

Table HS3-44. Environmental Justice Populations and Demographics for Homestead ARB

Geographic Unit	Total Population	Population for Whom Poverty is Determined ^a	Minority		Low-Income		Children		Elderly	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
CT 107.04 ^b	11,659	11,659	10,928	93.7	3,066	26.3	3,385	29.0	963	8.3
COC	11,659	11,659	10,928	93.7	3,066	26.3	3,385	29.0	963	8.3
Miami-Dade County	2,702,602	2,661,803	2,331,369	86.3	505,182	19.0	553,299	20.5	414,322	15.3
State of Florida	20,278,447	19,858,469	9,153,496	45.1	3,070,972	15.5	4,111,582	20.3	3,926,889	19.4
United States	321,004,407	313,048,563	123,726,618	38.5	45,650,345	14.6	73,601,279	22.9	47,732,389	14.9

^a Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years of age.

^b The 65 dB DNL contour only impacts one census tract with a residential population under the noise contour.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

HS3.10.2 Base Environmental Consequences

The following environmental justice analysis considers the three different afterburner scenarios when appropriate. For example, because noise impacts (i.e., DNL of 65 dB or greater) to environmental justice populations (minority, low-income, children, and elderly) would vary by afterburner scenario, an analysis of each afterburner scenario is included.

HS3.10.2.1 Scenario A

Based on the analysis results shown in Table HS3-45, disproportionate noise impacts to minority and low-income populations would result from the implementation of Scenario A. In the one ROI (BG) evaluated for this analysis, the proportion of the population identifying themselves as minority and the proportion of the population considered below poverty (low-income) both exceed the COC. The areas where these populations are located are shown on Figure HS3-9. “If percentages of minority and low-income populations in an ROI are greater than or equal to the corresponding percentages in the COC, then it is presumed that there would be disproportionate impacts to the EJ population” (USAF 2014). “When it is determined that disproportionate impacts on EJ populations will occur,” the EIS is to suggest “potential mitigation for the decision maker.” Mitigations for noise level reductions would have been designed for properties located near Homestead ARB and constructed since 2004. Because implementation of Scenario A would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and Record of Decision (ROD).

The other sensitive populations evaluated in this analysis are children and elderly. Table HS3-46 shows that there is a higher percentage of children and a lower percentage of elderly persons in the ROI (BG) than the COC. Implementation of the AFRC F-35A mission would expose an additional estimated 22 children and 3 elderly persons to DNL of 65 dB or greater. The areas where these populations are located are shown on Figure HS3-10. Under baseline conditions, these populations have not been exposed to DNL of 65 dB or greater. Sections HS3.2.2.2 and HS3.2.2.3 identify speech interference and classroom learning disruption associated with increased overflight and noise levels which would adversely impact children and elderly populations.

Table HS3-45. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario A)

Geographic Units		Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 107.04											
2	579	0	96.5	No ^a	37.5	No ^a	62	96.5	Yes	37.5	Yes
COC	11,659	NA	93.7	NA	26.3	NA	NA	93.7	NA	26.3	NA

^a No disproportionate impacts because there are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour.

Key: NA = Not applicable does not apply

Notes: Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table HS3-46. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario A)

Geographic Units		Baseline				AFRC F-35A Mission (Newly Exposed)					
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by 65 dB DNL or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 107.04											
2 ^a	579	0	35.6	0	4.5	0	62	35.6	22	4.5	3
COC	11,659	NA	29.0	3,385	8.3	963	NA	29.0	3,385	8.3	963

^a There are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour

Notes: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

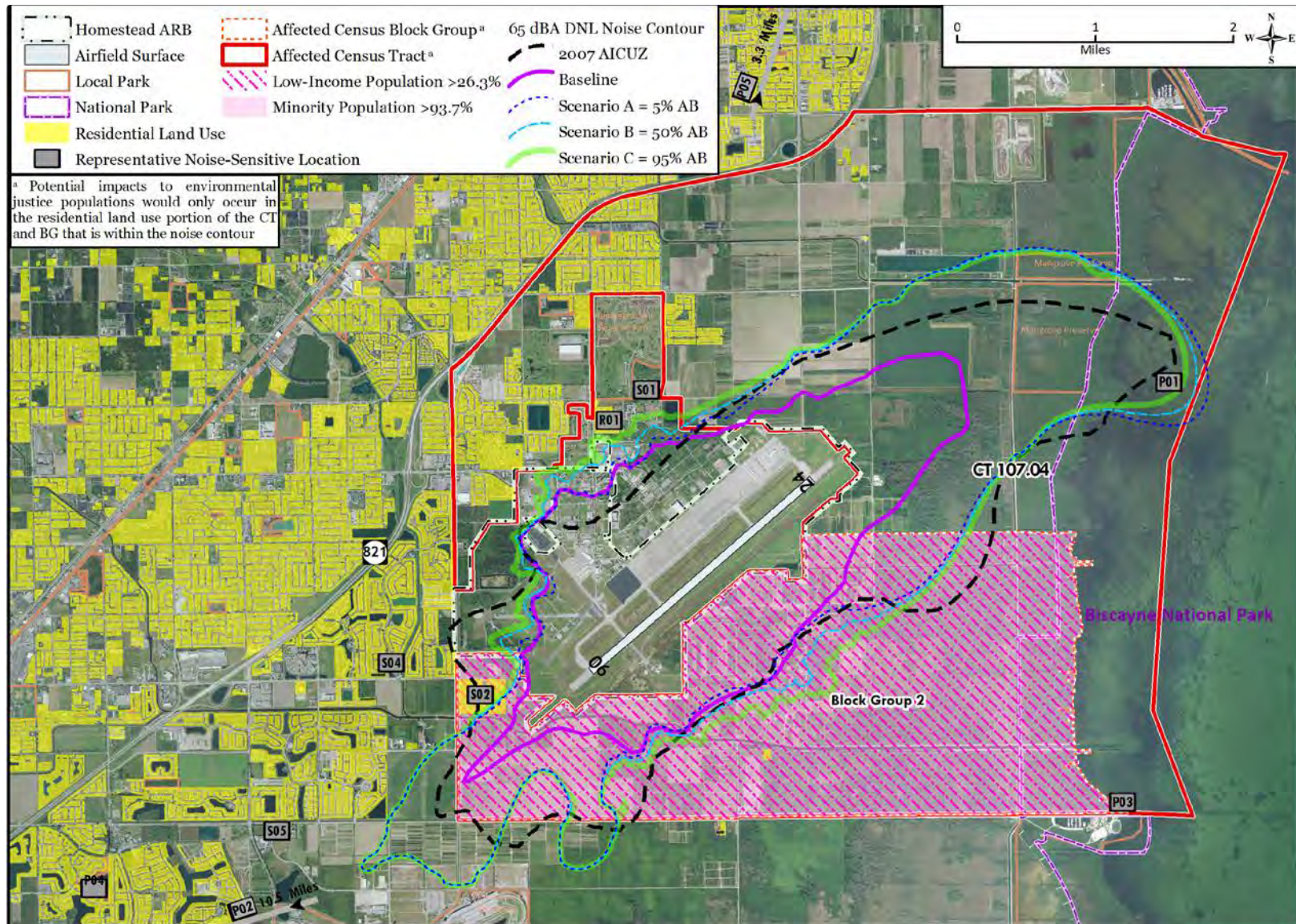


Figure HS3-9. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB

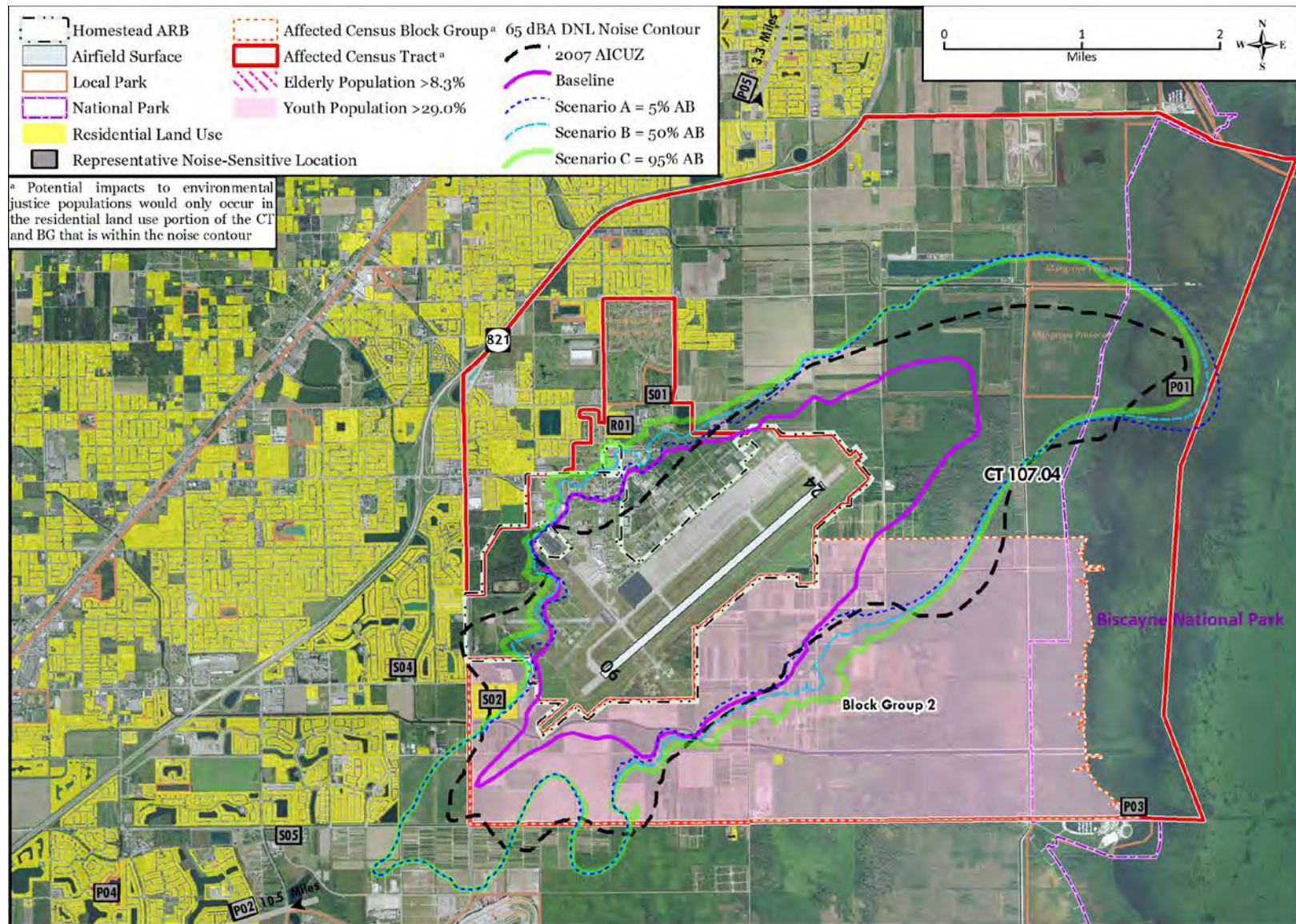


Figure HS3-10. Youth and Elderly Populations and Representative Noise-Sensitive Locations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB

No schools or childcare facilities would be exposed to DNL of 65 dB or greater from the AFRC F-35A mission at Homestead ARB. No hospitals or libraries would be exposed to DNL of 65 dB or greater.

HS3.10.2.2 Scenario B

Implementation of Scenario B would result in disproportionate noise impacts to minority and low-income populations in the one ROI (BG) evaluated for this analysis (Table HS3-47 and Figure HS3-9). This scenario would also expose an additional estimated 28 children and 4 elderly persons to DNL of 65 dB or greater (Table HS3-48 and Figure HS3-10). Because implementation of Scenario B would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

No schools or childcare facilities would be exposed to DNL of 65 dB or greater from Scenario B at Homestead ARB. No hospitals or libraries would be exposed to DNL of 65 dB or greater.

Table HS3-47. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario B)

Geographic Units		Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 107.04											
2	579	0	96.5	No ^a	37.5	No ^a	79	96.5	Yes	37.5	Yes
COC	11,659	NA	93.7	NA	26.3	NA	NA	93.7	NA	26.3	NA

^a No disproportionate impacts because there are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour.

Key: NA = Not applicable does not apply

Notes: Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table HS3-48. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario B)

Geographic Units		Baseline				AFRC F-35A Mission (Newly Exposed)					
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by 65 dB DNL or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 107.04											
2 ^a	579	0	35.6	0	4.5	0	79	35.6	28	4.5	4
COC	11,659	NA	29.0	3,385	8.3	963	NA	29.0	3,385	8.3	963

^a There are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour

Notes: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

HS3.10.2.3 Scenario C

Implementation of Scenario C would result in disproportionate noise impacts to minority and low-income populations in the one ROI (BG) evaluated for this analysis (Table HS3-49 and Figure HS3-9). This scenario would expose an additional estimated 37 children and 5 elderly persons to DNL of 65 dB or greater (Table HS3-50 and Figure HS3-10). Because implementation of Scenario C would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

No schools or childcare facilities would be exposed to DNL of 65 dB or greater from Scenario C at Homestead ARB. No hospitals or libraries would be exposed to DNL of 65 dB or greater.

Table HS3-49. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario C)

Geographic Units		Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by 65 dB DNL or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 107.04											
2	579	0	96.5	No ^a	37.5	No ^a	104	96.5	Yes	37.5	Yes
COC	11,659	NA	93.7	NA	26.3	NA	NA	93.7	NA	26.3	NA

^a No disproportionate impacts because there are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour.

Key: NA = Not applicable does not apply

Notes: Shading indicates that implementation of the AFRC F-35A mission would result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table HS3-50. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Homestead ARB (Scenario C)

Geographic Units		Baseline				AFRC F-35A Mission (Newly Exposed)					
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by 65 dB DNL or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by 65 dB DNL or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 107.04											
2 ^a	579	0	35.6	0	4.5	0	104	35.6	37	4.5	5
COC	11,659	NA	29.0	3,385	8.3	963	NA	29.0	3,385	8.3	963

^a There are no residential areas or people encompassed by the baseline 65 dB or greater DNL contour

Notes: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

HS3.10.3 Summary of Impacts to Environmental Justice and Protection of Children

Based on the analysis described in Section HS3.10.2 and shown in Table HS3-51, implementation of any of the three afterburner scenarios would result in disproportionate impacts to minority and low-income populations. The percentage of the population identifying themselves as minority residing in the ROI (BG) that would be exposed to DNL of 65 dB or greater exceeds the percentage of minority populations in the COC. The percentage of the exposed population that is considered below poverty residing in the ROI (BG) is greater than the percentage of low-income populations in the COC. The estimated number of children and elderly people exposed to DNL of 65 dB or greater from each afterburner scenario are listed in Table HS3-51.

Table HS3-51. Summary of the Minority, Low-Income, Children, and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and the Three Afterburner Scenarios for the AFRC F-35A Mission at Homestead ARB

Scenarios and Baseline/No Action	Disproportionate Impact		Newly Exposed Individuals	
	Minority Populations - Census BGs (ROIs)	Low-Income Populations - Census BGs (ROIs)	Children	Elderly Persons
Baseline/No Action ^a	0 of 1 ^a	0 of 1 ^a	0 ^a	0 ^a
Scenario A	1 of 1	1 of 1	22	3
Scenario B	1 of 1	1 of 1	28	4
Scenario C	1 of 1	1 of 1	37	5

^a Baseline/No Action is the existing conditions and does not include the values for any of the other scenarios.

HS3.11 INFRASTRUCTURE

HS3.11.1 Base Affected Environment

HS3.11.1.1 Potable Water System

Potable drinking water and wastewater treatment and disposal are provided to the base and surrounding areas by Miami-Dade Water and Sewer Department. The three hydrologic units present in the Homestead area include, in descending order, the Biscayne aquifer, the Intermediate Confining Unit, and the Floridian aquifer system. The Biscayne aquifer extends from ground surface to approximately 80 to 100 feet below ground surface near Homestead ARB. The Biscayne aquifer is designated by the USEPA as a “sole-source” potable water supply for Broward, Miami-Dade, Monroe, and Palm Beach Counties. This designation under the Safe Drinking Water Act affords stringent protection for the aquifer (Homestead ARB 2016b).

Miami-Dade County Water and Sewer Department’s Alexander Orr Wellfield, with a permitted pumping capacity of approximately 308 million gallons per day (MGD), provides potable water to Homestead ARB. Raw water is chlorinated and fluoridated at a treatment facility next to the wellfield (Homestead ARB 2016b).

The Lower Floridian aquifer near Homestead ARB has mineralization and high salinity values that exceed primary drinking water standards and make the aquifer unsuitable as a potable water supply (Homestead ARB 2016b).

HS3.11.1.2 Wastewater

Homestead ARB has six industrial wastewater operating permits prepared in accordance with Chapter 24, Miami-Dade County Code. Permits cover all waste generating activities on Homestead ARB (Homestead ARB 2016b).

Primary waste-generating activities include hazardous materials storage; vehicle maintenance; aircraft washing and maintenance; and petroleum, oil, and lubricant storage activities. Homestead ARB facilities covered under these permits include: the Military Aircraft Jet Engine Testing Facility, Tank Farm, Buildings 185, 192, 193, 194, 200, 706, and 4709 (Homestead ARB 2016b).

In the event of a reportable spill (more than 25 gallons on pervious surfaces or more than 100 gallons on other surfaces), Homestead ARB would report the spill to Miami Dade Regulatory and Economic Resources and the National Response Center (Homestead ARB 2016b, Cedeno 2018). The domestic wastewater treatment plant on Homestead ARB (former Homestead AFB) was closed and decommissioned in 1984. Miami-Dade Water and Sewer Department provides wastewater treatment and disposal for the base under contract to the AFRC. Homestead ARB has no industrial wastewater or stormwater disposal wells. Some wastewater treatment units at industrial areas are closed-loop-recycle systems that constantly treat and reuse the same wash water (Homestead ARB 2016b).

HS3.11.1.3 Stormwater System

Natural drainage on Homestead ARB is generally poor due to the relatively flat surface and the location of the water table, which is either at or near the land surface of Homestead ARB. Stormwater runoff is collected in an internal drainage system of canals, swales, ditches, and pipes, most of which eventually discharge into the Boundary Canal (Homestead ARB 2016b).

The stormwater reservoir is on the eastern side of the base and receives flow from the Boundary Canal system which collects runoff throughout the installation. The reservoir is approximately 300 feet wide and 900 feet long. Typical depths are estimated to range between 10 and 20 feet. Assuming an average depth of 12 feet, the reservoir volume is estimated to be 46.3-acre feet. A control structure at the eastern edge of the reservoir is used to discharge water when required (Homestead ARB 2016b).

This control structure is only opened when extra water must be discharged. During periods of heavy rainfall, three 100,000-gallon manual pumps with a total combined maximum rate of 300,000 gallons per minute pump water to the Military Canal. These pumps were designed to begin pumping at an elevation of 3.0 feet National Geodetic Vertical Datum (NGVD) and shut down at an elevation of 2.5 feet NGVD (Homestead ARB 2016b).

As a result, water elevations in the Flightline Canal are at acceptable operational levels and the pumps continue to operate until the water level in the canal is lowered to 2.5 feet NGVD. Manatee exclusion grates were installed at the control structure at the eastern edge of the reservoir (Homestead ARB 2016b).

HS3.11.1.4 Electrical System

The Florida Power and Light Company (FPL) provides electrical power to Homestead ARB. The main substation owned by FPL is on the former Homestead AFB near Mystic Lake. The electrical distribution system on Homestead ARB is owned by FPL, and most buildings are group-metered. Homestead ARB controls the airfield power grid (Homestead ARB 2016b).

FPL has the capacity to meet unusual power demands based on its ability to shift power from areas that are currently experiencing reduced electrical demands to areas that require additional power. The system's capacity is 22,412 megawatts (MW). The distribution system varies between 13 kilovolts (kV) and 23 kV capacity lines. The current demand is 8,530 MWh, allowing ample supply for future expansion (Homestead ARB 2016b).

Most of the electric lines on base are underground. However, areas along the west perimeter fence, an area south of the airfield, and scattered segments throughout the base still have overhead lines. Overhead street lighting is mounted on concrete poles and served by FPL-owned underground lines (Homestead ARB 2016b).

The parking lot lighting is owned by Homestead ARB. The airfield lighting system includes in-ground taxiway lights, runway edge lights, lighted directional signs, and a vault building with power regulators, controls, and a generator (Homestead ARB 2016b).

HS3.11.1.5 Natural Gas System

Although natural gas is supplied to the local area by the City Gas Company of Florida, no natural gas supply is located at Homestead ARB. City Gas Company of Florida services approximately 101,000 customers in Miami-Dade and Brevard Counties (Homestead ARB 2016b).

HS3.11.1.6 Solid Waste Management

Municipal solid waste management and compliance at USAF installations is established in AFI 32-7042, *Waste Management*. In general, AFI 32-7042 establishes the requirements for installations to have a solid waste management program to incorporate a solid waste management plan; procedures for handling, storage, collection and disposal of solid waste; record-keeping and reporting; and pollution prevention. Homestead ARB's Integrated Solid Waste Management Plan (ISWMP) provides guidance for the management of municipal solid waste, compostable materials, C&D debris, and industrial solid waste at Homestead ARB in accordance with AFI 32-7042 and other applicable federal, state, and local requirements (Homestead ARB 2013).

The USAF goal for solid waste reduction is to divert 65 percent of non-hazardous solid waste by 2020 and 60 percent of C&D debris by 2018 (DoD 2012). Homestead ARB has an extensive solid waste recycling program. The storage and processing (e.g., segregation, bailing, and glass crushing) of recyclables is conducted at an on-site Recycle Center in Building 164. The installation maintains a diversion rate greater than 50 percent (Homestead ARB 2013).

Municipal solid waste generated at Homestead ARB that is not recycled is collected by a contractor. The contractor removes and transports refuse to the South Dade Landfill located 4 miles north of the base for evaluation, segregation, and additional recycling. No active municipal landfills are located on the installation. Collection of C&D debris generated during contracted facility demolition, renovations, or new construction activity is the responsibility of the contractor performing the work (Homestead ARB 2013).

HS3.11.1.7 Transportation

Homestead ARB is located in southeast Florida, about 30 miles south of Miami. The following are approximate distances to major cities from Homestead ARB: Fort Lauderdale, Florida, 64 miles northeast, Key West, Florida, 130 miles southwest, Orlando, Florida, 270 miles northwest; and Tampa, Florida 300 miles northwest.

Homestead ARB is in northeast Homestead, Florida, approximately 7 miles from the central business district of Homestead (population: 64,079) and 30 miles south of Miami (population: 417,650). The base is situated along Biscayne Boulevard (SW 288th Street). The area around the base is a mix of commercial, residential, and agricultural.

The Miami-Dade metro area is the major transportation hub of South Florida. It lies at the intersection of two major national highways, Interstate (I)-95 and I-75. To the south, I-95 (which turns into US-1) connects Miami to the Florida Keys. Traveling east to west, I-75 connects the east

coast of South Florida to the west coast of South Florida. Beyond its roadway and air connections, the region has alternative options for travel, such as public transit, bicycle, and pedestrian facilities. The two major pedestrian options are the Metrorail and the M-Path. The Metrorail system is a 25-mile dual track, elevated rapid transit system that provides service to MIA and extends from Kendall through south Miami, Coral Gables, and downtown Miami; to the Civic Center/Jackson Memorial Hospital area; and to Brownsville, Liberty City, Hialeah, and Medley in northwest Miami-Dade, with connections to Broward and Palm Beach counties at the Tri-Rail/Metrorail transfer station. The system currently uses 136 train cars. The M-Path is a paved multi-use trail in urban Miami-Dade County, which opened in 1983 and is part of the Miami-Dade Transit (MDT) system. The trail follows a MDT right-of-way under the elevated Metrorail guideways.

HS3.11.1.7.1 Gate Access

The Entry Control Point (ECP) on Westover Street is the primary gate providing ingress/egress to the installation. Originally, this gate served as the commercial gate with the ECP at Coral Sea Boulevard serving as the primary gateway onto the installation. However, due to security concerns, the ECP at Coral Sea Boulevard was closed and is now only open during UTA weekends. A new Entry Control Complex is currently under construction north of Bougainville Boulevard across from the former Base Exchange (BX), Building 920. The new Entry Control Complex will provide more efficient and secure processing for vehicles and personnel associated with the host wing and tenant organizations (Homestead ARB 2016b).

HS3.11.1.7.2 On-Base Traffic Circulation

The installation road network is laid out in a grid pattern with the primary routes extending north-south and the secondary routes extending east-west. Westover Street and Coral Sea Boulevard, being the signature routes, are the two primary roadways. Elmendorf Street, St. Lo Boulevard, Biggs Street, and Tuskegee Boulevard are the secondary routes and can be considered collector roads. Coral Sea Boulevard extends from the northern edge of the installation at Bougainville Boulevard southward to the flightline road. Westover Street extends from the main gate at Bougainville Boulevard southward to the Mako ramp area. The secondary, east-west roads bisect Coral Sea Boulevard and Westover Street at regular intervals (Homestead ARB 2016b).

Vehicle parking areas on the installation are scattered and fragmented. A few consolidated parking and service areas support multiple facilities. One consolidated lot is at the corner of Coral Sea Boulevard and Ploesti Road. A unique north-south pathway links the administrative functions at the north end of the installation with the O&M functions at the south end. This pathway is wide enough to simultaneously accommodate pedestrians, bicyclists, and electric golf carts. The pathway is wide and straight and is crisscrossed by a serpentine, pedestrian path. The pathway is landscaped with trees to provide shade and is lighted at night by electricity from solar collectors (Homestead ARB 2016b).

HS3.11.2 Base Environmental Consequences

The projected change in population that would result from implementation of the proposed AFRC F-35A mission at Homestead ARB is a reduction of 91 base personnel or approximately 2 percent of the base population. This projected change in population and development was used to determine the impact on infrastructure. Since the proposed AFRC F-35A mission results in the loss of base personnel, it is assumed that the current demand for the potable water, wastewater, electric, and natural gas systems is sufficient to support the projected change in population. The

impact of the proposed AFRC F-35A mission on the transportation infrastructure, would be negligible based on the potential minor reduction of on-base traffic.

HS3.11.2.1 Potable Water System

Based on the average usage rate of 125 gallons per day (GPD) (UFC 3-230-03) per person, it is anticipated that the decrease in population (i.e., 91 people) associated with the proposed AFRC F-35A mission at Homestead ARB would reduce the water use demand by 11,375 GPD. This decrease would not result in significant impacts to the potable water system.

HS3.11.2.2 Wastewater

The USEPA estimates that the average person generates approximately 120 GPD of wastewater between showering, toilet use, and general water use (USEPA 2014). Based on this rate, the proposed decrease in population at Homestead ARB (i.e., 91 people) would decrease wastewater discharge by approximately 10,920 GPD. The decrease in wastewater discharge would not result in significant impacts to the wastewater system.

HS3.11.2.3 Stormwater System

The proposed AFRC F-35A mission would require demolition of facilities and construction of new facilities. These projects would disturb approximately 2.3 acres of land.

During the short-term construction period for the proposed AFRC F-35A mission, all contractors would be required to comply with applicable statutes, standards, regulations, and procedures regarding stormwater management. During the design phase, a variety of stormwater controls could be incorporated into construction plans. These could include planting vegetation in disturbed areas as soon as possible after construction; constructing retention facilities; and implementing structural controls (e.g., interceptor dikes, swales [excavated depressions], silt fences, straw bales, and other storm drain inlet protection), as necessary, to prevent sediment from entering inlet structures. Implementation of the AFRC F-35A mission would not result in significant impacts to the stormwater system.

HS3.11.2.4 Electrical System

The U.S. Energy Information Administration (USEIA) estimates that the average household in Florida uses 1.1 MWh per month (USEIA 2014). The proposed decrease in population would reduce the anticipated electrical use at Homestead ARB by approximately 100 MWh per month. This decrease would not affect the power supplied by FPL. Implementation of the AFRC F-35A mission would not result in significant impacts to the electrical system.

HS3.11.2.5 Natural Gas System

The proposed decrease in population would have no effect on the natural gas usage at Homestead ARB. Implementation of the AFRC F-35A mission would not result in significant impacts to the natural gas system.

HS3.11.2.6 Solid Waste Management

Solid waste would continue to be managed in accordance with AFI 32-7042 and the ISWMP with the implementation of the proposed AFRC F-35A mission at Homestead ARB. Using methodology developed by the USEPA (USEPA 2009b), it is estimated that implementation of the proposed AFRC F-35A mission would generate approximately 806 tons of C&D debris for recycling or

removal to landfills. Application of the 60 percent DoD target diversion rate (DoD 2012) for C&D debris would result in approximately 483 tons being reused or recycled, and approximately 323 tons being placed in a permitted construction debris landfill in the region. C&D debris is the responsibility of the contractor performing the work, and contract documents require disposal in a permitted construction debris landfill (Homestead ARB 2013).

Implementation of the AFRC F-35A mission at Homestead ARB would result in a reduction of 91 personnel and their associated dependents. Although this reduction in personnel would result in a minor decrease in municipal solid waste generation, this would have little effect on the municipal solid waste program (collection, disposal, etc.). The South Dade Landfill has an estimated life span through 2029 and would continue to accommodate the municipal solid waste from Homestead ARB (Miami Dade County 2018). Implementation of the AFRC F-35A mission would not result in significant impacts to solid waste management.

Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the base. C&D debris, including debris contaminated with hazardous waste, ACM, lead-based paint (LBP), or other hazardous components, would be managed in accordance with AFI 32-7042 and the installation's ISWMP.

HS3.11.2.7 Transportation

Implementation of the facilities and infrastructure projects associated with the proposed AFRC F-35A mission at Homestead ARB would require the delivery of materials to, and removal of construction-related debris from, construction, demolition, and renovation, sites. Construction-related traffic would comprise a small portion of the total existing traffic volume in the area and on the base. Increased traffic associated with these activities could contribute to increased congestion at the entry gates, delays in the processing of access passes, and degradation of the affected road surfaces. Traffic delays would be temporary in nature, ending once construction activities have ceased. As a result, no long-term impacts to on- or off-base transportation systems are anticipated.

Implementation of the proposed AFRC F-35A mission at Homestead ARB would result in a minor decrease of 91 on-base mission personnel, which would result in a slight reduction in daily commuting traffic to and from the base. No significant impacts to infrastructure would result from implementation of the proposed AFRC F-35A mission at Homestead ARB.

HS3.11.3 Summary of Impacts to Infrastructure

Implementation of the AFRC F-35A mission would not result in changes to any of the utility infrastructure (potable water, wastewater, stormwater, electricity, natural gas and solid waste) on Homestead ARB. In addition, the new mission would also not require any changes to transportation resources including any of the base gates. Therefore, implementation of the proposed mission would result in no significant impacts to infrastructure.

HS3.12 HAZARDOUS MATERIALS AND WASTE

HS3.12.1 Base Affected Environment

HS3.12.1.1 Hazardous Materials

Hazardous materials used by USAF and contractor personnel at Homestead ARB are managed in accordance with AFI 32-7086, *Hazardous Materials Management*, and are controlled through the

base Hazardous Materials Storage Facility. This process provides centralized management of the procurement, handling, storage, and issuance of hazardous materials and turn-in, recovery, reuse, or recycling of hazardous materials.

HS3.12.1.1.1 Aboveground and Underground Storage Tanks

The Homestead ARB Hazardous Material Emergency Planning and Response and Oil Spill Facility Response Plan (Homestead ARB Hazardous Material Plan) represents both the Spill, Prevention, Control, and Countermeasure (SPCC) Plan and Facility Response Plan (FRP) in the Integrated Contingency Plan (ICP) format. This plan covers all operations that handle, transport, store, and utilize hazardous materials, including petroleum products and wastes. The Homestead ARB Hazardous Material Plan describes the measures implemented to prevent petroleum product discharges from occurring and prepares the base to respond in a safe, effective, and timely manner to mitigate the impacts of an uncontrolled discharge. This plan and Installation Emergency Management Plan (IEMP) 10-2 address roles, responsibilities, and response actions for all major spills (Homestead ARB 2014, 2017c).

Homestead ARB has eight aboveground storage tanks (ASTs) with capacities greater than or equal to 10,000 gallons. These ASTs are located at the bulk fuel storage area (2), hydrant pump house (2), base service station (2), fire training area (1), and heated wash rack (1). These ASTs are used to store Jet-A, gasoline, diesel, and propane. Homestead ARB also manages two underground storage tanks (USTs) associated with the Army Air Force Exchange Store BX Shopette. The total Jet-A storage capacity at Homestead ARB is approximately 2,880,000 gallons (Homestead ARB 2018e). Homestead ARB used approximately 8,008,000 gallons of Jet-A in 2017. Homestead ARB receives fuel from commercial tank trucks. Jet-A is delivered to two fuel pits on the flightline apron via the fuel hydrant system which consists of two ASTs and associated pipelines and pump house. Jet-A is also delivered to aircraft via refueling trucks (Homestead ARB 2018e).

HS3.12.1.1.2 Toxic Substances

The Asbestos Management Plan implements AFI 32-1052, *Facility Asbestos Management*, policies and establishes management responsibilities and procedures to accomplish ACM-related activities at Homestead ARB. The plan also describes how the base will carry out ACM-related work (Homestead ARB 2012a). The Civil Engineering Environmental Flight office maintains the Asbestos Database, a permanent file, documenting asbestos-related activities and information on the status of ACM in buildings at Homestead ARB. Based on the plan, all proposed facility demolition, renovation, or removal projects must be reviewed, to the extent possible, to identify the presence of ACM prior to work beginning. Work on ACM projects would only be performed by individuals with a current license from the State of Florida and training in accordance with OSHA and USEPA standards. For any project on base, ACM wastes are removed by the contractor performing the work and handled and disposed of in accordance with federal, state, and local regulations at a waste disposal site authorized to accept such waste.

With regard to LBP, Homestead ARB currently has no residential housing, target housing, or child-occupied facilities as defined by the HUD. Therefore, all base buildings are designated as non-priority buildings and HUD standards do not apply. The LBP Management Plan (Homestead ARB 2012c) provides guidance and sets forth policies for managing LBP in accordance with state and federal regulations. The plan also addresses organizational roles and responsibilities, management practices, the management program, and work procedures and practices. As with ACM, the Civil Engineering Environmental Flight office maintains a LBP database to document the location of LBP on Homestead ARB. All demolition, renovation, and maintenance projects are reviewed to

determine if lead-containing materials are present in the proposed work area. LBP wastes from Homestead ARB are removed and disposed of in accordance with state and federal regulations at a permitted off-base landfill.

Electrical transformers and light ballasts are potential sources of polychlorinated biphenyls (PCBs). No PCBs have been found recently at Homestead ARB but could be present in old transformers and light ballasts (Vespe 2017). PCB wastes are managed in accordance with the Hazardous Waste Management Plan and in compliance with state and federal regulations (Homestead ARB 2012c).

HS3.12.1.2 Hazardous Waste Management

Homestead ARB is classified as a Small-Quantity Generator. Hazardous waste generated, stored, transported, or disposed of by Homestead ARB is regulated by the State of Florida under authority granted to the state by the USEPA. Typical hazardous wastes generated during O&M activities include absorbents, contaminated rags, paint/coating, stripping chemicals, blast media, waste paint-related materials, adhesives, aerosol cans, spent photo development chemicals, and other miscellaneous wastes.

Hazardous wastes at Homestead ARB are managed in accordance with the Hazardous Waste Management Plan (Homestead ARB 2012c). This plan describes the responsibilities, policies, and procedures for managing hazardous waste generated during operations at Homestead ARB. This plan also covers the control and management of hazardous wastes from the point the material becomes a hazardous waste to the point of ultimate disposal, as required by federal and state laws and regulations. In 2017, the base generated approximately 13,400 pounds of hazardous waste, which was disposed of at off-base permitted disposal facilities.

HS3.12.1.3 Environmental Restoration Program

Thirty-two (32) Environmental Restoration Program (ERP) sites at Homestead ARB are administered in accordance with the Management Action Plan (MAP). The MAP describes the integrated, coordinated approach of conducting the ERP activities required at the installation (Homestead ARB 2017d). Environmental response actions are planned and executed under the ERP in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and other applicable laws. Homestead ARB (formerly Homestead AFB) was listed on the USEPA's National Priorities List in August of 1990.

HS3.12.2 Base Environmental Consequences

HS3.12.2.1 Hazardous Materials Management

Implementation of the proposed AFRC F-35A mission at Homestead ARB would not add any new hazardous materials that would exceed the base's current hazardous waste processes. Existing procedures for the centralized management of the procurement, handling, storage, and issuance of hazardous materials and turn-in, recovery, reuse, and recycling of hazardous materials through the base Hazardous Materials Storage Facility are adequate to accommodate the changes anticipated with the replacement of the F-16 mission with the AFRC F-35A mission.

The F-35A was designed to reduce the quantities and types of hazardous materials needed for maintenance of the aircraft. Unlike the F-16 aircraft, the F-35A aircraft does not use hydrazine, cadmium fasteners, chrome plating, copper-beryllium bushings, or primers containing cadmium and hexavalent chromium. No adverse impacts are anticipated to result from implementation of

the AFRC F-35A mission at Homestead ARB. Long-term environmental benefits from the reduced use of hazardous materials are anticipated.

The F-35A aircraft is composed of composite materials, such as carbon fiber, which could pose a health risk under specific circumstances (e.g., when burned as a result of an aircraft crash). Section HS3.4.2.4.2 discusses composite materials and emergency crash response.

HS3.12.2.1.1 Aboveground and Underground Storage Tanks

New and remodeled facilities would require the addition of new ASTs to support generators, as well as new hazardous material and waste containers. The new and remodeled facilities would be constructed with berms and drains leading to oil-water separators (OWSs), if required, to contain potential uncontrolled releases of petroleum products. ASTs 208-1 and 208-2 would be removed with the demolition and replacement of Building 208. The Homestead ARB Hazardous Material Plan and IEMP would subsequently need to be revised to incorporate any changes in facility design, construction operation, or maintenance that materially affects the potential for an uncontrolled release of petroleum products (Homestead ARB 2014, 2017c).

HS3.12.2.1.2 Toxic Substances

Several demolition and renovation projects are planned as part of the proposed AFRC F-35A mission. Any construction, demolition, or renovation project proposed at Homestead ARB would be reviewed to determine if ACM is present. As shown in Table HS3-52, Building 194 is proposed for modification and contains ACM. Table HS3-52 also includes two additional buildings proposed for modification that have the potential to contain ACM. All handling and disposal of ACM wastes would be performed in accordance with the Homestead ARB *Asbestos Management Plan* (Homestead ARB 2012a) and in compliance with federal, state, and local regulations. Before initiating any demolition or renovation project requiring review for ACM, the required notifications to the Miami Dade County, Department of Regulatory and Economic Resources, Division of Environmental Resources Management, would be completed. The Notice of Demolition or Asbestos Renovation form must be submitted at least 10 days before the project start date. Work on ACM projects would only be conducted by persons licensed by the State of Florida and with current certificates of training in accordance with standards established by OSHA and the USEPA. All ACM wastes would be disposed of at an approved landfill.

All renovation and C&D projects proposed at Homestead ARB would be reviewed to determine if LBP or lead containing materials are present, and whether such materials would be disturbed. To the extent possible, the presence of lead within the work area would be identified prior to work beginning. Building 200 is proposed for modification and is known to contain LBP or lead-containing material. Table HS3-52 contains a list of two additional buildings (194 and 208) proposed for modification that have the potential to contain lead. If the presence of lead containing material in the project work area is unknown, the shop and real property records would be reviewed to determine the presence of lead. If the presence of lead containing material in the work area is still unknown, sampling and analysis for lead would be conducted. The handling and disposal of lead wastes would be conducted in accordance with the Homestead ARB *Lead Based Paint Management Plan* (Homestead ARB 2012b) and *Final Hazardous Waste Management Plan* (Homestead ARB 2012c), and in compliance with federal, state, and local requirements and regulations.

Table HS3-52. Toxic Substances Associated with Projects for the AFRC F-35A Mission at Homestead ARB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 208 (storage of AGE)	1969	a	b	c
Renovation				
Building 180 repair egress shop, battery storage	1997	d	d	c
Building 185 repair propulsion shop	1989	d	d	c
Building 191 renovation for flight equipment	1997	d	d	c
Building 192 repair vault and replace hoists	1981	d	d	c
Building 193 electrical upgrades	1993	d	d	c
Building 194 electrical upgrades	1972	X	X	c
Building 200 electrical upgrades and new addition for shop and administrative space	1963	a	b	c
Building 213 construct storage cage	1997	d	d	c

^a Inspections and surveys must be conducted in all buildings prior to undergoing demolition and renovation. Facilities built after 1980 usually do not require inspection (Homestead ARB 2012a).

^b Buildings constructed before 1980 are presumed to contain LBP (Homestead ARB 2012b).

^c PCBs could be present in old transformers and light ballasts (Vespe 2017).

^d Buildings constructed after 1980 are presumed to not contain ACM or LBP.

Key: X = Toxic substance known to occur in the building

Because some of the buildings proposed for renovation or demolition were constructed prior to 1980, it is assumed that those buildings could contain PCB-containing materials (light ballasts and transformers). The buildings that would be affected by demolition and renovation, their years of construction, and the potential for PCB-containing materials to be present are summarized in Table HS3-52. If PCB-containing materials are present, these materials would be removed, handled, and disposed of in accordance with federal and state regulations and the Homestead ARB *Final Hazardous Waste Management Plan* (Homestead ARB 2012c).

Although minor increases in the management requirements for ACM, LBP, or PCB removal are anticipated, no adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at Homestead ARB. Long-term environmental benefits from removal of toxic substances are anticipated.

HS3.12.2.2 Hazardous Waste Management

Homestead ARB would continue to operate as a Small-Quantity Generator and would generate hazardous wastes during various O&M activities associated with the proposed AFRC F-35A mission. Waste-associated maintenance materials include adhesives, sealants, conversion coatings, corrosion prevention compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, cleaners, strippers, tapes, and wipes. No new hazardous materials would be added that exceed the base's current hazardous waste processes. The Homestead ARB Hazardous Waste Management Plan (Homestead ARB 2012c) would be updated to reflect any change in disposal procedures or hazardous waste generators and waste accumulation points. Implementation of the AFRC F-35A operational beddown and mission at Homestead ARB would have a beneficial impact on hazardous waste management. Transition from the F-16 to the F-35A would decrease the volume and types of hazardous waste and waste streams because O&M involving hydrazine, cadmium and hexavalent chromium primer, and various heavy metals have been eliminated or greatly reduced. All hazardous wastes would be handled and managed in accordance with federal, state, and local regulations.

HS3.12.2.3 Environmental Restoration Program

There are 32 ERP sites at Homestead ARB that are administered in accordance with the MAP. None of the proposed construction, demolition, or renovation projects associated with the proposed AFRC F-35A mission at Homestead ARB are on or directly adjacent to active ERP sites. However, there is the possibility that undocumented contaminated soils and/or groundwater from historical fuel spills could be present. If encountered during C&D-related excavations, storage/transport/disposal of contaminated groundwater/soils would be conducted in accordance with applicable federal, state, and local regulations; AFIs; and base policies. Should soil or groundwater contaminants be encountered during C&D activities, health and safety precautions, including worker awareness training, would be required.

HS3.12.3 Summary of Impacts to Hazardous Materials and Hazardous Waste

Implementation of the new mission would not add any new hazardous materials that would exceed the base's current processes. ASTs 208-1 and 208-2 would be removed with the demolition and replacement of Building 208. The Homestead ARB Hazardous Material Plan and IEMP would subsequently need to be revised to incorporate any changes in facility design, construction operation, or maintenance that materially affects the potential for an uncontrolled release of petroleum products. Three of the buildings proposed for demolition or renovation could contain ACM and LBP. Prior to demolition or renovation, Homestead ARB would complete the appropriate notifications and complete the abatement work in accordance with applicable plans and per all local, state and federal requirements. None of the construction would affect ERP sites. Should contaminated media be encountered during construction, storage/transport/disposal of contaminated media would be conducted in accordance with base plans and applicable regulations. Implementation of the new mission would not result in significant impacts to hazardous materials and wastes.

HS4.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (federal or non-federal) undertakes such other actions” (40 *CFR* 1508.7). In this section, an effort has been made to identify past and present actions in the Homestead ARB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the AFRC F-35A mission at Homestead ARB are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the AFRC F-35A mission at Homestead ARB and in associated airspace.

Homestead ARB is an active military installation that undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analyses will be conducted, as necessary.

HS4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

On 24 August 1992, Hurricane Andrew nearly destroyed Homestead AFB, and 2 years later the Base Realignment and Closure (BRAC) Commission recommended closure due to the damage. In January 1994, the USAF completed an EIS on the disposal of Homestead AFB and the base was officially closed in April 1994. In 1994, a portion of the former Homestead AFB was realigned to Homestead Air Reserve Station (ARS) under BRAC. In 2003, Homestead ARS became Homestead ARB. As part of this, the USAF retained approximately 1,943 acres for Homestead ARB and the remaining acres were divided into parcels and transferred to other entities.

Table HS4-1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the AFRC F-35A mission at Homestead ARB. Table HS4-1 briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the AFRC F-35A mission at Homestead ARB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Homestead ARB and training airspace.

Table HS4-1. Past, Present, and Reasonably Foreseeable Actions at Homestead ARB and Associated Region

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions				
Homestead ARB IDP	482 FW	Future	The IDP includes 17 short-range projects, 4 medium-range projects and 4 long-range projects. The short-range projects range in size from as large as the construction of a new corrosion control hangar to parking lot repairs. Four projects have been identified for medium-range development, the largest of which is the construction of a new fitness facility. The long-range development plan includes four projects. These include construction of a consolidated operations facility, road and parking improvements across the base and construction of a new simulator facility.	Noise, Air Quality, Safety, Soil and Water Resources, Transportation.
Construction of Special Operations Command South Facility	Special Operations Command South/Homestead ARB	Past	Construction of a new 125,000 square foot multi-story facility for Special Operations Command South on 28 acres.	Noise, Air Quality, Soil and Water Resources, Transportation
Entry Control Complex	482 FW/Homestead ARB	Present	Construct a new entry control complex on Homestead ARB.	Noise, Air Quality, Soil and Water Resources, Transportation
Fleet Storage and Maintenance Facility	USAF	Future	Construct a new storage and maintenance facility on Homestead ARB.	Noise, Air Quality, Infrastructure, Traffic, Land Use and Recreation
Conservation Easement Purchases		Past, Present, Future	Polk County and APAFR were awarded a \$1.5 million dollar grant in 2015 to purchase conservation easements around the range.	Biological Resources
APAFR JLUS	USAF	Past, Present, Future	In 2010 the USAF worked with the Central Florida Regional Planning Council to develop the APAFR JLUS (CFPRC 2010). The JLUS includes numerous community outreach measures, various environmental protection policies and recommendations to implement Military Influence Planning Areas.	Airspace, Safety
APAFR Range Improvements	USAF	Past, Present, Future	Various facility projects are planned for APAFR. These include an addition to Building 77, runway repairs, installation of smart infrastructure, construction of a deployed unit complex, linking of airspace over water to land to improve training and range/airspace upgrades to support advances in aircraft and weapons technology.	Airspace, Safety
Atlantic Fleet Testing and Training Phase III	Navy	Past, Present, Future	The Navy completed an EIS in September 2018 for the Atlantic Fleet Testing and Training. This training includes training in the Gulf of Mexico.	Airspace, Safety, Noise

Table HS4-1. Past, Present, and Reasonably Foreseeable Actions at Homestead ARB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Non-Military (Federal) Actions				
Comprehensive Everglades Restoration Plan (CERP)	USFWS/Everglades National Park	Current-Future	Several CERP projects are intended to improve flows in and around Everglades National Park, including the de-compartmentalization of Water Conservation Area 3, Everglades National Park seepage management, the C-111 spreader canal project, the CERP Master Recreation Plan, the Central Everglades Planning Project, and the Water Control Plan.	Land Use, Biological Resources
Non-Military (Private Actions)				
Multi-model Complex and Parking Garage	Private Developer/City of Homestead	Future	This multilevel structure will contain a six and one-half story parking garage screened by aluminum canopies. It will contain an open plaza plus retail shops, ten movie theaters, 14 lanes of bowling, a bar, at least one restaurant, and public meeting rooms. A transit facility will be built to the south of the development.	Noise, Air Quality, Socioeconomics
Palm Drive Development	Private Developer/City of Homestead	Future	This project is a 10-acre development off of Palm Drive includes plans for 92 twin homes along a private street.	Noise, Air Quality, Socioeconomics
Kingman Commons Subdivision	Private Developer/City of Homestead	Future	This project includes the construction of 247 single family homes on 77 acres.	Noise, Air Quality, Socioeconomics
Turkey Point Power Plant Expansion	Florida Power and Light/Turkey Point	Current-Future	Development of two new nuclear units at the existing Turkey point site on Biscayne Bay. This expansion also includes various transmission line corridors that extend from Turkey Point to Miami either via a western corridor or an eastern corridor.	Noise, Air Quality, Infrastructure, Biological Resources, Land Use and Recreation
American Dream Miami indoor theme park	Disney/North Miami-Dade County	Future	This development would include a resort, a mall and a proposed housing-office park.	Noise, Air Quality, Infrastructure, Traffic, Land Use and Recreation
Walmart	Private	Past	The Walmart was constructed in early 2014 approximately 0.7 mile west of the North Gate.	Noise, Air Quality, Infrastructure, Traffic, Land Use and Recreation
FedEx Distribution Center	Private	Past	In April 2017, a private developer completed construction of a 150,000 square foot warehouse building to be leased to FedEx as a distribution center. The site is located directly north of Homestead ARB and encompasses approximately 50 acres.	Noise, Air Quality, Infrastructure, Traffic, Land Use and Recreation
State and Local				
Homestead Downtown Development	City of Homestead and Private Developers/Homestead	Current and Future	Multiple projects including a new City Hall, a new police station, a new fire station, the Seminole Theater Cultural Center, implementation of the National Park Trolley system. Additional development included the Palace Garden retirement facility, an extended stay facility, a Publix Supermarket, the Fresenius Dialysis Center and multiple residential developments.	Noise, Air Quality, Socioeconomics

HS4.2 CUMULATIVE IMPACTS

The following analysis considers how the impacts of the actions in Table HS4-1 might affect or be affected by the AFRC F-35A mission at Homestead ARB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the AFRC F-35A mission at Homestead ARB is considered alone. Table HS4-2 provides a summary of the cumulative effects. As shown in Table HS4-2, safety, cultural resources, infrastructure, and hazardous materials and waste are not anticipated to contribute to cumulative effects. Cumulative effects are described for airspace, noise, air quality, soil and water resources, biological resources, land use and recreation, socioeconomics, and environmental justice and protection of children. Climate change is also described in this section because changes in climate have the potential to cumulatively impact other resource areas.

Table HS4-2. Summary of Cumulative Effects for Homestead ARB

Resource Area	AFRC F-35A Mission	Past, Present, and Reasonably Foreseeable Actions ^a	Cumulative Effects
Airspace	■	■	■
Noise	■	■	■
Air Quality	○	■	○
Safety	○	○	○
Soil and Water Resources	■	■	■
Biological Resources	■	■	■
Cultural Resources	○	○	○
Land Use and Recreation	■	■	■
Socioeconomics	■	○	■
Environmental Justice and Protection of Children	■	■	■
Infrastructure	○	○	○
Hazardous Materials and Waste	○	○	○

^a When determining the potential for significance, past and ongoing actions in the region were considered as part of the baseline or existing conditions in the region surrounding Homestead ARB and the airspace (e.g., the cumulative noise impact of past and present missions at Homestead ARB were modeled under baseline conditions).

Key: ○ = not affected or beneficial impacts

■ = affected but not significant, short to medium term, impacts that range from low to high intensity

● = significant impacts, that are high in intensity or are long-term

HS4.2.1 Airspace

HS4.2.1.1 Airfield Operations

No present and/or known reasonable foreseeable future actions have the potential to interact with the minor increase in airfield operations that would result from implementation of the AFRC F-35A mission at Homestead ARB. Therefore, there is no potential for cumulative impacts to airfield operations or the management and configuration of the Class D and Miami Class B airspace surrounding this airfield environment.

HS4.2.1.2 Training Airspace and Ranges

The primary airspace proposed for use by AFRC F-35A pilots operating from Homestead ARB is offshore Warning Areas W-465A, W-465B and W-465D. The primary range proposed for use by AFRC F-35A pilots operating from Homestead ARB is the APAFR. The offshore Warning Areas and APAFR are identified on Figure HS2-2.

Regarding the primary airspace and range proposed for use, no past, present or reasonably foreseeable actions proposed for W-465A, W-465B, W-465D or APAFR would combine with the AFRC F-35A aircraft operations to result in significant impacts to any of the resource areas described in this EIS.

HS4.2.2 Noise

Cumulative noise impacts were evaluated for construction related noise and for the impact of aircraft noise resulting from operations in the airfield and airspace environments near Homestead ARB. Aircraft noise would affect off-base land uses with noise conditions consistent with the JLUS identified noise conditions. Community planning efforts to prevent incompatible land development near Homestead ARB would be expected to continue to reduce noise impacts in the long-term by avoiding incompatible development of new noise-sensitive land uses. The JLUS and purchase of APAFR conservation easements are examples of actions taken to prevent incompatible development.

Private and state/municipal government-sponsored land development actions could potentially affect noise impacts in the long-term by increasing the number of noise-sensitive locations in areas exposed to elevated noise levels. Military planners assess such projects for mission compatibility on a case by case basis, and contribute the results of their assessment as part of the civilian development planning process. Noise generated on-site during the construction and operation of privately-owned properties is localized and qualitatively consistent with surrounding existing noise environments in adjacent developed areas. There would be no cumulative additional off-base aircraft noise impacts associated with past, present, or reasonably foreseeable future actions.

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) occurring during the same time periods. C&D projects are a regular occurrence on and near active USAF installations such as Homestead ARB. C&D noise would be localized and temporary. Construction work is generally limited to normal working hours (i.e., 7:00 A.M. to 5:00 P.M.). Furthermore, the projects are or would be located in an acoustic environment that includes elevated aircraft operations noise levels. In the instance that multiple C&D projects affect a single area at the same time, construction noise would be a slightly more noticeable component of the acoustic environment.

Several actions listed in Table HS4-1 would occur in the AFRC F-35A training airspace ROI and could generate noise that would be additive with noise generated by AFRC F-35A training. The Atlantic Fleet Testing and Training Phase III EIS, which was completed in September 2018, includes Navy training in the Gulf of Mexico. Although Navy training in Warning Areas would overlap spatially with proposed training by the AFRC F-35A mission, both activities would occur over very large areas, and noise events in any given locations would remain infrequent. The APAFR Range Improvements Environmental Assessment (EA) is currently being prepared, and noise impacts associated with the action are not known at this time.

HS4.2.3 Air Quality

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Homestead ARB. These projects would generate the same types of construction-related impacts as described for the proposed AFRC F-35A mission (e.g., fugitive dust emissions, increases in construction-related criteria pollutant emissions). Although implementation of the AFRC F-35A mission would result in minor

air emission increases of all pollutants except VOCs, these increases, combined with air emission increases from past, present, and reasonably foreseeable future actions, would not prevent this area from maintaining the NAAQS or would result in significant cumulative impacts to the air quality.

The implementation of the proposed AFRC F-35A mission at Homestead ARB would not result in significant impacts to air quality. No known projects, when added to the emissions that would be generated by the AFRC F-35A mission, would result in significant impacts to air quality.

HS4.2.4 Soil and Water Resources

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Homestead ARB. These construction projects would increase the amount of soil disturbed and have the potential to increase erosion and sedimentation into surface water features. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the soil and water resources at Homestead ARB would not be significant.

HS4.2.5 Biological Resources

The additional C&D projects described in Table HS4-1 would be anticipated to have similar types of impacts to vegetation, wildlife, and special status species as those impacts described for the construction impacts for the proposed AFRC F-35A mission. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on biological resources at Homestead ARB would not be significant. The USAF has completed the formal Section 7 consultation process with the USFWS for current base operations at Homestead ARB.

The aircraft operations associated with implementation of the AFRC F-35A mission at Homestead ARB would not result in significant impacts to wildlife, including threatened and endangered species and migratory birds. Projects such as the APAFR Range Improvement may result in similar impacts to wildlife as those described in this EIS. Other projects such as the purchase of conservation easements around existing ranges would provide a positive impact to biological resources. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the biological resources at Homestead ARB would not be significant.

HS4.2.6 Land Use and Recreation

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects, construction from private and state and local development) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Homestead ARB. Construction projects would continue to comply with existing zoning ordinance. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on land use and recreation at Homestead ARB would not be significant.

Aircraft operations associated with implementation of the AFRC F-35A mission at Homestead ARB would not result in significant impacts to land use and recreation. Increased noise would impact some

recreational facilities and could reduce the enjoyment of those facilities for some persons. None of the projects listed in Table HS4-1 would contribute to aircraft noise at Homestead ARB.

HS4.2.7 Socioeconomics

The C&D projects associated with the AFRC F-35A mission would provide short-term, economic benefits to surrounding areas through employment of construction workers and through the purchase of materials and equipment. The short-term impact of implementing the proposed mission combined with any or all of the projects listed in Table HS 4-1 would result in negligible cumulative impacts to socioeconomics in the area. In addition, the decrease in personnel associated with the proposed mission is also not anticipated to result in cumulative impacts to housing, schools, or other socioeconomic resources.

HS4.2.8 Environmental Justice and the Protection of Children

The proposed C&D projects on and near Homestead ARB would not result in any cumulative impacts to environmental justice populations. Noise resulting from the operation of F-35A aircraft would affect people living near the installation. As discussed in Section HS3.10.2, implementation of the AFRC F-35A mission at Homestead ARB would result in disproportionate impacts to minority and low-income populations. Implementation of the proposed action in combination with one or more of the past, present, and reasonably foreseeable future actions would not result in additional cumulative impacts to environmental justice populations beyond the impacts identified for the AFRC F-35A mission.

HS4.2.9 Climate Change

Florida and the surrounding region could experience a continuing of recent upward trends in average temperatures, an increase in the intensity of naturally occurring droughts, an increase in projected hurricane rates, and a projected 1- to 4-foot rise in sea level by 2100 (USGCRP 2017).

Increases in temperature, drought intensity, hurricane rates, and sea level rise could interact with resource areas such as air quality, water resources, and socioeconomics. Increasing temperatures have been shown to increase ground level ozone and particulates (Orru et al. 2017). Increases in drought intensity could impact water availability. Potential socioeconomic impacts could include increased costs associated with poor air quality, water availability, and damage from hurricanes.

While Homestead ARB has operations to manage the recent temperature changes, exacerbation of climate conditions in the future could increase the cost of proposed operations and could impede operations during extreme events. Additional measures could be needed to mitigate such impacts over the operational life expectancy of the F-35A.

HS4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Homestead ARB, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term (e.g., air emissions from

construction) or longer lasting but negligible (e.g., public service increases). Those limited resources that could involve a possible irreversible or irretrievable commitment are discussed below.

Should the AFRC F-35A mission be located at Homestead ARB, some land in the cantonment area would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (e.g., wiring, insulation, windows, and drywall) and exterior construction (e.g., concrete, steel, sand, and brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Privately owned vehicles use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase; however, this additional use is not expected to significantly affect the availability of the resources.

CHAPTER 4

BASE ALTERNATIVE: NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE



FW1.0 NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE OVERVIEW

Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB) is located in the western portion of Fort Worth, directly south of Lake Worth, in Tarrant County, Texas (Figure FW1-1). The installation encompasses approximately 1,805 acres and is bordered to the east by residential development, to the west by the Lockheed Martin assembly plant and residential development, to the north by Lake Worth, and to the south by light industrial and commercial development. The primary runway at NAS Fort Worth JRB, Runway 18/36, is 12,000-feet long and 200-feet wide (Figure FW1-2).

NAS Fort Worth JRB is operated by the U.S. Department of Navy (DoN) and is home to a variety of units including U.S. Navy, U.S. Marine Corps (USMC), U.S. Air Force (USAF), Army, and Texas Air National Guard (TANG) units. The NAS Fort Worth JRB mission is to provide support and training for Air Force Reserve Command (AFRC) and Air National Guard (ANG) fighter and airlift units in all branches of the Armed Services. Headquarters (HQ) AFRC Tenth Air Force, the AFRC 301st Fighter Wing (301 FW), and the TANG 136th Airlift Wing (136 AW) are based at the installation.

The 301 FW is the largest tenant unit on NAS Fort Worth JRB and is the only AFRC fighter unit in the State of Texas. Their mission is to provide combat ready warriors to operate the USAF expeditionary fight, win America's wars, and protect America's worldwide interests. The 301 FW operates 24 F-16 aircraft at NAS Fort Worth JRB.

The 136 AW operates C-130H2 aircraft at NAS Fort Worth JRB, and Marine Aircraft Group 41 (MAG-41) operates the FA-18A Hornet and the KC-130T Hercules at the base. The Army Reserve operates C-12 aircraft from the base. Test pilots from the Lockheed Martin assembly plant adjacent to west side of Runway 18/36 fly a variety of different aircraft, including the F-35A, B, and C models.

Refer to Chapter 1 for the purpose and need for the AFRC F-35A mission, a description of the F-35A aircraft characteristics, and information about public involvement and agency coordination. Refer to Chapter 2 for the description of the proposed action and alternatives, and a description of the strategic basing and alternative identification processes. In the base-specific sections that follow, Section FW2 presents the description of the proposed action at NAS Fort Worth JRB. Section FW3 addresses baseline conditions and environmental consequences that could result from implementation of the proposed action at NAS Fort Worth JRB. Section FW4 identifies other, unrelated past, present, and reasonably foreseeable future actions in the affected environment and evaluates whether these actions would cause cumulative effects when considered along with the AFRC F-35A beddown action. This section also presents the irreversible and irretrievable resources that would be committed should the proposed action be implemented at NAS Fort Worth JRB.

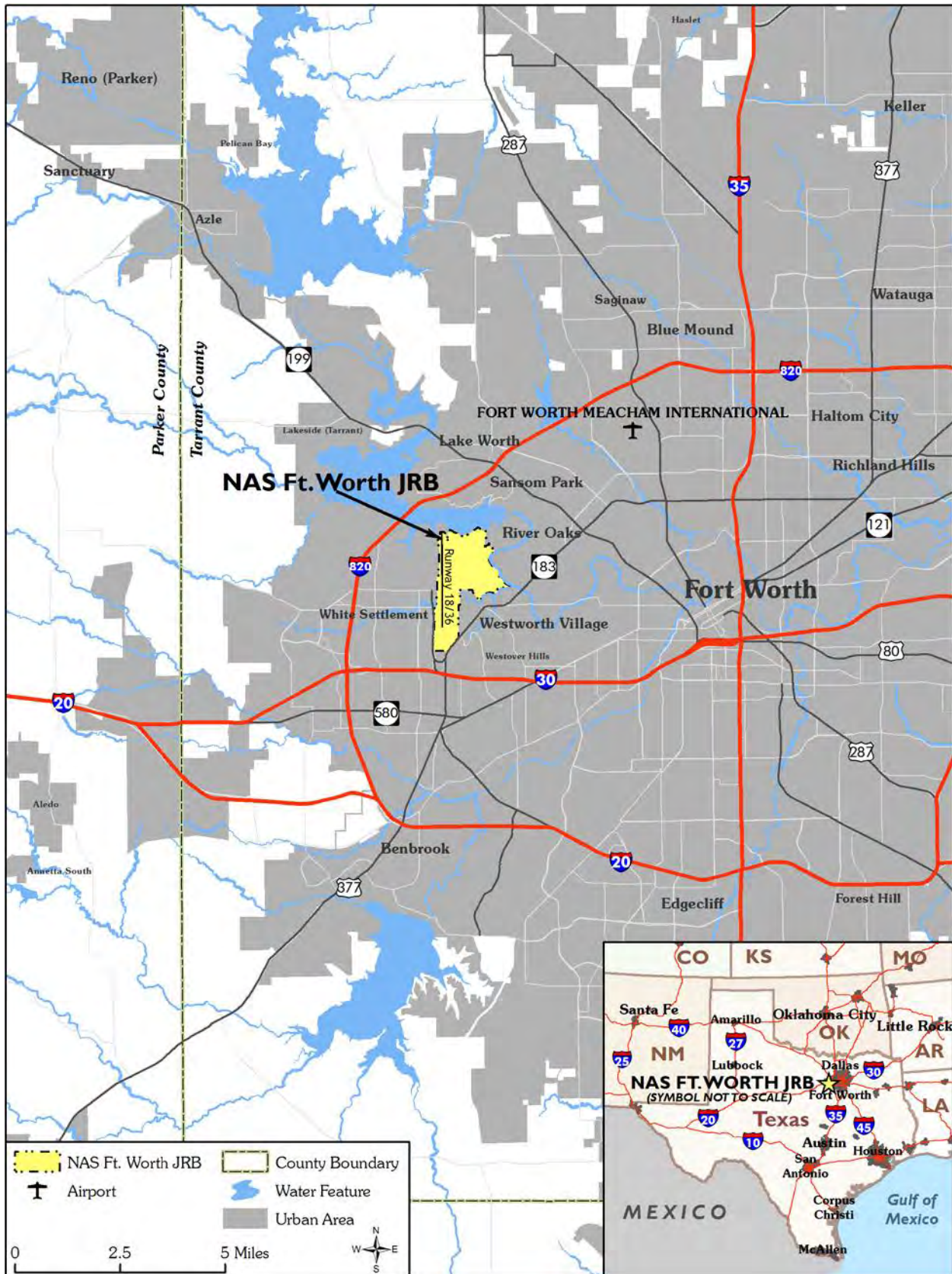


Figure FW1-1. Regional Location of NAS Fort Worth JRB

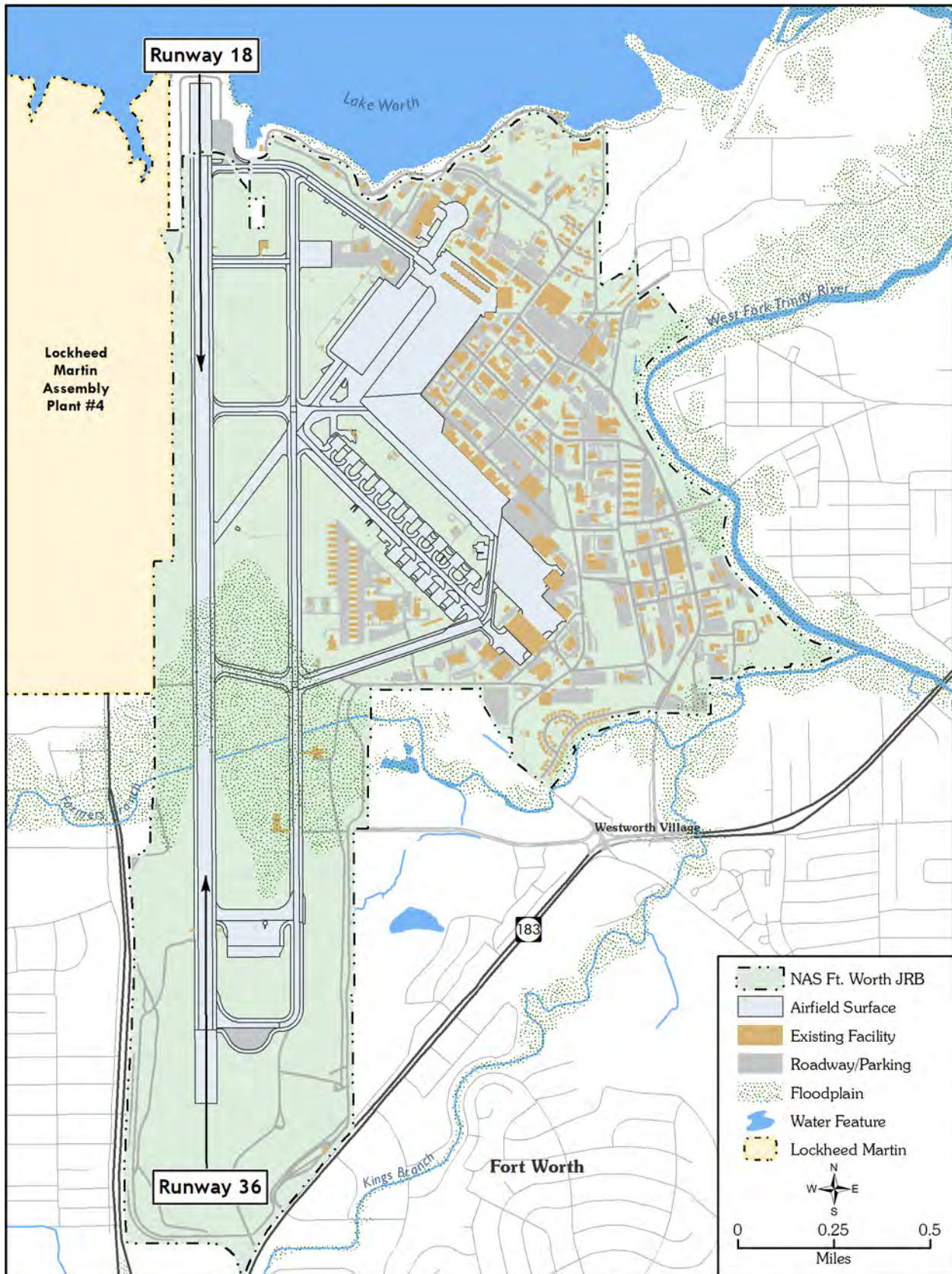


Figure FW1-2. Primary Runways at NAS Fort Worth JRB

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FW2.0 NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE ALTERNATIVE

This section presents the specifics of the proposed action at NAS Fort Worth JRB. Four elements of the proposed action have the potential to affect the base and associated airspace: (1) facility and infrastructure projects to support the F-35A beddown; (2) personnel changes necessary to meet F-35A requirements; (3) airfield operations conducted by AFRC F-35A pilots; and (4) airspace and range use by AFRC F-35A pilots. Each element is explained in the following subsections. In addition, this section also presents state and federal consultation efforts and associated permits that would be required should NAS Fort Worth JRB be selected to receive the AFRC F-35A mission.

Under the proposed action, 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft would start to arrive at NAS Fort Worth JRB in early 2024. Delivery of the full complement of 24 F-35A aircraft and 2 Backup Aircraft Inventory (BAI) is anticipated to take 2 years. At that time, the F-35A aircraft would completely replace the existing 24 F-16 aircraft assigned to the 301 FW. The F-16 aircraft that would be replaced by the F-35A aircraft would be reassigned or removed from the USAF inventory.

FW2.1 FACILITIES AND INFRASTRUCTURE

To support the AFRC F-35A mission, additional infrastructure and facility modifications would be required at NAS Fort Worth JRB (Table FW2-1). A total of 17 different improvement projects and 5 demolition projects would be implemented in 2021 (Figure FW2-1). The USAF estimates that \$21.7 million in Military Construction (MILCON) expenditures would be required to implement the proposed AFRC F-35A mission at NAS Fort Worth JRB.

Table FW2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at NAS Fort Worth JRB

Project ^a	Size (ft ²) ^b
Demolition	
Building 1604	2,544
Building 1606	780
Building 1608	5,520
Building 1632	992
Building 1641	1,722
Demolition Total	11,558
Renovation	
Building 1602 electrical upgrade	NA ^c
Building 1628 electrical and ventilation upgrades	NA ^c
Building 1637 renovate for logistics readiness	NA ^c
Building 1637 addition for battery storage	2,970
Building 1643 electrical upgrade, classified storage, renovate egress shop	648 ^d
Building 1648 renovate for gun maintenance and expand vault door	NA ^c
Building 1650 renovate for Logistics Readiness Squadron parts storage	10,194 ^d
Building 1655 replace hoist and expand door	NA ^c
Building 1656 electrical upgrade	NA ^c
Building 1790 electrical and ventilation upgrades	NA ^c
Building 1792 renovate for logistics system	NA ^c
Building 3355 expand trailer maintenance area	572
Renovation Total	13,736

Table FW2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at NAS Fort Worth JRB (Continued)

Project ^a	Size (ft ²) ^b
New Construction	
Construct Office of Special Investigations building	3,253
Construct a maintenance support section building	5,500
Construct a hazardous material storage building	1,584
Construct two sunshades	12,800
Construct a combined squadron operations and F-35A flight simulator building	49,000
New Construction Total	59,337

^a Data in this table were obtained from AFRC in 2017 and in 2019 (NAS Fort Worth JRB 2017a, NAS Fort Worth JRB 2019).

^b Size is the area covered by the footprint of the proposed facilities and consists of the designed limits of the structure, facility, apron, road, access, and/or parking lot.

^c Includes minor interior upgrade projects that do not have a square footage.

^d Interior renovation only.

New construction and facility additions would require construction grading, clearing, and equipment laydown space. To account for this disturbance, this analysis also includes disturbance areas in addition to the facility size. These disturbance areas encompass 20 feet adjacent to linear features (e.g., roads, utility extensions, etc.) and 50 feet around the facility footprint for all other facilities. Repairs of existing aircraft aprons or ramps are not included in these calculations because these repairs would occur on paved or concrete surfaces. Interior renovations are also not included in these calculations because these renovations would not create ground disturbance or a change in impervious surfaces.

New construction and facility additions would also result in changes to existing impervious surfaces. It is assumed that any demolition would include demolition of the building slab and result in a reduction in impervious surfaces. Table FW2-2 provides a summary of the ground disturbance and changes in impervious surfaces.

Table FW2-2. Summary of Facility and Infrastructure Projects for NAS Fort Worth JRB

Project Type	Ground Disturbance (Acres)	Change in Impervious Surfaces (Acres)
Demolition	2.5	-0.3
Renovation ^a	0.9	+0.0
New Construction	4.3	+1.5
Total	7.7	+1.2

^a Totals do not include interior renovation projects.

Facility siting on military installations is predominantly functional-use based (i.e., locating facilities with like functional uses adjacent to one another). However, safety and compliance with policies and regulations are also used as planning factors. During the planning phase for a new aircraft mission beddown, military planners consider a variety of alternatives necessary to meet the requirements of the new mission, including the use of existing facilities that can be partially or entirely used to meet mission requirements. Depending on available infrastructure, facilities, and, to some degree, personnel available to support the AFRC F-35A mission, proposed construction, demolition, and renovation projects vary between alternatives. The facility siting analysis for each alternative base considered the functional requirements of the AFRC F-35A mission and compared them with the existing infrastructure and environmental constraints at each alternative base.

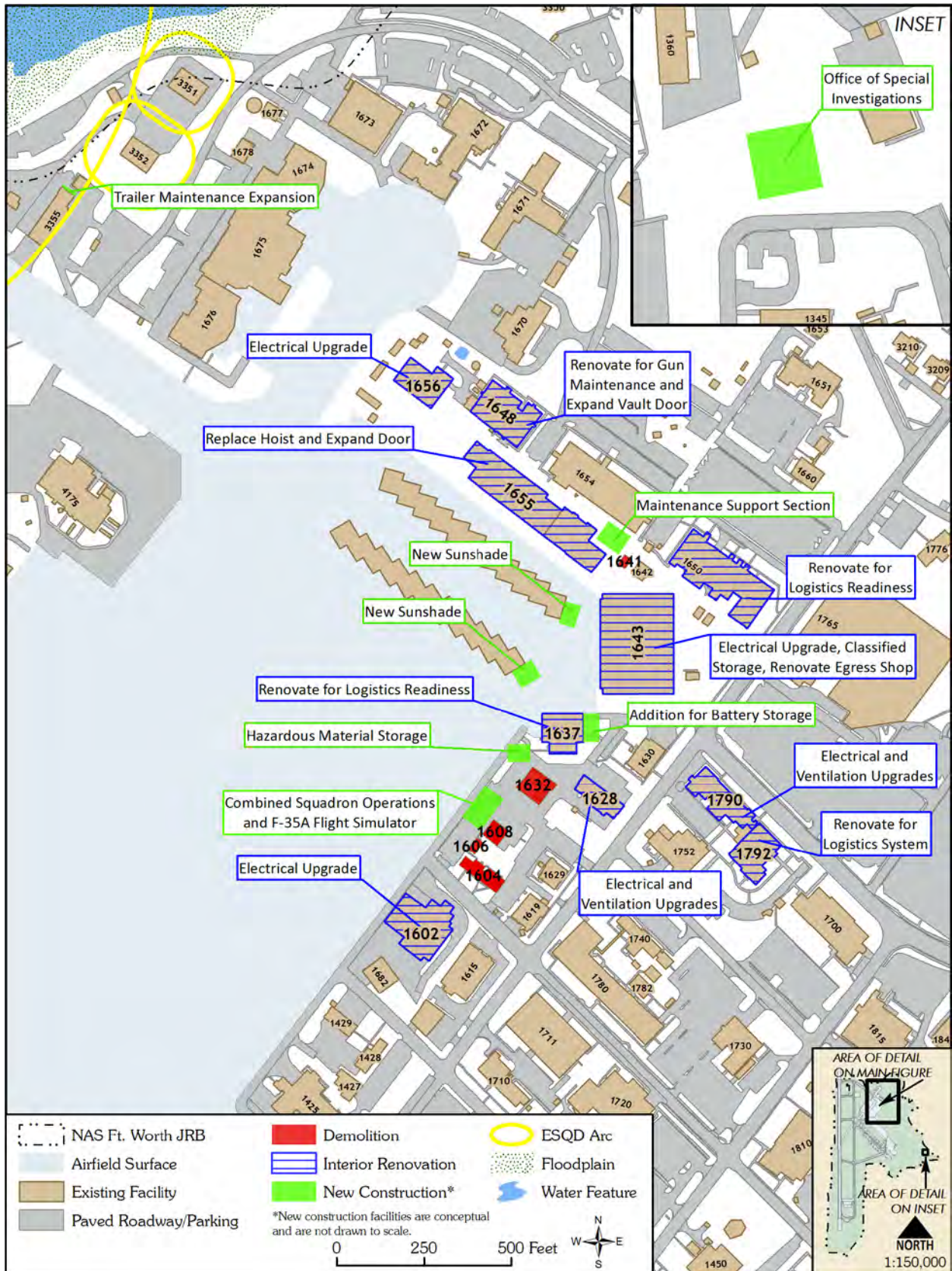


Figure FW2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at NAS Fort Worth JRB

New construction siting is a stepwise process that includes identifying suitable sites relative to existing facilities and base infrastructure to provide operational efficiencies and suitable cost-benefit values. Utility siting, including the re-routing of existing utilities or the installation of new utility infrastructure (e.g., power, water, sewer, and communication lines), could also be required to accommodate the new mission. The siting process for utilities focused on using existing conduits and previously disturbed areas or areas that would also be disturbed for facility modifications. Temporary construction laydown areas could also be required to support construction. Construction laydown areas would be located in developed or semi-developed areas, or previously disturbed or paved areas. Construction laydown areas not proposed for permanent disturbance would be returned to their pre-construction state upon completion of construction. All construction contracts would be managed under Unified Facilities Criteria (UFC) 3-101-01, *Best Management Practices*, and attainment of a Leadership in Energy and Environmental Design (LEED) Silver certification.

Construction and renovation projects within the 65-decibel (dB) noise contour would include acoustical design considerations for façade elements and interior design requirements per UFC 3-101-01. Land use would be consistent with Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*; Chief of Naval Operations Instruction (OPNAVINST) 11010.36C, *AICUZ Program*; and Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager’s Guide*.

FW2.2 PERSONNEL

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would require sufficient and appropriately skilled military and civilian personnel to operate and maintain the F-35A aircraft and to provide other necessary support services. Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in a decrease of 102 positions. This would constitute a 1.1 percent decrease in base staffing (Table FW2-3).

Table FW2-3. Personnel Changes for the AFRC F-35A Mission at NAS Fort Worth JRB

Baseline Personnel			Proposed F-35A Authorized Personnel			Percent Change to Total Personnel
Total Authorized Personnel	AFRC Authorized Personnel	Percent of Total Authorized Based Personnel	AFRC F-35A	Change to AFRC Unit Personnel Positions	Percent Change to AFRC Unit Personnel	
9,600	1,751	18.24%	1,649	-102	-5.83%	-1.1%

FW2.3 AIRFIELD OPERATIONS

The 301 FW is an integral part of the Combat Air Forces (CAF). The CAF defends the homeland of the United States and deploys forces worldwide to meet threats and ensure the security of the nation. To fulfill this role, the 301 FW must train as it would fight.

The USAF anticipates that once the full complement of aircraft is received, the 24 F-35A aircraft would be used to fly 11,580 operations per year from the airfield. Based on the proposed requirements and deployment patterns, AFRC F-35A pilots would fly additional operations during deployments, or at other locations for exercises or in preparation for deployments. In addition, AFRC F-35A pilots stationed at NAS Fort Worth JRB could participate in remote training exercises. Some of these missions could involve ordnance delivery training or missile firing exercises (within the scope of existing National Environmental Policy Act [NEPA] documentation) at ranges approved for such use (e.g. Falcon Range on Fort Sill, Oklahoma).

Conducting 11,580 operations per year would represent an increase of 3,056 annual airfield operations compared to current F-16 aircraft operations (Table FW2-4). Of the 25,292 total airfield operations currently conducted at NAS Fort Worth JRB, 34 percent are conducted by the 301 FW. Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in a 12.1 percent increase in annual total airfield operations.

Table FW2-4. NAS Fort Worth JRB Baseline F-16 and Proposed F-35A Annual Airfield Operations

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
Based F-16	8,524	0
Proposed F-35A	0	11,580
Other Aircraft	16,768	16,768
Total Airfield Operations	25,292	28,348
Percent Change		12.1%

^a Total baseline operations is for the last year. Data in this table were collected from the operations staff at NAS Fort Worth JRB in 2017 (NAS Fort Worth JRB 2017a).

AFRC F-35A pilots would perform departure and landing procedures similar to those currently conducted by the F-16 pilots at the installation. Due to differences in aircraft characteristics and performance, the flight profiles and tracks used by AFRC F-35A pilots would slightly vary from those currently used by F-16 pilots. F-16 pilots from the 301 FW average 260 flying days per year. For the purposes of this analysis and to compare the alternatives on an equal basis, the total number of possible flying days for AFRC F-35A pilots is also assumed to be 260, including both Saturday and Sunday (on Unit Training Assembly [UTA] weekends).

Afterburners are used on occasion by F-16 pilots at NAS Fort Worth JRB when additional power is needed. As described in Chapter 2, Section 2.3.3, the USAF evaluated three different scenarios for afterburner use. Scenario A is afterburner use on 5 percent of takeoffs. Scenario B is afterburner use on 50 percent of takeoffs. Scenario C is afterburner use on 95 percent of takeoffs.

AFRC F-35A pilots would operate similar to F-16 pilots. Currently, F-16 operations primarily begin at 7:00 A.M. and conclude by 10:00 P.M. on weekdays and on UTA weekends (except when weather contingencies or special exercises cause operations to occur after 10:00 P.M.). After-dark training is normally scheduled to be completed before 10:00 P.M. After-dark training for AFRC F-35A pilots would also be scheduled to be completed before 10:00 P.M. Because of the capabilities and expected tactics of the F-35A aircraft, AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC F-16 pilots depending on weather or special exercises.

FW2.4 AIRSPACE AND RANGE USE

Table FW2-5 identifies the Federal Aviation Administration (FAA)-designated airspace currently used by NAS Fort Worth JRB F-16 pilots that is also proposed for use by AFRC F-35A pilots. Implementation of the AFRC F-35A mission would not require any new airspace or changes to existing airspace boundaries, and the type and number of ordnance used at any of the ranges approved for such use could decrease.

Table FW2-5. NAS Fort Worth JRB Training Airspace

FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Brady High MOA	6,000	UTBNI 18,000
Brady Low MOA	500 AGL	UTBNI 6,000
Brady North MOA	500 AGL ^c	UTBNI 18,000

Table FW2-5. NAS Fort Worth JRB Training Airspace (Continued)

FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Brownwood 1 East & West MOAs	7,000	UTBNI 18,000
Brownwood 2 East & West MOAs	7,000	UTBNI 18,000
Brownwood 3 & 4 MOAs	13,000 ^c	UTBNI 18,000
Hood MOA	2,000	UTBNI 10,000
Hood High MOA	10,000	UTBNI 18,000
Lancer MOA	6,200 (operationally 6,500)	UTBNI 18,000
Gray MOA	2,000	10,000
Sheppard 1 MOA	8,000	UTBNI 18,000
Rivers MOA	8,000	UTBNI 18,000
Washita MOA	8,000	UTBNI 18,000
Falcon Range R-5601A, B, C & H	Surface	40,000
Falcon Range R-5601D, F & J	500 AGL	40,000
Falcon Range R-5601E	500 AGL	6,000
Falcon Range R-5601G	500 AGL	8,000
Falcon Range R-5602A & B	40,000	60,000
Fort Hood R-6302A, C & D	Surface	UTBNI 30,000
Fort Hood R-6302B	Surface	UTBNI 11,000

^a Airspace used by F-35A pilots would include Air Traffic Control Assigned Airspaces (ATCAAs) that occur over the Military Operations Areas (MOAs) included in the table. The ATCAAs will accommodate training above 18,000 feet mean sea level (MSL).

^b Floor altitudes could exclude certain areas. See FAA Sectional Charts for exclusions.

^c Altitudes established by Letters of Agreement (LOAs) between the FAA and the 301 FW.

Note: MSL is the elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level. The elevation of a mountain, for example, is marked by its highest point and is typically illustrated as a small circle on a topographic map with the MSL height shown in either feet or meters or both. Because aircraft fly across vast landscapes, where points above the ground can and do vary, MSL is used to denote the “plane” on which the floors and ceilings of Special Use Airspace (SUA) are established and the altitude at which aircraft must operate within that SUA.

Key: AGL = above ground level; UTBNI = Up To But Not Including

Source: Brownsville 2018, Dallas Fort Worth 2018, and San Antonio 2018 FAA Sectional Charts

FW2.4.1 Airspace Use

AFRC F-35A pilots would conduct missions and training activities necessary to fulfill the multi-role responsibility of this aircraft. All F-35A flight activities would occur in existing airspace. AFRC F-35A pilots would operate in the same airspace used by F-16 pilots from the 301 FW, but at higher altitudes. F-16 pilots from the 301 FW use Military Operations Areas (MOAs), Restricted Areas (RAs), and Air Traffic Control Assigned Airspace (ATCAA) (Figure FW2-2 and Table FW2-5). To support realistic training, F-16 pilots schedule and use multiple adjacent airspaces together.

The FAA-designated airspace identified in Table FW2-5 is also used by Lockheed Martin test pilots operating F-35A, B, and C aircraft; Navy pilots operating F-18 aircraft; and other USAF pilots operating F-35A and F-16 aircraft. F-16 pilots from the 301 FW conduct approximately 6 percent of the total sorties flown in the airspace identified in Table FW2-5. Although AFRC F-35A pilots would conduct missions similar to those of F-16 pilots, the capabilities of the F-35A aircraft allow for supersonic and higher altitude flight. Regardless of the altitude structure and percent use indicated in Table FW2-6, AFRC F-35A pilots (as do existing military aircraft pilots) would adhere to all established floors and ceilings of existing FAA-designated airspace. For example, the floor of the Lancer MOA is 6,200 feet mean sea level (MSL). While in this MOA, AFRC F-35A pilots would not fly below that altitude. Rather, AFRC F-35A pilots would adapt training to this and other airspace with lower floors.

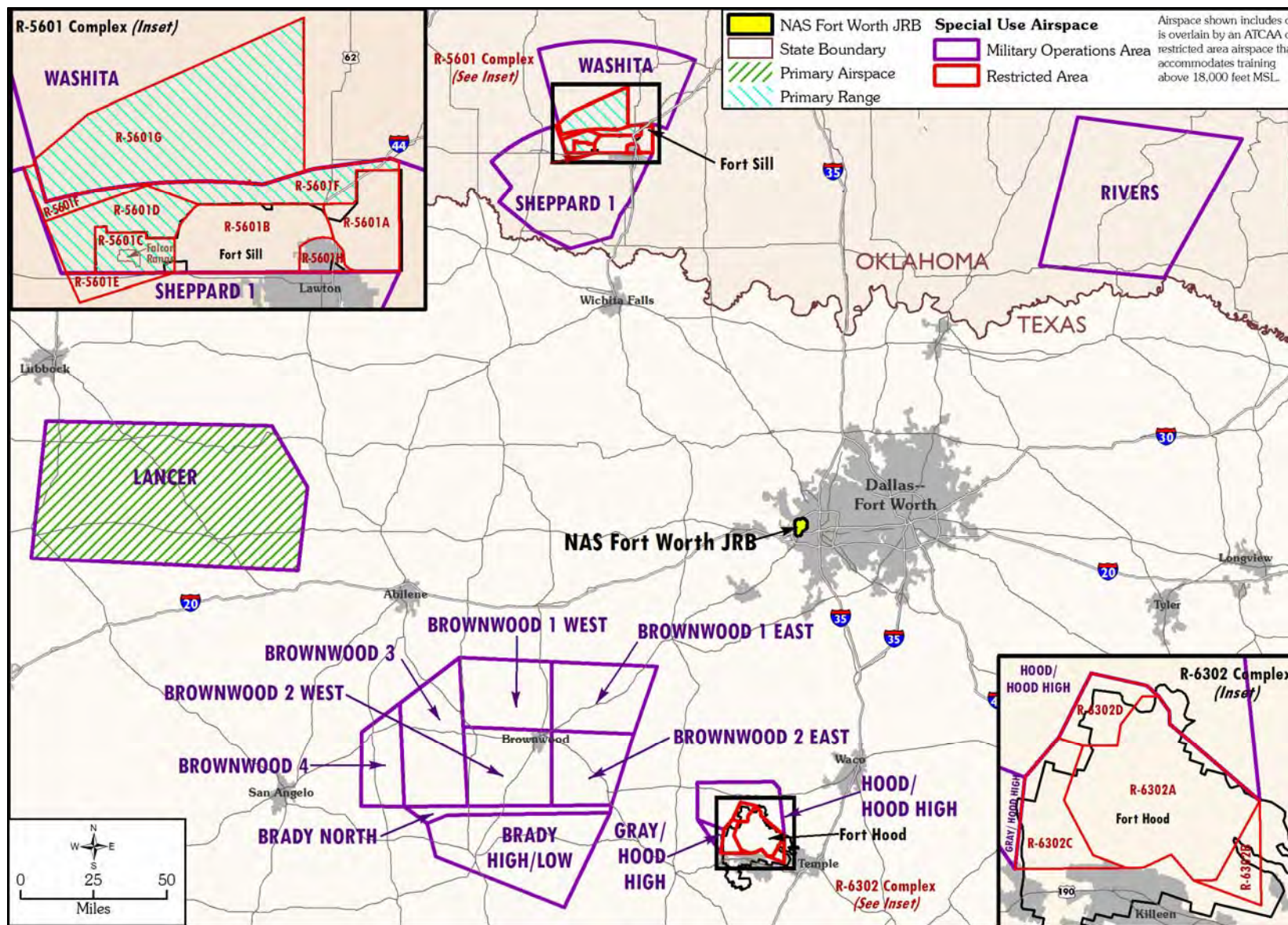


Figure FW2-2. Airspace Associated with NAS Fort Worth JRB

Table FW2-6. Current and Proposed Aircraft Altitude Distribution in the Airspace

Altitude (feet)	Percentage of Use	
	F-16	AFRC F-35A
100 – 500 AGL	0%	0%
500 AGL – 2,000 AGL	2%	1%
2,000 – 5,000 AGL	4%	0%
5,000 AGL – 10,000 MSL	10%	5%
10,000 – 18,000 MSL	70%	23%
18,000 – 30,000 MSL	12%	60%
+30,000 MSL	2%	11%

F-16 pilots from the 301 FW generally operate 86 percent of the time at or below 18,000 feet MSL, depending on mission type. In contrast, AFRC F-35A pilots would operate 71 percent of the time at or above 18,000 feet MSL, with 11 percent of the flight time above 30,000 feet MSL.

By 2030, total annual sorties would increase 1.2 percent from baseline levels (Table FW2-7). In the most heavily used airspace, like the Lancer MOA, AFRC F-35A sorties would account for 63 percent of total airspace sorties. Similar proportions would apply to the other airspace. The total percent of use by AFRC F-35A pilots would not significantly vary from baseline.

Table FW2-7. Airspace Sorties Flown from NAS Fort Worth JRB

Airspace ^a	Total Baseline	F-16 Baseline	AFRC F-35A Sorties	Net Change (Total) ^a	Percent Change (Total)
Southern Texas	77,445	3,715	4,632	917	1.2%
Total	77,445	3,715	4,632	917	1.2%

^a Includes all airspace identified in Table FW2-5.

To train with the full capabilities of the aircraft, AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities. Due to the capability of the F-35A aircraft, the USAF anticipates that approximately 10 percent of the time spent in air combat training would involve supersonic flight.

AFRC F-35A missions would last approximately 45 to 115 minutes, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, AFRC F-35A pilots would fly approximately 20 to 60 minutes in the training airspace. Occasionally, AFRC F-35A pilots could fly up to 90-minute missions. AFRC F-35A pilots would not fly in Special Use Airspace (SUA) during environmental night (10:00 P.M. to 7:00 A.M.), except for rare contingencies and special mission training.

FW2.4.2 Range Use

AFRC F-35A pilots would only use existing ranges. AFRC F-35A pilots stationed at NAS Fort Worth JRB would use the Falcon Range at Fort Sill in Oklahoma and the Fort Hood Range in Texas.

Most air-to-ground training would be simulated (i.e., nothing is released from the aircraft and electronic scoring is used). However, as described in Chapter 2, Section 2.3.4.2, the F-35A (like the F-16) is capable of carrying and using several types of air-to-air and air-to-ground ordnance, and pilots would require training in their use. The type and number of ordnance used by AFRC F-35A pilots could decrease from that currently used by F-16 pilots. If in the future the USAF identifies weapon systems that are either new or could exceed currently approved levels, appropriate NEPA documentation would be completed prior to their use.

Similar to F-16 pilots, AFRC F-35A pilots would use flares as defensive countermeasures in training. Flares are one of the defensive mechanisms dispensed by military aircraft to avoid attack by enemy aircraft and air defense systems. For the purposes of this analysis, it is estimated that flare use by AFRC F-35A pilots would be less than or equal to that of F-16 pilots. Chapter 2, Section 2.3.4.2.1, provides details on the composition and characteristics of flares. Flares would only be used in areas currently approved for such use. Current restrictions on the altitude of flare use would also apply. Approximately 70 percent of F-35A flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete combustion of each flare.

FW2.5 PUBLIC, AGENCY, AND TRIBAL INVOLVEMENT

FW2.5.1 Scoping Process

The public scoping period for the AFRC F-35A Environmental Impact Statement (EIS) began on 22 March 2018 with publication of the Notice of Intent (NOI) in the *Federal Register*. During the following weeks, notification letters were mailed to federal, state, and local agencies; elected officials; federally recognized tribes (tribes)¹; nongovernmental organizations; and interested individuals as a part of an interagency/intergovernmental coordination process. Through this process, concerned federal, state, and local agencies are notified and allowed sufficient time to evaluate potential environmental impacts of a proposed action.

Volume II, Appendix A, provides sample notification letters, the notification mailing lists, and the agency comments and concerns received by the USAF during the public scoping period. For the NAS Fort Worth JRB alternative, newspaper advertisements announcing the intent to prepare an EIS and hold a public scoping meeting were published in three different local newspapers. These advertisements were published in the weeks preceding the scheduled public scoping meeting.

For the NAS Fort Worth JRB alternative, one public scoping meeting was held on 19 April 2018 at the Cendera Center (3600 Benbrook Highway, Fort Worth, Texas 76116). This meeting was held in an open-house format where attendees could sign in, if desired, review display boards about the proposed AFRC F-35A mission, and provide written comments on the project. During this meeting, USAF personnel presented information on the project through the use of display boards and fact sheets. The NAS Fort Worth JRB public scoping meeting was attended by 76 people, including residents, elected officials, local business leaders, military affairs committee members, congressional staffers, base employees, local media, and others.

Throughout the public scoping period, the USAF offered multiple ways in which comments could be submitted. Comments were submitted at the public scoping meeting and through the project website, via email, and via regular mail or courier. The public scoping period closed on 11 May 2018, and approximately 27 comments were received regarding the NAS Fort Worth JRB alternative. Some comments were received after the public scoping period closed but were still considered during development of the Draft EIS.

After the public scoping period closed, the USAF was made aware that the address provided for submittal of courier-delivered (e.g., Federal Express or United Parcel Service) public scoping

¹ Per DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*, “tribe” refers to a federally recognized Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges (DoDI 4710.02, Section 3.5). Although not included as federally recognized tribes in the list, the USAF similarly must consult with Native Hawaiian organizations in accordance with DoDI 4710.03, *Consultation with Native Hawaiian Organizations (NHOs)*.

comments was incorrect. Consequently, the USAF provided the correct address and an additional 10 working days to resubmit scoping comments from the time resubmittal instructions were published in the *Federal Register* on 13 August 2018 and in three different local newspapers. During this second public scoping period, no additional comments were received regarding the NAS Fort Worth JRB alternative.

The majority of comments received for the NAS Fort Worth JRB alternative were generally supportive of the proposed mission. However, some people expressed concerns about noise, air quality, socioeconomics, airspace, biological resources, and safety. To a lesser extent, some people submitted comments concerning soil and water resources, cultural resources, hazardous materials and hazardous waste, infrastructure, and traffic and transportation.

FW2.5.1.1 Airspace Management and Use

Comments related to airspace included those that requested the EIS analyze any changes in airspace use, creation of new airspace, or alterations in flight paths. Other comments included concerns about 24-hour flight training and the increasing amount of air traffic using the airspace, both during the day and at night.

FW2.5.1.2 Noise

Several commenters expressed concern about aircraft noise. One of most commonly expressed concerns dealt with the potential for an increase in noise pollution and the effects of any noise increases on people, children, insects, birds, wildlife, and fish and aquatic invertebrates. Some commented on how the F-35 sounds different than existing aircraft while others requested information on how the aircraft compares to existing aircraft such as the F-16. Several comments were received noting that the F-35 is already flying at Fort Worth and that additional aircraft should not impact any resources.

FW2.5.1.3 Air Quality

The North Central Texas Council of Governments (NCTCOG) indicated that the USAF should use the Aviation Environmental Design Tool to evaluate impacts to air quality and if there is a net increase in emissions, the NCTCOG stands ready to offset any increase. The Texas Commission on Environmental Quality (TCEQ) indicated that a general conformity analysis would not be required. Residents of Lake Worth expressed concerns about air particulates and the impacts air pollution could have on trees. Other commenters requested the EIS compare the F-35A emissions with the F-16 emissions.

FW2.5.1.4 Safety

Comments received during scoping expressed concern about flight safety. One commenter asked about higher crash rates between the F-35 and the F-16, and about the safety of single engine aircraft. A commenter also expressed concern about the safety of operating the aircraft in a major metropolitan area and liability should an aircraft crash and cause property damage.

FW2.5.1.5 Soil and Water Resources

TCEQ indicated that the office of water does not anticipate significant, long-term impacts from the project as long as the construction and waste disposal are completed in accordance with all regulations. TCEQ recommended the proponent take steps to ensure that Best Management Practices (BMPs) are used to control runoff to protect surface and ground water. Residents of the

Lake Worth area expressed concerns about water quality. The Texas Parks and Wildlife Department (TPWD) recommended the use of erosion and seed/mulch stabilization measures that avoid hazards to snakes and other wildlife. No netting materials should be used and plastic mesh matting should be avoided.

FW2.5.1.6 Biological

Some commenters expressed concern about how noise and pollutants could affect migratory birds and other wildlife. Other commenters expressed concern about noise pollution and vibration effects on insects, wildlife, and fish and aquatic invertebrates.

TPWD encouraged the minimization of impacts to fish and wildlife including federal and state endangered species and migratory birds. TPWD stated that if vegetation is required for removal during nesting season, the area should be surveyed for nests with eggs or young. TPWD expressed concerns about night time lighting on migratory birds and recommended identifying impacts to threatened and endangered species. TPWD recommended considering the timing and location of migrating whooping cranes.

Several commenters indicated that the F-35 is already flying at Fort Worth and having a squadron would have no impact on the lake or any resources.

FW2.5.1.7 Land Use

One comment was received on the expansion of aviation easements and another commenter asked if the USAF would purchase homes. Concern was expressed about the impacts of the project on the Fort Worth Nature Center & Refuge (FWNC&R).

FW2.5.1.8 Socioeconomics

One commenter asked if realtors are required to disclose that children exposed to noise have an increased potential for cognitive problems. Several commenters expressed concern about the potential impact of noise on property use and values.

FW2.5.2 Draft EIS Public and Agency Review

FW2.5.3 Consultation

FW2.5.3.1 Government-to-Government Consultation

In January 2012 the Department of Defense (DoD) updated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. This policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective DoD services. In an ongoing effort to identify significant cultural resources, tribal resources, or other issues of interest to tribes, and as part of the NEPA scoping process, combined notification and Section 106 consultation letters were submitted to the federally-recognized American Indian tribes associated with NAS Fort Worth JRB.

Following standard USAF practice for government-to-government correspondence, tribal consultation was initiated by the Commanding Officer. NAS Fort Worth JRB has identified 16 tribes potentially affiliated with the installation. These tribes along with a record of consultations are listed in Section A.2.6.2 in Volume II, Appendix A. Two tribes, the Cheyenne

and Arapaho Tribes of Oklahoma and the Comanche Nation of Oklahoma responded to initial scoping letters and indicated that they had no interest or properties in the area of the proposed action. Nine (9) tribes responded to additional outreach efforts. Altogether 11 tribes have responded to USAF requests for information or consultation. Additional direct communication efforts (phone calls and emails) were conducted for tribes that did not respond to USAF mailings. Section 106 consultation is considered complete for all tribes and NAS Fort Worth JRB will continue to coordinate with interested tribes throughout the EIS process.

All communications with tribes will be completed in accordance with 54 *United States Code (USC) 300101 et seq., National Historic Preservation Act of 1966, as amended (NHPA)*; 36 *Code of Federal Regulations (CFR) § 800, Protection of Historic Properties*; Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*; and DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*.

FW2.5.3.2 State Historic Preservation Officer Consultation

NAS Fort Worth JRB determined that no historic properties would be affected by implementing the AFRC F-35A mission at the installation. Initially the Texas State Historic Preservation Officer (SHPO) concurred with this finding in a letter received on 22 June 2018 (Volume II, Appendix A, Section A.2.6.3). After concurrence was received, two additional projects were added and NAS Fort Worth JRB determined that no historic properties would be affected by the new projects. SHPO concurred with this finding in a letter dated 11 April 2019 (Volume II, Appendix A, Section A.2.6.3).

FW2.5.3.3 U.S. Fish and Wildlife Service Consultation

Because no federally listed threatened, endangered, or candidate species and/or designated critical habitat occur near NAS Fort Worth JRB, no impacts to federally listed species would result from implementation of the proposed AFRC F-35A mission. Although a variety of federally listed species have the potential to occur under the primary airspace and ranges proposed for use, the potential impacts would not be significant. In an email dated 27 June 2018, the U.S. Fish and Wildlife Service (USFWS) agreed that Endangered Species Act (ESA) Section 7 requirements had been applied and that no further Section 7 consultation is required (Volume II, Appendix A, Section A.2.6.4).

**FW3.0 NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE
AFFECTED ENVIRONMENT AND ENVIRONMENTAL
CONSEQUENCES**

FW3.1 AIRSPACE MANAGEMENT AND USE

FW3.1.1 Base Affected Environment

FW3.1.1.1 Airfield Operations

Baseline annual airfield operations at NAS Fort Worth JRB are described in Section FW2.3 and shown in Table FW2-4. The primary runway at NAS Fort Worth JRB, Runway 18/36, is described in Section FW1.0 and shown on Figure FW1-2. Runway 18 (takeoffs/landings to the south) is the higher use runway for standard daily operations.

The NAS Fort Worth JRB air traffic control (ATC) tower is responsible for airfield operations within the Class D airspace surrounding this airfield. This Class D area extends from the surface (field elevation 650 feet MSL) up to and including 3,000 feet MSL within a 4.5-mile radius of the airfield except where it abuts the Meacham Airport Class D airspace to the east. This airspace area extends 2 nautical miles (NM) to both the north and south with a 1.3 NM width on both sides of the north/south Tactical Air Navigation (TACAN) radials aligned with the runway. These extensions provide the additional controlled airspace needed for the instrument approaches to this airfield/runway environment.

The Fort Worth Air Route Traffic Control Center (ARTCC) has delegated the more highly regulated Class B airspace established around the Dallas-Fort Worth Airport to the Dallas-Fort Worth Terminal Radar Approach Control (TRACON) (Regional Approach) for controlling the high-density air traffic at this international airport and the local area, including NAS Fort Worth JRB. This Class B airspace is subdivided into 14 different areas (A-N) with varying floor altitudes that extend up to 11,000 feet MSL. Two areas (J and M) overlie the NAS Fort Worth JRB Class D area. The structure of this Class B airspace is designed to separate Dallas-Fort Worth instrument flight rules (IFR) aircraft from the NAS Fort Worth JRB and other airport Class D and E areas within this air traffic environment. Nearly 650,000 air traffic operations were conducted in this Class B airspace by the TRACON in 2017 that included military and civilian air traffic.

The airfield Instrument Landing System (ILS) and TACAN navigational aids provide instrument approach (10), departure (7) and Standard Terminal Arrival Route (STAR) (4) published procedures for aircraft navigating to the airfield. Global Positioning System (GPS) guided Radio Navigation (RNAV) approach and STAR procedures are also available for directing aircraft to the airfield. These published procedures, coupled with those standard operating procedures pilots are to follow while transiting between the base and the different training areas, provide a safe, efficient means for ATC to separate these daily routine flights from other IFR traffic.

FW3.1.2 Base Environmental Consequences

FW3.1.2.1 Airfield Operations

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in an increase of 3,056 annual airfield operations (12.1 percent) from current operations, as shown in Table FW2-4. This increase in operations would have a minimal effect on the existing airspace, where more than 650,000 operations per year are currently conducted. The percentage of operations flown during environmental night by AFRC F-35A pilots would be less than the percentage currently conducted

by F-16 pilots. No modifications would be required for this airspace structure or the manner in which ATC manages airfield arrival/departure operations.

FW3.1.3 Airspace Affected Environment

FW3.1.3.1 Airspace and Range Use

The training areas (MOAs, ATCAAs, RAs, and ranges) currently used by pilots from NAS Fort Worth JRB and projected for use by AFRC F-35A pilots are identified in Table FW2-5. The published floor/ceiling altitudes in which training activities are contained are also shown in Table FW2-5. The different training areas are located in regions where aircraft using those areas are controlled by either the Houston ARTCC or the Fort Worth ARTCC. Table FW3-1 notes the baseline and projected AFRC F-35A sortie operations for each training complex as well as the responsible military agency for coordinating and scheduling the use of each airspace/range area.

FW3.1.4 Airspace Environmental Consequences

FW3.1.4.1 Airspace and Range Use

Implementation of the AFRC F-35A mission would result in replacing the baseline 3,197 F-16 sorties with the 4,632 F-35A sorties. The AFRC F-35A mission would increase overall training sorties by 1.2 percent, as noted in Table FW3-1. While most of the training airspace and ranges would experience decreases in annual sorties, sorties would increase in the Lancer, Washita, and Sheppard 1 MOAs. The Lancer MOA would experience 1,776 more annual sorties. The Washita MOA would see an increase of 565 annual sorties and the Sheppard 1 MOA an increase of 214 annual sorties.

Table FW3-1. Baseline and AFRC F-35A Annual Sorties

Training Airspace/Ranges ^a	Using/Scheduling Agency	Baseline Total	AFRC F-16	AFRC F-35A	Proposed Total	Percent Change
Brady Hi and Low MOA	301 FW, NAS Fort Worth JRB	1,687	-596	0	1,091	-35.0
Brady Hi, Low, North, and Brownwood 1, 2, & 3 Combined		2,490	-664	497	2,323	-6.7
Brownwood 1 & 2 East MOAs		2,332	-607	276	2,001	-14.2
Brownwood 1 & 2 West MOA		2,331	-606	236	1,961	-15.9
Brownwood 3 & 4 MOAs		2,333	-607	118	1,844	-21.0
Lancer MOA	7th Bomb Wing, Dyess AFB	1,058	0	1,776	2,834	167.9
Rivers MOA	138th Fighter Wing, Tulsa International	308	-266	157	199	-35.4
Falcon Range R-5601 A, B, C, D, E, F, G, H, & J; R-5602A & B	USAFCOE, Fort Sill	3,026	-145	146	3,027	0.0
Washita MOA	80th FTW, Sheppard AFB	3,847	-196	761	4,412	14.7
Sheppard 1 MOA		6,701	-326	540	6,915	3.2
Fort Hood R-6302 A, B, C, & D with Hood MOA and Gray MOA	III Corps, Fort Hood	58,205	-43	125	58,290	0.1
Total		77,445	-3,715	4,632	78,362	1.2

^a AFRC F-35A training airspace and ranges also includes the high altitude air traffic control airspace overlying the MOAs. Airspace areas in this table have been grouped due to similarity of training use and for noise modeling purposes.

Key: USAFCOE = U.S. Army Fires Center of Excellence

The Lancer MOA/ATCAA was evaluated for 2,350 sorties in the EIS for Realistic Bomber Training Initiative (USAF 2000) and is currently using less than half of that capacity. The AFRC F-35A

annual sorties would increase the proposed total annual sorties in the Lancer MOA to 2,834. AFRC F-35A sorties would require deconfliction with existing 7th Bomb Wing sorties who are the scheduling agency for this MOA and have priority for training. Scheduling coordination within the USAF would avoid conflicts within the airspace and the addition of 484 sorties above the currently analyzed sorties is not anticipated to impact existing training.

Implementation of the AFRC F-35A mission would not result in the creation of new SUA or change the boundaries of existing SUA. Therefore, no major changes to civilian operations are anticipated as the current boundaries of the Lancer MOA would remain unchanged. The FAA controls the airspace when the Lancer MOA/ATCAA is activated, ensuring that there are no conflicts with the use of the jet routes and airways. Minor rerouting of flights along these routes and/or scheduling of specific portions of the MOA/ATCAA could alleviate potential conflicts.

The Washita and Shepard 1 MOAs are high-density student training areas used by the Air Education and Training Center at Shepard Air Force Base (AFB). Operations in the Washita and Sheppard 1 MOA would require coordination within the USAF to avoid conflicts in the use of those MOAs.

FW3.1.5 Summary of Impacts to Airspace Management and Use

Implementation of the AFRC F-35A mission would involve a one-for-one exchange of F-16 aircraft with F-35A aircraft, and would not require any changes to airspace or to how the airfield is managed. Eventual replacement of F-16 aircraft at NAS Fort Worth JRB with F-35A aircraft would result in a 12.1 percent increase in airfield operations. This increase would have a minimal effect on the current airspace surrounding NAS Fort Worth JRB. AFRC F-35A sorties proposed for the airspace could be accommodated in the training airspace, ranges, and while en route to/from these areas without adversely affecting other airspace uses throughout the affected region. Therefore, impacts to airspace around NAS Fort Worth JRB and the airspace proposed for use would not be significant.

FW3.2 NOISE

Although noise can affect several resource areas, this section describes potential noise impacts on human annoyance and health, physical effects on structures, and potential impacts to animals in the care of humans. Noise impacts on biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomic (e.g., property values), and environmental justice/protection of children are discussed in sections dedicated to those resources. Chapter 3, Section 3.2, defines terms used to describe the noise environment as well as methods used to calculate noise levels and assess potential noise impacts. These terms and analytical methods are uniformly applied to all four bases. A summary of noise metrics used in this EIS is also provided in Table FW3-2.

For consistency, the dB unit is used throughout this EIS. However, all subsonic aircraft noise levels described in this EIS are measured in dBA. In compliance with current DoD Noise Working Group guidance, the overall noise environment is described in this EIS using the day-night average sound level (DNL) metric. During scoping, people submitted comments expressing concern about use of the DNL metric. The DNL metric is used because it is the preferred noise metric of the U.S. Department of Housing and Urban Development (HUD), FAA, U.S. Environmental Protection Agency (USEPA), and DoD. Studies of community annoyance in response to numerous types of environmental noise show that there is a correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise. In addition to the DNL metric, supplemental noise metrics are used to provide a more complete picture of noise and particular types

of noise impacts (Table FW3-2). Operations occurring during environmental nighttime hours are assessed a 10-dB penalty applied in calculation of DNL (refer to Chapter 3, Section 3.2.3, for more detailed resource definition and methodology used to evaluate impacts).

Table FW3-2. Summary of Noise Metrics Used in this EIS

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- The A-weighted decibel (dBA) is used to reflect a weighting process applied to noise measurements to filter out very low and very high frequencies of sound in order to replicate human sensitivity to different frequencies of sound and reflect those frequencies at which human hearing is most sensitive. Environmental noise is typically measured in dBA.
- Day-Night Average Sound Level (DNL) combines the levels and durations of noise events, the number of events over a 24-hour period, and more intrusive nighttime noise to calculate an average noise exposure.
- Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.
- C-Weighted Day-Night Average Sound Level (CDNL) is a day-night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of impulsive noise.
- Sound Exposure Level (SEL) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- Maximum Noise Level (L_{max}) is the highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight).
- Equivalent Noise Level (L_{eq}) represents aircraft noise levels decibel-averaged over a specified time period and is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$ and measured from 8:00 A.M. to 4:00 P.M.).

In this EIS, multiple noise metrics are used to describe the noise environment at each alternative base. This approach, which is in accordance with DoD policy, provides a more complete picture of the current and expected noise experience than can be provided by any one noise metric alone.

Comments received during scoping indicated a broad range of concerns and requested a comprehensive presentation of noise impacts. Therefore, this analysis covers a wide variety of potential noise impact categories. Additional details are provided in Volume II, Appendix B.

FW3.2.1 Base Affected Environment

This section discusses noise impacts near the installation. Noise generated in the training airspace and during training to and from the training airspace is discussed in Section FW3.1.

Under baseline conditions, 25,292 airfield operations are conducted annually at NAS Fort Worth JRB. This includes 8,524 operations flown by AFRC F-16 pilots, and 1,106 operations flown by Lockheed Martin F-16 pilots. Lockheed Martin pilots also conduct 1,486 F-35A operations, 306 F-35B operations, and 42 F-35C operations annually. USMC pilots conduct 1,426 F-18 operations and 1,070 C-130 operations annually. An additional 7,096 airfield operations are flown by pilots from other tenant units, including the TANG (C-130), Naval Air Reserve (C-40A), Army Reserve (C-12 and UC-35), and the `Auxiliary Security Force (H-60 and CH-47). Transient aircraft pilots conduct a total of 4,236 operations annually. Transient aircraft pilots use the airfield for a variety of purposes (e.g., stop-over during cross country flights, unfamiliar airfield for practice approaches, divert landing location during severe weather), and transient aircraft could potentially

include any aircraft type. Approximately 2 percent of total airfield operations are conducted between 10:00 P.M. and 7:00 A.M. Less than 1 percent of 301 FW airfield operations are conducted between 10:00 P.M. and 7:00 A.M.

FW3.2.1.1 Noise Exposure

Because the Lockheed Martin Assembly Plant is located on the west side of the runway, both F-16 and F-35A aircraft currently operate at NAS Fort Worth JRB, and people who live around the base have experienced noise generated by overflights of each aircraft type. Table FW3-3 compares F-16 and F-35A individual overflight noise levels at a representative noise-sensitive location southwest of the runway (Brewer Middle School). The noise levels listed in Table FW3-3 reflect flight procedures at NAS Fort Worth JRB (e.g., pattern altitudes) and are not directly applicable to other installations. The specific types of flight departure, arrival, or closed pattern procedures listed in the table were selected because they generate the highest dB sound exposure level (SEL) of any departure, arrival, or closed pattern procedure flown by that aircraft at the location studied. The same set of NAS Fort Worth JRB-specific flight procedures used to calculate DNL noise contours was also used to calculate noise levels in Table FW3-3.

Table FW3-3. Comparison of F-16 and F-35A Noise Levels at the Brewer Middle School near NAS Fort Worth JRB

Aircraft	Operation Type	Engine Power	Airspeed (knots)	Altitude (feet AGL)	Slant Distance (feet)	SEL (dB)	L _{max} (dB)
AFRC F-35A (Military Power)	Departure	100% ETR	300	1,443	3,580	103	95
AFRC F-35A (Afterburner) ^a		100% ETR	300	1,529	3,598	104	96
Lockheed F-35A (Military Power) ^b		100% ETR	300	1,437	3,579	104	95
AFRC F-16C (Military Power) ^c		104% NC	300	2,124	3,774	97	87
AFRC F-16C (Afterburner) ^c		104% NC	350	2,676	4,013	100	96
Lockheed F-16C (Afterburner) ^c		93% NC	300	1,959	3,721	100	93
AFRC F-35A (Overhead Break) ^b	Arrival	40% ETR	170	765	3,509	92	78
Lockheed F-35A (Straight-in) ^b		40% ETR	160	782	3,509	87	77
AFRC F-16C (Overhead Break) ^c		87% NC	350	2,921	2,636	81	70
Lockheed F-16C (Straight-in) ^c		80% NC	160	782	3,509	75	66
AFRC F-35A (Practice Precautionary Pattern) ^b	Closed Pattern	100% ETR	300	2,716	3,592	104	94
Lockheed F-35A (Visual Flight Rules Touch and Go) ^b		100% ETR	300	1,698	1,417	112	107
AFRC F-16C (Visual Flight Rules Low Approach) ^c		97% NC	200	1,977	3,059	94	83
Lockheed F-16C (Visual Flight Rules Touch and Go) ^c		95% NC	300	1,698	1,417	113	109

Notes: Noise levels presented were calculated at Brewer Middle School for the departure, arrival, and closed pattern flight that has the highest SEL at that location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^a For a detailed explanation of why F-35A afterburner departures might have lower SEL and L_{max} values than military power departures, see Chapter 3, Section 3.2.3.1. Essentially, during afterburner takeoffs, the aircraft reaches the required takeoff speed and leaves the ground sooner, and is at a slightly higher altitude throughout the flight profile. As a result, the aircraft altitude and slant distance at the location studied are both typically higher for the afterburner departure. Typically, the afterburner is turned off at approximately 10,000 feet from brake release, which occurs before the aircraft is over the location studied. The engine power (i.e., ETR) setting of the aircraft when it is above the location studied is the same for both the military power and the afterburner departure.

^b Although AFRC F-35A pilots and Lockheed Martin test pilots would fly the same aircraft type (F-35A), the Lockheed Martin test mission requires different flight profiles than would be used by AFRC pilots during training. Therefore, noise levels would differ between the two missions even though the aircraft are the same.

^c AFRC F-16C aircraft are equipped with General Electric engines, and Lockheed F-16C aircraft are equipped with Pratt and Whitney engines. ETR = Engine Thrust Request. NC = core engine speed

Several comments received during scoping requested the USAF provide individual overflight noise levels quantified using the SEL noise metric. The information on SELs shown in Table FW3-4 was calculated based on local flying procedures and conditions using methods described in Chapter 3, Section 3.2.3.1. Specifically, Table FW3-4 lists only the highest SEL generated by any flight procedure (e.g., arrival, departure or closed pattern) by any based or transient aircraft type. The table also states the number of times per year that the flight procedure occurs during “acoustic day” (7:00 A.M. to 10:00 P.M.) and “acoustic night” (10:00 P.M. to 7:00 A.M.). It is worth noting that the noise environment at a particular location is complex and the highest SEL is only one descriptor of this complex situation. In addition, actual flight paths vary, due to weather, winds, aircrew technique, and other factors, from the most-frequently followed (representative) flight paths used in noise modeling. Therefore, individual flight events could be closer to, or be farther away from, the representative noise-sensitive location, resulting in noise levels being slightly higher or lower than indicated in Table FW3-4.

Table FW3-4. Highest SEL at Representative Noise-Sensitive Locations near NAS Fort Worth JRB Under Baseline Conditions

Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{a,b}
Type	ID	Description	Aircraft	Aircraft Group	Operation Type	Annual Operations at this SEL		
						7:00 A.M. to 10:00 P.M.	10:00 P.M. to 7:00 A.M.	
Library	L01	White Settlement Library	F-16C	B	Closed Pattern	24	0	113
Park	P01	North Z Boaz Park	F-35B	B	Departure	12	0	114
	P02	Vinca Circle Park	F/A-18E/F	T	Arrival	284	0	118
	P03	Malaga Park	F-35B	B	Closed Pattern	36	0	115
	P04	Casino Park	F/A-18E/F	T	Arrival	110	0	119
	P05	Leonard Park	F-35B	B	Departure	12	0	104
	P06	Lake Worth Public Park	F/A-18E/F	T	Closed Pattern	47	0	115
	P07	Plover Circle Park	F-35B	B	Departure	5	0	122
School ^c	S01	Brewer Middle School	F-35B	B	Closed Pattern	36	0	114
	S02	Effie Morris Elementary School	F-35B	B	Departure	5	0	112
	S03	Luelle Merritt Elementary School	F/A-18E/F	T	Closed Pattern	74	0	115

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c For the purposes of this noise analysis, noise levels at schools are described throughout this EIS using representative schools; discussion of noise at schools may not include all schools in the area.

Key: T = Transient aircraft or non-NAS Fort Worth JRB-based aircraft involved in training exercise; B = Based aircraft

Several factors, including, but not limited to, weather conditions, the precise flight path followed, and whether the aircraft is flying in formation, affect the sound level of individual overflights (Chapter 3, Section 3.2.3). Formation flights involve multiple aircraft, usually of the same type, flying together. The maximum noise level experienced during a formation overflight depends on the spacing and arrangement of the formation’s member aircraft. If the aircraft are spaced close together, then doubling the number of aircraft would add as much as 3 dB to the maximum noise level (L_{max}) of the event. Since the SEL metric is an exposure-based metric, doubling the number of aircraft of a single aircraft type adds 3 dB to the event sound level. For example, a two-aircraft formation would generate an SEL that is 3 dB higher than single aircraft SEL listed in Table FW3-3.

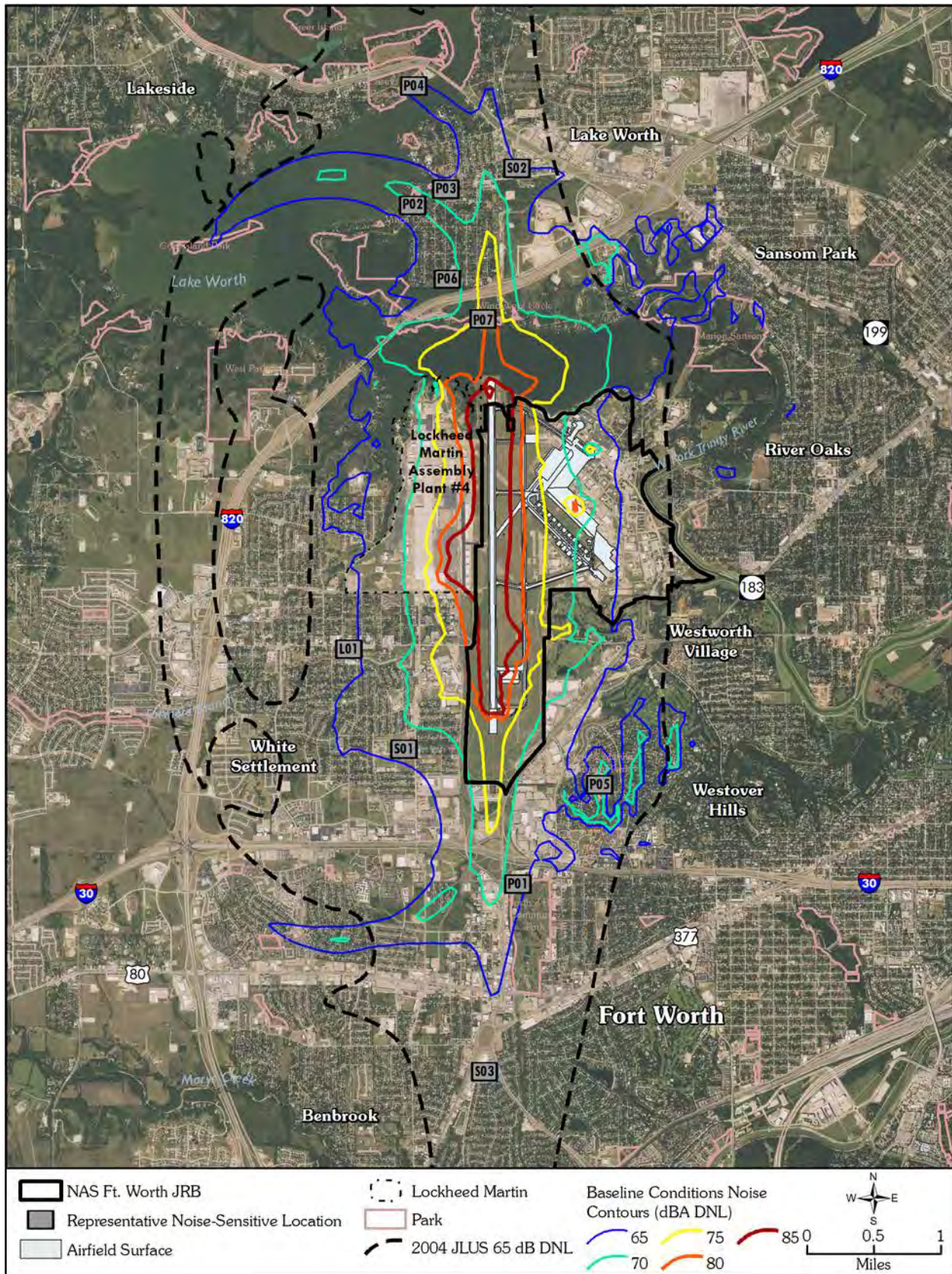


Figure FW3-1. Baseline DNL Contours at NAS Fort Worth JRB

Figure FW3-1 shows baseline DNL contours in 5-dB increments. Areas with the highest DNL are located along the runway and extended runway centerline and in areas near the airfield where aircraft static engine runs are conducted. The shape of the noise contours reflects the effects of topography on noise propagation. In the Westover Hills neighborhood, hill slopes facing toward the airfield experience higher noise levels than hill slopes facing away. A series of ridges extending north-south in this area results in irregularly-shaped and non-contiguous areas being exposed to DNL of 65 dB or greater. The effect of water bodies on noise distribution is apparent at Lake Worth. Because noise propagates more efficiently over water (i.e., with less energy being lost), DNL greater than 65 dB extends farther than if the underlying surface were land. Land on the north shore of the lake sloping upwards from the lakes surface experiences higher noise levels both because of the reduced impedance of the lake's surface and because the rising hill slope faces toward the aircraft flight paths.

The area surrounding NAS Fort Worth JRB is urbanized, and much of the area currently affected by noise levels is residential. In total, 5,499 acres and an estimated 13,093 residents are currently exposed to DNL greater than 65 dB (Table FW3-5). People living in areas exposed to higher DNL are more likely to become highly annoyed by the noise. DoD land use guidelines state that, unless the structures provide at least 25 dB of noise level reduction, residences are incompatible with DNL between 65 and 69 dB. The guidelines state that residences are incompatible with DNL of 70 to 74 dB unless the structures provide at least 30 dB of noise level reduction. The guidelines also state that residential uses in areas exposed to DNL greater than 75 dB are not compatible and should be prohibited. Additional details on annoyance and land use recommendations for areas exposed to elevated noise levels are provided in Chapter 3, Section 3.2.3, and Volume II, Appendix B.

The NCTCOG published a JLUS in 2017 which references historical noise levels for planning purposes (NCTCOG 2017). The JLUS recommends several measures related to aircraft noise near NAS JRB Fort Worth. These recommendations include a recommendation that local governments pass zoning ordinances to prevent additional incompatible land development in areas exposed to high noise levels. The JLUS defines incompatible land use based on noise level compatibility guidelines that mirror DoD guidelines. Implications of the JLUS for the land use resource area are discussed in section FW3.8. Although it does not directly affect the current experience of noise, the 65 dB DNL contour from the JLUS document has been included on Figure FW3-1 for reference. The number of acres and estimated population exposed to JLUS DNL greater than 65 dB are listed in Table FW3-5 for reference.

Table FW3-5. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater Under Baseline Conditions at NAS Fort Worth JRB

DNL (dB)	Acres		Estimated Population	
	JLUS	Baseline	JLUS	Baseline
65-69	8,062	3,435	21,968	9,992
70-74	3,316	1,204	8,450	2,673
75-79	1,364	522	2,415	372
80-84	395	200	287	56
≥85	218	138	0	0
Total	13,355	5,499	33,120	13,093

Table FW3-6 lists baseline DNL at several representative noise-sensitive locations around the base. These include a library as well as several parks and schools. The representative noise-sensitive locations are in residential areas, and baseline DNL in the residential areas are similar to those listed in Table FW3-6. Ten (10) of the 11 locations listed are exposed to DNL of 65 dB or greater. The JLUS identifies a neighborhood park with DNL greater than 75 dB as an incompatible use. Plover Circle Park is currently exposed to DNL of 78 dB and is therefore an incompatible land use.

Areas outside the 65 dB DNL contour line could also experience noise that can be disturbing at times. Although noise events are less frequent and/or less intense in locations below 65 dB DNL than in locations above 65 dB DNL, loud and potentially disturbing noise events do occur. Some people are more noise-sensitive than others as a result of physical, psychological, and emotional factors. People with autism and people afflicted with post-traumatic stress disorder (PTSD) may be particularly sensitive to sudden loud noises such as those that occur near an airbase. The DNL metric is useful for describing the noise environment at a location with a single number, but it does not provide a complete description of the noise environment. In accordance with current DoD policy, this EIS makes use of several supplemental noise metrics (e.g., SEL, L_{max} , number of events exceeding dB threshold) to provide a more complete description of the noise experience.

Table FW3-6. DNL at Representative Noise-Sensitive Locations near NAS Fort Worth JRB Under Baseline Conditions

Type	ID	Description	DNL (dB)
Library	L01	White Settlement Library	65
Park	P01	North Z Boaz Park	66
	P02	Vinca Circle Park	69
	P03	Malaga Park	66
	P04	Casino Park	65
	P05	Leonard Park	70
	P06	Lake Worth Public Park	68
	P07	Plover Circle Park	78
School	S01	Brewer Middle School	67
	S02	Effie Morris Elementary School	65
	S03	Luelle Merritt Elementary School	62

FW3.2.1.2 Speech Interference

Speech interference is possible when noise levels exceed 50 dB. For the purposes of this analysis, any change to normal speech patterns is counted as an interference event. Table FW3-7 lists the number of events exceeding L_{max} of 50 dB in buildings with windows open, in buildings with windows closed, and outdoors. Predictions of indoor speech interference events account for standard values of 15 dB or 25 dB of noise attenuation provided by buildings with windows open or closed, respectively. Many of the parks listed in Table FW3-7 are near residential areas, and noise levels are similar. Flight paths are variable and speech interference events sometimes occur far from standard NAS Fort Worth JRB flight patterns.

Table FW3-7. Potential Speech Interference Under Baseline Conditions at NAS Fort Worth JRB

Type	ID	Description	Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour		
			Windows Open ^a	Windows Closed ^a	Outdoor
Library	L01	White Settlement Library	2	2	3
Park	P01	North Z Boaz Park	2	2	3
	P02	Vinca Circle Park	3	2	3
	P03	Malaga Park	2	2	3
	P04	Casino Park	2	1	3
	P05	Leonard Park	2	1	3
	P06	Lake Worth Public Park	3	3	3
	P07	Plover Circle Park	3	3	3

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

FW3.2.1.3 Interference with Classroom Learning

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. When considering intermittent noise caused by aircraft overflights, guidelines for classroom interference indicate that an appropriate criterion is a limit of 35 to 40 dB (depending on classroom size) on indoor background equivalent noise levels during the school day ($L_{eq(SD)}$) and a 50 dB L_{max} limit on single events. Table FW3-8 lists $L_{eq(SD)}$ and the average number of events per hour exceeding 50 dB L_{max} at several schools near NAS Fort Worth JRB when windows are open and when windows are closed. Currently, indoor noise levels at all three of the schools studied exceed 40 dB $L_{eq(SD)}$ when windows are open, and indoor noise levels at Brewer Middle School and Effie Morris Elementary School exceed 40 dB $L_{eq(SD)}$ when windows are closed. Indoor and outdoor noise levels temporarily exceed 50 dB L_{max} at a rate ranging from two to three events per hour. The number of outdoor events per hour with potential to interfere with speech between 7:00 A.M. and 10:00 P.M. is not directly related to classroom noise level, but is relevant during recess and to other activities that could occur outside the school building. Additional information on schools within the noise contours is discussed in FW 3.10.1.

Table FW3-8. Indoor Classroom Learning Disruption Under Baseline Conditions at NAS Fort Worth JRB

Type	ID	Description	Windows Open ^a		Windows Closed ^a		Outdoor
			$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Brewer Middle School	54	3	44	2	3
	S02	Effie Morris Elementary School	52	3	42	2	3
	S03	Luelle Merritt Elementary School	49	2	39	1	2

^a Assumes standard values of 15 dB and 25 dB of noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

Key: $L_{eq(SD)}$ is the equivalent noise level during a school day (defined as 8:00 A.M. to 4:00 P.M.).

FW3.2.1.4 Sleep Disturbance

Nighttime flying, which is required as part of training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (ANSI) (ANSI 2008). The method first predicts the probability of awakening associated with each type of flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects all flying events that occur between 10:00 P.M. and 7:00 A.M., when most people sleep (Table FW3-9). The analysis also accounts for standard building attenuation of 15 dB and 25 dB with windows open and closed, respectively. Sleep disturbance probabilities listed for parks and schools are used because they are indicative of impacts in nearby residential areas are not intended to imply that people regularly sleep in schools or at parks.

Table FW3-9. Average Probability of Awakening Under Baseline Conditions at NAS Fort Worth JRB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)	
			Windows Open ^a	Windows Closed ^a
Library	L01	White Settlement Library	1	<<1
Park	P01	North Z Boaz Park	1	1
	P02	Vinca Circle Park	1	1
	P03	Malaga Park	1	1
	P04	Casino Park	1	1
	P05	Leonard Park	1	<<1
	P06	Lake Worth Public Park	1	1
	P07	Plover Circle Park	2	1
School	S01	Brewer Middle School	1	<<1
	S02	Effie Morris Elementary School	1	1
	S03	Luelle Merritt Elementary School	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reduction for windows open and closed, respectively.

Key: <<1 indicates that the number of potential speech interference events (>50 dB) per hour resulting from NAS Fort Worth JRB-based aircraft overflights is low (rounding to zero).

FW3.2.1.5 Potential for Hearing Loss

The risk of hearing loss was assessed using the methodology prescribed by DoD policy, which is described in Chapter 3, Section 3.2.3, and Volume II, Appendix B. Potential for hearing loss (PHL) risk is calculated based on the 24-hour equivalent noise level (L_{eq24}) noise metric. Under baseline conditions, an estimated 49 residents are currently exposed to outdoor noise levels that could potentially be harmful to hearing (Table FW3-10). The DNL noise metric results in a greater number of residents exposed because DNL applies a noise penalty to events during acoustic night. An estimated 56 persons (Table FW3-5) are currently exposed to DNL of 80 dB or greater. The census-based population estimate may be higher or lower than the actual population. Seven residential land parcels are exposed to these noise levels. These parcels are located on Lake Worth opposite Runway 36. Some of these parcels are located in the Clear Zone (CZ) and all of these parcels are located in areas zoned by the City of Fort Worth as high noise areas.

Table FW3-10. Estimated Population Exposed to Noise Levels that Could Result in Noise-Induced Permanent Threshold Shift Under Baseline Conditions at NAS Fort Worth JRB

L_{eq24} (dB)	Estimated Population
80-81	41
81-82	8
82-83	0
Total	49

FW3.2.1.6 Occupational Noise

In on-base areas with high noise levels, existing USAF occupational noise exposure prevention procedures, such as hearing protection and monitoring, are implemented to comply with all applicable Occupational Safety and Health Administration (OSHA) and USAF occupational noise exposure regulations.

FW3.2.1.7 Non-auditory Health Impact

During scoping, the question of the potential for non-auditory health effects from noise was raised. Several studies have been performed to see whether noise can cause health effects other than hearing

loss. The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. Cantrell (1974) confirmed that noise can provoke stress, but noted that results on cardiovascular health have been contradictory. Some studies have found a connection between aircraft noise and blood pressure (e.g., Michalak *et al.* 1990; Rosenlund *et al.* 2001), while others have not (e.g., Pulles *et al.* 1990).

Kryter and Poza (1980) noted, “It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body.”

The connection from annoyance to stress to health issues requires careful experimental design and the resulting data are subject to different interpretations. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods under the approach path to Los Angeles International Airport. When the same data were subsequently analyzed by others (Frerichs *et al.* 1980), no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhood. However, when the Centers For Disease Control performed a more thorough study near Atlanta’s Hartsfield International Airport, no relationships were found for levels above 65 dB (Edmonds *et al.* 1979).

A carefully designed study, Hypertension and Exposure to Noise near Airports (HYENA), was conducted around six European airports from 2002 through 2006 (Jarup *et al.* 2005, 2008). There were 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires administered for health, socioeconomic, and lifestyle factors, including diet and physical exercise. Hypertension was defined by World Health Organization blood pressure thresholds (WHO 2003). Noise from aircraft and highways was predicted from models.

The HYENA results were presented as an odds ratio (OR). An OR of 1 means there is no added risk, while an OR of 2 would mean risk doubles. An OR of 1.14 was found for nighttime aircraft noise, measured by the equivalent noise level during nighttime hours (L_{night}). For daytime aircraft noise, measured by 16-hour equivalent noise level (L_{eq16}), the OR was 0.93. For road traffic noise, measured by L_{eq24} , the OR was 1.1.

Note that OR is a statistical measure of change, not the actual risk. Risk itself and the measured effects were small, and not necessarily distinct from other events. Haralabidis *et al.* (2008) reported an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise, and an increase of 7.4 mmHg for other indoor noises such as snoring. For the purpose of this EIS analysis, it is interesting to note that the studies demonstrated aircraft noise was a factor at night, while traffic noise was a factor for the full day.

Two recent studies examined the correlation of aircraft noise with hospital admissions for cardiovascular disease. Hansell *et al.* (2013) examined neighborhoods around London’s Heathrow airport. Correia *et al.* (2013) examined neighborhoods around 89 airports in the United States. Both studies included areas of various noise levels. They found associations that were consistent with the HYENA results that found nighttime noise to have a higher OR ratio (greater impact) than daytime noise.

The current state of scientific knowledge cannot yet support inference of a causal or consistent relationship between aircraft noise exposure and non-auditory health consequences for exposed residents. The large scale HYENA study (Jarup *et al.* 2005, 2008) and the recent studies by Hansell *et al.* (2013) and Correia *et al.* (2013) offer indications, but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

FW3.2.1.8 Structural Damage

Noise that does not exceed 130 dB in any 1/3-octave frequency band or last for more than 1 second does not typically have the potential to damage structures in good repair (CHABA 1977). The term “frequency bands” refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Noise exceeding 130 dB in any 1/3-octave frequency band and lasting for more than 1 second of that intensity and duration does not occur except on the flightline immediately adjacent to jet aircraft. The installation has not received any claims for noise-induced property damage.

Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects within structures can occur during loud overflights. Rattling of objects such as dishes, hanging pictures, and loose window panes can cause residents to fear damage. Rattling objects have the potential to contribute to annoyance along with other potential noise effects (e.g., speech interference, sleep disturbance).

FW3.2.1.9 Animals in the Care of Humans

Potential noise impacts on wildlife are described in Section FW3.6. However, pets, other domesticated animals, and animals kept in zoos live in different circumstances than wild animals and often react differently to human-generated noises, particularly when enclosed in small spaces. Negative reactions to loud overflights are possible under baseline conditions.

FW3.2.2 Base Environmental Consequences

Implementation of the AFRC F-35A mission would replace the 24 AFRC F-16 aircraft currently assigned at NAS Fort Worth JRB with 24 F-35A aircraft. The number of airfield operations flown annually by AFRC jets would increase from 8,524 to 11,580, resulting in a 12.1 percent increase in the total number of airfield operations flown by all aircraft at NAS Fort Worth JRB.

AFRC F-35A pilots would fly less than 1 percent of initial approaches to the runway during the late-night time period between 10:00 P.M. and 7:00 A.M. This is approximately the same percentage of total flights that are conducted by AFRC F-16 pilots late at night. As is currently the case with F-16 pilots, AFRC F-35A pilots would not typically conduct departures or closed patterns (i.e., multiple practice approaches) between 10:00 P.M. and 7:00 A.M.

Based on context and intensity, noise impacts resulting from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would be considered significant. As described in Section 2.5, the USAF considered several potential noise mitigation measures. None of the measures considered were determined to be operationally feasible. Local flight procedures at NAS Fort Worth JRB are internally reviewed on a regular basis for changes that create the best balance between safety (paramount concern), mission and training effectiveness, and minimizing noise impacts. Furthermore, the base maintains open lines of communication with the City of Fort Worth and local community leaders to develop and implement potential noise abatement procedures when possible. Currently, no additional noise abatement procedures have been identified that would reduce noise impacts without also adversely affecting safety of flight and/or mission effectiveness.

Operating procedures at NAS Fort Worth JRB already include several procedures to minimize noise impacts. These procedures, which have been developed over several years as part of regularly-occurring procedural review process, have been selected to minimize mission impacts while maintaining operational efficiency and flexibility; these procedures would be applied to any new aircraft at the installation, including the F-35A. Noise modeling conducted as part of this EIS analysis reflects the following procedures:

- Quiet hours are observed from 10:00 P.M. to 7:00 A.M. Monday through Saturday and from 10:00 P.M. to 12:00 P.M. on Sunday. During these times, departures are not authorized except with Operations Officer approval; only straight-in to full-stop landings are allowed; and low-power static engine runs are permitted;
- Aircrews are instructed to climb expeditiously to assigned altitudes. Departing aircraft are not authorized to turn prior to reaching 1,700 feet MSL unless an operational necessity exists;
- Afterburner must be de-selected prior to the airfield boundary unless required for safe operation;
- Aircraft in the visual flight rules (VFR) traffic pattern must turn prior to Interstate (I)-30 during approaches to Runway 18 and prior to I-820 during approaches to Runway 36; and
- Aircrews are instructed to avoid low-altitude flight over populated areas to the extent practicable.

Construction and demolition (C&D) projects in support of the proposed AFRC F-35 mission would generate short-term, localized increases in noise. However, the installation is currently exposed to elevated aircraft noise levels as well as noise generated by the day-to-day operation and maintenance (O&M) of vehicles and equipment. Construction would occur during normal working hours (i.e., 7:00 A.M. to 5:00 P.M.), and construction equipment would be equipped with mufflers. Workers would wear hearing protection in accordance with applicable regulations. Transportation of materials and equipment to and from the construction sites would generate noise similar to heavy trucks currently operating on base and along local roadways. In the context of ongoing frequent and intense aircraft noise events on an active military installation, construction noise generated by the AFRC F-35A mission would not result in significant impacts.

FW3.2.2.1 Noise Exposure

FW3.2.2.1.1 Scenario A

The difference in individual overflight sound level between F-35A and F-16 aircraft depends on the specific flight configurations being used by each aircraft and the aircraft's location relative to the listener (both of which are heavily dependent on the aircraft's performance characteristics). Lockheed Martin test pilots currently fly F-35A, B and C aircraft at NAS Fort Worth JRB and many people living near the base are familiar with the sound of F-35 aircraft overflights. Single overflight event noise levels (L_{max} and SEL) for F-35A and F-16 aircraft at a location near NAS Fort Worth JRB are listed in Table FW3-3. The noise levels in this table were calculated in NOISEMAP based on field measurements (obtained under past controlled test conditions at other locations) of noise levels generated by both aircraft types and information on local conditions and flying procedures.

As noted in Chapter 3, Section 3.2.3, computer noise modeling was conducted in compliance with current USAF and DoD-approved methods. The modeling accounted for the effects of terrain relief (e.g., hills and valleys) near NAS Fort Worth JRB as well as surface type (e.g., land and water) on the propagation of sound. Noise modeling at NAS Fort Worth JRB used median atmospheric conditions for sound propagation based on local climate records. The modeling does not reflect possible future climates in part because the degree to which the climate will change and the timeframe in which change will occur are not known at this time. Noise levels were calculated for an average annual day, which is a day with 1/365th of annual total operations. The computer noise model NOISEMAP references a database of field-measured sound levels for aircraft in various flight configurations. The model also uses data on flight procedures for current and proposed aircraft operations (e.g., where, how often, what time of day, and what configurations are used)

based on recent inputs provided by all pilots operating from NAS Fort Worth JRB and ATC. Because flight procedures, surrounding terrain, and other factors are different at each base, application of noise results generated for another airfield would be inappropriate. F-35A flight parameters (e.g., altitude, airspeed, and engine power setting) that are expected to be used at NAS Fort Worth JRB were developed based on information provided by F-35A pilots at bases where the aircraft is operating currently, such as Luke, Hill, and Eglin AFBs. These flight parameters were used to generate results specific to NAS Fort Worth JRB.

Several comments received during scoping requested that the USAF provide individual predicted overflight noise levels using the SEL noise metric. Information is provided on the flight procedure with the highest SEL at several representative noise-sensitive locations in Table FW3-11. A flight procedure is a specific type of operation (e.g., afterburner departure) on a specific flight path, by a specific aircraft type. Actual flight paths vary as a result of weather, winds, aircrew technique, and other factors, and individual flights would deviate in position and noise level from those listed in Table FW3-11. In addition, the flight procedure with the highest SEL is one aspect of a complex sound environment which includes many other flight procedures (e.g., flaps or gear position) as well as other noise sources. At all of the locations, the highest SEL would remain the same or decrease as a result of the new mission relative to baseline conditions. At several locations, F-35B aircraft operated by Lockheed Martin pilots or transient F/A-18E/F aircraft generate the highest SEL under baseline conditions, and would continue to follow the same flight procedures as well as other noise sources. At the White Settlement Library, the highest SEL would decrease by 1 dB because an F-16 flight procedure would discontinue and AFRC F-35A aircraft nor any other aircraft would regularly fly as close to this particular library. Following the proposed beddown, the frequency of F-35A operations would increase substantially, and impacts of this increase are reflected in the DNL noise metric.

Table FW3-11. Highest SEL at Representative Noise-Sensitive Locations near NAS Fort Worth JRB Under Baseline and AFRC F-35A Mission Conditions

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) _{a,b}
				Aircraft	Aircraft Group	Operation Type	Annual Operations at this SEL		
	Type	ID	Description				7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
Baseline	Library	L01	White Settlement Library	F-16C	B	Closed Pattern	24	0	113
	Park	P01	North Z Boaz Park	F-35B	B	Departure	12	0	114
		P02	Vinca Circle Park	F/A-18E/F	T	Arrival	284	0	118
		P03	Malaga Park	F-35B	B	Closed Pattern	36	0	115
		P04	Casino Park	F/A-18E/F	T	Arrival	110	0	119
		P05	Leonard Park	F-35B	B	Departure	12	0	104
		P06	Lake Worth Public Park	F/A-18E/F	T	Closed Pattern	47	0	115
		P07	Plover Circle Park	F-35B	B	Departure	5	0	122
	School	S01	Brewer Middle	F-35B	B	Closed Pattern	36	0	114
		S02	Effie Morris Elementary	F-35B	B	Departure	5	0	112
S03		Luelle Merritt Elementary	F/A-18E/F	T	Closed Pattern	74	0	115	

Table FW3-11. Highest SEL at Representative Noise-Sensitive Locations near NAS Fort Worth JRB Under Baseline and AFRC F-35A Mission Conditions (Continued)

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) _{a,b}
	Type	ID	Description	Aircraft	Aircraft Group	Operation Type	Annual Operations at this SEL		
							7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
AFRC F-35A Mission ^c	Library	L01	White Settlement Library	F/A-18E/F	T	Closed Pattern	151	0	112
	Park	P01	North Z Boaz Park	F-35B	B	Departure	12	0	114
		P02	Vinca Circle Park	F/A-18E/F	T	Arrival	284	0	118
		P03	Malaga Park	F-35B	B	Closed Pattern	36	0	115
		P04	Casino Park	F/A-18E/F	T	Arrival	110	0	119
		P05	Leonard Park	F-35B	B	Departure	12	0	104
		P06	Lake Worth Public Park	F/A-18E/F	T	Closed Pattern	47	0	115
		P07	Plover Circle Park	F-35B	B	Departure	5	0	122
	School	S01	Brewer Middle	F-35B	B	Closed Pattern	36	0	114
		S02	Effie Morris Elementary	F-35B	B	Departure	5	0	112
S03		Luelle Merritt Elementary	F/A-18E/F	T	Closed Pattern	74	0	115	

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c Military power and afterburner power departure SELs at the noise-sensitive locations are within 1 dB of each other and the numbers of annual operations include all three afterburner scenarios.

Key: T = Transient or non-NAS Fort Worth JRB-based aircraft involved in training exercise; B = Based aircraft

Figure FW3-2 shows the DNL contours in 5-dB increments that would result from Scenario A overlain on the baseline noise contours for comparison. Approximately 726 acres of the 2,350 acres that would be newly exposed to DNL of 65 dB is designated as water or undesignated land and approximately 640 acres is residential land. The estimated number of residents exposed to DNL of 65 dB or greater would increase by 8,593 to a total of 21,686 (Table FW3-12). As described in Chapter 3, Section 3.2.3, the affected population was estimated based on U.S. Census data at the Block Group (BG) level with adjustments to remove non-residential areas from calculations (USCB 2016a). Implementation of the AFRC F-35A mission would increase the number of estimated residents in residential areas exposed to DNL of 75 dB or greater by 458 (from 428 under baseline conditions to 886). Both in intensity and in context, this would constitute a significant impact.

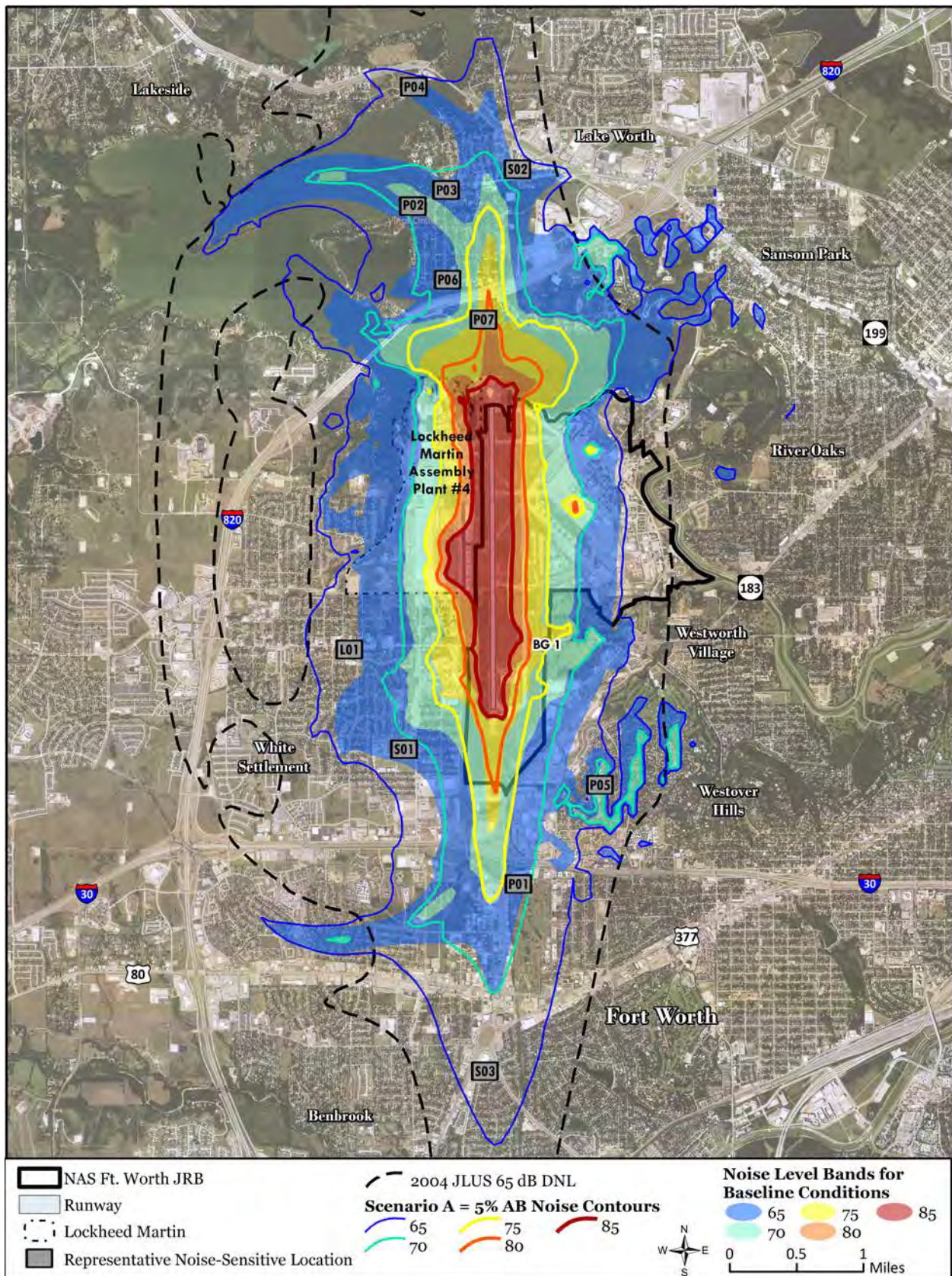


Figure FW3-2. AFRC F-35A Scenario A DNL Contours at NAS Fort Worth JRB

Table FW3-12. Off-Base Acres and Population Exposed to DNL of 65 dB or Greater Under Baseline and Scenario A Conditions at NAS Fort Worth JRB

DNL (dB)	Acres				Estimated Population			
	JLUS	Baseline	Scenario A	Change ^a	JLUS	Baseline	Scenario A	Change ^a
65-69	8,062	3,435	4,667	1,232	21,968	9,992	15,899	5,907
70-74	3,316	1,204	2,003	799	8,450	2,673	4,901	2,228
75-79	1,364	522	758	236	2,415	372	793	421
80-84	395	200	261	61	287	56	93	37
≥85	218	138	160	22	0	0	0	0
Total	13,355	5,499	7,849	2,350	33,120	13,093	21,686	8,593

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

As noted in Chapter 3, Section 3.2.3, the probability that an individual would become annoyed by noise is impossible to predict with confidence because of differing physical and emotional variables between individuals (Newman and Beattie 1985). These variables include, but are not limited to, the person's feeling about the necessity or preventability of the noise, the person's attitude about the environment, and any feelings of fear the person might have about the noise source. It can be said with confidence that people in communities exposed to increased DNL would be more likely to become highly annoyed by the noise (Schultz 1978, Finegold et al. 1994, Meidema and Vos 1998). Studies conducted by Schultz in 1978 and Finegold et al. in 1994 indicated that approximately 12 percent of people exposed to DNL of 65 dB and 36 percent of people exposed to DNL of 75 dB could be expected to be highly annoyed by the noise (Schultz 1978, Finegold et al. 1994). More recent studies suggest that the percentage of people highly annoyed by noise—and aircraft noise in particular—might be higher than previously thought. A study conducted by Meidema and Vos in 1998 indicated that 28 percent of people could be expected to be annoyed by DNL of 65 dB, and 48 percent of people could be expected to be highly annoyed by DNL of 75 dB (Meidema and Vos 1998). Additional details on the prevalence of annoyance in high noise communities are contained in Volume II, Appendix B.

USAF land use compatibility guidelines classify residential land uses as incompatible with DNL greater than 65 dB unless the residences meet minimum structural noise reduction goals. Residential land uses are considered compatible if measures are incorporated which achieve outdoor-to-indoor noise level reduction of at least 25 dB in areas exposed to DNL of 65 to 69 dB and 30 dB in areas exposed to DNL of 70 to 74 dB. Structural elements with better-than-average temperature insulation properties (e.g., double-paned windows) tend to also provide better-than-average noise level reduction. The guidelines state that residential uses in areas exposed to DNL greater than 75 dB are not compatible and should be prohibited. The NCTCOG has published a JLUS that incorporates land use guidelines mirroring DoD guidelines and recommends that local governments take steps to prevent additional incompatible land development (NCTCOG 2017). A more detailed discussion of land use compatibility is contained in Section FW3.8.

The DNL changes that would result from Scenario A are shown in Table FW3-13. Noise levels at the locations listed are similar to noise levels in nearby residential areas. At all 11 locations studied, DNL would exceed 65 dB, at 6 of the locations DNL would exceed 70 dB, and at 1 location DNL would exceed 75 dB. The DNL at North Z Boaz Park would increase by 6 dB. DNL at Malaga Park and Luelle Merritt Elementary School would increase by 5 dB. The DNL at the other locations would increase by 1 to 4 dB.

Table FW3-13. DNL at Representative Noise-Sensitive Locations near NAS Fort Worth JRB Under Baseline and Scenario A Conditions

Type	ID	Description	DNL (dB)		
			Baseline	Scenario A	Change
Library	L01	White Settlement Library	65	68	3
Park	P01	North Z Boaz Park	66	72	6
	P02	Vinca Circle Park	69	72	3
	P03	Malaga Park	66	71	5
	P04	Casino Park	65	67	2
	P05	Leonard Park	70	71	1
	P06	Lake Worth Public Park	68	72	4
	P07	Plover Circle Park	78	79	1
School	S01	Brewer Middle School	67	68	1
	S02	Effie Morris Elementary School	65	67	2
	S03	Luelle Merritt Elementary School	62	67	5

FW3.2.2.1.2 Scenario B

The sole difference between Scenario B and Scenario A is that, under Scenario B, 50 percent rather than 5 percent of departures would use afterburner. All flight procedures flown under the two scenarios would be the same, and there would be no difference in the highest SEL experienced at representative noise-sensitive locations (Table FW3-11). Military power and afterburner power departures generate SELs within 1 dB of each other, and the numbers of annual operations in Table FW3-11 include all three afterburner scenarios.

As discussed in Section FW3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. The Scenario B 65 dB DNL contour is slightly larger than the Scenario A 65 dB DNL contour in areas to the right and left of the runway, but is slightly smaller in areas farther out along departure flight paths (Figure FW3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-25 in Appendix B, Section B.4. The relatively minor differences in noise contour extent between afterburner percent usage scenarios reflects the fact that baseline flying operations, which are constant under all scenarios, generate high time-averaged noise levels. In this context, the changing percentage of AFRC F-35A departures that use afterburner would have a minimal effect on overall noise levels. The 2,369 acres and estimated 8,622 people that would be newly exposed to DNL greater than 65 dB under Scenario B differ by less than 1 percent from the number of acres and estimated population that would be exposed to this level of noise under Scenario A (Table FW3-14).

Table FW3-14. Off-Base Acres and Population Exposed to DNL of 65 dB or Greater Under Baseline and Scenario B Conditions at NAS Fort Worth JRB

DNL (dB)	Acres				Estimated Population			
	JLUS	Baseline	Scenario B	Change ^a	JLUS	Baseline	Scenario B	Change ^a
65-69	8,062	3,435	4,662	1,227	21,968	9,992	15,871	5,879
70-74	3,316	1,204	2,013	809	8,450	2,673	4,940	2,267
75-79	1,364	522	763	241	2,415	372	810	438
80-84	395	200	264	64	287	56	94	38
≥85	218	138	166	28	0	0	0	0
Total	13,355	5,499	7,868	2,369	33,120	13,093	21,715	8,622

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

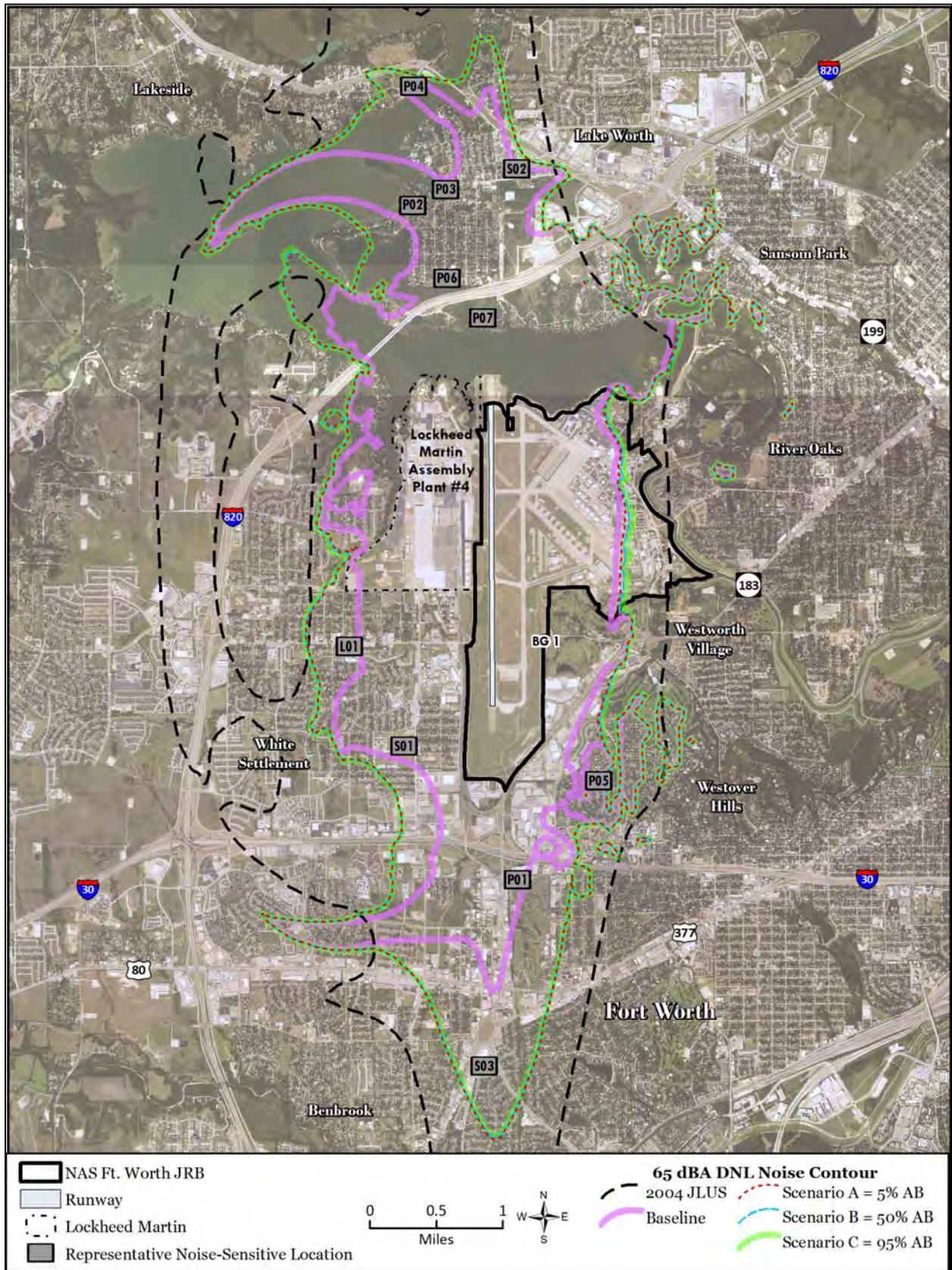


Figure FW3-3. AFRC F-35A Mission 65 dB DNL Contours (Scenarios A, B, and C) at NAS Fort Worth JRB

The DNL at representative noise-sensitive locations under Scenario B would be the same as under Scenario A (see Table FW3-13) except at White Settlement Library, which would be exposed to DNL of 68 dB rather than 67 dB.

FW3.2.2.1.3 Scenario C

Under Scenario C, 95 percent of afterburner departures would use afterburner as opposed to 50 percent under Scenario B or 5 percent under Scenario A. The highest SELs experienced at representative noise-sensitive locations would be the same under Scenario C as shown for Scenario A in Table FW3-11. Military power and afterburner power departures would generate SELs within 1 dB of each other at each of the locations studied, and the number of events per year listed in Table FW3-11 reflect both departure types.

As discussed in Section FW3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. As discussed in Section FW3.2.2.1.2, adjusting the percent of total F-35A departures using afterburner has minimal effect on DNL because baseline flying operations, which are constant under all scenarios, generate a context in which noise levels are already relatively high. The 65 dB DNL noise contours under Scenario C are shown on Figure FW3-3. The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-26 in Appendix B, Section B.4. The 2,386 acres and estimated 8,648 people newly exposed to DNL of 65 dB under Scenario C (Table FW3-15) would differ by less than 1 percent from the number of acres and estimated population exposed to this noise level under Scenario A or B.

Table FW3-15. Off-Base Acres and Population Exposed to DNL of 65 dB or Greater Under Baseline and Scenario C Conditions at NAS Fort Worth JRB

DNL (dB)	Acres				Estimated Population			
	JLUS	Baseline	Scenario C	Change ^a	JLUS	Baseline	Scenario C	Change ^a
65-69	8,062	3,435	4,655	1,220	21,968	9,992	15,836	5,844
70-74	3,316	1,204	2,025	821	8,450	2,673	4,984	2,311
75-79	1,364	522	768	246	2,415	372	826	454
80-84	395	200	268	68	287	56	95	39
≥85	218	138	169	31	0	0	0	0
Total	13,355	5,499	7,885	2,386	33,120	13,093	21,741	8,648

^a Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

The DNL at representative-noise sensitive locations would be the same under Scenario C as under Scenario B. Noise levels at these locations would also be the same as under Scenario A (see Table FW3-13) except that White Settlement Library would be exposed to DNL of 68 dB rather than 67 dB.

FW3.2.2.2 Speech Interference

The number of daytime (7:00 A.M. to 10:00 P.M.) events per hour that could potentially interfere with speech are listed in Table FW3-16. Any aircraft noise event exceeding L_{max} of 50 dB was assumed to have some potential to interfere with speech. The interference would be for a few seconds for each overflight. Noise levels at the locations listed are similar to noise levels in nearby residential areas. Calculations with windows closed and with windows open assume standard values of 25 dB and 15 dB of noise attenuation provided by buildings, respectively. Noise levels at the locations listed are similar to noise levels in nearby residential areas. The number of indoor events per hour with windows open, with windows closed, and outdoor events would increase by one event or less. Any increases in the frequency of disruptions in communication have a high

likelihood of being annoying. Impacts to speech interference resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table FW3-16. Potential Speech Interference Resulting from the AFRC F-35A Mission at NAS Fort Worth JRB

Type	ID	Description	Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour					
			AFRC F-35A Mission			Change		
			Windows Open ^a	Windows Closed ^a	Outdoor	Windows Open ^a	Windows Closed ^a	Outdoor
Library	L01	White Settlement Library	3	2	4	1	0	1
Park	P01	North Z Boaz Park	3	2	4	1	0	1
	P02	Vinca Circle Park	3	2	4	0	0	1
	P03	Malaga Park	3	2	4	1	0	1
	P04	Casino Park	3	2	4	1	1	1
	P05	Leonard Park	3	2	4	1	1	1
	P06	Lake Worth Public Park	3	3	4	0	0	1
	P07	Plover Circle Park	4	3	4	1	0	1

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

FW3.2.2.3 Interference with Classroom Learning

Table FW3-17 presents changes in classroom noise levels with windows open and closed. As described in Section FW3.2.1.3, all of the representative schools with windows open are currently exposed to L_{eq(SD)} greater than 40 dB under baseline conditions and the Luelle Merritt Elementary School is currently exposed to L_{eq(SD)} of 39 dB with windows closed. Under the proposed action, the three schools evaluated would be exposed to noise levels above recommended background levels with windows open and closed. At the Luelle Merritt Elementary School with windows closed, the L_{eq(SD)} would increase from 39 to 44 dB. The number of events per hour with potential to interrupt speech indoors with windows closed, with windows open, and outdoors would increase by one or less. Interference with classroom learning resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table FW3-17. Indoor Classroom Learning Disruption Resulting from the AFRC F-35A Mission at NAS Fort Worth JRB

Type	ID	Description	AFRC F-35A Mission					Change				
			Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
			L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Brewer Middle School	55	3	45	2	4	1	0	1	0	1
	S02	Effie Morris Elementary School	54	3	44	2	4	2	0	2	0	1
	S03	Luelle Merritt Elementary School	54	2	44	2	3	5	0	5	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of outdoor events per hour at or above L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

FW3.2.2.4 Sleep Disturbance

As noted in Chapter 3, Section 3.2.3, the probability of sleep being disturbed at least once per night is estimated based on the number of overflight events and the SEL of each event. The number of late-night flights by AFRC F-35A pilots would be similar to the number currently conducted by AFRC F-16 pilots, and the probability of awakening with windows open would not increase at any location except near the Effie Morris Elementary School and Lake Worth Public Park (i.e., residential areas near the school and park) where the probability would increase by 1 percent. With windows closed, the probability of awakening would increase by 1 percent near Plover Circle Park (Table FW3-18). Impacts to sleep disturbance resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table FW3-18. Average Probability of Awakening Resulting from the AFRC F-35A Mission at NAS Fort Worth JRB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)			
			AFRC F-35A Mission		Change	
			Windows Open ^a	Windows Closed ^a	Windows Open ^a	Windows Closed ^a
Library	L01	White Settlement Library	1	0	0	0
Park	P01	North Z Boaz Park	1	1	0	0
	P02	Vinca Circle Park	1	1	0	0
	P03	Malaga Park	1	1	0	0
	P04	Casino Park	1	1	0	0
	P05	Leonard Park	1	0	0	0
	P06	Lake Worth Public Park	2	1	1	0
	P07	Plover Circle Park	2	2	0	1
School	S01	Brewer Middle School	1	0	0	0
	S02	Effie Morris Elementary School	2	1	1	0
	S03	Luelle Merritt Elementary School	1	1	0	0

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

FW3.2.2.5 Potential for Hearing Loss

FW3.2.2.5.1 Scenario A

The risk of hearing loss was assessed using the methodology prescribed by DoD policy, which is described in Chapter 3, Section 3.2.3, and Volume II, Appendix B. PHL risk is calculated based on the L_{eq24} noise metric. The estimated number of residents exposed to outdoor L_{eq24} exceeding 80 dB would increase by 41 people to a total estimated population of 90 (Table FW3-19). The DNL noise metric results in a greater number of people exposed because DNL applies a noise penalty to events during acoustic night. The DNL metric results in 93 persons exposed to DNL of 80 dB or greater under Scenario A (Table FW3-12).

Three (3) residential land parcels would be newly exposed to this level of DNL. As described in Section FW3.2.1.5, these parcels are located on the shore of Lake Worth, opposite Runway 36. Some of these parcels are located in the CZ, and all are of these parcels are located in a high noise zone as zoned by the City of Fort Worth. The census-based population estimate of 90 persons for this area could be higher or lower than the actual population depending on the types and density of residential use.

Table FW3-19. Estimated Population Exposed to Noise Levels that Could Result in Noise-Induced Permanent Threshold Shift Under Baseline and Scenario A Conditions at NAS Fort Worth JRB

L _{eq24} (dB)	Estimated Population		
	Baseline	Scenario A	Change
80-81	41	40	-1
81-82	8	36	28
82-83	0	14	14
Total	49	90	41

FW3.2.2.5.2 Scenario B

Under Scenario B, the estimated number of residents exposed to outdoor L_{eq24} exceeding 80 dB would increase by 42 to a total estimated population of 91 residents (Table FW3-20). An estimated 94 people would be exposed to DNL greater than 80 dB under Scenario B.

Table FW3-20. Estimated Population Exposed to Noise Levels that Could Result in Noise-Induced Permanent Threshold Shift Under Baseline and Scenario B Conditions at NAS Fort Worth JRB

L _{eq24} (dB)	Estimated Population		
	Baseline	Scenario B	Change
80-81	41	40	-1
81-82	8	37	29
82-83	0	14	14
Total	49	91	42

FW3.2.2.5.3 Scenario C

Under Scenario C, the estimated number of residents exposed to outdoor L_{eq24} exceeding 80 dB would increase by 44 to a total estimated population of 93 residents (Table FW3-21). An estimated 95 people would be exposed to DNL greater than 80 dB under Scenario C.

Table FW3-21. Estimated Population Exposed to Noise Levels that Could Result in Noise-Induced Permanent Threshold Shift Under Baseline and Scenario C Conditions at NAS Fort Worth JRB

L _{eq24} (dB)	Estimated Population		
	Baseline	Scenario C	Change
80-81	41	41	0
81-82	8	37	29
82-83	0	15	15
Total	49	93	44

FW3.2.2.6 Occupational Noise

USAF occupational noise exposure prevention procedures (e.g., hearing protection and monitoring) would be implemented under the AFRC F-35A mission, regardless of which afterburner scenario is selected. These procedures would comply with all applicable OSHA and USAF occupational noise exposure regulations.

FW3.2.2.7 Non-auditory Health Impacts

As noted in Section FW3.2.1.7, the current state of scientific knowledge does not yet support a consistent causal relationship between exposure to aircraft noise and non-auditory health impacts (i.e., impacts other than hearing loss). Several types of potential health impacts have been investigated in multiple studies with contradictory results (Meecham and Shaw 1979, Frericks *et al.* 1980, Jones and Tauscher 1978, Edmonds *et al.* 1979). The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. The connection from annoyance to stress to health issues requires careful experimental design, and the resulting data are subject to different interpretations. A recent, large-scale study indicated that nighttime aircraft noise could be linked to increases in the likelihood of hypertension (Jarup *et al.* 2005, 2008), but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

As discussed in Section FW3.2.2.5, under Scenario A, an estimated 41 residents (10 residential land parcels) would be newly exposed to noise levels that are associated with an increased risk of measureable noise-induced hearing loss under certain circumstances. Under Scenarios B and C, an estimated 42 and 44 people, respectively, would be newly exposed to these noise levels. Consistent with this high risk, and as noted in Section FW3.1.1.1, the USAF and the NCTCOG JLUS recommend applying land use guidelines for communities subject to DNL greater than 65 dB. These guidelines state that residential uses in areas subject to DNL greater than 75 dB are not compatible and should be prohibited.

Studies are consistent with identifying the effects of nighttime aircraft noise on systolic blood pressure as small, but greater than daytime noise. At NAS Fort Worth JRB, 2 percent of total airfield operations are conducted between 10:00 P.M. and 7:00 A.M. Less than 1 percent of AFRC F-35A operations would be flown between 10:00 P.M. and 7:00 A.M. Additional information on the potential for non-auditory health impacts is contained in Section FW3.2.1.7 and Volume II, Appendix B.

FW3.2.2.8 Structural Damage

Damage to structures is not anticipated to result from AFRC F-35A subsonic noise because noise resulting from implementation of the AFRC F-35A mission would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet (CHABA 1977).

Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating noise levels similar to those that result from operation of the F-35A in ancient Anasazi ruins indicate that vibrations would not occur at or near potentially damaging levels (Battis 1983). Additional discussion of the effects of noise on cultural resources is contained in Section FW3.7. Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects in structures would continue to occur. Induced vibrations do not normally result in structural damage, but the rattling of objects does have the potential to contribute to annoyance. Although the risk posed to structures by noise would be minimal, a process exists for dealing with any such damage. Any claims from USAF-related damage would begin by contacting the NAS Fort Worth JRB Public Affairs Office with details of the claim. The claim would then be investigated to establish the exact nature and extent of the damage.

FW3.2.2.9 Animals in the Care of Humans

The reactions of animals in the care of humans (e.g., pets, other domesticated animals, and animals kept in zoos) to an increased number of loud overflight events was a concern raised in several

scoping comments. An animal's reaction to noise depends on several factors including the animal's temperament, training, and past experiences associated with the noise. Certain domesticated species (e.g., horses) are more likely to have strong reactions to noise than others. Potential noise impacts on wildlife are described in Section FW3.6.

In the airfield environment, aircraft typically operate at slower speeds than are used in training airspace. Although these slower speeds mean that elevated overflight sound levels last longer, they also mean that there is a time lag between when the aircraft is first heard and maximum overflight noise level. Sounds with slow rise-times are less likely to induce panic than sudden onset noise (USAF 1995). Because F-35 and F-16 aircraft operate at similar speeds in the airfield environment, the rise times of noise generated by the two aircraft are similar.

One of the most important factors affecting an animal's reaction to noise is the level of familiarity with the noise source. Lockheed Martin pilots currently operate F-35 aircraft at NAS Fort Worth JRB. As described in Section FW2.0, the replacement of AFRC F-16 aircraft with F-35A aircraft would occur over approximately 2 years, and the tempo of F-35A operations would increase slowly as the new airframe gets established at the base. Around the base, AFRC F-35A pilots would use similar flight paths and altitudes to those currently used by the Lockheed Martin test pilots and F-16 pilots. For the purposes of this analysis, all noise impacts show the full impact of 24 aircraft. Because the reactions of domestic animals depends on several factors (e.g., species, situation, predisposition), there is no single noise level below which animals will never react negatively to noise. However, if it is assumed that noise events with the potential to interfere with human conversation could also be bothersome to animals, then the number of noise events per hour with potential to interfere with speech (Table FW3-16) could be an indicator of how frequently animals could be bothered by noise. It is recognized that this metric of noise events per hour with potential to interfere with speech is an arbitrary metric for determining how frequently animals would be bothered by noise. The metric is used purely as a measure of relative change between the No Action Alternative and proposed action.

FW3.2.3 Airspace Affected Environment

This section presents noise levels in training airspace and ranges that would be used by AFRC F-35A pilots. As described in Section FW2.4.1, NAS Fort Worth JRB-based AFRC F-35A pilots would operate in existing MOAs, RAs, and ATCAAs performing combat training missions similar to those currently conducted by AFRC F-16 pilots. The noise analysis accounts for subsonic and supersonic flight noise generated in locations where supersonic flight is authorized. As noted in Chapter 3, Section 3.2.1.1, subsonic noise in training airspace is quantified using the onset-rate adjusted day-night average sound level (L_{dnmr}) and supersonic noise levels are quantified using C-weighted day-night average sound level (CDNL) as well as the number of booms per month that would be heard on the ground. The location, types and number of munitions used during F-35A training would be similar to that used during F-16 training. Therefore, munitions noise levels would remain approximately the same as under baseline conditions.

FW3.2.3.1 Subsonic Noise

Figure FW3-4 shows baseline subsonic noise levels beneath airspace proposed for use by AFRC F-35A pilots from NAS Fort Worth JRB. L_{dnmr} beneath the Brady, Brownwood, Hood, Lancer, Rivers, Sheppard, and Washita MOAs and R-5601/R-5602 are less than 45 dB. The area beneath R-6302 is exposed to L_{dnmr} of 56 dB.

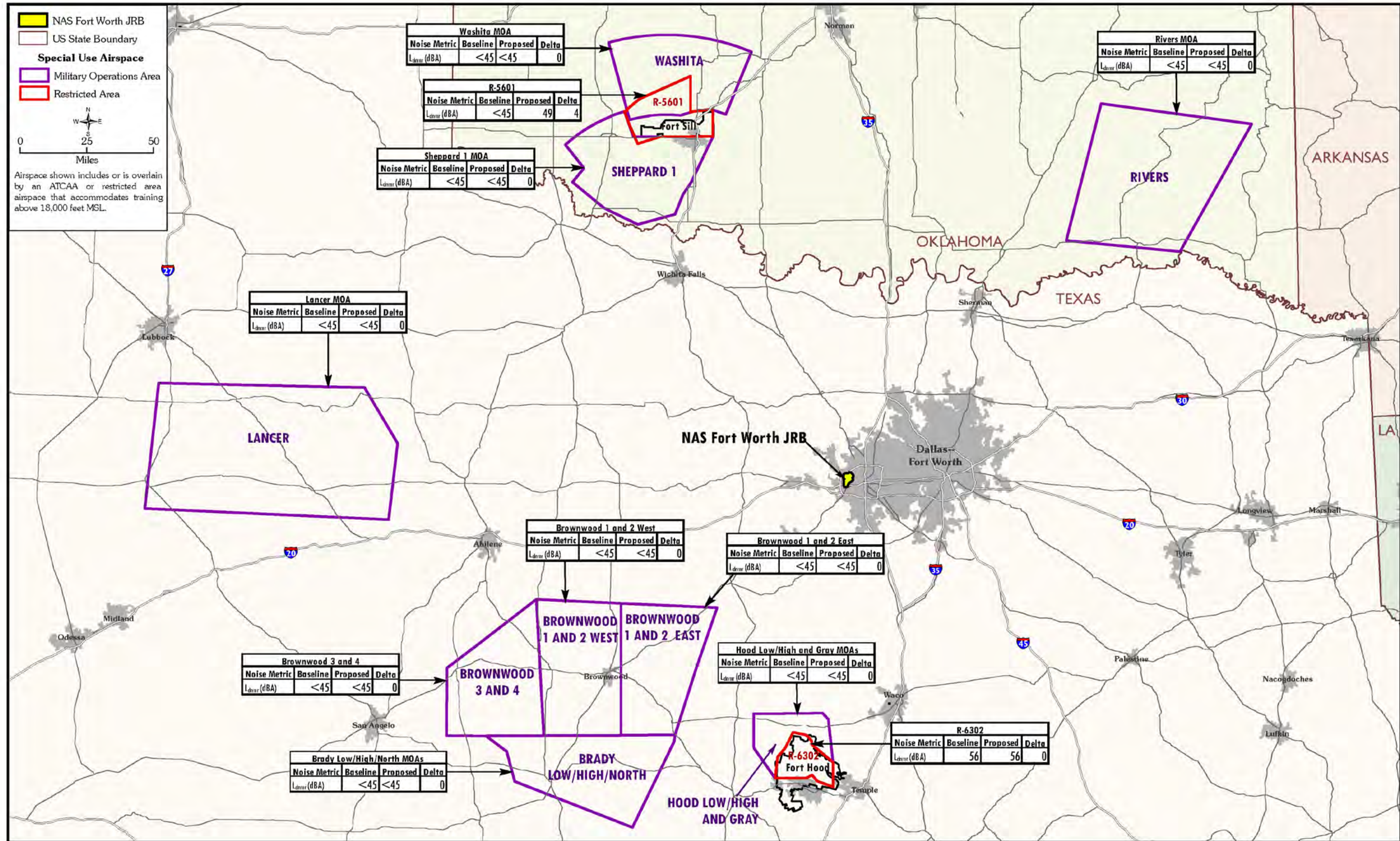


Figure FW3-4. Noise Levels in Training Airspace used by NAS Fort Worth JRB

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FW3.2.3.2 Supersonic Noise

Supersonic flight is permitted in airspace above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher. A sonic boom is created whenever an aircraft exceeds the speed of sound. Whether the sonic boom is experienced at the surface depends on a variety of factors, including the maneuvers of the aircraft creating the sonic boom, the meteorological conditions at different altitudes, the shape of the aircraft, and other factors. Sonic booms generated at altitudes above 30,000 feet MSL often do not ever reach the surface because a sonic boom tends to be refracted upward by the denser air at lower altitudes. The area beneath the Brownwood MOAs currently experiences less than one sonic boom per annual average day and the resulting CDNL is 24 dB.

FW3.2.4 Airspace Environmental Consequences

FW3.2.4.1 Subsonic Noise

Changes in sortie tempo under the AFRC F-35A mission are discussed in Chapter 2, Section 2.3.4.1, and Section FW2.4.1. Late-night training (10:00 P.M. to 7:00 A.M.) by AFRC F-35A pilots would only be conducted in rare contingencies and special mission training. As shown on Figure FW3-4, L_{dnmr} would remain less than 45 dB L_{dnmr} beneath the Brownwood, Hood, Lancer, Rivers, Sheppard, and Washita MOAs. These training airspace areas are very large, and training operations are sufficiently spread out such that intense overflight noise events at any one location are infrequent. Individual overflight noise levels (SEL) generated by F-16 and F-35A aircraft are listed in Chapter 3, Table 3-4. AFRC F-35A pilots would primarily use high altitudes, with 94 percent of total training time being spent at altitudes above 10,000 feet MSL. Training flights are concentrated in a smaller area within R-6302 (Fort Hood Range) and R-5601/R-5602 (Falcon Range). In R-6302, L_{dnmr} would remain at 56 dB under the proposed action, and L_{dnmr} would increase from below 45 dB to 49 dB in R-5601/R-5602. The number of sorties flown annually in R-5601/R-5602 would remain the same, but the F-35A is somewhat louder than the F-16.

Low time-averaged noise levels (e.g., L_{dnmr}) do not imply that loud overflights do not or would not occur. Rather, they should be interpreted to mean that intense overflight noise events occur less frequently (or less frequently between 10:00 P.M. and 7:00 A.M.) than in other areas.

Overflight noise events have the potential to interfere with activities. An increase in the number of loud events, as reflected in increased L_{dnmr} , would be expected to increase the percentage of the population that is highly annoyed by noise.

During scoping, several comments expressed concerns about overflight noise while the aircraft are transiting from the airfield to and from the airspace proposed for use. Aircrews transiting from the installation to training airspace and back again typically use a set of existing prescribed routes. Actual ground tracks of transiting aircraft vary based on several factors, and non-standard routing may be used, as needed, in response to air traffic, weather, or other time-varying conditions. F-35A pilots would typically transit at high altitudes and in cruise configuration using lowered engine power settings to reduce noise impacts and improve fuel efficiency. In addition, flight at these altitudes allows the aircraft to arrive at the training airspace at an appropriate altitude to begin training. Single overflight event noise levels generated by F-35A aircraft in cruise configuration are listed in Chapter 3, Tables 3-3 and 3-4.

Although AFRC F-35A pilots would implement measures to reduce noise, the noise generated by transiting aircraft can be disturbing, particularly when overflight noise affects national parks and other noise-sensitive places where ambient noise levels are low. Detailed discussion of recreation impacts is contained in Section FW3.8.

FW3.2.4.2 Supersonic Noise

AFRC F-35A pilots would conduct supersonic training above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher, similar to training conducted by F-16 pilots under baseline conditions. Most of the sonic booms generated at or above 30,000 feet MSL never reach the ground (Volume II, Appendix B). The number of training sorties flown in the Brownwood MOAs would decrease under the proposed action, and the number of sonic booms would decrease proportionally.

FW3.2.5 Summary Noise Impacts

Implementation of Scenario A would expose an additional 2,350 acres of off-base land and an estimated 8,593 people to DNL of 65 dB or greater. Implementation of Scenario B would expose 2,369 additional acres and an estimated 8,622 additional people to DNL greater than 65 dB. Implementation of Scenario C would expose 2,386 additional acres and an estimated 8,648 additional people to DNL greater than 65 dB. DNL would increase from 1 dB to 6 dB at all of the representative noise-sensitive locations around NAS Fort Worth JRB. These impacts would be the same regardless of which afterburner scenario is selected. Ten (10) of the 11 representative locations are within the 65 dB or greater DNL contour under baseline conditions. All 11 locations would be within the 65 dB or greater DNL contour under the AFRC F-35A mission. Under all three scenarios, indoor events with potential to interfere with speech would increase from one event per hour to two events per hour at Luelle Merritt Elementary School when windows are closed. The frequency of indoor events would not change at Luelle Merritt Elementary School when windows are open, or at any other representative school when windows are open or closed. The frequency of outdoor events would increase by one event per hour at each representative school under all three scenarios. The number of residents newly exposed to outdoor L_{eq24} exceeding 80 dB would increase by 41 under Scenario A, 42 under Scenario B, and 44 under Scenario C. These individuals would be exposed to noise levels that are associated with an increased risk of measureable noise-induced hearing loss under certain circumstances. Based on context and intensity, noise impacts to the area surrounding NAS Fort Worth JRB resulting from implementation of the proposed AFRC F-35A mission would be considered significant.

Regarding noise in the training airspace, subsonic noise levels would remain below 45 dB L_{dnmr} in the majority of the airspace proposed for use. Noise levels in R-6302 would remain unchanged at 56 dB L_{dnmr} and areas under R-5601/R-5602 would experience a 4-dB increase to a level of 49 dB L_{dnmr} . Supersonic flights would continue to occur above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher. However, AFRC F-35A pilots would fly fewer sorties in this airspace. Less than one sonic boom per day currently reaches the ground, and this number would decrease with implementation of the AFRC F-35A mission.

FW3.3 AIR QUALITY

The proposed AFRC F-35A mission at NAS Fort Worth JRB would result in net changes in air emissions due to the replacement of existing aircraft operations with operations from the proposed mission in the base region and associated airspace. The following section describes the air quality affected environment and estimations of impacts due to proposed construction and operational activities within these project regions.

FW3.3.1 Base Affected Environment

Air emissions resulting from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would affect air quality within Tarrant County and surrounding counties. The TCEQ

has adopted the National Ambient Air Quality Standards (NAAQS) for purposes of regulating criteria air pollutant levels within Texas. Table 3-6 in Chapter 3, Section 3.3, of this Draft EIS presents the NAAQS.

FW3.3.1.1 Region of Influence and Existing Air Quality

Identifying the Region of Influence (ROI) for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as carbon monoxide [CO] and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as ozone (O₃) may extend much farther downwind than for inert pollutants. Ozone is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O₃ levels usually occurs several hours after they are emitted and many miles from their source.

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by the annual to tri-annual metrics described in Chapter 3, Section 3.3.1. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, Tarrant County is in attainment of all NAAQS, except that it is in moderate nonattainment of the 2008 O₃ standard and in marginal nonattainment of the 2015 O₃ standard (TCEQ 2018a). Tarrant County is within the Dallas-Fort Worth O₃ nonattainment area. The nonattainment area for the 2008 O₃ standard includes Collin, Dallas, Denton, Ellis, Johnson, Kaufman, Parker, Rockwell, Tarrant, and Wise Counties. The nonattainment area for the 2015 O₃ standard comprises the same counties, except it also includes Hood and excludes Wise Counties.

FW3.3.1.2 Regional Air Emissions

Table FW3-22 summarizes annual emissions generated by activities within Tarrant County for year 2014. Emissions for Tarrant County were obtained from the National Emissions Inventory (NEI) process (USEPA 2018). The majority of emissions within these regions occur from (1) on-road and nonroad mobile sources (VOCs, CO, NO_x, sulfur oxides [SO_x], and carbon dioxide equivalent [CO₂e]), (2) fuel combustion by industrial sources (NO_x and SO_x), (3) solvent/surface coating usages (VOCs), (4) fugitive dust from paved/unpaved roads (particulate matter less than or equal to 10 micrometers in diameter [PM₁₀]), and (5) commercial cooking (particulate matter less than or equal to 2.5 micrometers in diameter [PM_{2.5}]).

Table FW3-22. Annual Emissions for Tarrant County, Texas, 2014

Source Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO ₂ e (mt)
Stationary Sources	26,012	12,462	5,799	345	16,200	3,467	NA
Mobile Sources	11,820	137,668	28,227	552	1,874	1,205	4,020,139
Total Emissions^a	37,832	150,130	34,026	897	18,073	4,672	4,020,139

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO₂e (mt) = carbon dioxide equivalent in metric tons; NA = not available

Source: USEPA 2018

FW3.3.1.3 NAS Fort Worth JRB Emissions

The AFRC F-35A mission at NAS Fort Worth JRB would replace activities associated with the 301 FW. This unit operates 24 F-16 aircraft at NAS Fort Worth JRB. The proposed F-35A aircraft replacement action at NAS Fort Worth JRB would primarily replace existing emissions from (1) F-16 operations, (2) F-16 engine maintenance and testing, and (3) Aerospace Ground Equipment (AGE). While the decrease of 102 personnel that would result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in virtually inconsequential changes in emissions from other base sources associated with the 301 FW (e.g., onsite government motor vehicles or privately owned vehicles), those reductions have been calculated as part of the build-out emission calculations for the action. Nonetheless, the main focus of the project air quality analysis remains emissions from existing and proposed aircraft-specific source categories to determine the net changes in emissions from the F-16 aircraft to the proposed F-35A mission.

To estimate emissions from F-16 aircraft operations and AGE usages associated with the 301 FW mission at NAS Fort Worth JRB, the analysis employed the USAF Air Conformity Applicability Model (ACAM) version 5.0.13a (Solutio Environmental, Inc. 2019). FW3-19 summarizes the annual emissions estimated for the existing F-16 operations of the 301 FW. Volume II, Appendix C, presents details of the emission calculations presented in Table FW3-23. The net emissions change from the decrease of 102 personnel (e.g., emissions from government and privately owned vehicle miles traveled by those 102 personnel) were calculated as a net reduction in the build-out emission calculations for the action.

Table FW3-23. Annual Emissions of Existing 301 FW F-16 Operations at NAS Fort Worth JRB

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Flight Operations and Engine Trim Tests - F-16Cs	14.38	45.28	34.69	3.14	5.48	4.73	8,765
Aircraft Engine Test Cells – F-16C	0.23	0.46	1.22	0.08	0.13	0.12	224
Aerospace Ground Equipment	6.56	11.51	18.88	1.32	1.95	1.89	904
Total Emissions^a	21.16	57.25	54.80	4.54	7.50	6.73	9,893

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e}(mt) = carbon dioxide equivalent in metric tons

FW3.3.1.4 Regional Climate

Meteorological data collected at NAS Fort Worth JRB are used to describe the climate of the NAS Fort Worth JRB project region (National Weather Service 2018a).

Temperature. Tarrant County has hot and humid summer months and mild to cool conditions during the winter. The average high and low temperatures during the summer months at NAS Fort Worth JRB range from about 96 to 68 degrees Fahrenheit (°F). The average high and low temperatures during the winter months range from 69 to 36 °F.

Precipitation. The average annual precipitation for NAS Fort Worth JRB is 34.2 inches. Annual precipitation in the region peaks in late spring, with a secondary peak in the fall (October). The peak monthly average precipitation of 4.6 inches occurs in May. Winter is the driest season, although the lowest monthly average precipitation of 1.6 inches occurs in August. The base averages about two inches of snow per year.

Prevailing Winds. Wind data collected in the Dallas-Fort Worth area are used to describe the wind climate of the NAS Fort Worth JRB project region (National Climatic Data Center 1998).

The annual average wind speed at NAS Fort Worth JRB is 11 miles per hour. February through April is the windiest period, with March having the highest monthly average wind speed of 13 miles per hour. However, the strongest instantaneous winds can occur most of the year in association with thunderstorms and tornados. Tarrant County as a whole experienced 1.4 tornados per year during the 1950-to-2017 period (National Weather Service 2018b). Winds prevail from the south during each month of the year.

FW3.3.1.5 Applicable Regulations and Standards

The TCEQ is responsible for enforcing air pollution regulations in Texas. The TCEQ enforces the NAAQS by monitoring air quality and developing rules to regulate and to permit stationary sources of air emissions. The TCEQ air quality regulations are found in Title 30, Part I of the Texas Administrative Code (TCEQ 2018b).

Historically, the Dallas-Fort Worth area has not attained the O₃ NAAQS. To comply with the requirements of the CAA, the TCEQ has developed plans that would demonstrate attainment or progress towards attainment of the O₃ NAAQS. These plans include measures that would reduce future emissions within the region from both stationary and mobile sources. Once adopted by the state of Texas, these control measures are included in the Texas State Implementation Plan (SIP). The TCEQ approved the latest revision to the attainment plan for the 2008 O₃ standard for the Dallas-Fort Worth area on 8 August 2018. On 12 December 2018, the TCEQ also approved a proposal to request the USEPA to re-designate the Dallas-Fort Worth area to attainment for the revoked 1-hour and 1997 8-hour ozone NAAQS and to provide a maintenance plan that demonstrates the area will remain in attainment of these NAAQS through 2032 (TCEQ 2018c).

FW3.3.2 Base Environmental Consequences

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the proposed AFRC F-35A mission at NAS Fort Worth JRB. The estimation of operational impacts is based on the net change in emissions due to the replacement of existing F-16 aircraft operations with those of the proposed AFRC F-35A mission. Volume II, Appendix C, of this Draft EIS presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources at NAS Fort Worth JRB.

The air quality analysis for the AFRC mission at NAS Fort Worth JRB evaluates F-35A takeoff operations based on the three afterburner scenarios. Activity levels and resulting emissions for all other proposed operational activities would remain the same under each afterburner scenario.

Tarrant County is in moderate nonattainment of the 2008 O₃ standard, in marginal nonattainment of the 2015 O₃ standard, and in attainment of all other NAAQS. Therefore, the analysis used the USEPA General Conformity Rule (GCR) *de minimis* thresholds of 100 tons per year for VOCs and NO_x, and the prevention of significant deterioration permitting threshold of 250 tons per year for all other criteria pollutants as indicators of the significance of projected air quality impacts within the NAS Fort Worth JRB project region.

FW3.3.2.1 Construction

The AFRC F-35A mission at NAS Fort Worth JRB would require demolition and construction/renovation of airfield facilities such as training facilities and maintenance and storage facilities. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM₁₀/PM_{2.5}) resulting from the operation of equipment on exposed soil.

Construction activity data were developed to estimate construction equipment usages and areas of disturbed ground due to the proposed F-35A mission. These data were used as inputs to ACAM, which was used to estimate air emissions from proposed construction activities at NAS Fort Worth JRB. The air quality analysis assumed that all construction activities for the proposed mission would begin in 2021 and be completed in 2023.

Inclusion of standard construction practices and LEED Silver certification into proposed construction activities would potentially reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. Chapter 3, Section 3.3.3.1, of this Draft EIS describes the standard construction practices that would control fugitive dust.

Table FW3-24 presents estimates of emissions from the infrastructure improvements for the AFRC F-35A mission at NAS Fort Worth JRB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, temporary construction emissions associated with the proposed AFRC F-35A mission would not result in significant air quality impacts.

Table FW3-24. Total Construction Emissions from the AFRC F-35A Mission at NAS Fort Worth JRB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Demolish Buildings	0.03	0.20	0.16	0.00	0.06	0.01	35
Renovate/Construct Buildings	0.58	3.15	2.81	0.01	0.12	0.12	609
Total Emissions^a	0.61	3.35	2.97	0.01	0.18	0.13	644
Annual Indicator Threshold	NA	250	NA	250	250	250	NA
General Conformity De Minimis Threshold	100	NA	100	NA	NA	NA	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.
Key: NA = not applicable

FW3.3.2.2 Operations

The proposed AFRC F-35A mission at NAS Fort Worth JRB would primarily generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, and (3) AGE. The analysis also includes emissions that would occur from the net change in commuting activities between the proposed F-35A and existing F-16 missions at NAS Fort Worth JRB. Because the mission would result in a net reduction of 102 personnel, this would produce a net reduction in emissions from commuting activities. To estimate emissions from the F-35A mission at NAS Fort Worth JRB, the analysis employed the ACAM. The air quality analysis assumed that the proposed mission would reach full operations and resulting emissions in 2024 after the completion of all required infrastructure improvements.

The analysis of proposed aircraft operations is limited to operations that would occur in the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer, where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

During scoping, people submitted comments regarding the pollutant impacts that could result from implementation of the proposed AFRC F-35A mission. Table FW3-25 summarizes the annual operational emissions that would result from implementation of the proposed mission at NAS Fort Worth JRB. The data in Table FW3-25 show that the replacement of existing F-16 aircraft operations with the proposed AFRC F-35A operations would result in a reduction of VOC emissions and increases in all other pollutant emissions for the three afterburner scenarios. The

data in Table FW3-25 also show that scenario emissions would increase with increasing afterburner use rates. Implementation of Scenario C (95 percent afterburner rate) would result in the most emissions, but the emissions would increase by less than 6 percent for any criteria pollutant compared to Scenario A (5 percent afterburner rate). These emission increases would not exceed any annual indicator threshold or applicable General Conformity threshold for NO_x or VOCs. Therefore, operational emissions associated with the proposed AFRC F-35A mission at NAS Fort Worth JRB would not result in significant air quality impacts.

Table FW3-25. Projected Annual Emissions from AFRC F-35A Mission Operations at NAS Fort Worth JRB, 2024 – All Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Scenario A							
Flight Operations and Engine Trim Tests - F-35As	0.14	61.35	54.62	6.04	9.64	8.66	16,724
Aircraft Engine Test Cells – F-35As	0.00	0.41	1.95	0.13	0.17	0.15	375
Aerospace Ground Equipment	8.20	14.39	23.60	1.65	2.43	2.36	1,130
Net Commuting Activities (F-35A - F-16 staff)	(0.17)	(1.97)	(0.14)	0.00	0.00	0.00	(164)
Total F-35A Mission Emissions	8.17	74.18	80.03	7.82	12.24	11.17	18,064
Existing 301 FW Emissions	21.16	57.25	54.80	4.54	7.50	6.73	9,893
F-35A Mission Minus 301 FW Emissions	(13.00)	16.93	25.24	3.28	4.74	4.43	8,172
Scenario B							
Total F-35A Mission Emissions	8.18	76.30	80.33	7.92	12.33	11.26	18,003
F-35A Mission Minus 301 FW Emissions	(12.99)	19.05	25.54	3.38	4.83	4.52	8,111
Scenario C							
Total F-35A Mission Emissions	8.19	78.41	80.48	8.01	12.41	11.33	17,920
F-35A Mission Minus 301 FW Emissions	(12.98)	21.16	25.69	3.47	4.91	4.59	8,028
Annual Indicator Threshold	NA	250	NA	250	250	250	NA
General Conformity <i>De Minimis</i> Threshold	100	NA	100	NA	NA	NA	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: NA = not applicable; () = negative values and net reductions in emissions

The VOC emission reductions estimated to result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would result in the following positive effect within the Dallas-Fort Worth region:

- Proposed operations would generate hazardous air pollutants (HAPs), primarily in the form of VOCs and particulates from the combustion of aviation fuel in F-35A aircraft and AGE. Because the decrease in VOC emissions from the proposed mission would be greater than the increases in PM₁₀ and PM_{2.5} emissions, implementation of the proposed mission would result in a net reduction of HAPs. These emission reductions would result in a net benefit to ambient HAPs levels.

FW3.3.2.3 General Conformity Statement

The previous analyses show that the net change in annual emissions resulting from implementation of the AFRC F-35A mission at NAS Fort Worth JRB would remain below the applicable VOCs and NO_x conformity *de minimis* thresholds. As a result, the proposed AFRC F-35A mission at NAS Fort Worth JRB would not require a conformity determination under the GCR.

FW3.3.3 Airspace Affected Environment

Projected AFRC F-35A aircraft operations in the airspace proposed for use and along the flight routes between these locations and NAS Fort Worth JRB would affect air quality within these portions of northcentral Texas and southern Oklahoma. All of the regions below these areas are currently in attainment of all of the NAAQS.

FW3.3.4 Airspace Environmental Consequences

AFRC F-35A pilots operating from NAS Fort Worth JRB would operate in the same airspace and training areas as existing 301 FW pilots, but at higher altitudes. The proposed AFRC F-35A operations in these areas would occur above 3,000 feet above ground level (AGL) about 99 percent of the time (Table FW2-6) and therefore these operations would not appreciably affect ground-level air quality. Compared to existing 301 FW operations, F-16 operations occur below 3,000 feet AGL approximately 21 percent of the time. AFRC F-35A pilots would fly about 1.2 percent more sorties in the airspace compared to existing 301 FW F-16 aircraft.

To quantify the air quality effects of the F-35A mission within the NAS Fort Worth JRB airspaces and training areas, the analysis employed the ACAM to estimate the net change in emissions between the replacement of existing F-16 aircraft operations with proposed F-35A aircraft operations within these areas. The analysis used aircraft flight profiles developed by the project noise analyses as inputs to the ACAM. The analysis focused on operations within the lowest 3,000 feet of the atmosphere.

Table FW3-26 presents the annual operational emissions that would result from implementation of the F-35A mission within the NAS Fort Worth JRB airspaces and training areas. These data show that the proposed changes in aircraft operations within these areas would result in net reductions in all air pollutant emissions within 3,000 feet AGL. Therefore, implementing the proposed AFRC F-35A mission in existing airspace and training areas would not result in significant air quality impacts.

Table FW3-26. Projected Annual Emissions from the AFRC F-35A Mission Operations within NAS Fort Worth JRB Airspaces and Training Areas - 2024

Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Existing 301 FW Flight Operations - F-16	(11.08)	(5.33)	(181.55)	(6.63)	(8.24)	(7.43)	(20,026)
AFRC Mission Flight Operations – F-35A	0.00	0.22	11.89	0.58	0.63	0.57	1,748
F-35A Mission Minus 301 FW Emissions	(11.08)	(5.11)	(169.66)	(6.05)	(7.60)	(8.63)	(18,278)
Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

FW3.3.5 Summary of Impacts to Air Quality

Tarrant County is in nonattainment of the 2008 and 2015 O₃ standards, but is in attainment of all other NAAQS. As shown in Table FW3-27, calendar year annual emissions from construction activities and the net change in aircraft operations around the base would not exceed any annual indicator threshold. Emissions would decrease in training airspace. Therefore, implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would not result in significant air quality impacts.

Table FW3-27. Summary of Calendar Year Annual Emissions from the AFRC F-35A Mission at Fort Worth JRB

Activity/Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Construction – Year 2021	0.20	1.42	1.26	0.00	0.10	0.06	271
Construction – Year 2022	0.41	1.93	1.72	0.01	0.08	0.08	372
Construction – Year 2023	0.00	0.00	0.00	0.00	0.00	0.00	0
Net Change in Operations – Most Emissive Afterburner Scenario C - Year 2024+	(12.98)	21.16	25.69	3.47	4.91	4.59	8,028
Annual Indicator Threshold	NA	250	NA	250	250	250	NA
General Conformity De Minimis Threshold	100	NA	100	NA	NA	NA	NA

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions.

FW3.4 SAFETY

Air Force Instruction (AFI) 90-801, *Environment, Safety, and Occupational Health Councils*, implements the risk management guidance within Air Force Policy Directive (AFPD) 90-8, *Environment, Safety, and Occupational Health Management and Risk Management* (USAF 2013). All USAF missions and daily routines involve risk. Requirements outlined in this document provide for a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety analysis contained in the following sections addresses issues related to the health and well-being of both military personnel and civilians living on or near NAS Fort Worth JRB and under the training airspace.

Specifically, this section provides information on explosive safety; fire risk and management; hazards associated with aviation safety (Accident Potential Zones [APZs]); aircraft mishaps; and Bird/Wildlife Aircraft Strike Hazard [BASH]).

The FAA is responsible for ensuring safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. To fulfill these requirements, the FAA has established safety regulations, airspace management guidelines, a civil-military common system, and cooperative activities with the DoD. The primary safety concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird-aircraft strikes.

FW3.4.1 Base Affected Environment

FW3.4.1.1 Explosive Safety

Explosive safety quantity-distance (ESQD) arcs at NAS Fort Worth JRB include the area around the magazines north of the taxiways, the ready-alert facilities, and the southern end of the main runway. The ESQD arcs are shown on Figure FW2-1.

FW3.4.1.2 Fire Risk and Management

Day-to-day O&M activities conducted at the base are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders (TOs), and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements including AFI 91-202, *The US Air Force Mishap Prevention Program*. Aircraft Rescue Firefighting services are available on a

24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services.

The NAS Fort Worth JRB Fire and Emergency Services provides 24-hour crash, structural, and emergency medical first response; technical rescue; hazardous material and weapons-of-mass-destruction incident response; and fire prevention, safety, and training/education services to NAS Fort Worth JRB. Equipment includes two command vehicles, two ambulances, three fire engines, three aircraft crash response apparatuses, a hazardous material response vehicle and a rescue boat. Base Fire and Emergency Services holds mutual aid agreements with the Lockheed-Martin Aeronautics Company and the Cities of Sansom Park, Benbrook, Fort Worth, Lake Worth, River Oaks, and White Settlement.

NAS Fort Worth JRB adheres to specific emergency-response procedures contained in TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, for aircraft mishaps involving composite materials. TO 00-105E-9 contains a section (Chapter 3) on Mishap Composite Awareness.

FW3.4.1.3 Accident Potential Zones

In accordance with DoDI 4165.57, APZs are established at military airfields to delineate recommended compatible land uses for the protection of people and property on the ground. APZs define the areas of a military airfield that would have the highest potential to be affected if an aircraft mishap were to occur. Air Installations Compatible Use Zones (AICUZ) guidelines identify three types of APZs for airfields based on aircraft mishap patterns: the CZ, APZ I, and APZ II. Safety zones (CZs/APZs) have been established to delineate recommended surrounding land uses for the protection of people and property on the ground. Runway 18/36 at NAS Fort Worth JRB has cone-shaped CZs encompassing an area 1,500 to 2,284-feet-wide (1,500 feet in width at the runway threshold and 2,284 feet in width at its outer edge) by 3,000-feet-long. APZ I is 3,000-feet-wide by 5,000-feet-long and APZ II is 3,000-feet-wide by 7,000-feet-long. The boundaries of the CZs and APZs have been provided to local governments for their use in planning documents. If needed, to reflect different departure and arrival patterns, both the shape and size of APZs can be modified. Figure FW3-5 depicts the CZs and APZs at NAS Fort Worth JRB.

Multiple land uses are found in the CZs and APZs including residential, retail, parks, and industrial. The northern APZ I primarily consists of single-family residential, park lands and industrial properties. Howry Junior High and Effie Morris Elementary are located within APZ II. The remainder of the APZ II is primarily residential and commercial, with some industrial uses.

To the south, APZ I and APZ II cross the installation boundary into the community. A majority of the southern CZ is contained within NAS Fort Worth JRB property, the remaining acreage, approximately 77 acres, is either privately owned and currently vacant or roadway. The only exceptions are two structures located within the southeast corner of the CZ. APZ I primarily consists of commercial and industrial properties, including portions of Ridgmar Mall and Z. Boaz Park. Many dwelling units exist within the southernmost portion of the APZ I and II areas (DFW Advisors Ltd. 2008).



Figure FW3-5. CZs and APZs at NAS Fort Worth JRB

FW3.4.1.4 Aircraft Mishaps

Mishaps are defined as any damage that occurs on the ground or in flight. As shown in Table FW3-28, mishaps are classified into four categories, based on the severity of the mishap relative to property damage or personnel injury. Class A mishaps are the most severe with total property damage of \$2 million or more or a fatality and/or permanent total disability. Comparison of Class A mishap rates for various engine types, as calculated per 100,000 flying hours provide the basis for evaluating risks among different aircraft and levels of operations. This safety section analyzes existing and projected Class A mishap potentials based on flying hours and aircraft types.

Table FW3-28. Aircraft Class Mishaps

Mishap Class	Total Property Damage	Fatality/Injury
A	\$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	\$500,000 or more but less than \$2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	\$50,000 or more but less than \$500,000	Nonfatal injury resulting in loss of one or more days from work beyond day/shift when injury occurred
D	\$20,000 or more but less than \$50,000	Recordable injury or illness not otherwise classified as A, B, or C

Aircraft flight operations at NAS Fort Worth JRB are governed by standard flight rules. Aircrews ensure flight safety when operating at the airfield by complying with all safety and aircraft operating requirements. No Class A or B mishaps have occurred during the past 3 years at NAS Fort Worth JRB. The F-16 has a lifetime Class A mishap rate of 3.43 (10,889,468 cumulative hours through 2017) (USAF 2017).

FW3.4.1.5 Bird/Wildlife-Aircraft Strike Hazard

Bird and wildlife-aircraft strikes and the hazards they present form another safety concern for aircraft operations. Bird/wildlife-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area.

According to the Air Force Safety Center BASH statistics, from 1995 to 2016, where altitude at time of strike was known, more than 50 percent of the strikes occurred below 400 feet AGL, and 90 percent occurred below 2,000 feet AGL (USAF 2017). Waterfowl generally present the greatest BASH potential due to their flocking flight patterns and because, when migrating, they can be encountered at altitudes up to 20,000 feet AGL. Raptors also present a substantial hazard due to their size and soaring flight patterns. In general, the threat of bird-aircraft strikes increases during March and April and from August through November due to migratory activities. The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 20 years indicates that 11 USAF aircraft have been destroyed and five fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2016 (USAF 2017).

The USAF BASH program was established to minimize the risk for collisions of birds and aircraft and the subsequent loss of life and property. AFI 91-202 requires each flying unit in the USAF to develop a BASH plan to reduce hazardous bird/animal activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined in the plan include monitoring the

airfield for bird activity, issuing bird hazard warnings, initiating bird avoidance procedures when potentially hazardous bird activities are reported, and submitting BASH reports for all incidents.

NAS Fort Worth JRB developed a Wildlife Hazard Management Plan (WHMP) to integrate wildlife, BASH, environmental, and military concerns to make safety a top priority to pilots, the public, and equipment.

From 2012 to 2017, NAS Fort Worth JRB personnel recorded 109 bird strikes in the airfield and airspace. The concentration of birds at and around NAS Fort Worth JRB poses a risk to flying operations. The terrain, bodies of water, and climate are ideal living conditions for birds year-round, as well as migratory species.

The WHMP provides the final BASH program component, combining the local BASH program concept of operations and wildlife hazards identified in the Wildlife Hazard Assessment with specific integrated wildlife damage management actions to mitigate, control, remove, or depredate those hazards to local airfield operations. The WHMP infuses risk management into resource planning by identifying habitat modification techniques and wildlife management actions for priority funding which will provide the greatest improvement to aviation safety.

The WHMP establishes implementation procedures and actions to minimize the potential of bird-aircraft strikes. Such measures include eliminating seed producing vegetation, eliminating grasshoppers, and maintaining grass heights between 7 and 14 inches. BASH reduction techniques currently employed by the base include surveys, harassment (various types), habitat management, effigies, nest removal or destruction, depredation, exclusion devices, and others. Most bird activity is between May-June and September-October. During this time, the NAS Fort Worth JRB operates under BASH Phase 2 procedures: Minimum altitude of 1,000 feet AGL and if significant bird activity is observed, low altitude operations will terminate (NAS Fort Worth JRB 2017b).

FW3.4.2 Base Environmental Consequences

O&M activities conducted on NAS Fort Worth JRB would continue to be performed in accordance with all applicable safety directives. No specific aspects of F-35A O&M would create any unique or extraordinary safety issues. Refer to Chapter 2, Section 2.3.4.2, for a discussion of the types of defensive countermeasures and ordnance that would be used by AFRC F-35A pilots. Only approved weapons systems would be used by AFRC F-35A pilots on the impact training ranges and pilots would adhere to all flare and live-fire use restrictions.

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All renovation and construction activities would be completed in compliance with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with antiterrorism/force protection requirements and explosives safety requirements. The USAF does not anticipate any significant safety impacts to result from construction, demolition, or renovation if all applicable AFOSH and OSHA requirements are implemented. In addition, O&M of the new munitions buildings would not result in significant safety impacts.

Although F-35A aircraft are currently being operated at NAS Fort Worth JRB, base emergency and mishap response plans would be updated to include procedures and response actions necessary to address a mishap involving AFRC F-35A aircraft and associated equipment. With this update, airfield safety conditions would remain similar to baseline conditions. As indicated in Section FW3.4.2.2, base fire and emergency services would continue to be party to mutual-aid support agreements with nearby communities.

FW3.4.2.1 Explosive Safety

The construction and operation of the proposed facilities would comply with Department of Defense Explosives Safety Board Standard (DDESB) 6055.09, *DoD Ammunition and Explosives Safety Standards* (DoD 2008), Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards* (USAF 2017) and AFMAN 32-1084, *Facility Requirements* (USAF 2016). No new requirements for ESQD arcs are anticipated. No changes to explosive safety would result from the construction and operation of the proposed facilities at NAS Fort Worth JRB.

FW3.4.2.2 Fire Risk and Management

Fire and crash response would continue to be provided by NAS Fort Worth JRB Fire and Emergency Services. TO 00-105E-9 provides guidance on fire response to aircraft containing composite materials, including the F-35A. Firefighters would continue to be fully trained and appropriately equipped for crash and rescue response and the proposed AFRC F-35A beddown would not change these abilities. Aircraft pre-incident plans would be developed for the F-35A. Aircraft pre-incident plans are required to be reviewed, validated and/or updated annually or anytime there is a change to TO 00-105E-9 for the applicable aircraft. Equipment and training specific to addressing F-35A mishaps would be obtained and conducted prior to beddown. Additionally, NAS Fort Worth JRB would keep local firefighting departments informed about any new information or firefighting techniques associated with composite materials should an accident occur.

FW3.4.2.3 Accident Potential Zones

No changes to existing APZs or CZs would be required to accommodate AFRC F-35A operations. As documented in Section FW3.8.1.1, there is incompatible residential development within the CZs and APZs. For the reasons described below, implementation of the AFRC F-35A mission would not increase the safety risk to these or other off-base areas. NAS Fort Worth JRB would continue to work with communities and developers to apply the AICUZ guidelines. Implementation of flight safety procedures and compliance with all flight safety requirements would minimize the potential for significant impacts to result from aircraft mishaps in the APZs and CZs.

FW3.4.2.4 Aircraft Mishaps

Implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would replace the existing F-16 mission operated by the 301 FW. During public scoping, several commenters were concerned with the flight safety of the single-engine F-35A, as well as the increased use of composite aerospace materials in the construction of the F-35A. Approximately 13 percent of the F-16, by weight, is comprised of composite materials, while approximately 42 percent of the F-35A, by weight, is comprised of composite materials (Air Force Research Laboratory 2015).

FW3.4.2.4.1 Flight Safety

As of March 2019, the F-35A has amassed more than 76,000 hours of flight time with three Class A mishaps, resulting in a mishap rate of 3.94 (Table FW3-29). These mishaps included an engine failure during takeoff preparation (the aircraft was safely brought to a halt), an aborted takeoff with damage confined to the engine, and a hydraulic failure resulting in collapsed nose landing gear that occurred after landing and parking. No injuries occurred during these events. Because the F-35A has not yet reached 100,000 hours, this mishap rate is not directly comparable to other aircraft (Chapter 3, Section 3.4.3) with more flying hours. However, this rate does provide some indication of the overall safety of the F-35A aircraft. For example, this rate is much lower than the 18.65 rate of the F-16 after a comparable amount of hours.

Table FW3-29. F-35A Class A Flight Mishap History

Fiscal Year	Class A		Destroyed		Fatal		Hours Flown Per Year	Cumulative Flight Hours
	Number of Mishaps	Rate	Aircraft	Rate	Pilot	All		
2010	0	0.00	0	0.00	0	0	0	0
2011	0	0.00	0	0.00	0	0	0	0
2012	0	0.00	0	0.00	0	0	215	215
2013	0	0.00	0	0.00	0	0	1,283	1,498
2014	1	37.54	0	0.00	0	0	2,664	4,162
2015	0	0.00	0	0.00	0	0	7,467	11,629
2016	0	0.00	0	0.00	0	0	11,343	22,972
2017	0	0.00	0	0.00	0	0	22,714	45,686
2018	2	11.90	0	0.00	0	0	30,514	76,200
Lifetime	3	3.94	0	0.00	0	0	-	76,200

Note: Flight "rates" are number of mishaps per 100,000 flight hours. Only aviation "Flight" mishaps are reported here. An aviation "Flight" mishap is any mishap in which there is intent for flight and reportable damage to a DoD aircraft.
 Source: USAF 2019

Historical trends of USAF aircraft show that mishaps of all types decrease the longer an aircraft is operational. For example, when the last single-engine fighter fielded by the USAF (F-16) surpassed 100,000 hours in 1982, its Class A rate was 15.83 with four fatal mishaps (USAF 2017). Since then, the mishap rate for the F-16 has decreased substantially. In 2017, the F-16 had a lifetime Class A mishap rate of 3.39, and its rate for the last 10 years is 1.83 (USAF 2019). Similarly, in 1979, when the A-10 surpassed 100,000 hours, its Class A rate was 9.24 with four fatalities recorded (USAF 2019). The A-10 has a lifetime Class A mishap rate of 1.90, and its rate for the last 10 years is 0.55 (USAF 2019). The mishap rate for the F-35A is expected to decline as the aircraft becomes operationally mature. The Pratt & Whitney F135 engine used in the F-35A was derived from the F119 engine, which is used in the F-22 Raptor. The F-22 features a 0.54 lifetime engine-related Class A flight mishap rate.

In addition, aircraft with newer engines and designs generally have fewer mishaps than aircraft with older engines and designs. Table FW3-30 demonstrates the decreases in engine-related and lifetime mishap rates for 11 historic and current single-engine aircraft.

Table FW3-30. Class A Flight Mishap Rates

Decade Introduced	Aircraft/Engine	Engine-Related Cumulative Class A Mishap Rate	Engine-Related Class A Mishap Rate Last 6 Quarters	Lifetime Class A Mishap Rate
1950s	F-100/ J57	5.61	No longer in service	21.22
	F-102/ J57	3.41	No longer in service	Not available
	F-104/ J79	9.48	No longer in service	Not available
	F-105/ J75	4.56	No longer in service	12.15
	F-106/ J75	2.04	No longer in service	Not available
1960s	A-7/TF41	1.73	No longer in service	5.71
1970s	F-16/ F100-200	1.84	No longer in service	3.43
1980s	F-16/ F110-100	1.06	0.76	
	F-16/ F100-220	0.96	0	
1990s	F-16/ F110-129	0.85	0	
	F-16/ F100-229	0	0	

During scoping, some comments were received regarding safety deficiencies of the F-35A aircraft. In a review of the production program for all models of the F-35 (A, B, and C), the Government

Accountability Office has noted various deficiencies as this advanced aircraft is developed and brought into production (GAO 2018). These deficiencies are being addressed as full-rate production is approached. The USAF recognizes that certain components have yet to reach full capability. The USAF would not operate any aircraft should safety-of-flight concerns be present.

FW3.4.2.4.2 Composite Aerospace Materials

Advanced composites have been used in aircraft construction since the late 1960s, when a boron-epoxy rudder was installed on the F-4 jet. As composite technology has advanced, the percentage of composite material used in modern aircraft has increased. Types of composites include carbon fiber (e.g., graphite used in sporting equipment), metal-matrix composites (e.g., materials used on spacecraft and racing bicycles), and ceramic-matrix composites (e.g., medical implants). As noted by members of the public during scoping, one disadvantage of certain composites is that these materials can degrade under extreme temperatures, resulting in the production of toxic fumes and airborne fibers. Because of these characteristics, composite aerospace materials present unique hazards to mishap responders. A burning aircraft could release toxic products, exposing personnel and the environment. Individuals exposed to a crash site could experience dermatological and respiratory problems. Exposure to these hazards would not necessarily end when a fire is extinguished; exposure to recovery crews, site security, the surrounding population, and others could continue (NAVFAC 2016). Sampling at mishap sites of aircraft containing composite materials indicated the presence of respirable fibers/dusts in the air. In addition, laboratory studies have identified respirable fiber products and toxic gases (including high levels of CO, NO_x, and hydrogen cyanide) from burning composite materials (NAVFAC 2016).

Due to the rarity of mishaps involving composite aerospace materials, no epidemiological data are available on personnel exposure to burning composites. Similarly, no studies have assessed the toxicology of carbon fibers generated in a fire scenario with extended post-exposure duration. Synergistic interactions between the solid, vapor, and gaseous combustion products have also not been determined. However, research and experience during several crash responses do indicate that composite fiber release is relatively low (Air Force Research Laboratory 2015).

In the event of a crash of an aircraft containing composite materials, the USAF would follow the guidance contained in the *Mishap Response Checklist for Advanced Aerospace Materials/Composites* (USAF Advanced Composites Program Office 1993).

- Areas in the immediate vicinity of the mishap site affected by direct and dense fallout from the fire/explosion-generated smoke plume would be evacuated, along with easily mobile critical equipment. Aircraft and flight operations exposed to the immediate fallout area would be altered or moved. All unprotected personnel would be restricted from assembling downwind of the crash site.
- The fire would be extinguished and composites cooled to below 300°F. Only firefighters equipped with a self-contained breathing apparatus would be authorized in the immediate vicinity of a burning/smoking mishap site until the fire chief declares the area safe. If possible, high-pressure water break-up and dispersal of composite structures would be avoided.
- The mishap site would be roped or cordoned off and a single entry/exit point would be established upwind of the wreckage. Only sufficiently protected individuals would be authorized in the immediate mishap site and peripheral areas.
- Should personnel other than those at the accident site be directly and substantially exposed to adverse material hazards, the medical staff would be consulted for evaluation and

tracking. Time permitting, the otherwise un-threatened populace in affected or fallout areas would be advised to do the following:

- Remain indoors;
 - Shut external doors and windows;
 - Turn off forced air intakes; and
 - Await further notification.
- Specific aircraft hazards would be identified by inspection and consultation with the crew chief or aircraft specialists. Composite and other hazardous materials would be identified to mishap response personnel. The On-Scene Commander would be advised of all findings and recommendations.
 - When exiting the crash site, personnel would use a high-efficiency particulate air-filtered vacuum, if available, to remove asbestos-containing materials (ACM) from their outer clothing, work gloves, boots, headgear, and equipment. If unavailable, efforts would be made to wipe or brush off as much contamination as possible. Clean sites (i.e., tent or trailer) would be set up for donning/removal of personal protective equipment if practical.
 - Non-disposable clothing involved with crash/fire-damaged composite parts would be removed and laundered as determined by the base environmental engineer. Personnel should shower (in cool water) prior to going off-duty to preclude injury from loose fibers. Portable showers would be provided, if necessary.
 - Burned/mobile composite fragments and loose ash/particulate residue would be secured with firefighting foam or a fine water mist until a hold-down fixant material is applied to immobilize the fibers. Initial actions should concentrate on debris containment. Investigators, specific aircraft authority, and the base environmental engineer would be consulted before applying any fixant.

FW3.4.2.4.3 Aircraft Mishap Summary

Aviation in all forms has inherent risk and it is not possible to guarantee the future flight-safety risk of any aircraft. However, due to the current F-35A record, the increasing safety trend for single-engine fighter aircraft, and increases in safety as an airframe matures operationally, it is reasonable to expect nominal changes in flight-safety risk to result from implementation of the AFRC F-35 mission at NAS Fort Worth JRB.

FW3.4.2.5 *Bird/Wildlife-Aircraft Strike Hazards*

The 12.1 percent airfield operations increase resulting from the AFRC F-35A mission could increase the risk of bird/wildlife-aircraft strike. However, strict adherence to the WHMP and the active BASH program activities would minimize these risks. The WHMP would remain in place to reduce the risk of bird/wildlife-aircraft strikes.

FW3.4.3 **Airspace Affected Environment**

The airspace proposed for use by AFRC F-35A pilots from NAS Fort Worth JRB includes RAs, MOAs, and ATCAAs (Table FW2-5 and Figure FW2-2). Aircraft flight operations are governed by standard flight rules. The volume of airspace encompassed by the combination of airspace elements constitutes the ROI for airspace safety. These training areas allow military flight operations to occur without exposing civil aviation users, military aircrews, or the general public to hazards associated with military training and operations. This section describes the existing

safety procedures in the airspace proposed for use and the following section evaluates changes that would occur with the introduction of the F-35A.

FW3.4.3.1 Fire Risk and Management

Fires attributable to flares are rare for three reasons. First, the altitude and other restrictions on flare use minimize the possibility for burning material to contact the ground. Second, to start a fire, burning flare material must contact vegetation that is susceptible to burning at the time. The probability of a flare igniting vegetation is expected to be equally minimal. Third, the amount and density of vegetation, as well as climate conditions, must be capable of supporting the continuation and spread of fire.

Aircraft based at NAS Fort Worth JRB utilize two live fire ranges, the Falcon Range at Fort Sill in Oklahoma and the Fort Hood Range in Texas. Both Fort Sill and Fort Hood conduct prescribed burning and maintain firebreaks to contain fires originating from live-fire areas. Prescribed burning is controlled by the Directorate of Emergency Services and is conducted by qualified personnel. The number of acres treated each season depends on weather conditions and the availability of areas not occupied for training. Areas are usually treated on a 5- to 7-year burn cycle, depending on the success of each burn, although some areas might go for longer periods without treatment (Fort Hood 2013) (USAFACFS 2014).

FW3.4.3.2 Aircraft Mishaps

Aircraft flight operations are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield (AFI 11-2F-16V3, *Flying Operations F-16 Operations Procedures*) to ensure flight safety.

FW3.4.3.3 Bird/Wildlife-Aircraft Strike Hazard

The primary threat to military aircraft operating in the airspace is migratory birds. The exact number of birds struck in the airspace areas is difficult to assess because small birds are not detected until post-flight maintenance checks and the location of such strikes cannot be determined. Refer to Section FW3.4.1.5 for more information regarding BASH and the actions that are implemented to minimize bird strikes.

FW3.4.4 Airspace Environmental Consequences

The addition of F-35A aircraft to the airspace would not require changes to the management or structure of existing airspace. AFRC F-35A pilots would fly mission profiles similar to those currently flown by F-16 pilots operating from NAS Fort Worth JRB, only at higher average altitudes, including air-to-ground ordnance delivery and air combat training operations. Implementation of the proposed AFRC F-35A mission would result in a 1.2 percent increase overall airspace sorties in the existing airspace proposed for use. As described in Section FW3.1.4.1, total sorties would remain within the capability and capacity of the airspace and ranges proposed for use.

FW3.4.4.1 Fire Risk and Management

Flare and ordnance deployment in authorized ranges and airspace is governed by a series of regulations based on safety and environmental considerations and limitations. These regulations establish procedures governing the use of flares over ranges, other government-owned

and -controlled lands, and nongovernment-owned or -controlled areas. Chapter 2, Section 2.3.4.2, details the flares and ordnance proposed for use by AFRC F-35A pilots.

The frequency of flare use would remain the same or decrease from baseline conditions. AFRC F-35A pilots would only use flares in compliance with existing airspace altitude and seasonal restrictions to ensure fire safety. Based on the emphasis of flight at higher altitudes, roughly 90 percent of F-35A flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires. Lands surrounding the air-to-ground training impact areas underlying airspace ensure public protection by restricting access to areas associated with laser use, emitters, and ordnance delivery. All guidance, regulations, and instructions for ordnance delivery at the ranges would be adhered to by AFRC F-35A pilots. Mutual fire response and suppression agreements would continue.

FW3.4.4.2 Aircraft Mishaps

Continued maintenance of situational awareness and use of available communications for tracking the scheduled and near real-time status of the SUAs would help maintain a safe flying environment for all concerned. Any changes to those capabilities and the current or future areas in which this service is provided would be appropriately addressed and communicated through those same venues. The majority of flight operations would be conducted over remote areas; however, in the unlikely event that an aircraft accident occurs, existing response, investigation, and follow-on procedures would be enforced to ensure the health and safety of underlying populations and lands. Implementation of flight safety procedures and compliance with all flight safety requirements would minimize the chances for aircraft mishaps.

FW3.4.4.3 Bird/Wildlife-Aircraft Strike Hazards

AFRC F-35A pilots would operate the aircraft in the same airspace environment as other pilots from NAS Fort Worth JRB, albeit at a higher altitude than current aircraft. Therefore, the overall potential for bird-aircraft strikes would be reduced following the beddown of the F-35A. When BASH risk increases due to time of year, limits are and would continue to be placed on low-altitude flights. Briefings are provided to pilots when the potential exists for greater bird-strike risks within the airspace; AFRC F-35A pilots would also be subject to these procedures. Implementation of the AFRC F-35A mission would not result in significant BASH risks in the airspace proposed for use.

FW3.4.5 Summary of Impacts to Safety

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All new construction would incorporate antiterrorism/force protection requirements and would comply with applicable safety regulations.

As of September 2017, the F-35A has amassed more than 36,000 hours of flight time with one Class A mishap resulting in a mishap rate of 2.73. As the F-35A becomes operationally mature, the F-35 mishap rate would be expected to continue to decline, as supported by the documented decline in mishap rates for the F-16 and A-10.

NAS Fort Worth JRB has an active BASH program and the changes in operations could increase BASH incidents. This increase is not anticipated to be significant. With regard to airspace, AFRC F-35A pilots would use the same airspace used by 924 FG pilots. Impacts to safety resulting from implementation of the new mission are not anticipated to be significant.

FW3.5 SOIL AND WATER RESOURCES**FW3.5.1 Base Affected Environment***FW3.5.1.1 Soil Resources*

NAS Fort Worth JRB is located in the Grand Prairie section of the Central Lowlands of north-central Texas (NAS Fort Worth JRB 2015a). This area is characterized as a broad, gently sloping terrace. The predominant soil type at NAS Fort Worth JRB is the Urban land soil complex. Soils in this complex have been altered and disturbed from previous development to the extent that they cannot be classified (Soil Survey Staff 2018). Additional information on soils at the base is provided on the Web Soils Survey (Soil Survey Staff 2018).

*FW3.5.1.2 Water Resources***FW3.5.1.2.1 Surface Water**

The base and all of Tarrant County are located in the Trinity River Watershed. Surface water on or adjacent to the base includes Lake Worth, Farmers Branch Creek, Kings Branch, and the West Fork of the Trinity River. Lake Worth is a man-made impoundment that serves as the northern border for the installation. Water quality concerns in Lake Worth include polychlorinated biphenyls (PCBs) and dioxins. The Texas Department of State Health Services (TDSHS) has issued a fish consumption advisory for Lake Worth and recommends people limit or avoid consumption of various species of fish (TDSHS 2018). The segment of the West Fork of the Trinity River adjacent to the base is listed on the State of Texas Clean Water Act Section 303 (d) List of Threatened and Impaired Water Bodies. Farmers Branch Creek conveys water from the west side of the installation into the West Fork of the Trinity River. This creek extends under the runways and taxiways through a drainage culvert (NAS Fort Worth JRB 2015a).

The majority of the base is drained by a system of swales, inlets, ditches, and canals. The system also includes a sub-surface storm drainage system. Runoff from the northern part of the base is directed into the Lake Worth outfall. Runoff from the southern part of the base is routed to Farmers Branch Creek and the central and eastern portion of the base is drained into the West Fork of the Trinity River (USAF 1995). Residential and commercial development occurring west of the installation in the City of White Settlement and other areas has the potential to increase stormwater flow over the airfield. Although two 15-foot culverts are located under the runway, the area has infrequently flooded in the past, causing potential runway closures (NAS Fort Worth JRB 2015a).

Regarding water permits, discharges from the base are authorized under Texas Pollutant Discharge Elimination System (TPDES) Multi-Sector General Permit (MSGP) No. TXR050000. The MSGP is valid through July 13, 2021. As part of the MSGP, the base is required to prepare, implement and maintain a Stormwater Pollution Prevention Plan (SWPPP) (NAVFAC 2016). The most recent version of the SWPPP was prepared in 2016 to address the requirements of the MSGP. The plan is reviewed annually and revised as necessary. The plan identifies 42 different drainage areas on the installation, each with its own outfall. Six of the outfalls (1, 3, 4, 5, 6, and 7) are permitted by TPDES for industrial stormwater discharges. With the exception of outfall 7 (because it is substantially similar to outfall 5), stormwater discharge monitoring is conducted at the outfalls that are permitted for industrial discharge. Both visual and analytical monitoring is conducted at each of the six outfalls. The visual monitoring is conducted quarterly and the analytical monitoring is conducted annually.

Section 1.3.1 of the SWPPP includes reference to the TPDES Construction General Permit TXR150000 permit which establishes requirements for construction sites disturbing greater than one acre of soil, including lay-down, ingress and egress areas. Although deicing is discussed in the SWPPP and NAS Fort Worth JRB has a deicing pad, the SWPPP states that, for three years prior to 2016, deicing activities have not been conducted at the installation. In addition, analytical monitoring is only required when 100,000 gallons or more of glycol-based deicing chemicals and/or 100 tons or more of urea are used at the installation in any of the three prior calendar years.

FW3.5.1.2.2 Groundwater

Five major hydrogeologic units are located below the base. The units are described as an upper zone of perched water in alluvial terrace deposits; an aquitard in the Goodland, Limestone, and Walnut Formations; an aquifer in the Paluxy Formation; an aquitard in the Glen Rose Formation; and, an aquifer in the Twin Mountain Formation (NAS Fort Worth JRB 2004). There are no active groundwater supply wells on the base. All of the potable water used on base is received from the City of Fort Worth.

FW3.5.1.2.3 Floodplains

As shown on Figure FW1-2, the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) identifies areas of the 100- and 500- year floodplain located adjacent to Lake Worth, along the West Fork of the Trinity River and along Farmers Branch Creek as it extends under the southern end of the runway and flightline. The majority of the installation is located outside of any floodplains.

FW3.5.2 Base Environmental Consequences

FW3.5.2.1 Soil Resources

Implementation of the projects identified in Table FW2-1 would disturb approximately 7.7 acres of land, most of which has been previously disturbed. Impacts to soil resources near each of the project sites would result from ground disturbance (e.g., compaction; vegetation removal; and excavation for foundations, footings, or utilities). Onsite soils (Urban land) have been disturbed to the point that classification of the soils is not possible (Soil Survey Staff 2018). Implementation of management practices would minimize impacts to soil resources. These actions could include, but would not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, as appropriate. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would occur as a result of implementation of the proposed AFRC F-35A mission.

FW3.5.2.2 Water Resources

FW3.5.2.2.1 Surface Water

Impacts to surface water can result from land clearing, grading, and moving soil leading to localized increases in stormwater runoff volume and intensity. Approximately 1.2 acre of new impervious surfaces would be created and pollutants have the potential to be introduced into construction areas. In accordance with UFC 3-210-10, *Low Impact Development* (LID) (as amended, 2016) and the Emergency Independence and Security Act (EISA) Section 438 (42 USC §17094), any potential increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features (i.e., use of porous materials, directing runoff to permeable areas, and use of detention basins to

release runoff over time). The integration of LID concepts incorporates site design and stormwater management principles to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area.

All of the projects proposed for the new mission are located near the north end of the runway in existing developed areas. With the exception of the trailer maintenance expansion on Building 3355 (Drainage Area 1), all of the proposed development is in Drainage Area 3. Prior to construction, the contractor would be required to obtain coverage under the TPDES Construction General Permit (TXR150000) by filing a NOI with the TCEQ and prepare a site-specific SWPPP to manage stormwater discharges during and after construction until the area is revegetated. The Navy would specify compliance with the stormwater discharge permit in all of the contractor construction requirements. The contractor would be required to prepare the SWPPP in accordance with the TPDES SWPPP Instructions (TCEQ 2018). The plan would include site-specific management practices to eliminate or reduce sediment and non-stormwater discharges. Other management practices in the plan could include the use of water sprays during construction to keep soil from becoming airborne, use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials and revegetating the site in a timely manner.

Drainage Area 1 is approximately 53 acres and drains stormwater from the grassy areas between Taxiway Alpha 2, Foxtrot, and the parking apron. Stormwater is collected through a series of pipes and inlets until it exits through the magazine area, through Outfall 1, and into Lake Worth. The Building 3355 expansion project would occur on existing pavement and no additional impervious surface would be added to this drainage area.

Drainage Area 3 is approximately 280 acres and is the third largest drainage area on the base. This drainage area is composed primarily of impervious surface (NAVFAC 2016). This area drains into a large open channel ditch which directs runoff into large subsurface pipes. A stormwater diversion system behind Building 1803 diverts light precipitation flow towards basin four. During moderate to heavy precipitation flow, stormwater from this area flows over the diversion and through Outfall 3 and into the West Fork of the Trinity River. Approximately one acre of impervious surface would be added to this drainage area accounting for less than a one percent increase in impervious surface.

The existing NAS Fort Worth JRB SWPPP also identifies control practices to be followed for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. As part of the SWPPP, the base has identified individuals to be part of the Stormwater Pollution Prevention Team (SWPPT). The SWPPT meets annually, is responsible for all aspects of the SWPPP and provides recommendations to the Environment, Safety, and Occupational Health Leadership Committee regarding the SWPPP status, any deficiencies, deicing usage data and outfall monitoring data.

No changes to the existing aircraft deicing operations would be necessary with implementation of the new mission. For 3 years prior to 2016, deicing activities have not been conducted at the installation and deicing is not anticipated to be required with the new mission. However, if deicing is required, Building 4199 has a deicing pad and the SWPPP contains provisions for inspections and monitoring when necessary.

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would not result in significant impacts to water resources.

FW3.5.2.2.2 Groundwater

Implementation of the AFRC F-35A mission would result in a decrease (-102) in personnel, and no additional demand for water from the City of Fort Worth would be required. Implementation of the proposed mission is not anticipated to result in impacts to groundwater resources.

FW3.5.2.2.3 Floodplains

No floodplains are located near any of the areas proposed for infrastructure development on NAS Fort Worth JRB. Therefore no impacts to floodplains would result from implementation of the proposed AFRC F-35A mission.

FW3.5.3 Summary of Impacts to Soil and Water Resources

Implementation of the proposed action would disturb approximately 7.7 acres of land. Approximately 1.2 acres of new impervious surface would be added, resulting in less than a 1 percent increase in impervious surface in this drainage area. No floodplains or groundwater would be impacted. Implementation of management practices would minimize impacts to soil and water resources and projects would be designed and implemented in accordance with LID and EISA to minimize impacts to soil and water resources. Therefore, potential impacts to soil and water resources would be minimal, and no significant impacts to these resources would result from implementation of the proposed action.

FW3.6 BIOLOGICAL RESOURCES

The ROI for biological resources is defined as the land area (habitats) that could be affected by the infrastructure and construction projects on the base, and the primary airspace where AFRC F-35 pilots would predominantly fly. For the purposes of this biological resources analysis, the ROI for the proposed action and No Action Alternative includes Tarrant County, Texas.

FW3.6.1 Base Affected Environment

FW3.6.1.1 Vegetation

NAS Fort Worth JRB is located within a transition zone between the Cross Timbers and Blackland Prairie ecoregions of north-central Texas. This area was once dominated by alternating woodlands and broad tall-grass prairies. Historical vegetation included areas of oak-hickory, open savannah, and dense brush of post and blackjack oaks. Areas surrounding the installation are now primarily developed, with the exception of the shorelines of Lake Worth to the north.

NAS Fort Worth JRB is comprised mostly of improved and semi-improved grounds, with mowed grassland as the primary vegetation community. Little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardi*), and buffalo grass (*Buchloe dactyloides*) are the most common species. Due to historical urban sprawl, the majority of native vegetation that was once present on the installation has now been replaced with non-native grasses and ornamental trees (NAS Fort Worth JRB 2004).

Unimproved areas of the installation include small woodland and riparian patches and the shorelines of Lake Worth. Post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), cedar elm (*Ulmus crassifolia*), American elm (*U. americana*), hackberry (*Celtis laevigata*), and sumac (*Rhus* spp.) are the most common species of trees. Stream edges and riparian areas are dominated by a thick understory of trumpet vine and shrubs (*Campsis radicans*) and honeysuckle (*Lonicera* spp.). Sporadic patches of rush species (*Juncus* spp.), black willow (*Salix nigra*), and cattails (*Typha* spp.)

are present near the shoreline of Lake Worth. Vegetation management at NAS Fort Worth JRB is guided by the WHMP (NAS Fort Worth JRB 2017b).

FW3.6.1.2 Wildlife

Information on wildlife occurring on NAS Fort Worth JRB is provided in the historical Integrated Natural Resources Management Plan (INRMP) and the WHMP (NAS Fort Worth JRB 2004, 2017b). Grassland and wooded habitats at NAS Fort Worth JRB support numerous small mammals, birds, reptiles, and amphibians. Mammals such as coyotes (*Canis latrans*) and black-tailed hares (*Lepus californicus*) are typically found in the upland grassy areas and along the runways, while cottontail rabbits (*Sylvilagus floridanus*), fox squirrels (*Sciurus niger*), and opossums (*Didelphis virginiana*) inhabit the wooded lowlands. Common bird species include mourning dove (*Zenaidura macroura*), brown-headed cowbird (*Molothrus ater*), western meadowlark (*Sturnella neglecta*), common grackle (*Quiscalus quiscula*), European starling (*Sturnus vulgaris*), and red-tailed hawk (*Buteo jamaicensis*). Although amphibian and reptile surveys have not been conducted on base, the wooded and wet areas along Lake Worth likely support a wide variety of reptiles and amphibians including various species of toads, frogs, turtles, lizards, and snakes.

FW3.6.1.3 Threatened, Endangered, and Special Status Species

FW3.6.1.3.1 Federally Listed Species

The USFWS’s Information for Planning and Consultation (IPaC) online system was accessed on 8 February 2018 to identify current USFWS trust resources (e.g., migratory birds, species proposed or listed under the ESA, inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands) with potential to occur within the ROI for biological resources at NAS Fort Worth JRB.

On 8 February 2018, the USFWS provided an automated *Official Species List* via Section 7 letter that identified two endangered species protected under the ESA (16 USC § 1531 et seq.) that could occur in Tarrant County, Texas. Neither of these two species has been seen on NAS Fort Worth JRB. Table FW3-31 presents these species.

Table FW3-31. Federally Listed Species with Potential to Occur in Tarrant County, Texas

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at NAS Fort Worth JRB?
<i>Birds</i>				
Least Tern	<i>Sterna antillarum</i>	FE	Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally on gravel rooftops.	No
Whooping Crane	<i>Grus americana</i>	FE	Whooping cranes winter on the Gulf Coast, primarily in Texas’s Aransas National Wildlife Refuge. The species nest in potholes dominated by bulrushes and containing other aquatic plants (e.g., cattails, sedge, and muskgrass). Farther inland, their range includes sandy, gently rolling grasslands with live oak, red bay, and bluestem plants. Migrating birds feed in croplands and roost in shallow, freshwater wetlands.	No

Key: FE = federally endangered; FT = federally threatened
 Source: NAS Fort Worth JRB 2004; USFWS 2001, 2005, 2014, 2018a, b

No federally listed species are currently known to occur on NAS Fort Worth JRB. This assessment is based on historical surveys completed by the TPWD and subsequent survey work conducted as part of the INRMP (NAS Fort Worth JRB 2004; 2018). Additionally, no critical habitat occurs on or near NAS Fort Worth JRB (USFWS 2018a).

FW3.6.1.3.2 Migratory Birds

Migratory bird species protected under the Migratory Bird Treaty Act (MBTA) (16 *USC* §§ 703–712) could occur as residents or migrants near NAS Fort Worth JRB. The Lake Worth area located directly north of the installation attracts a variety of water birds such as wood duck (*Aix sponsa*), mallard (*Anas platyrhynchos*), pintail (*A. acuta*), golden eye (*Bucephala clangula*), common merganser (*Mergus merganser*), and great blue heron (*Ardea herodias*). Other birds observed near the lake shoreline include killdeer (*Charadrius vociferus*), rock doves (*Columba livia*), house sparrows (*Passer domesticus*), and northern cardinals (*Cardinalis cardinalis*). Although no suitable nesting habitat is present on NAS Fort Worth JRB, peregrine falcons (*Falco peregrinus tundrius*), bald eagles (*Haliaeetus leucocephalus*), interior least terns (*Sterna antillarum athalassos*), various species of gulls, and whooping cranes (*Grus americana*) have been reported to use Lake Worth as stopover habitat during migrations (NAS Fort Worth JRB 2004). The installation WHMP serves as the BASH plan and provides an active program to minimize bird/aircraft strikes, and is based on known hazards from both resident and seasonal bird populations that utilize the area (NAS Fort Worth JRB 2017b).

FW3.6.1.3.3 Bald and Golden Eagles

Bald eagles protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 *USC* 668-668c), have not been observed at NAS Fort Worth JRB. However, bald eagles have been historically observed foraging near Lake Worth within the undisturbed tracts of bottomland forest habitat (TPWD 2018a). There are no known golden eagle (*Aquila chrysaetos*) occurrences on or near NAS Fort Worth JRB (Texas A&M 2007).

FW3.6.1.3.4 State-Listed Species

The TPWD online list of Rare, Threatened, and Endangered Species of Texas by County was reviewed for state-listed species with potential to occur within the ROI for biological resources at NAS Fort Worth JRB (TPWD 2018b). No state-listed species are known to occur at NAS Fort Worth JRB (NAS Fort Worth JRB 2004, 2018b).

FW3.6.1.4 Wetlands

According to the INRMP, NAS Fort Worth JRB contains a single 1.3 acre jurisdictional wetland, as determined by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act (CWA) (NAS Fort Worth JRB 2004). The wetland is located along a fence that controls access between the base and the West Fork of the Trinity River, east of Knights Lake Road and the NAS Fort Worth JRB Chapel (NAS Fort Worth JRB 2004).

FW3.6.2 Base Environmental Consequences

FW3.6.2.1 Vegetation

Activities associated with construction, demolition, and renovation projects would occur in developed or disturbed areas within the commercial land use area of NAS Fort Worth JRB. Revegetation of temporarily disturbed areas would be conducted as directed by the base natural resource manager to

minimize the potential for erosion and dust generation. No significant impacts to vegetation would result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB.

FW3.6.2.2 Wildlife

Potential impacts to wildlife could include ground disturbance and construction noise from the associated facility and infrastructure projects. In addition, airfield operations can result in bird/wildlife-aircraft strikes and noise impacts.

The areas planned for development for the proposed AFRC F-35A mission at NAS Fort Worth JRB are highly disturbed and provide little habitat for wildlife species. The existing turfgrass and landscaped areas provide some urban adapted wildlife species with limited habitat. This habitat would be lost with construction of the proposed facilities and infrastructure projects.

Noise resulting from the proposed construction, demolition, and renovation activities would be localized, short-term, and only occur during daylight hours. Areas proposed for construction are in a military industrial land use with frequent elevated noise levels. Impacts to wildlife from construction noise would be minimal.

Annual airfield operations are anticipated to increase by approximately 12.1 percent (Section FW2.3). Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. NAS Fort Worth JRB would continue to adhere to the installation's WHMP and employ wildlife dispersal methods as outlined in the USFWS issued Depredation Permit to minimize the risk of strikes.

Impacts to wildlife and domestic animals that could result from aircraft noise are summarized below and discussed in more detail in Volume II, Appendix B. As described in Section FW3.2.2, there would be an increase in the number of acres exposed to DNL of 65 dB or greater. This increase in noise levels surrounding NAS Fort Worth JRB would result in an increase in the numbers of animals exposed to higher noise levels. Animals hear noise at different levels, in different frequency ranges, and tolerate noise differently than humans. These differences make comparing the noise metrics created for evaluating human impacts to animal impacts difficult. However, the number of noise events per hour with potential to interfere with speech (Table FW3-16) can be used as an indicator of changing frequency noise events that could affect animals. For example, under baseline conditions animals in Malaga Park currently experience four events per hour that are at a sufficient level to interfere with human speech. Implementation of the proposed mission would increase this number by one event per hour.

Volume II, Appendix B, summarizes a number of scientific studies that have been conducted on the effects of aircraft noise on animals. These studies have shown that animal species have a wide range of responses to aircraft noise. One conclusion of these studies is that a general response to noise by domestic animals and wildlife is a startle response. These responses vary from flight, trampling, stampeding, jumping, or running to the movement of the head in the directions of the noise. These studies report that the intensity and duration of the startle response decreases with time, suggesting no long-term, adverse effects. The majority of the studies suggest that domestic animal species and wildlife show behaviors characteristic of adaptation, acclimation, and habituation to repeated aircraft noise (Volume II, Appendix B). Therefore, significant impacts to wildlife are not anticipated in the ROI surrounding NAS Fort Worth JRB.

FW3.6.2.3 *Threatened, Endangered, and Special Status Species*

FW3.6.2.3.1 Federally Listed Species

Because no federally listed threatened, endangered, or candidate species and/or designated critical habitat occur in the ROI near NAS Fort Worth JRB, no impacts would result from implementation of the proposed AFRC F-35A mission in the areas surrounding NAS Fort Worth JRB. In an email dated 27 June 2018, the USFWS agreed that ESA Section 7 requirements had been applied and that no further Section 7 consultation is required (Volume II, Appendix A, Section A.2.6.4).

FW3.6.2.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in a 12.1 percent increase in total annual airfield operations. Any increase in operations could result in an increased opportunity for bird-aircraft strikes to occur. Adherence to the existing WHMP would minimize the risk of bird-aircraft strikes including those for migratory birds to negligible levels (Section FW3.4.1). Noise-related impacts to migratory birds nesting near NAS Fort Worth JRB would be the same as those described for other wildlife. Minimal impacts to migratory birds protected under the MBTA would result from implementation of the proposed AFRC F-35 mission in the ROI near NAS Fort Worth JRB.

FW3.6.2.3.3 Bald and Golden Eagles

No bald or golden eagles or eagle nesting is known to occur at NAS Fort Worth JRB or in the immediate vicinity of the installation and therefore impacts to sensitive nesting habitat would not occur. Bald eagles are known to forage near the installation and noise-related impacts to these bald eagles would be similar to that described for other wildlife. No significant impacts to eagles protected under the BGEPA are anticipated to result from implementation of the proposed AFRC F-35A mission in the ROI near NAS Fort Worth JRB.

FW3.6.2.3.4 State-Listed Species

No state-listed species are known to occur at NAS Fort Worth JRB and therefore no impacts to state-listed species would result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB.

In a letter dated 2 May 2018, the TPWD provided recommendations regarding the proposed AFRC F-35A mission and biological resources at NAS Fort Worth JRB. See Volume II, Appendix A, Section A.2.6.1 for a copy of the scoping letter. The TPWD identified specific state-listed species that have a greater potential of being impacted by the proposed project. These included the timber rattlesnake (*Crotalus horridus*), Western burrowing owl (*Athene cunicularia hypugaea*), Plains spotted skunk (*Spilogale putorius interrupta*), and Texas garter snake (*Thamnophis sirtalis annectens*). The TPWD also provided recommendations to address species protected under the MBTA, ESA, and habitats for state-listed species were provided.

All of the proposed facility and infrastructure projects would occur entirely in developed or disturbed areas within the improved or semi-improved grounds on base. No construction activities would occur in riparian or stream corridors. As described in Section FW3.6.2.2, wildlife habitat in the proposed construction areas is limited. The only potential habitat in the proposed construction area would be for the Western burrowing owl. These owls are known to nest in developed and semi-developed areas. No populations of the Western burrowing owl have been observed at

NAS Fort Worth JRB and no other suitable habitats for state-listed species are known to occur in the proposed construction areas.

The TPWD letter also addressed the use of artificial nighttime lighting and subsequent adverse impacts such as disorientation and exhaustion to night-migrating birds. The TPWD recommends the USAF use the minimum amount of night-time lighting needed for safety and security and to use dark-sky friendly lighting that is on only when needed, down-shielded, as bright as needed, to minimize blue light emissions. Under the proposed action, NAS Fort Worth JRB would continue to employ Pilot Controlled Lighting (PCL) phase, within the runway, taxiway, and approach to minimize any use of artificial nighttime lighting. Under the PCL phase, lighting is manually controlled by the pilots during takeoff or landing in the evenings when the tower is closed. See Section FW3.6.3.3.2 for an additional discussion on migratory birds within the airspace proposed for use. No impacts to state-listed species would result from implementation of the proposed AFRC F-35 mission at NAS Fort Worth JRB.

FW3.6.2.4 Wetlands

Construction, demolition, and renovation projects associated with the proposed action would not occur within or near any wetland areas. Therefore, there would be no impacts to wetlands at NAS Fort Worth JRB.

FW3.6.3 Airspace Affected Environment

The primary airspace and range area proposed for use by AFRC F-35A pilots comprises the ROI for biological resources.

FW3.6.3.1 Vegetation

The airspace proposed for use by AFRC F-35A pilots from NAS Fort Worth JRB covers approximately 16,133 square miles of land in north-central Texas and southern Oklahoma. Primary range area covers approximately 491 square miles of land in Oklahoma and primary airspace covers approximately 4,224 square miles of land in north-central Texas (Figure FW2-2). Vegetation communities under the airspace proposed for use includes those of the Cross Timbers ecoregion. Native vegetation of this area was once dominated by woodlands (oak-hickory and post-oak savannah) and irregular plains and prairies with tall-growing grasses such as big bluestem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and switchgrass (*Panicum virgatum*). However, crop production and cattle ranching have drastically changed the landscape (TPWD 2018c).

FW3.6.3.2 Wildlife

The Cross Timbers ecoregion supports a wide range of wildlife species. Common mammal species known from the region include white-tailed deer (*Odocoileus virginianus*), mule deer (*O. hemionus*), desert bighorn sheep (*Ovis canadensis nelsoni*), pronghorn antelope (*Antilocapra americana*), gray squirrel (*Sciurus carolinensis*), fox squirrel, and collared peccary (*Pecari tajacu*). Common bird species of the region include eastern turkey (*Meleagris gallopavo silvestris*), various quail species (*Colinus virginianus*, *Callipepla squamata*, *C. gambelii*, *Cyrtonyx montezumae*), ducks, geese, coots, rails, snipes, woodcock, and doves (mourning, white-tipped or white-fronted). Common reptiles and amphibians of the region include a wide variety of lizards (e.g., collard lizards [*Crotaphytus collaris*], spiny lizards [*Sceloporus* spp.], and horned lizards [*Phrynosoma* spp.], whiptails (*Aspidoscelis* sp.), snakes, turtles, skinks (*Plestiodon* spp.), alligators, geckos, frogs (*Pseudacris* spp., *Hyla* spp.), and toads (*Bufo* spp.).

FW3.6.3.3 Threatened, Endangered, and Special Status Species

FW3.6.3.3.1 Federally Listed Species

Federally listed threatened, endangered, and/or candidate species that could occur within the 14 counties included in the analysis of primary airspace and range areas proposed for use are presented in Table FW3-32. Due to the limited nature of ground disturbance in the areas under the primary airspace, plant, invertebrate, and fish species were excluded from further analysis. No critical habitat is present under the primary airspace and ranges.

Table FW3-32. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at NAS Fort Worth JRB

Common Name	Scientific Name	Federal Listing Status	Habitat
<i>Birds</i>			
Least Tern	<i>Sterna antillarum</i>	FE	Least terns nest on barren to sparsely vegetated sandbars along rivers, sand and gravel pits, lake and reservoir shorelines, and occasionally on gravel rooftops.
Whooping Crane	<i>Grus americana</i>	FE	Whooping cranes winter on the Gulf Coast, primarily in Texas's Aransas National Wildlife Refuge. The species nests in potholes dominated by bulrushes and containing other aquatic plants (e.g., cattails, sedge, and muskgrass). Farther inland, their range includes sandy, gently rolling grasslands with live oak, red bay, and bluestem plants. Migrating birds feed in croplands and roost in shallow, freshwater wetlands.
Piping Plover	<i>Charadrius melodus</i>	FT	Piping plovers are found on mudflats, sandy beaches, and shallow wetlands with sparse vegetation. The species can also be found along the margins of lakes and large rivers where there is exposed (bare) sand or mud.
Red Knot	<i>Calidris canutus rufa</i>	FT	The red knot migrates annually between its breeding grounds in the Canadian Arctic and wintering regions, including the southeast United States, the northwest Gulf of Mexico, northern Brazil, and the southern tip of South America.
Golden-cheeked Warbler	<i>Dendroica chrysoparia</i>	FE	Golden-cheeked warbler habitat includes woodlands with tall Ashe juniper (colloquially “cedar”), oaks, and other hardwood trees.

Key: FE = federally endangered; FT = federally threatened

Source: NAS Fort Worth JRB 2004; ODWC 2011, 2017; USFWS 2001, 2005, 2014, 2018b, c; TPWD 2018d

FW3.6.3.3.2 Migratory Birds

The primary airspace and range areas proposed for use are located in the USFWS designated Bird Conservation Region 21 Oaks and Prairies under the Central Flyway (USFWS 2008). Under AFI 91-202 and AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*, NAS Fort Worth JRB employs a WHMP that serves as the BASH program that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes.

FW3.6.3.3.3 Bald and Golden Eagles

Habitat and historic range for the bald eagle includes the primary airspace and range areas proposed for use. Habitat for the bald eagle in Texas generally includes large aquatic environments such as ocean coasts, reservoirs, large lakes and rivers, marshes and swamps where they can forage and scavenge for prey (Texas A&M 2007).

FW3.6.3.3.4 USFWS National Wildlife Refuge System Lands

The primary airspace and range areas proposed for use occur over the Wichita Mountains National Wildlife Refuge (WMWR) adjacent to Fort Sill Army post in Lawton, Oklahoma. The 59,020-acre WMWR is an ecosystem management partner of Fort Sill, collaborating on special status species management, wildfire protection, fish stocking, and trespass issues (USAFACFS 2014).

FW3.6.4 Airspace Environmental Consequences

Impacts to biological resources occurring under the airspace proposed for use by AFRC F-35A pilots could result from overflights and associated noise, sonic booms, the use of munitions and flares, and bird-aircraft collisions. A review of current literature evaluating potential noise effects on wildlife is presented in Volume II, Appendix B.

FW3.6.4.1 Vegetation

Ground disturbance beneath the airspace proposed for use would be limited to the use of flares and munitions, which would be less than or the same as what is currently being used by F-16 pilots from NAS Fort Worth JRB and would only occur in areas that are currently approved for such use. No significant impacts to vegetation would result from implementation of the AFRC F-35 mission in the areas under the airspace proposed for use by AFRC F-35A pilots stationed at NAS Fort Worth JRB.

FW3.6.4.2 Wildlife

All airspace proposed for use by AFRC F-35A pilots is currently used as active military airspace by military jet aircraft; therefore, no new types of impacts would be introduced into these areas as a result of introducing the F-35A aircraft. Potential impacts are described below for overflights and associated noise, sonic booms, munitions and flares, and bird-aircraft collisions.

As shown on Figure FW3-4, L_{dnmr} would remain less than 45 dB beneath the Brownwood, Hood, Lancer, Rivers, Sheppard, and Washita MOAs. Wildlife that are under the path of training overflights would be exposed to short, but intense noise events from overflights. These training airspace areas are very large, and training operations are sufficiently spread out such that intense overflight noise events at any one location are infrequent.

In R-6302, L_{dnmr} would remain at 55 dB, and L_{dnmr} would increase from below 45 dB to 49 dB in R-5601/R-5602. Low time-averaged noise levels (e.g., L_{dnmr}), such as those modeled for R-6302, do not imply that loud overflights do not or would not occur. Rather, they should be interpreted to mean that intense overflight noise events occur less frequently than in other areas.

Some physiological/behavioral responses (from both subsonic and supersonic noise) 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 could be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance,

the results of one study indicate that wood ducks appear to be more sensitive to noise and more resistant to acclimation to jet aircraft noise than Canada geese (Edwards et al. 1979). Similarly, wild ungulates (e.g., deer) seem to be more easily disturbed than domestic animals.

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 (see Volume II, Appendix B2.14 for additional information). 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. Proposed AFRC F-35A training would primarily occur at high altitudes, with 94 percent of total training time being spent at altitudes above 10,000 feet MSL. The higher flight profile could reduce the response of wildlife to aircraft noise.

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.

In summary adverse behavioral responses ranging from mild to severe could occur in individual animals as a result of loud overflights or sonic booms. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance could be nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Volume II, Appendix B).

AFRC F-35A pilots would conduct supersonic training above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher, as is currently conducted by F-16 pilots under baseline conditions. The number of training sorties flown in the Brownwood MOAs would decrease under the proposed action, and the number of sonic booms is anticipated to decrease proportionally. Therefore no additional impacts related to supersonic noise are anticipated.

Flares would be used as a defensive countermeasure by AFRC F-35A pilots during training operations. Flares would only be used in airspace areas currently approved for flare use. Flare use by AFRC F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires or adverse impacts to underlying land areas and habitats. Ordnance delivery would only occur in ranges authorized for use. AFRC F-35A pilots would use the same amount of flares and ordnance as the current F-16 pilots, resulting in no change to the potential for adverse impacts to wildlife under the training airspace.

AFRC F-35A pilots would fly at higher altitudes than F-16 pilots, with the majority (99 percent) of operations occurring above 5,000 feet AGL (operations under 5,000 feet AGL would occur less frequently than baseline operations). Most birds fly below 500 feet, except during migration (Section FW3.6.4.3.2). No F-35A low-level flight training is expected to occur below 500 feet AGL and the potential for bird-aircraft collisions would be minor.

FW3.6.4.3 Threatened, Endangered, and Special Status Species

FW3.6.4.3.1 Federally Listed Species

Potential impacts to federally listed species and critical habitats that could occur under the airspace proposed for use would be the same as those described for wildlife. Therefore, it is anticipated that

significant adverse impacts to federally listed species would not result from implementation of the AFRC F-35A mission.

FW3.6.4.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in slight increase (1.2 percent) in aircraft sorties in the training airspace. Increased operations could result in an increased opportunity for bird-aircraft strikes. The chances of such bird-aircraft strikes are considered unlikely for the following reasons. AFRC F-35A pilots would predominantly fly above 5,000 feet AGL. Most bird strikes (95 percent) occur below 5,000 feet AGL. Except during migration most birds spend the majority of their time below 500 feet. Migrations typically occur in ranges from 500 to 2,000 feet. The highest known flight of a North American migratory bird species is that of the mallard duck (*Anas platyrhynchos*), which has been observed to fly as high as 21,000 feet (World Atlas 2016). Vultures (*Aegypius monachus*) sometimes rise to elevations higher than 10,000 feet in order to scan larger areas for food and to watch the behavior of distant vultures for clues to the location of food sources (Stanford University 1988). Due to the predominant use of higher altitudes, implementation of the proposed AFRC F-35A mission would result in minimal impacts to migratory birds protected under the MBTA.

Current procedures for avoiding flight operations during periods of high concentrations of migratory birds (both in space and time) would continue. Adherence to the existing, BASH program would minimize the risk of bird-aircraft strikes including those for migratory birds to negligible levels (see Section FW3.4). NAS Fort Worth JRB would continue to adhere to conditions outlined under the WHMP and implement BASH program activities to minimize bird/aircraft strikes. The WHMP would remain in place to reduce bird/wildlife-aircraft strike risks. Due to the predominant use of higher altitudes, implementation of the proposed AFRC F-35A mission would result in minimal impacts to migratory birds protected under the MBTA.

FW3.6.4.3.3 Bald and Golden Eagles

Potential impacts to bald and golden eagles and habitats that occur in areas under the primary airspace and range areas would be similar to those described in Section FW3.6.4.3.2. AFRC F-35A pilots would fly at higher altitudes than F-16 pilots, further reducing the potential for BASH and noise-related impacts. As such, no impacts to eagles would result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB.

FW3.6.5 Summary of Impacts to Biological Resources

Construction activities on the base would occur in previously disturbed areas. Impacts to wetlands and protected species would not result from implementation of the proposed action. Noise resulting from construction activities would not adversely affect wildlife or protected species because areas where construction is proposed are currently exposed to high noise levels. The increase in aircraft operations near the base and in the airspace proposed for use could result in slight increases in bird-aircraft strikes. Aircraft operations near NAS Fort Worth JRB and in the airspace proposed for use would expose some animal and wildlife species to increased levels of noise. The majority of the studies suggest that domestic animal species and wildlife show behaviors characteristic of adaptation, acclimation, and habituation to repeated aircraft noise. Therefore, only minor impacts to animals and wildlife are not anticipated in the ROI surrounding NAS Fort Worth JRB.

FW3.7 CULTURAL RESOURCES

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, architectural/engineering resources, and traditional resources. Cultural resources that are eligible for listing on the National Register of Historic Places (NRHP) are known as historic properties.

FW3.7.1 Base Affected Environment

FW3.7.1.1 Architectural Resources

Historical building inventories at NAS Fort Worth JRB (USAF 1993, Earth Technologies Inc. 1994) have identified two buildings that are eligible for listing in the NRHP. Building 247 is a private residence that was constructed around 1930 and is located in the base housing area to the east of the airfield. Building 4175 is a crew readiness facility constructed in 1960 and located off the north end of the runway. NAS Fort Worth AFB has concluded that no other NRHP-eligible buildings are present on the installation.

FW3.7.1.2 Archaeological Resources

In 1990, an archaeological survey was conducted on the former Carswell AFB (now NAS Fort Worth JRB). The survey report indicates no significant potential for undiscovered sites exists at the installation (NAS Fort Worth JRB 2004). The Texas SHPO concurred with these findings in a letter dated 5 March 1991.

FW3.7.1.3 Traditional Resources

NAS Fort Worth JRB has identified 16 tribes potentially affiliated with the installation. These tribes, listed in Table A-1 in Volume II, Appendix A, Section A.6.2, were asked to provide information on any properties to which they attach religious or cultural significance. No known tribal sacred sites or properties of traditional religious and cultural importance are located on NAS Fort Worth JRB.

FW3.7.2 Base Environmental Consequences

Implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would include the construction of five new facilities, demolition of five buildings, and 12 renovation projects (Table FW2-1 and Figure FW2-1). Initially all buildings within the Area of Potential Effects (APE) had been evaluated for NRHP eligibility and determined non-eligible, and the Texas SHPO concurred with these findings (see letter dated 22 June 2018 Volume II, Appendix A, Section A.6.3). After concurrence was received from the SHPO, two additional projects were added to the proposed action. NAS Fort Worth JRB determined that no historic properties would be affected by the addition of the two projects, and the SHPO concurred with this determination (see letter dated 11 April 2019 Volume II, Appendix A, Section A.6.3).

No impacts to known archaeological resources would result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB. All portions of the base with proposed construction are either in areas that have already been disturbed by previous construction or have been inventoried for archaeological resources. No NRHP-eligible archaeological resources have been identified in the APE. Because ground-disturbing activities would occur in previously disturbed and inventoried areas, it is extremely unlikely that any previously undocumented archaeological resources would be

encountered during facility demolition, renovation, addition, or construction. In the case of unanticipated or inadvertent discoveries, the USAF would comply with NHPA and Native American Graves Protection and Repatriation Act (NAGPRA) regulations.

NRHP-eligible facilities located on the installation (Buildings 247 and 4175) are located outside the APE and there would be no direct impact to historic properties. Indirect impacts on cultural resources from population changes, noise or visual intrusions would be extremely unlikely. The total authorized personnel for NAS Fort Worth JRB would decrease slightly (1.1 percent) with the proposed action. This small population change would not have an indirect impact on cultural resources at the installation. Building 247 is located within the current 65-70 dB DNL contour and would remain in that contour with implementation of the proposed action. Building 4175 is located within the current 70-75 dB DNL contour and would remain in that contour with implementation of the proposed action. These facilities have been part of the active military installation including exposure to aircraft related noise since their construction with no adverse impacts. Visual intrusion from the proposed action would not be a significant issue. Buildings 247 and 4175 derive their historical significance from association with military activities and their setting within a military installation. New construction would occur in the context of an active military base, where changes in the infrastructure are common. The viewshed of remaining historic properties would not be affected by the proposed construction.

No Section 106 impacts to tribal resources or traditional cultural properties are anticipated to result from implementation of the AFRC F-35A mission. As required by Sections 101(d)(6)(B) and 106 of the NHPA; implementing regulations prescribed in 36 *CFR* Section 800.2(c)(2); EO 13175, *Consultation and Coordination with Indian Tribal Governments*; DoDI 4710.02; and AFI 90-2002, *Air Force Interactions with Federally-Recognized Tribes*, NAS Fort Worth JRB initiated Section 106 government-to-government consultation with 16 tribes to identify traditional cultural properties. Volume II, Appendix A, Section A.2.6.2 contains a record of these consultations. The consultation correspondence included an invitation to participate in the NEPA and Section 106 process, and an invitation to consult directly with the NAS Fort Worth JRB Commander regarding any comments, concerns, and suggestions.

The Cheyenne and Arapaho Tribes of Oklahoma and the Comanche Nation of Oklahoma responded to initial scoping letters and indicated that they had no interest or no properties in the APE of the proposed action. Nine (9) other tribes responded to additional outreach efforts. Altogether 11 tribes have responded to USAF requests for information or consultation. Section 106 consultation is considered complete for all tribes and NAS Fort Worth JRB will continue to coordinate with interested tribes throughout the EIS process.

FW3.7.3 Airspace Affected Environment

Table FW3-33 presents the NRHP-listed sites and Native American Reservation lands under the airspace currently used by military pilots and proposed for use by AFRC F-35A pilots from NAS Fort Worth JRB. The NAS Fort Worth JRB training airspace overlies at least part of 18 Oklahoma counties (Atoka, Bryan, Caddo, Choctaw, Comanche, Cotton, Grady, Jackson, Jefferson, Kiowa, Latimer, Le Flore, McCurtain, Pittsburg, Pushmataha, Stephens, Tillman, and Washita) and 22 Texas counties (Bell, Borden, Brown, Callahan, Coleman, Comanche, Concho, Coryell, Dawson, Eastland, Erath, Fisher, Garza, Kent, Llano, Lynn, McCulloch, Mills, Runnels, San Saba, Scurry, and Stonewall). Ninety-six (96) NRHP-listed properties have been identified under NAS Fort Worth JRB airspace. Twenty-three (23) of these are located under the primary airspace and range areas. Nine (9) Native American tribes are known to own land under the proposed airspace (Kiowa Tribe of Oklahoma, Comanche Nation of Oklahoma, Apache Tribe of

Oklahoma, Fort Sill Apache Tribe of Oklahoma, Choctaw Nation of Oklahoma, Caddo Nation of Oklahoma, Wichita and Affiliated Tribes, Delaware Nation, and Cheyenne and Arapaho Tribes of Oklahoma). No known traditional cultural resources have been identified under the airspace. It is possible that such resources could exist in the area as the exact location of some traditional cultural resources is confidential.

Table FW3-33. NRHP-Listed Sites and Native American Reservation Lands Under NAS Fort Worth JRB Training Airspace

Airspace Designations	Number of NRHP Properties Under Airspace ^a	Native American Reservation Lands Under Airspace ^a
Brady High/Low/North MOA	3	None
Brownwood 1 and 2 East MOA	14	None
Hood Hi and Low and Gray MOAs	1	None
Lancer MOA	6	None
R-5601/R-5602	17	Kiowa Tribe of Oklahoma Comanche Nation of Oklahoma Apache Tribe of Oklahoma Fort Sill Apache Tribe of Oklahoma
Rivers MOA	23	Choctaw Nation of Oklahoma
Sheppard 1 MOA	22	None
Washita MOA	10	Kiowa Tribe of Oklahoma Comanche Nation of Oklahoma Apache Tribe of Oklahoma Fort Sill Apache Tribe of Oklahoma Caddo Nation of Oklahoma Wichita and Affiliated Tribes Delaware Nation Cheyenne and Arapaho Tribes, Oklahoma

^a Due to the sensitivity of the locations, archaeological sites are not included in this table or shown on any figures.

FW3.7.4 Airspace Environmental Consequences

Implementation of the proposed action would result in a 1.2 percent increase in the total sorties conducted annually in the airspace proposed for use. As described in Section FW3.2.4.2, subsonic noise levels under the training airspace would generally remain the same. L_{dnmr} would increase by 4 dB in R-5601/R-5602 and would not exceed 56 dB in any of the training airspace areas. Supersonic flights would continue to occur above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher. However, AFRC F-35A pilots would fly fewer sorties in this airspace. Less than one sonic boom per day currently reaches the ground, and this number would decrease with implementation of the AFRC F-35A mission.

No impacts on historic properties under the NAS Fort Worth JRB training airspace are expected. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (Volume II, Appendix B, Section B.2.10).

Use of ordnance and flares would continue in areas where they are currently used. No additional ground disturbance would occur. Existing use of flares and ordnance is not known to have impacted historic resources under the airspace; therefore, the continued use of flares and ordnance from F-35A aircraft is not expected to result in impacts.

FW3.7.4.1 Native American Concerns

During scoping, the USAF contacted 16 federally affiliated Native American tribes to invite them to attend the public meetings and express their concerns about the potential F-35A beddown at NAS Fort Worth JRB. Two (2) tribes, the Comanche Nation of Oklahoma and the Cheyenne and Arapaho Tribes of Oklahoma, replied that they had no interest in the project or no properties in the project area. No other tribal comments or concerns were received during the public scoping process.

In accordance with Section 106 of the NHPA and EO 13175, the USAF has contacted the remaining 14 tribes to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and traditional cultural properties under airspace associated with NAS Fort Worth JRB. Nine (9) additional Native American tribes have responded to the Section 106 Consultation letters. Section 106 consultation is considered complete for all tribes and NAS Fort Worth will continue to coordinate with interested tribes throughout the EIS process.

FW3.7.5 Summary of Impacts to Cultural Resources

No known archaeological sites or NRHP-eligible facilities are located in any of the proposed construction footprints at NAS Fort Worth JRB. No historic properties would be impacted through the implementation of the AFRC F-35A mission in the airspace proposed for use. Therefore, the USAF has determined that no historic properties would be impacted by the implementation of the AFRC F-35A mission. Section 106 consultation with the Texas SHPO is complete. NAS Fort Worth JRB will continue to coordinate with interested tribes throughout the EIS process. Implementation of the AFRC F-35A mission is not anticipated to result in significant impacts to cultural resources.

FW3.8 LAND USE AND RECREATION

FW3.8.1 Base Affected Environment

FW3.8.1.1 Land Use

On-base construction would be consistent with established base land uses. Because potential land use consequences would primarily be noise-related, the discussion in this section focuses on noise-related land use regulations and compatibility constraints. The following paragraphs address federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for NAS Fort Worth JRB and the surrounding areas.

Installation Development Plan (IDP). The NAS Fort Worth JRB IDP guides future development and land use decisions at NAS Fort Worth JRB (NAS Fort Worth JRB 2015a).

Regional Joint Land Use Study (JLUS). The JLUS for NAS Fort Worth JRB was published in 2017 as part of the Joining Forces Process in Texas (NCTCOG 2017). The JLUS was developed to reduce or, when feasible, eliminate non-compatibility issues between the military and surrounding civilian land uses. The JLUS is a planning tool which includes several cities in Tarrant County: Fort Worth, Benbrook, Lake Worth, River Oaks, Sansom Park, Westover Hills, Westworth Village, and White Settlement. The JLUS focuses on and uses the CZ and APZs to work with communities in support of compatible land uses. Noise contours are identified in the JLUS and land use compatibility for noise levels is explained. As described in the JLUS, new development pressures and flight obstructions are the two primary concerns associated with this installation.

City of Fort Worth 2018 Comprehensive Plan. The comprehensive plan for Fort Worth is the official guide for making decisions about growth and development. This plan was shaped by citizens' comments and lays a successful foundation for the future of Fort Worth (Fort Worth 2018).

City of Lake Worth Comprehensive Land Use Plan Update. The City of Lake Worth 2035 Comprehensive Plan was adopted on 10 April 2018. The 2018 update to the Comprehensive Plan focuses on the future development pattern in the form of the future land use plan. NAS Fort Worth JRB is listed in this plan as a special land use consideration.

Cities of Benbrook, River Oaks, Sansom Park, Westover Hills, Westworth Village and White Settlement Comprehensive Plans. Through the Planning for Livable Military Communities plan, the NCTCOG has assisted cities throughout North Central Texas with the development of comprehensive plans, all of which contain information about NAS Fort Worth JRB.

Texas Statutes. During its 85th Regular Session the Texas Legislature passed House Bill 890, which provides information to the public and purchasers of real property on the impact of military installations. Effective 1 September 2017, the legislation requires counties and cities in which a military installation is located to ensure the public availability of the most recent AICUZ or JLUS. A Seller's Disclosure Notice must also acknowledge if a property may be near a military installation and subject to high noise, AICUZ, or other operations.

Local Regulations and Ordinances. NAS Fort Worth JRB and surrounding communities have been working on compatibility planning since the 2008 JLUS (NCTCOG 2008). The base actively participates in ongoing community planning initiatives. Similarly, two surrounding communities have adopted regulatory overlays to address noise and air safety impacts. The NAS Fort Worth JRB compatibility menu identifies 39 strategies for land use planning.

On-Base Land Use. NAS Fort Worth JRB occupies approximately 1,805 acres, much of which is developed for use on a daily basis. Land use on the base is generally divided into eight planning districts, the largest of which is the Carswell Airfield District.

Surrounding Land Use. NAS Fort Worth JRB is located in the western portion of Fort Worth in Tarrant County, south of Lake Worth. The Lockheed Martin assembly plant is located to the west on government-owned and contractor-operated land. Land use surrounding the base is generally compatible with the mission (NAS Fort Worth JRB 2015a). The 2017 JLUS provides recommendations to help ensure continued compatibility with the base. The installation is bounded to the west and south by the Cities of White Settlement and Westworth Village, to the east by the City of River Oaks, and to the north across Lake Worth by the City of Lake Worth.

As identified in Table FW3-34, under baseline conditions, land uses exposed to DNL of 65 dB or greater primarily consist of undesignated land or water and residential lands, followed by open land, industrial, and recreational land uses. Baseline conditions represent the noise levels as modeled using the current conditions and operations at NAS Fort Worth JRB. Table FW3-34 also identifies land use within the JLUS contour. The JLUS contour represents land that current zoning requirements already treat as if it is in a high-noise environment (i.e. DNL of 65 dB or greater). The JLUS Report land use guidelines state that residential land use is incompatible in the JLUS-designated DNL zones between 65 and 69 dB unless the structures provide at least 25 dB of noise level reduction. The JLUS Report guidelines state that residential land use is incompatible in the JLUS-designated DNL zones 70 and 74 dB unless the structures provide at least 30 dB of noise level reduction. The JLUS recognizes that there are existing incompatible land uses in the 65 dB or greater DNL JLUS contour (2,948 acres). Under baseline conditions, 977 acres of residential land are currently exposed to DNL of 65 dB and greater, 965 acres of which are located in the 65 dB DNL JLUS contour.

Table FW3-34. Off-Base Acres Currently Exposed to DNL of 65 dB or Greater at NAS Fort Worth JRB

Land Use Category ^a	DNL (dB)											
	65–69		70–74		75–79		80–84		≥ 85		Total	
	JLUS	Baseline	JLUS	Baseline	JLUS	Baseline	JLUS	Baseline	JLUS	Baseline	JLUS	Baseline
Commercial	607	367	394	113	270	45	49	1	1	<1	1,321	526
Industrial	95	125	120	171	222	146	150	88	85	54	672	584
Open	1,419	517	394	135	126	40	44	1	1	<1	1,984	693
Public/Quasi-Public	492	191	197	36	54	7	22	40	107	81	872	355
Recreational	913	400	434	123	107	10	5	0	0	0	1,459	533
Residential	1,982	739	749	209	199	27	18	2	0	0	2,948	977
Undesignated ^b or Water	2,554	1,096	1,028	417	386	247	107	68	24	3	4,099	1,831
Total	8,062	3,435	3,316	1,204	1,364	522	395	200	218	138	13,355	5,499

^a All numbers are in units of acres

^b Undesignated land includes roads, retention basins, and other municipal features that might not be shown on Figure FW3-6.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Source: City of Fort Worth 2017

FW3.8.1.2 Recreation

NAS Fort Worth JRB offers a variety of both indoor and outdoor recreational facilities. The Lake Worth waterfront area includes a recreational marina with boat slip rentals, property storage, and boat storage. The outdoor recreation rental and recreation program provides items and programs for outdoor leisure activities. Services include rental of camping equipment and gear for outdoor trips and activities. The aquatic center is an indoor swimming pool that provides unit training and fitness swim, water aerobics, swim lessons, and special events throughout the year. The TEN bowling center features 10 bowling lanes with pinsetters and automatic scoring. Other outdoor facilities include baseball and multi-purpose fields and opportunities for biking and jogging.

The City of Fort Worth has a wide variety of recreational facilities, including more than 200 parks and public spaces as well as recreational activities and educational programming. Fort Worth hosts numerous community centers, each offering different opportunities for recreation, including pools and all types of sports. The FWNC&R was designated a National Landmark by the Department of Interior in 1980. The FWNC&R encompasses approximately 3,621 acres of land and is a natural area comprised of forests, prairies, and wetlands. Table FW3-35 identifies seven recreational facilities near NAS Fort Worth JRB, along with the baseline noise levels and JLUS compatibility. Plover Circle Park is currently exposed to DNL greater than 75 dB, resulting in a use determination of incompatible.

Table FW3-35. Recreation Facilities near NAS Fort Worth JRB

ID	Recreational Facility	Activities	Current DNL (dB)	Compatibility (Y/N)
P01	North Z Boaz Park	Playground, pet area, small pond area	66	Y
P02	Vinca Circle Park	Open areas	69	Y
P03	Malaga Park	Open areas, hiking	66	Y

Table FW3-35. Recreation Facilities near NAS Fort Worth JRB (Continued)

ID	Recreational Facility	Activities	Current DNL (dB)	Compatibility (Y/N)
P04	Casino Park	Boating, fishing, barbeque pits	65	Y
P05	Leonard Park	Playground, hiking,	70	Y
P06	Lake Worth Public Park	Playground, ball fields, barbeque pits, skate park, concession stand, picnic areas, hiking	68	Y
P07	Plover Circle Park	Open areas, hiking	78	N

Source: <http://fortworthtexas.gov/parks/>

FW3.8.2 Base Environmental Consequences

FW3.8.2.1 Land Use

FW3.8.2.1.1 Physical Development

The facilities that would be developed and constructed to support the proposed AFRC F-35A mission at NAS Fort Worth JRB would occur in previously disturbed areas near the flightline. On-base land use would be consistent with the NAS Fort Worth JRB land uses designated for the proposed use. The proposed on-base development would have no impact to off-base land use. Impacts associated with physical development would be the same regardless of which afterburner scenario is selected.

FW3.8.2.1.2 Aircraft Operations

This analysis includes an evaluation of the potential noise impacts to on- and off-base land uses resulting from the three afterburner scenarios for the proposed AFRC F-35A mission at NAS Fort Worth JRB. Volume II, Appendix B, Section B.2.2, presents the noise compatibility guidelines for noise exposure to various land uses.

Scenario A

Implementation of Scenario A would increase the area surrounding NAS Fort Worth JRB exposed to DNL of 65 dB or greater by a total of approximately 2,350 acres (Table FW3-36 and Figure FW3-6). The largest increase in acreage exposed to additional noise would be undesignated or water areas, followed by residential and recreational land uses. Acreage of commercial, industrial, open, public/quasi-public, and residential land uses exposed to DNL of 65 dB or greater would also increase. Residences that would be newly exposed to DNL of 65 dB or greater, and which did not achieve the JLUS recommended noise level reductions in the structure, would constitute an incompatible land use (see Section FW3.8.1.1). Approximately 640 acres of land classified as residential use would be newly exposed to DNL of 65 dB or greater. Of the 640 acres, approximately 408 acres would be newly exposed to DNL of 65 to 69 dB, 193 acres would be newly exposed to DNL of 70 to 74 dB, and 39 acres would be newly exposed to DNL greater than 75 dB. Although an additional estimated 8,593 off-installation residents reside in the residential land (640 acres) that would be newly exposed to DNL of 65 dB or greater, much of this land (638.5 acres) is currently in the JLUS noise level zones. Therefore, these areas have been under the same zoning requirements as if they were already in the 65 dB or greater DNL contour. Residential land use exposed to DNL of 65 to 85 dB, where sound attenuation was not incorporated into the structures, would constitute an adverse impact to the affected land use.

Table FW3-36. Off-Base Acres Exposed to DNL of 65 dB or Greater at NAS Fort Worth JRB under Scenario A

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥ 85				Total			
	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b
Commercial	607	367	437	70	394	113	287	174	270	45	89	44	49	1	2	1	1	<1	0	0	1,321	526	815	289
Industrial	95	125	123	-2	120	171	177	6	222	146	153	7	150	88	95	7	85	54	61	7	672	584	609	25
Open	1,419	517	567	50	394	135	271	136	126	40	77	37	44	1	5	4	1	<1	0	0	1,984	693	920	227
Public/Quasi-Public	492	191	268	77	197	36	67	31	54	7	8	1	22	40	32	-8	107	81	92	11	872	355	467	112
Recreational	913	400	627	227	434	123	214	91	107	10	22	12	5	0	1	1	0	0	0	0	1,459	533	864	331
Residential	1,982	739	1,147	408	749	209	402	193	199	27	65	38	18	2	3	1	0	0	0	0	2,948	977	1,617	640
Undesignated or Water	2,554	1,096	1,498	402	1,028	417	585	168	386	247	344	97	107	68	123	55	24	3	7	4	4,099	1,831	2,557	726
Total	8,062	3,435	4,667	1,232	3,316	1,204	2,003	799	1,364	522	758	236	395	200	261	61	218	138	160	22	13,355	5,499	7,849	2,350

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

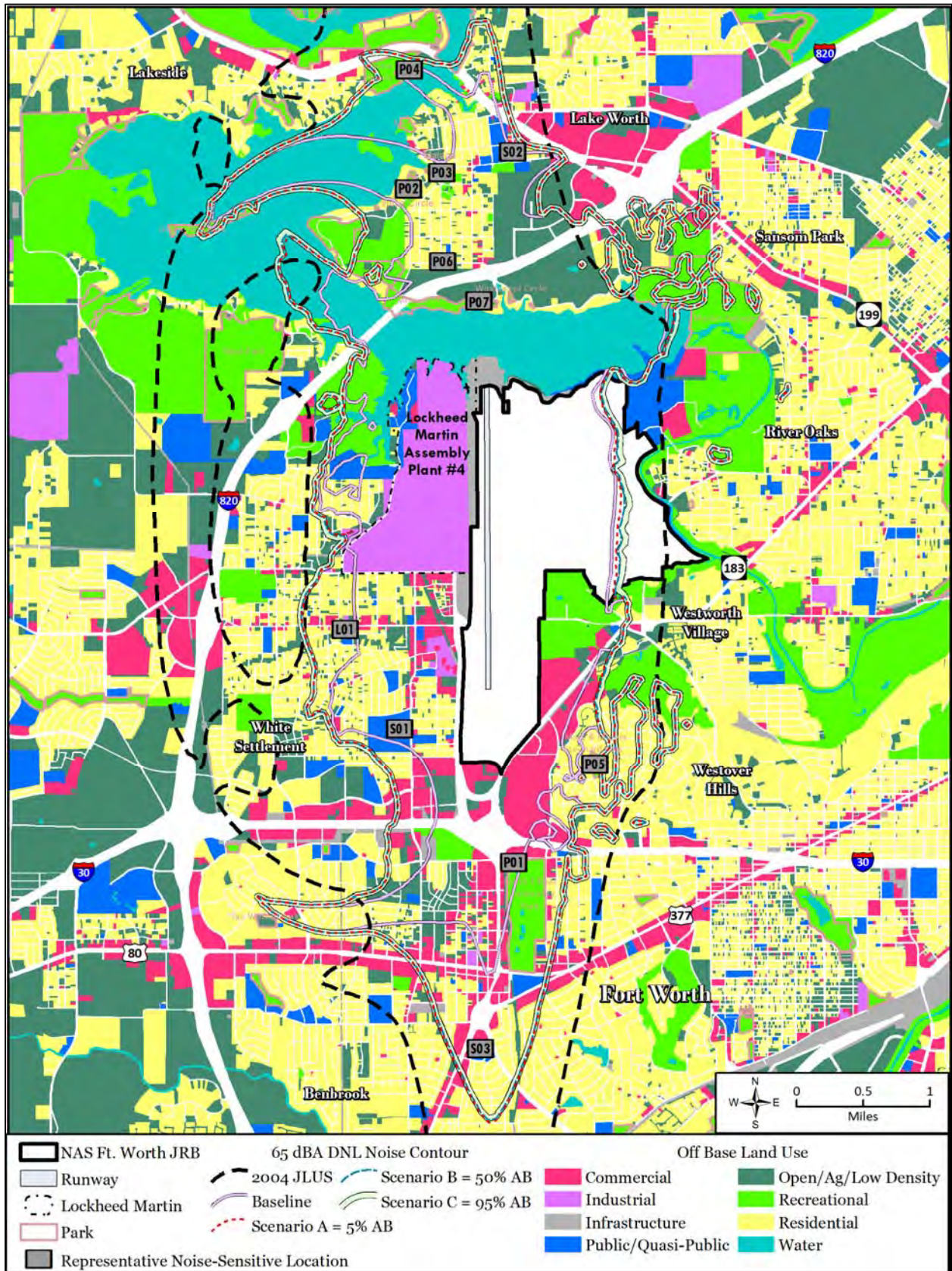


Figure FW3-6. Baseline, JLUS, and AFRC F-35A Mission DNL Contours Relative to Land Use at NAS Fort Worth JRB

Scenario B

Implementation Scenario B would increase the area surrounding NAS Fort Worth JRB exposed to DNL of 65 dB or greater by a total of approximately 2,369 acres (Table FW3-37 and Figure FW3-6). The largest increase in acreage exposed to additional noise would be undesignated or water areas, followed by residential and recreational land uses. Acreage of commercial, industrial, open, public/quasi-public, and residential land uses exposed to DNL of 65 dB or greater would also increase. Residences that would be newly exposed to DNL of 65 dB or greater, and which did not achieve the JLUS-recommended noise level reductions in the structure, would constitute an incompatible land use (see Section FW3.8.1.1). Approximately 643 acres of land classified as residential use would be newly exposed to DNL of 65 dB or greater. Of the 643 acres, approximately 406 acres would be newly exposed to DNL of 65 to 69 dB, 197 acres would be newly exposed to DNL of 70 to 74 dB, 38 acres would be newly exposed to DNL of 75 to 79 dB, and 2 acres would be newly exposed to DNL of 80 to 84 dB. Although an additional 8,622 off-installation residents reside in the 643 acres that would be newly exposed to DNL of 65 dB or greater, much of this land (641.5 acres) is currently in the JLUS noise level zones (i.e., current zoning requirements treat these areas as if they were already in the 65 dB or greater DNL contour). Residential land use exposed to DNL of 65 to 85 dB, where sound attenuation was not incorporated into the structures, would constitute an adverse impact to the affected land use.

Scenario C

Implementation Scenario C would increase the area surrounding NAS Fort Worth JRB exposed to DNL of 65 dB or greater by a total of approximately 2,386 acres (Table FW3-38 and Figure FW3-6). The largest increase in acreage exposed to additional noise would be undesignated or water areas, followed by residential and recreational land uses. Acreage of commercial, industrial, open, public/quasi-public, and residential land uses exposed to DNL of 65 dB or greater would also increase. Residences that would be newly exposed to DNL of 65 dB or greater, and which did not achieve the JLUS-recommended noise level reductions in the structure, would constitute an incompatible land use (see Section FW3.8.1.1). Approximately 643 acres of land classified as residential use would be newly exposed to DNL of 65 dB or greater. Of the 643 acres, approximately 402 acres would be newly exposed to DNL of 65 to 69 dB, 200 acres would be newly exposed to DNL of 70 to 74 dB, 39 acres would be newly exposed to DNL of 75 to 79 dB, and 2 acres would be newly exposed to DNL of 80 to 84 dB. Although an additional 8,648 off-installation residents reside in the 643 acres that would be newly exposed to DNL of 65 dB or greater, much of this land (641.5 acres) is currently in the JLUS noise level zones (i.e., current zoning requirements treat these areas as if they were already in the 65 dB or greater DNL contour). Residential land use exposed to DNL of 65 to 85 dB, where sound attenuation was not incorporated into the structures, would constitute an adverse impact to the affected land use.

Table FW3-37. Off-Base Acres Exposed to DNL of 65 dB or Greater at NAS Fort Worth JRB under Scenario B

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥ 85				Total			
	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b
Commercial	607	367	438	71	394	113	287	174	270	45	90	45	49	1	3	2	1	<1	0	0	1,321	526	818	292
Industrial	95	125	118	-7	120	171	177	6	222	146	155	9	150	88	95	7	85	54	63	9	672	584	608	24
Open	1,419	517	564	47	394	135	272	137	126	40	77	37	44	1	4	3	1	<1	0	0	1,984	693	917	224
Public/Quasi-Public	492	191	268	77	197	36	68	32	54	7	9	2	22	40	31	-9	107	81	94	13	872	355	470	115
Recreational	913	400	630	230	434	123	216	93	107	10	23	13	5	0	1	1	0	0	0	0	1,459	533	870	337
Residential	1,982	739	1,145	406	749	209	406	197	199	27	65	38	18	2	4	2	0	0	0	0	2,948	977	1,620	643
Undesignated or Water	2,554	1,096	1,499	403	1,028	417	587	170	386	247	344	97	107	68	126	58	24	3	9	6	4,099	1,831	2,565	734
Total	8,062	3,435	4,662	1,227	3,316	1,204	2,013	809	1,364	522	763	241	395	200	264	64	218	138	166	28	13,355	5,499	7,868	2,369

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Table FW3-38. Off-Base Acres Exposed to DNL of 65 dB or Greater at NAS Fort Worth JRB under Scenario C

Land Use Category ^a	DNL (dB)																							
	65–69				70–74				75–79				80–84				≥ 85				Total			
	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b	JLUS	Baseline	AFRC F-35A Mission	Change ^b
Commercial	607	367	437	70	394	113	286	173	270	45	90	45	49	1	3	2	1	<1	<1	<1	1,321	526	816	290
Industrial	95	125	112	-13	120	171	178	7	222	146	156	10	150	88	97	9	85	54	65	11	672	584	608	24
Open	1,419	517	566	49	394	135	274	139	126	40	79	39	44	1	4	3	1	<1	<1	<1	1,984	693	923	230
Public/Quasi-Public	492	191	267	76	197	36	69	33	54	7	9	2	22	40	30	-10	107	81	95	14	872	355	470	115
Recreational	913	400	634	234	434	123	218	95	107	10	24	14	5	0	1	1	0	0	0	0	1,459	533	877	344
Residential	1,982	739	1,141	402	749	209	409	200	199	27	66	39	18	2	4	2	0	0	0	0	2,948	977	1,620	643
Undesignated or Water	2,554	1,096	1,498	402	1,028	417	591	174	386	247	344	97	107	68	129	129	24	3	9	6	4,099	1,831	2,571	808
Total	8,062	3,435	4,655	1,220	3,316	1,204	2,025	821	1,364	522	768	246	395	200	268	68	218	138	169	31	13,355	5,499	7,885	2,386

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

FW3.8.2.2 Recreation

Construction in support of the proposed AFRC F-35A mission would occur in the existing cantonment area. Surrounding parks, schools, and recreational facilities are too far from the installation to be affected by construction noise. Increased truck traffic to the installation during the 2-year construction period could cause temporary effects to traffic flow on local roads, but this is not anticipated to interfere with access to recreational areas around the installation. New facilities would not alter any sensitive views that have important recreational value.

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in a net loss of 102 personnel with dependents as a result of the drawdown of the AFRC F-16 mission as the F-35A aircraft arrive. This change in the number of people would have no discernable effect on recreational resources. Noise impacts to recreational resources would be the same regardless of which afterburner scenario is selected.

Average noise levels would increase at the recreational facilities near NAS Fort Worth JRB. Noise modeling results summarized in Table FW3-39 show the baseline DNL at various recreational facilities near NAS Fort Worth JRB and the DNL that would result from implementation of the proposed mission at NAS Fort Worth JRB. Noise impacts to recreational facilities would be the same regardless of which afterburner scenario is selected.

Table FW3-39. Noise Effects on Recreation Facilities near NAS Fort Worth JRB

ID	Recreational Facility	DNL (dB)	
		Baseline Conditions	AFRC F-35A Mission
P01	North Z Boaz Park	66	72
P02	Vinca Circle Park	69	72
P03	Malaga Park	66	71
P04	Casino Park	65	67
P05	Leonard Park	70	71
P06	Lake Worth Public Park	68	72
P07	Plover Circle Park	78	79

Source: <http://fortworthtexas.gov/parks/>

The use of some outdoor recreation facilities such as outdoor sports fields and ball courts is marginally compatible with DNL up to 75 dB. Plover Circle Park would remain incompatible with DNL greater than 75 dB. Noise increases could reduce the quality and enjoyment of outdoor activities for some persons. One measure of annoyance is the potential for speech interference. As described in Section FW3.2.2.2, 50 dB L_{max} is the metric used to determine potential speech interference. As shown in Table FW3-16, all of the recreational facilities evaluated would experience one additional outdoor noise event per hour at L_{max} greater than 50 dB.

Another noise metric that can be used to evaluate potential impacts to recreational uses is SEL. As shown in Table FW3-11, SEL would not increase at any of the recreational facilities analyzed. Although the SEL from a single overflight would not change, certain recreational areas could experience an increase in the number of overflights at existing SEL values and experience an increased DNL.

FW3.8.3 Airspace Affected Environment

FW3.8.3.1 Land Use

This section summarizes land ownership and affected Special Use Land Management Areas (SULMAs) under the airspace proposed for use by pilots from NAS Fort Worth JRB. SULMAs include selected areas managed by federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or wilderness experiences (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of these attributes. Some SULMAs could include recreation-oriented sites such as campgrounds, trails, and visitor centers; recreation is addressed in Section FW3.8.3.2. Pilots from NAS Fort Worth JRB currently use airspace in Texas and Oklahoma, with most areas in Texas. Figure FW3-7 identifies the airspace currently used along with the SULMAs aggregated by ownership (i.e., USACE, USFWS, state land, etc.). The majority of public land under this airspace is administered by the States of Texas and Oklahoma, followed by lands managed by the USFWS.

FW3.8.3.2 Recreation

Recreational opportunities under the airspace used by pilots from NAS Fort Worth JRB are similar to those described in Section FW3.8.1.2. The underlying land reflects the same mosaic of federal, state, and private ownership, with a similar range of outdoor recreational activities. The public lands support a variety of recreational opportunities and activities, with some areas having particular qualities or recreational purposes. SULMAs in this region include Native American Reservation lands, lakes managed by the USACE, refuges managed by the USFWS, and numerous state-owned lands managed for recreational purposes.

Southwest Texas and Southern Oklahoma host habitats that support a wide variety of birds, particularly along waterways and in mountainous areas. These areas are popular for recreational bird watching. Public access is permitted to limited portions of Fort Sill and Fort Hood for recreation. The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities within Fort Sill and Fort Hood include, hunting, off-highway vehicle uses in designated areas, and viewing of cultural and natural resources of interest.

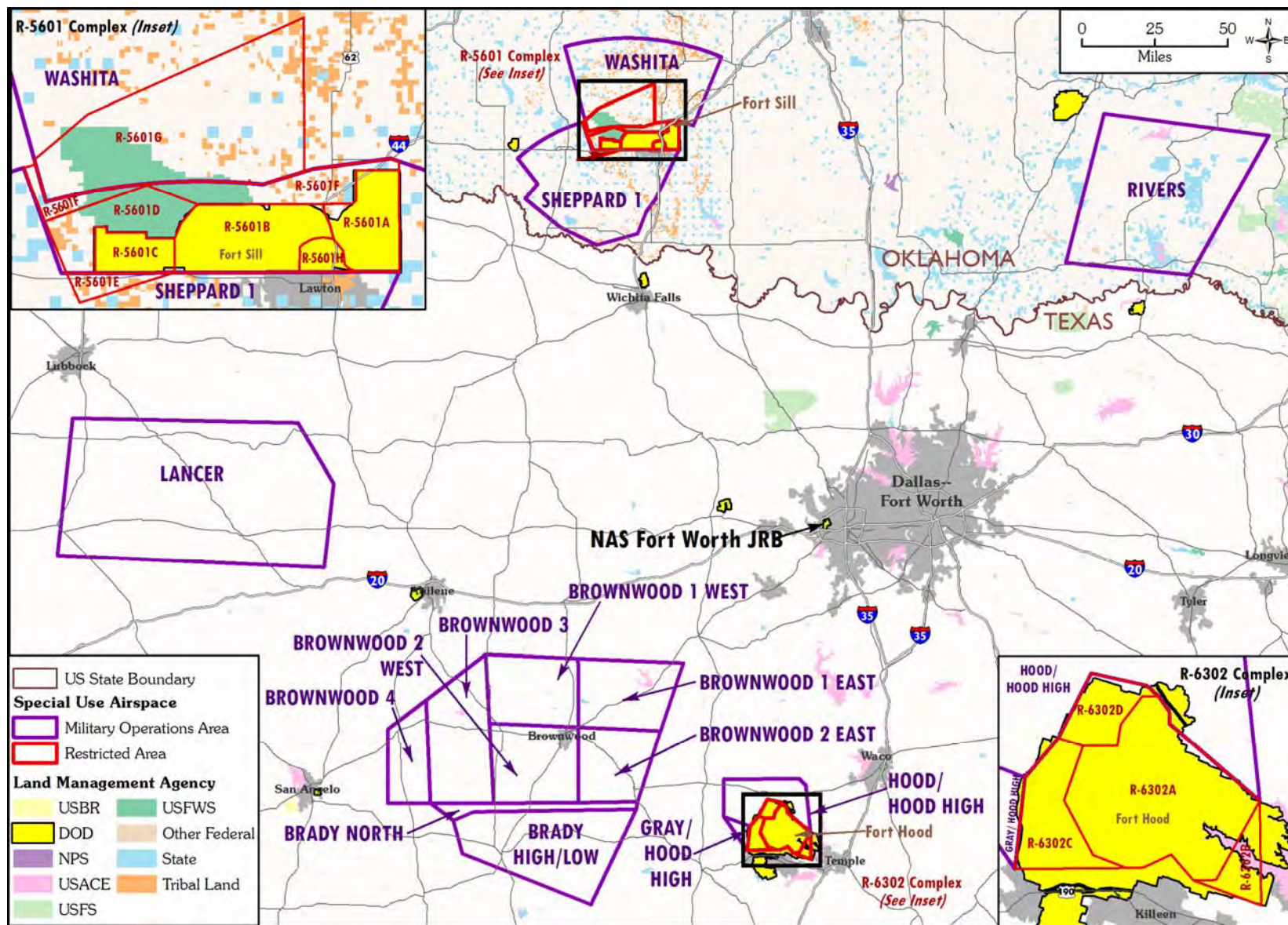


Figure FW3-7. SULMAs Beneath NAS Fort Worth JRB Airspace

FW3.8.4 Airspace Environmental Consequences

FW3.8.4.1 Land Use

With the exception of R-5601/R-5602 at Fort Sill and R-6302 at Fort Hood, implementation of the proposed AFRC F-35A operations from NAS Fort Worth JRB would not result in any average subsonic noise increases below any of the airspace proposed for use. Table FW3-40 identifies the SULMAs that occur under the airspace that would be exposed to subsonic noise that would increase L_{dnmr} by 4 dB above baseline conditions. Table FW3-40 also presents the SULMA total acres along with the percentage of each SULMA covered by the respective airspace.

When compared to baseline conditions, subsonic L_{dnmr} at the Falcon Range on Fort Sill and areas below the R-5601/R-5602 complex would experience a noticeable 4-dB increase (from less than 45 to 49 dB). However, the Fort Sill Installation Compatible Use Zone Study identifies the Wichita Mountains Wilderness Area (WMWA) as a moderate noise complaint risk (Fort Sill 2015).

Table FW3-40. Special Use Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at NAS Fort Worth JRB

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L_{dnmr}	L_{dnmr}	Change
Falcon Range R-5601/R-5602					
WMWR	58,860	99.4	<45	49	4
WMWA	9,787	100	<45	49	4

Supersonic aircraft operations are only authorized in the Brownwood ATCAA at altitudes of 30,000 feet MSL or higher. AFRC F-35A pilots would conduct supersonic training above the Brownwood MOAs at altitudes of 30,000 feet MSL or higher, as currently conducted by F-16 pilots under baseline conditions. Most of the sonic booms generated at or above 30,000 feet MSL never reach the ground (Volume II, Appendix B). The number of training sorties flown in the Brownwood ATCAA would decrease, and the number of sonic booms would decrease proportionally.

FW3.8.4.2 Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources under the airspace proposed for use are provided in Chapter 3, Section 3.8. Chapter 3, Section 3.8.2, describes typical recreational impacts that could be expected to result from the AFRC F-35A mission at NAS Fort Worth JRB. In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of exposure to military overflight and supersonic events. Increased numbers of sorties in some airspace would discernibly affect the noise levels and could result in recreational participants experiencing startle effects from these events. This could continue to result in some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments under the airspace. Increased noise could diminish opportunities for visitors to experience natural soundscapes in national park units, and could similarly diminish the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, roadless areas, national forests and other remote locations.

Table FW3-40 lists special use areas with high recreational value or opportunity under military training airspace that would be exposed to subsonic noise that would increase L_{dnmr} by 4 dB above baseline conditions.

The F-35A would generate sonic booms, similar to other aircraft using the areas above the Brownwood MOAs. The potential for isolated events to interfere with persons who are engaging in recreational activities throughout the affected area would still exist, but the frequency of these events is not expected to increase. Areas supporting recreational uses sensitive to loud, intrusive noise (e.g., wilderness areas and wildlife refuges) would benefit from fewer sonic booms.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities. This includes maintaining the natural setting and allowing minimal human disturbance and development. Wilderness management goals could be negatively affected by increased noise and disturbance associated with military overflights. Increased noise in wilderness areas, recreation areas, and other specially managed lands could also be perceived by some recreational users as affecting their recreation experience.

FW3.8.5 Summary of Impacts to Land Use and Recreation

Land use and recreational resources would not be impacted by any of the construction because all of the construction would be conducted in compatible use zones on the base. Implementation of Scenarios A, B or C would expose an additional 2,350, 2,369, or 2,386 acres, respectively, to DNL of 65 dB or greater. Of the residential land newly exposed under Scenarios A, B or C, approximately 1.5 acres are located outside of the JLUS noise contour (under all afterburner scenarios), rendering those acres incompatible. Noise levels would also increase for some off-installation recreational facilities. Noise increases could reduce the quality and enjoyment of outdoor activities for some persons

Regarding impacts to land use and recreation under the airspace proposed for use, average subsonic noise would not increase in the majority of the lands under the airspace proposed for use. Noise would increase in R-5601/R-5602, exposing the WMWR and the WMWA to an L_{dnmr} increase of 4 dB. Impacts to land use and recreational resources near NAS Fort Worth JRB would not be significant.

FW3.9 SOCIOECONOMICS

Socioeconomics refers to features or characteristics of the social and economic environment. The factors affecting socioeconomic resources are the change in personnel, construction of new facilities, renovations and modifications to existing facilities, and noise from F-35A aircraft at NAS Fort Worth JRB. These factors are evaluated relative to the existing population, employment, earnings, housing, education, and public and base services. NAS Fort Worth JRB is located approximately 5 miles west of the central business district of Fort Worth in Tarrant County, Texas. Impacts to socioeconomic resources would extend beyond the base boundaries. Therefore, for the purposes of this socioeconomics analysis, the ROI for the proposed action and No Action Alternative is Tarrant County, with an emphasis on NAS Fort Worth JRB.

FW3.9.1 Base Affected Environment

FW3.9.1.1 Population

Population estimates for Tarrant County totaled more than 2.05 million persons in 2017 (USCB 2018). Between 2010 and 2017, the county population increased at an average annual rate of 1.8 percent, with a total increase of approximately 245,441 persons over the 7-year period (USCB 2018). The State of Texas has an estimated population of 28.3 million (USCB 2018). Average annual population growth in the county has been nearly the same as the state (Table FW3-41).

Table FW3-41. Population in the ROI for NAS Fort Worth JRB

Location	2010 Census	2017 Estimates	Annual Percent Change (2010–2017)
Tarrant County	1,809,034	2,054,475	1.8
Texas	25,145,561	28,304,596	1.7

Source: USCB 2018

As shown in Table FW2-3, the total current authorized personnel at the base is 9,600 persons. Of the total authorized base personnel, approximately 18 percent (1,751 persons) are associated with AFRC.

FW3.9.1.2 Economic Activity (Employment and Earnings)

In 2016, employment in Tarrant County totaled 1,209,868 jobs (BEA 2017a). The largest employment sector in Tarrant County was retail trade (10.3 percent), followed by government and government services (9.7 percent) and health care and social assistance (9.7 percent) (BEA 2017). Construction accounted for 6.0 percent of total employment. Over the last several years, the average annual unemployment rate in the county has steadily declined from 6.0 percent in 2013 to 3.7 percent in 2017 (BLS 2018a). During this same time the average annual unemployment rate for Texas has also declined from 6.3 percent to 4.3 percent (BLS 2018b). Per capita personal income in Tarrant County is estimated at \$48,050, which is more than the estimated \$46,274 per capita personal income in the state (BEA 2017b).

NAS Fort Worth JRB is an important economic contributor to Tarrant County. Estimated contributions of NAS Fort Worth JRB include 47,256 direct and indirect jobs, \$4.3 billion in gross domestic product, and \$2.7 billion in annual disposable personal income (Texas Comptroller of Public Accounts 2015). The total economic impact of the base on the surrounding communities in 2015 was \$6.6 billion (Texas Comptroller of Public Accounts 2015). Based on the Impact Analysis for Planning (IMPLAN) economic model, the on-base authorized employment of 9,600 personnel supports an estimated additional 2,353 secondary jobs in the community.

FW3.9.1.3 Housing

Table FW3-42 presents census-derived housing data for Tarrant County. The county has an estimated 740,355 total housing units (houses), of which 8 percent (57,388 units) were vacant in 2016 (USCB 2016). Less than half (40 percent) of the occupied houses in the county are renter-occupied and the remaining 60 percent are owner-occupied. The median value of owner-occupied houses in Tarrant County is estimated at \$148,100. The median gross rent was \$944 in 2016 (USCB 2016). As described in Section FW3.2.1.1, an estimated 13,093 residents and approximately 5,255 houses in Tarrant County are currently exposed to DNL of 65 dB or greater from aircraft operations at NAS Fort Worth JRB.

Table FW3-42. Housing Data in the ROI for NAS Fort Worth JRB

Location	Houses	Occupied	Vacant
Tarrant County	740,355	682,967	57,388

Source: USCB 2016

The recent real estate market in Texas is characterized by rising demand and severe shortages of inventory, particularly for homes less than \$300,000. Since 2012, Texas incomes have not been keeping pace with rising housing prices, resulting in a decline in housing affordability. Between 2012 and 2016, the average annual increase in incomes was 2.8 percent, compared to a 7.4 percent average annual increase in housing prices (Torres 2017). Fort Worth had the highest affordability conditions

compared to Austin, Dallas, Houston, and San Antonio, despite posting the largest percentage increase in median price per square foot at 10.5 percent year over year (TAMU 2018). Reasons cited for the recent conditions include the state's population and economic growth due to the most recent oil boom and lightly regulated commercial development (Torres 2017). As of March 2018, the median home price in Fort Worth rose 1.7 percent year to date to \$230,200, which is slightly less than the Texas median home price of \$231,600 (TAMU 2018).

Accompanied and unaccompanied housing is available on base at NAS Fort Worth JRB. Military family housing at NAS Fort Worth JRB is privatized and owned by Balfour Beatty Communities. Four neighborhoods on base provide a total of 83 units for service members. Estimated waiting times for family housing varies depending on the size of the unit and the rank; at up to 2 years, four-bedroom size units have the longest wait times (CNIC 2018).

FW3.9.1.4 Education

Tarrant County has 20 independent school districts. No schools are located on NAS Fort Worth JRB. School-aged children living on base who attend public schools attend schools within the four school districts that serve NAS Fort Worth JRB. The Fort Worth Independent School District is the largest in the area with 86,869 students enrolled in one of the 143 schools during 2016. The student to teacher ratio is 15.5:1 (Texas Education Agency 2016). Five schools are known to be currently exposed to DNL of 65 dB or greater from aircraft operations at NAS Fort Worth JRB. These schools include Brewer Middle School, Effie Morris Elementary, Mesa High School, Liberty Elementary, and N.A. Howry Intermediate.

FW3.9.1.5 Public Services

Fire and emergency services, law enforcement and protection, and medical services are available throughout Tarrant County. Tarrant County Emergency Services District No. 1 includes 25 contracted fire departments (Tarrant County 2018). Fire and emergency services are available on base. The Fort Worth Police Department provides law enforcement and safety services to residents in the City of Fort Worth. As of December 2017, the Fort Worth Police Department employed 1,759 civil service and 459 civilian staff members. The officer-to-population ratio was 1:497 in 2017 (Fort Worth Police Department 2017).

FW3.9.1.6 Base Services

Base services at NAS Fort Worth JRB include Morale, Welfare and Recreation Facilities, commissary, and an exchange.

FW3.9.2 Base Environmental Consequences

FW3.9.2.1 Population

The current personnel at NAS Fort Worth JRB and the projected change anticipated to support the AFRC F-35A mission are provided in Table FW2-3. Implementation of the AFRC F-35A mission would result in a net decrease of 102 full-time mission personnel. This would result in a 1.1 percent decline in the existing base employment and a less than 0.1 percent decrease in the existing county population. Calculation of this potential decrease in the county population is based on the assumption that all 102 personnel would be full-time and be reassigned to other bases, and that the personnel and any dependents would migrate out of the area. Employment opportunities in the Fort Worth area would be expected to absorb any reduction in secondary employment. For purposes of the EIS analysis, a change in personnel assumes those personnel will leave the area. It is possible that these

personnel could remain in the area and associated changes in housing, schools, etc. would not occur. Impacts for such a small change in personnel would be negligible.

FW3.9.2.2 Economic Activity (Employment and Earnings)

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would decrease the full-time work force assigned to the base by 102 total personnel (Table FW2-3). Using the IMPLAN model, the direct effect of a net decrease of 102 full-time personnel at NAS Fort Worth JRB would have a negative estimated indirect and induced effect of a loss of up to 25 jobs in service industries in Tarrant County (IMPLAN 2018). This number of jobs would not be noticed in the regional economy.

Construction activities provide economic benefits to the surrounding areas through the employment of construction workers and the purchase of materials and equipment. Construction activities would be temporary and provide a limited amount of economic benefit. Noise associated with construction activities would be limited to within the base boundaries and would not impact economic activity. The USAF estimates that a total of \$21.7 million in MILCON expenditures during 2021-2023 would be associated with implementation of the AFRC F-35A mission at NAS Fort Worth JRB. The total expenditures could generate up to 74 jobs, primarily within the construction industry, and to a lesser extent in retail, wholesale trade, real estate, architectural, engineering, and related services, and truck transportation (IMPLAN 2018). Jobs generated by construction expenditures in the area would offset induced and indirect jobs associated with a decrease in personnel. With a labor force of more than 1.03 million people and an unemployment rate of 3.7 percent, the local labor force would be sufficient to fill construction-related jobs without a migration of workers into the area. Implementation of the AFRC F-35A mission and projected total MILCON expenditures of \$21.7 million at NAS Fort Worth JRB would generate an estimated \$11.4 million in direct, indirect, and induced labor income in the ROI. The jobs and related income generated would be temporary (i.e., during the construction activity).

FW3.9.2.3 Housing

Military housing is available at NAS Fort Worth JRB. Assuming that all 102 full-time personnel reside off-base in separate units and would be reassigned out of the area, approximately 102 units could become available for sale or rent in the Fort Worth market. Recent real-estate trends in the Fort Worth area suggest that additional supply of units would be beneficial to the area, which is experiencing a shortage of residential properties.

During scoping, individuals raised concerns about the potential impact of noise on surrounding property values. As discussed in more detail in Chapter 3, Section 3.9.3, studies have shown a relation between noise and property values. A study conducted by Trojanek et al (2017) summarized the results from 79 studies; the majority of those studies found that housing values decreased from 0.26 to 1.00 percent for every decibel increase in DNL above 65 dB. Some of the studies had values that decreased less than this range and others decreased more. It is a reasonable assumption, based on these studies, that increases in noise could cause some reduction in the rate of increase in housing prices. The percent of effect is dependent upon a number of factors, including the noise indicators used, thresholds, types of properties evaluated, proximity to employment, schools, and other factors.

Table FW3-43 shows the total estimated number of houses that would be newly exposed to DNL of 65 dB or greater from the AFRC F-35A mission, although many of these homes are located in areas zoned for high noise levels. The estimated number of residents newly exposed to this level of noise is identified in Tables FW3-12, FW3-14, and FW3-15. As explained in Section FW3.8.1.1, residential land use exposed to DNL of 65 to 74 dB is identified in the JLUS as a compatible use

where the structures have sound attenuation of at least 25 to 30 dB. Residential land is incompatible with DNL greater than 75 dB. Residential land exposed to DNL greater than 65 dB where sound attenuation was not incorporated into the structures would constitute an adverse impact to housing.

Table FW3-43. Estimated Houses Exposed to DNL of 65 dB or Greater from Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB

DNL (dB)	Estimated Houses							
	JLUS	Baseline	Scenario A	Change	Scenario B	Change	Scenario C	Change
65-69	10,397	4,138	6,982	2,844	6,973	2,835	6,961	2,823
70-74	3,470	1,010	1,908	898	1,928	918	1,949	939
75-79	828	98	213	115	217	119	220	122
80-84	81	9	15	6	15	6	15	6
≥85	0	0	0	0	0	0	0	0
Total	14,776	5,255	9,118	3,863	9,133	3,878	9,145	3,890

Prices for homes in the Fort Worth region have been increasing over the last several years due to economic and population growth in the region. These recent upward price trends in the local real estate market are expected to continue into the near future, although housing newly affected by increased DNL greater than 65 dB would be expected to experience a lesser price increase when compared with housing not affected by increased DNL.

FW3.9.2.4 Education

As described in Chapter 3, Section 3.9.3, the total number of dependents, including spouse and children, was estimated at 2.5 times 65 percent of full-time active duty and full-time active reserve. The total number of children was estimated at 1.5 times 65 percent of full-time personnel, because it was assumed each military member would be accompanied by a spouse. Thus, it is estimated that up to 100 dependents would be of school age and would no longer attend schools in Tarrant County. The projected number of students leaving would represent a 0.12 percent decrease of the current total enrollment of the Fort Worth Independent School District. Based on the number and size of the school district in the ROI, as well as class size for the state, it is anticipated that the capacity of the schools in the county would not be noticeably affected by the reduction in students.

During scoping, several people expressed concern about the impacts of noise on children and educational facilities. Results of recent reviews on how chronic aircraft noise exposure at school or at home has been associated with children having poorer reading and memory skills (Basner et al., 2018). Studies also suggest that “children exposed to chronic aircraft noise at school have poorer performance on standardized achievement tests compared to children who are not exposed to aircraft noise” (Basner et al., 2018).

Five off-base schools (Brewer Middle School, Effie Morris Elementary, Mesa High School, Liberty Elementary, and N.A. Howry Intermediate) are currently exposed to DNL of 65 dB or greater resulting from aircraft operations at NAS Fort Worth JRB. With the exception of Liberty Elementary, these schools would continue to be exposed to DNL greater than 65 dB resulting from the proposed AFRC F-35A mission (Table FW3-44). Liberty Elementary is currently exposed to DNL of 65 dB but would be exposed to DNL of 70 dB from the new mission. Two additional schools (Applied Learning Academy/International Newcomer Academy and Luella Merrett Elementary) would be newly exposed to DNL of 65 dB (Table FW3-44). Classrooms with sound attenuation are identified in the JLUS as compatible land uses up to an outside DNL of 75 dB. Noise impacts to students have been identified as interfering with learning (Section FW3.2.2.3). The number of students impacted

by increased noise would constitute an adverse impact. These impacts would be the same regardless of which afterburner scenario is selected.

Table FW3-44. Representative Schools Exposed to DNL of 65 dB or Greater from Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB

Schools	dB DNL Contour	
	Baseline	AFRC F-35A Mission
Brewer Middle School ^a	65-69	65-69
Effie Morris Elementary ^a	65-69	65-69
Mesa High School	65-69	65-69
Liberty Elementary	65-69	70-74
N.A. Howry Intermediate	65-69	65-69
Applied Learning Academy/International Newcomer Academy	NA	65-69
Luella Merret Elementary ^a	NA	65-69

^a These schools were used as representative noise-sensitive locations. Additional information on noise impacts are discussed in Section FW3.2.2.3.

FW3.9.2.5 Public Services

Tarrant County represents a large community with police, fire, and other services. The estimated reduction of 102 full-time, USAF-related personnel and dependents would represent an indiscernible decrease of approximately 0.01 percent of the existing Tarrant County population. Implementation of the AFRC F-35A mission would result in no discernible affects to public services.

During scoping, people submitted comments regarding the potential impact that noise from the F-35A aircraft would have on the quality of life and health of residents. Aircraft noise has the potential to cause a variety of effects such as annoyance, speech interference, sleep interference, hearing loss, and non-auditory health effects (Section FW3.2.2). Potential non-auditory health impacts due to aircraft noise are discussed in more detail in Section FW3.2.2.7 and Volume II, Appendix B. The USAF continually works with local governments and communities to assess and manage aircraft noise in the environment and attempts to reduce, where possible, the potential impacts of noise to people. When possible, the AFRC F-35A pilots would intentionally avoid overflying identified noise-sensitive locations.

FW3.9.2.6 Base Services

The population on military bases is constantly in flux as deployments and mission personnel changes are assigned; therefore, a change in 102 personnel to a base with 9,600 authorized personnel would have no discernible effect on revenue-generating services on base.

FW3.9.3 Summary of Impacts to Socioeconomics

The personnel decreases and community service requirements of the AFRC F-35A mission (Scenario A, B, or C) at NAS fort Worth JRB would not result in adverse socioeconomic impacts. However, the noise increases to houses and schools would constitute adverse socioeconomic impacts.

FW3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

The environmental justice analysis considers affected populations that meet certain characteristics based on income and age. Analysis of environmental justice and other sensitive receptors is conducted pursuant to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 13045, *Protection of Children from Environmental Health*

Risks and Safety Risks. Environmental justice addresses impacts to minority and low-income populations. This analysis focuses on increased noise resulting from the proposed action as the primary impact to these populations. The USAF guidelines for environmental analysis use census data (i.e., percentages of populations identifying themselves as minority, low-income, etc.) to determine potential impacts to these populations. The guidelines also address children (under 18) and elderly (65 and older) as additional sensitive populations. (Minority, low-income, children, and elderly populations are henceforth referred to as environmental justice populations). Tables FW3-12, FW3-14, and FW3-15 list the number of people exposed to DNL of 65 dB or greater from baseline and the three afterburner scenario conditions at NAS Fort Worth JRB.

This analysis is completed to determine if there are existing disproportionate noise impacts to environmental justice populations (i.e., baseline DNL of 65 dB or greater) and if implementation of the proposed action would result in disproportionate noise impacts to environmental justice populations (i.e., AFRC F-35A mission DNL of 65 dB or greater).

Environmental justice analysis overlays the 65 dB DNL contour on the census data polygons. The smallest census data which has the information necessary for analysis of potential impacts to environmental justice populations is used to determine potential impacts. The smallest group of census data which contain the needed information for this analysis is the Census BG. Each BG that is partially or wholly encompassed by the 65 dB DNL contour is defined as an ROI.

Census blocks are the smallest unit for which the USCB collects census information. **Block Groups (BGs)** are comprised of a combination of census blocks and are a subdivision of **census tracts (CTs)**. Census tracts are a small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting census data. This EIS uses **BGs** and **CTs** in the environmental justice analysis. The **BGs** also comprise the **Region of Influence (ROI)** analyzed in the EIS.

There could be few or many ROIs for a specific environmental justice analysis, depending on the extent of the noise contour and the size of the BGs. The next higher level of census data is the Census Tract (CT). Each CT contains a number of BGs (ROIs).

In order to identify disproportionate impacts from baseline or proposed action noise levels, a Community of Comparison (COC) is needed. The COC is defined by summing the population in all the CTs which contain any part of an ROI affected by the 65 dB DNL contour. The percentages of minority and low-income persons are calculated for each ROI (i.e., BG). The ROI and COC percentages are then compared. If the percentage of minorities or low-income persons in an ROI is equal to or greater than the percentage of minorities or low-income persons in the COC, there is a disproportionate impact to the environmental justice population in that ROI (USAF 2014). Chapter 3, Section 3.10.3, provides a description of the method applied to calculate the proportion of the population in the ROIs.

For NAS Fort Worth JRB, there are 17 CTs containing 38 ROIs which are partially or wholly exposed to DNL of 65 dB or greater from the AFRC F-35A mission. Figure FW3-8 presents an overlay of the baseline and AFRC F-35A mission 65 dB DNL contour on the ROIs and the COC.

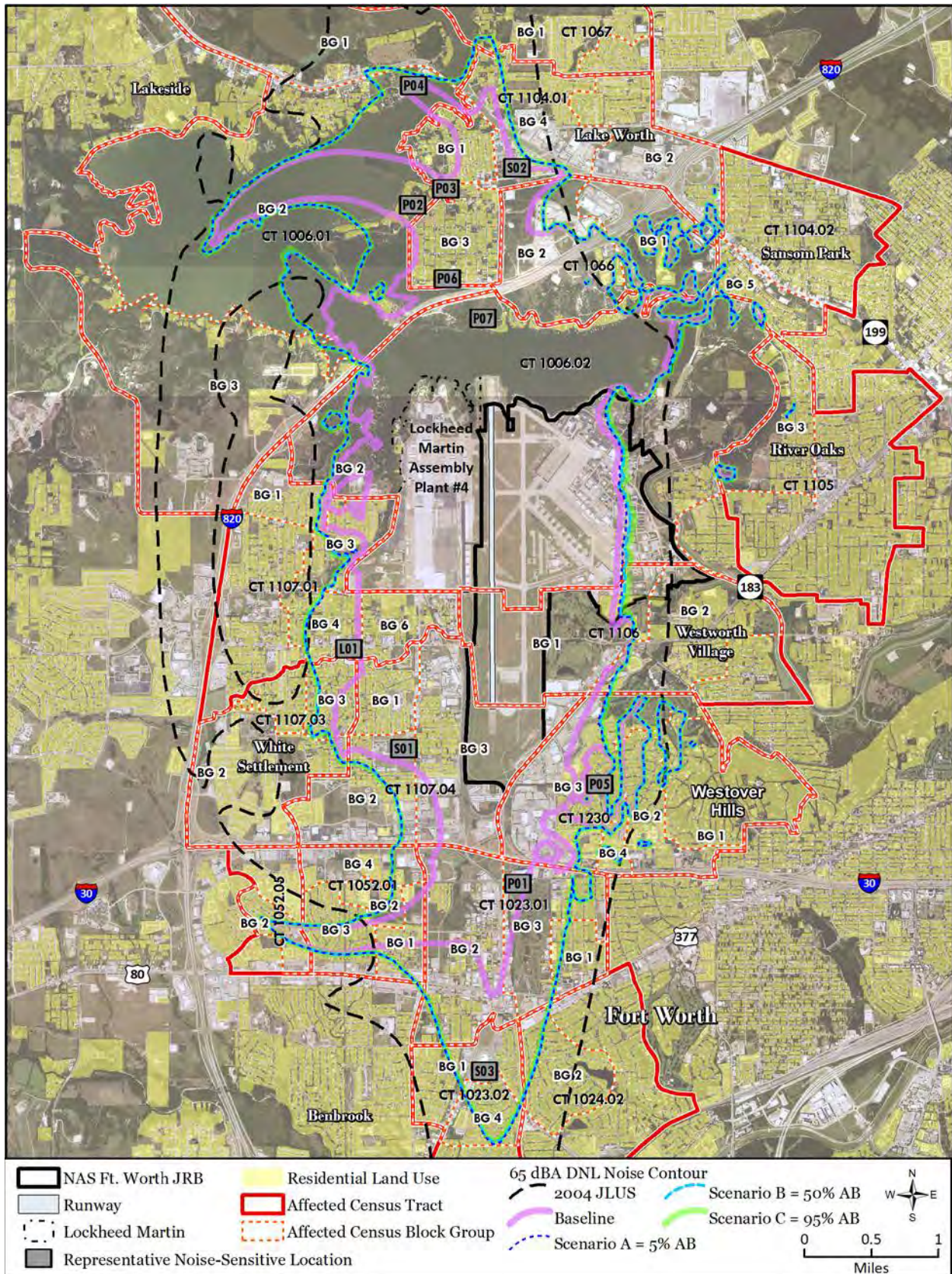


Figure FW3-8. NAS Fort Worth JRB Census Tracts and Block Groups Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions

FW3.10.1 Base Affected Environment

Table FW3-45 provides baseline demographic conditions in Tarrant County, where NAS Fort Worth JRB is located. Also shown in Table FW3-45 is the existing proportion of environmental justice populations in the 17 CTs located in the proposed action affected area at NAS Fort Worth JRB. The 17 CTs are the COC for the environmental justice analysis. Table FW3-45 includes minority, low-income, children, and elderly population numbers and percentages for county, state, and nation census categories to show context and to help determine the intensity of impacts. As shown in Table FW3-45, the COC has a lower proportion of minority and children populations than Tarrant County and the State of Texas, but a larger proportion than the nation. The COC also has a higher proportion of low-income populations than the county, state, or nation.

Table FW3-46 lists the percentages of environmental justice populations residing in the 38 ROIs (BGs) exposed to DNL of 65 dB or greater from baseline and AFRC F-35A mission conditions. Table FW3-46 shows that under baseline conditions 12 ROIs (BGs) have higher percentages of minority populations than the percentage of minority populations living in the COC. This means that there are existing disproportionate impacts to minority persons living in these 12 ROIs. Thirteen (13) ROIs (BGs) encompassed by the baseline 65 dB or greater DNL contour have higher percentages of low-income populations than the percentage of low-income populations living in the COC. This means that there are existing disproportionate impacts to low-income persons living in these 13 ROIs. Table FW3-47 documents that children and elderly populations in the ROIs also are currently exposed to DNL of 65 dB or greater. Under baseline conditions, 2,833 children and 1,754 elderly persons reside in areas exposed to DNL 65 dB or greater.

Five off-base schools are currently exposed to DNL of 65 to 69 dB. These schools are Brewer Middle School, Effie Morris Elementary, Mesa High School, Liberty Elementary, and N.A. Howry Intermediate. For more information about potential noise impacts as modeled for representative schools, refer to Section FW3.2.1.3.

Figure FW3-9 maps the census data minority and low-income populations and Figure FW3-10 maps the children and elderly populations exposed to DNL of 65 dB or greater resulting from the AFRC F-35A mission at NAS Fort Worth JRB. Both figures also show the Census BGs and the CTs used for the environmental justice analysis. The letter designations on the figure represent noise-sensitive locations identified and described in Section FW3.2.1.1.

Table FW3-45. Environmental Justice Populations and Demographics for NAS Fort Worth JRB

Geographic Unit	Total Population	Population for Whom Poverty is Determined ^a	Minority		Low-Income		Children		Elderly	
			Percent	Number	Percent	Number	Percent	Number	Percent	Number
1006.01	2,415	2,406	20.2	488	13.4	324	13.9	336	16.3	393
1006.02	3,872	1,996	52.9	2,048	7.7	298	12.0	463	7.9	307
1023.01	3,258	3,258	68.3	2,225	16.9	551	22.7	738	9.6	313
1023.02	5,653	5,645	58.9	3,332	20.9	1,181	30.1	1,699	8.8	500
1024.02	4,639	4,639	16.2	751	4.6	213	23.5	1,090	17.9	830
1052.01	5,459	5,445	68.7	3,752	34.1	1,862	34.3	1,875	8.4	460
1052.05	5,627	5,612	68.9	3,878	29.6	1,666	29.7	1,673	6.2	348
1066.00	2,349	2,349	52.4	1,232	30.6	719	28.7	674	6.5	152
1067.00	2,124	2,117	34.9	742	14.7	312	25.3	537	12.0	254
1104.01	4,898	4,662	34.5	1,688	9.0	441	25.1	1,230	14.5	708
1104.02	5,027	4,884	69.4	3,489	21.0	1,056	29.8	1,499	8.7	435
1105.00	8,733	8,733	54.3	4,739	17.4	1,520	27.2	2,376	10.1	882
1106.00	2,678	2,673	34.4	922	9.2	246	22.1	592	12.6	337
1107.01	7,161	7,161	37.6	2,695	14.8	1,060	23.2	1,664	11.3	807
1107.03	5,240	5,030	42.1	2,204	11.8	618	28.4	1,490	9.7	509
1107.04	4,734	4,427	36.7	1,737	16.4	776	24.0	1,137	16.8	793
1230.00	5,614	5,614	34.3	1,926	15.1	848	11.7	659	26.9	1,510
COC	79,481	76,651	47.6	37,848	17.2	13,691	24.8	19,732	12.0	9,538
Tarrant County	1,983,675	1,957,580	48.3	959,103	13.5	264,575	26.9	534,079	10.5	208,089
State of Texas	27,419,612	26,794,198	57.1	15,664,119	16.0	4,291,384	26.3	7,213,117	11.7	3,215,906
United States	321,004,407	313,048,563	38.5	123,726,618	14.6	45,650,345	22.9	73,601,279	14.9	47,732,389

^a Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years of age.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

FW3.10.2 Base Environmental Consequences

FW3.10.2.1 Scenario A

Based on the analysis shown in Table FW3-46, implementation of Scenario A would result in disproportionate noise impacts to minority and low-income populations. Table FW3-46 identifies the ROIs (BGs) exposed to DNL of 65 dB or greater under baseline and Scenario A conditions.

The percentage of the population that identifies themselves as minority in four ROIs (BGs) that would be newly exposed to DNL of 65 dB or greater exceeds the percentage of minority populations in the COC. The percentage of the population that is considered below poverty (low-income) in two newly exposed ROIs (BGs) is greater than the percentage of low-income populations in the COC. The areas where these populations are located are shown on Figure FW3-9. Because the percentages of minority and low-income populations in these ROIs are greater than or equal to the corresponding percentages in the COC, disproportionate impacts to environmental justice populations in these ROIs would result from the implementation of Scenario A.

Because implementation of Scenario A would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and Record of Decision (ROD).

The other sensitive populations evaluated in this analysis are children and elderly. Table FW3-47 identifies the ROIs (BGs) where youth and elderly are exposed to DNL of 65 dB or greater under baseline and AFRC F-35A mission conditions. Implementation of Scenario A would expose an additional estimated 2,188 children and 1,126 elderly persons to DNL of 65 dB or greater. The areas where these populations are located are shown on Figure FW3-10.

Sections FW3.2.2.2 and FW3.2.2.3 describe speech interference and classroom learning disruption associated with increased overflight and noise levels, which would adversely impact children and elderly populations.

Table FW3-46. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario A)

Geographic Units		Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1006.01											
2 ^a	979	126	24.9	No	15.8	No	129	24.9	No	15.8	No
3	653	0	25.9	No ^c	10.1	No ^c	1	25.9	No	10.1	No
CT 1006.02											
2 ^a	2,866	1,122	50.2	Yes	10.3	No	15	50.2	Yes	10.3	No
CT 1023.01											
1	1,178	0	64.9	No ^c	18.6	No ^c	255	64.9	Yes	18.6	Yes
2 ^a	1,323	397	69.8	Yes	13.8	No	810	69.8	Yes	13.8	No
3 ^a	757	1	71.1	Yes	19.8	Yes	401	71.1	Yes	19.8	Yes
CT 1023.02											
1	2,259	0	60.8	No ^c	6.5	No ^c	794	60.8	Yes	6.5	No
4	953	0	63.4	No ^c	29.2	No ^c	591	63.4	Yes	29.2	Yes
CT 1024.02											
2	1,264	0	10.8	No ^c	1.0	No ^c	166	10.8	No	1.0	No
CT 1052.01											
1 ^a	1,566	683	91.1	Yes	57.1	Yes	650	91.1	Yes	57.1	Yes
2 ^a	1,346	157	73.4	Yes	36.1	Yes	184	73.4	Yes	36.1	Yes
3 ^a	1,796	660	47.0	Yes	9.1	No	151	47.0	Yes	9.1	No
4	751	0	65.5	No ^c	42.5	No ^c	117	65.5	Yes	42.5	Yes
CT 1052.05											
2 ^a	1,741	247	69.3	Yes	15.7	No	95	69.3	Yes	15.7	No
CT 1066.00											
1 ^a	1,541	457	62.0	Yes	41.0	Yes	48	62.0	Yes	41.0	Yes
2 ^a	808	564	34.3	No	10.6	No	12	34.3	No	10.6	No

Table FW3-46. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario A) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1067.00											
1	1,682	0	36.9	No ^c	12.1	No ^c	19	36.9	No	12.1	No
CT 1104.01											
1 ^a	1,255	827	27.3	No	11.0	No	428	27.3	No	11.0	No
2 ^a	1,259	10	51.3	Yes	12.7	No	2	51.3	Yes	12.7	No
3 ^a	1,569	1,519	35.3	No	5.1	No	50	35.3	No	5.1	No
4 ^a	815	64	17.9	No	8.5	No	214	17.9	No	8.5	No
CT 1104.02											
5 ^a	626	15	48.2	Yes	25.6	Yes	2	48.2	Yes	25.6	Yes
CT 1105.00											
3 ^a	925	1	41.3	No	8.6	No	1	41.3	No	8.6	No
CT 1106.00											
1 ^a	617	85	36.8	No	15.9	No	12	36.8	No	15.9	No
2 ^a	900	0	23.6	No ^c	10.1	No ^c	10	23.6	No	10.1	No
CT 1107.01											
1 ^a	1,311	104	15.9	No	7.6	No	148	15.9	No	7.6	No
3 ^a	1,221	578	32.4	No	11.5	No	303	32.4	No	11.5	No
4 ^a	1,638	76	57.1	Yes	4.3	No	1,088	57.1	Yes	4.3	No
6 ^a	970	970	39.0	No	33.6	Yes	-1	39.0	No	33.6	No ^b
CT 1107.03											
2 ^a	2,830	34	47.1	No	12.6	No	38	47.1	No	12.6	No
3 ^a	810	173	31.1	No	11.5	No	452	31.1	No	11.5	No

Table FW3-46. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario A) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1107.04											
1 ^a	1,327	1,311	27.9	No	13.5	No	16	27.9	No	13.5	No
2 ^a	2,213	204	31.9	No	19.5	Yes	630	31.9	No	19.5	Yes
3 ^a	1,194	1,192	55.3	Yes	14.0	No	1	55.3	Yes	14.0	No
CT 1230.00											
1 ^a	640	31	2.0	No	8.0	No	1	2.0	No	8.0	No
2 ^a	1,538	445	25.9	No	10.3	No	47	25.9	No	10.3	No
3 ^a	1,984	819	15.7	No	16.1	No	581	15.7	No	16.1	No
4	1,452	221	82.8	Yes	22.0	Yes	131	82.8	Yes	22.0	Yes
ROI Totals	51,340	13,093	NA	NA	NA	NA	8,593	NA	NA	NA	NA
COC	79,481	NA	47.6	NA	17.2	NA	79,481	47.6	NA	17.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour.

Notes: Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

Table FW3-47. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions (Scenario A) at NAS Fort Worth JRB (Scenario A)

Geographic Units		Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area		Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1006.01											
2 ^a	979	126	20.8	26	16.5	20	129	20.8	27	16.5	23
3	653	0	6.1	0	13.5	0	1	6.1	0	13.5	0
CT 1006.02											
2 ^a	2,866	1,122	8.0	89	6.9	77	15	8.0	1	6.9	2
CT 1023.01											
1	1,178	0	22.7	0	7.9	0	255	22.7	58	7.9	20
2 ^a	1,323	397	16.3	65	12.8	51	810	16.3	132	12.8	104
3 ^a	757	1	33.8	0	6.6	0	401	33.8	136	6.6	27
CT 1023.02											
1	2,259	0	24.8	0	6.6	0	794	24.8	197	6.6	52
4	953	0	29.1	0	14.5	0	591	29.1	172	14.5	86
CT 1024.02											
2	1,264	0	26.8	0	21.8	0	166	26.8	45	21.8	36
CT 1052.01											
1 ^a	1,566	683	44.3	303	2.4	16	650	44.3	287	2.4	15
2 ^a	1,346	157	33.2	52	9.5	15	184	33.2	61	9.5	17
3 ^a	1,796	660	35.4	233	13.7	90	151	35.4	54	13.7	21
4	751	0	13.2	0	6.5	0	117	13.2	15	6.5	8
CT 1052.05											
2 ^a	1,741	247	36.9	91	11.6	29	95	36.9	35	11.6	11
CT 1066.01											
1 ^a	1,541	457	31.9	146	7.5	34	48	31.9	15	7.5	4
2 ^a	808	564	22.5	128	4.6	26	12	22.5	2	4.6	1
CT 1067.00											
1	1,682	0	26.3	0	9.6	0	19	26.3	5	9.6	2
CT 1104.01											
1 ^a	1,255	827	18.8	156	19.8	163	428	18.8	80	19.8	85
2 ^a	1,259	10	28.8	3	10.2	1	2	28.8	0	10.2	0
3 ^a	1,569	1,519	33.0	500	8.9	134	50	33.0	16	8.9	5
4 ^a	815	64	14.0	9	23.7	15	214	14.0	30	23.7	51

Table FW3-47. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario A) (Continued)

Geographic Units Census BG (ROI)/COC	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1104.02											
5 ^a	626	15	23.2	3	32.4	5	2	23.2	1	32.4	0
CT 1105.00											
3 ^a	925	1	29.6	0	19.2	0	1	29.6	1	19.2	0
CT 1106.00											
1 ^a	617	85	18.2	15	0.0	0	12	18.2	3	0.0	0
2	900	0	14.2	0	22.6	0	11	14.2	2	22.6	2
CT 1107.01											
1 ^a	1,311	104	23.7	25	8.7	9	148	23.7	35	8.7	13
3 ^a	1,221	578	14.7	85	20.1	116	303	14.7	45	20.1	61
4 ^a	1,638	76	33.2	25	5.1	4	1088	33.2	361	5.1	56
6 ^a	970	970	8.9	86	17.4	168	-1	8.9	0	17.4	1
CT 1107.03											
2 ^a	2830	34	25.0	8	12.2	4	38	25.0	10	12.2	5
3 ^a	810	173	24.8	43	8.6	15	452	24.8	112	8.6	39
CT 1107.4											
1 ^a	1,327	1,311	24.7	324	13.9	182	16	24.7	4	13.9	2
2 ^a	2,213	204	25.9	53	22.2	45	630	25.9	163	22.2	140
3 ^a	1,194	1,192	19.7	253	9.8	117	1	19.7	0	9.8	-1
CT 1230.00											
1 ^a	640	31	23.6	8	36.3	11	1	23.6	0	36.3	0
2 ^a	1,538	445	5.7	25	30.0	133	47	5.7	2	30.0	15
3 ^a	1,984	819	10.8	89	37.3	306	581	10.8	62	37.3	216
4 ^a	1,452	221	14.3	31	5.3	12	131	14.3	19	5.3	7
ROI Totals	51,340	13,093	NA	2,856	NA	1,798	8,593	NA	2,188	NA	1,126
COC	79,481	NA	24.8	19,711	12.0	9,538	NA	24.8	19,711	12.0	9,538

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

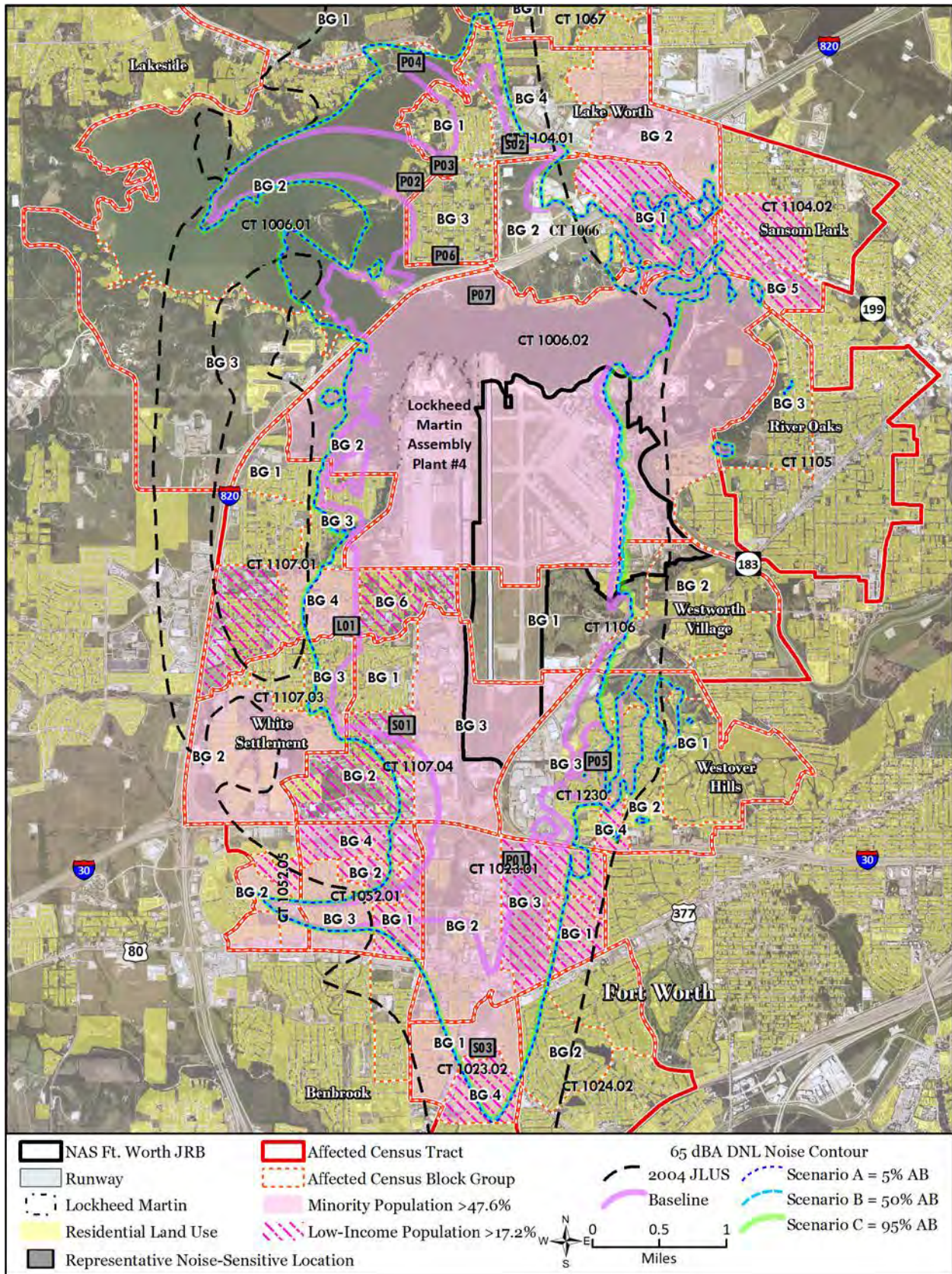


Figure FW3-9. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB

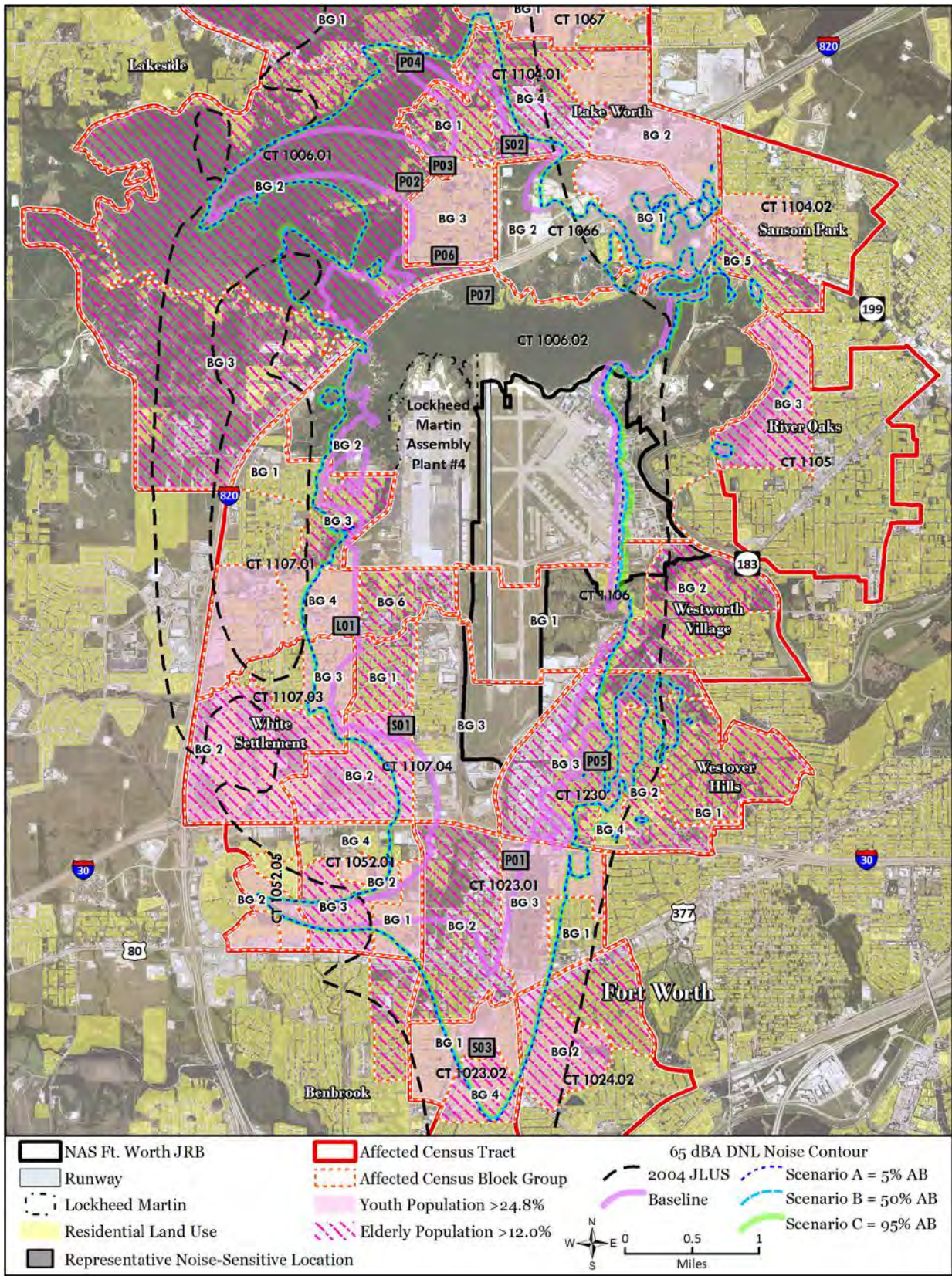


Figure FW3-10. Youth and Elderly Populations and Noise-Sensitive Receptors Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB

FW3.10.2.2 Scenario B

Implementation of Scenario B would result in disproportionate noise impacts to minority and low-income populations in an additional four ROIs (BGs) evaluated for this analysis (Table FW3-48 and Figure FW3-9). Implementation of this scenario would also expose an additional estimated 2,192 children and 1,129 elderly persons to DNL of 65 dB or greater (Table FW3-49 and Figure FW3-10). Because implementation of Scenario B would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

Table FW3-48. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario B)

Geographic Units		Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1006.01											
2 ^a	979	126	24.9	No	15.8	No	129	24.9	No	15.8	No
3	653	0	25.9	No ^c	10.1	No ^c	1	25.9	No	10.1	No
CT 1006.02											
2 ^a	2,866	1,122	50.2	Yes	10.3	No	18	50.2	Yes	10.3	No
CT 1023.01											
1	1,178	0	64.9	No ^c	18.6	No ^c	251	64.9	Yes	18.6	Yes
2 ^a	1,323	397	69.8	Yes	13.8	No	805	69.8	Yes	13.8	No
3 ^a	757	1	71.1	Yes	19.8	Yes	399	71.1	Yes	19.8	Yes
CT 1023.02											
1	2,259	0	60.8	No ^c	6.5	No ^c	782	60.8	Yes	6.5	No
4	953	0	63.4	No ^c	29.2	No ^c	564	63.4	Yes	29.2	Yes
CT 1024.02											
2	1,264	0	10.8	No ^c	1.0	No ^c	157	10.8	No	1.0	No
CT 1052.01											
1 ^a	1,566	683	91.1	Yes	57.1	Yes	649	91.1	Yes	57.1	Yes
2 ^a	1,346	157	73.4	Yes	36.1	Yes	185	73.4	Yes	36.1	Yes
3 ^a	1,796	660	47.0	Yes	9.1	No	150	47.0	Yes	9.1	No
4	751	0	65.5	No ^c	42.5	No ^c	118	65.5	Yes	42.5	Yes
CT 1052.05											
2 ^a	1,741	247	69.3	Yes	15.7	No	97	69.3	Yes	15.7	No
CT 1066.00											
1 ^a	1,541	457	62.0	Yes	41.0	Yes	53	62.0	Yes	41.0	Yes
2 ^a	808	564	34.3	No	10.6	No	12	34.3	No	10.6	No

Table FW3-48. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario B) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1067.00											
1	1,682	0	36.9	No ^c	12.1	No ^c	18	36.9	No	12.1	No
CT 1104.01											
1 ^a	1,255	827	27.3	No	11.0	No	428	27.3	No	11.0	No
2 ^a	1,259	10	51.3	Yes	12.7	No	2	51.3	Yes	12.7	No
3 ^a	1,569	1,519	35.3	No	5.1	No	50	35.3	No	5.1	No
4 ^a	815	64	17.9	No	8.5	No	214	17.9	No	8.5	No
CT 1104.02											
5 ^a	626	15	48.2	Yes	25.6	Yes	2	48.2	Yes	25.6	Yes
CT 1105.00											
3 ^a	925	1	41.3	No	8.6	No	1	41.3	No	8.6	No
CT 1106.00											
1 ^a	617	85	36.8	No	15.9	No	17	36.8	No	15.9	No
2 ^a	900	0	23.6	No ^c	10.1	No ^c	14	23.6	No	10.1	No
CT 1107.01											
1 ^a	1,311	104	15.9	No	7.6	No	152	15.9	No	7.6	No
3 ^a	1,221	578	32.4	No	11.5	No	305	32.4	No	11.5	No
4 ^a	1,638	76	57.1	Yes	4.3	No	1,112	57.1	Yes	4.3	No
6 ^a	970	970	39.0	No	33.6	Yes	0	39.0	No	33.6	No ^b
CT 1107.03											
2 ^a	2,830	34	47.1	No	12.6	No	39	47.1	No	12.6	No
3 ^a	810	173	31.1	No	11.5	No	462	31.1	No	11.5	No

Table FW3-48. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario B) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1107.04											
1 ^a	1,327	1,311	27.9	No	13.5	No	16	27.9	No	13.5	No
2 ^a	2,213	204	31.9	No	19.5	Yes	646	31.9	No	19.5	Yes
3 ^a	1,194	1,192	55.3	Yes	14.0	No	2	55.3	Yes	14.0	No
CT 1230.00											
1 ^a	640	31	2.0	No	8.0	No	1	2.0	No	8.0	No
2 ^a	1,538	445	25.9	No	10.3	No	50	25.9	No	10.3	No
3 ^a	1,984	819	15.7	No	16.1	No	590	15.7	No	16.1	No
4	1,452	221	82.8	Yes	22.0	Yes	131	82.8	Yes	22.0	Yes
ROI Totals	51,340	13,093	NA	NA	NA	NA	8,622	NA	NA	NA	NA
COC	79,481	NA	47.6	NA	17.2	NA	79,481	47.6	NA	17.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour.

Notes: Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

Table FW3-49. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions (Scenario A) at NAS Fort Worth JRB (Scenario B)

Geographic Units		Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area		Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1006.01											
2 ^a	979	126	20.8	26	16.5	20	129	20.8	27	16.5	23
3	653	0	6.1	0	13.5	0	1	6.1	0	13.5	0
CT 1006.02											
2 ^a	2,866	1,122	8.0	89	6.9	77	18	8.0	0	6.9	1
CT 1023.01											
1	1,178	0	22.7	0	7.9	0	251	22.7	57	7.9	20
2 ^a	1,323	397	16.3	65	12.8	51	805	16.3	130	12.8	103
3 ^a	757	1	33.8	0	6.6	0	399	33.8	135	6.6	26
CT 1023.02											
1	2,259	0	24.8	0	6.6	0	782	24.8	194	6.6	51
4	953	0	29.1	0	14.5	0	564	29.1	164	14.5	82
CT 1024.02											
2	1,264	0	26.8	0	21.8	0	157	26.8	42	21.8	34
CT 1052.01											
1 ^a	1,566	683	44.3	303	2.4	16	649	44.3	287	2.4	15
2 ^a	1,346	157	33.2	52	9.5	15	185	33.2	62	9.5	18
3 ^a	1,796	660	35.4	233	13.7	90	150	35.4	53	13.7	21
4	751	0	13.2	0	6.5	0	118	13.2	16	6.5	8
CT 1052.05											
2 ^a	1,741	247	36.9	91	11.6	29	97	36.9	36	11.6	11
CT 1066.01											
1 ^a	1,541	457	31.9	146	7.5	34	53	31.9	17	7.5	4
2 ^a	808	564	22.5	128	4.6	26	12	22.5	2	4.6	0
CT 1067.00											
1	1,682	0	26.3	0	9.6	0	18	26.3	5	9.6	2
CT 1104.01											
1 ^a	1,255	827	18.8	156	19.8	163	428	18.8	80	19.8	85
2 ^a	1,259	10	28.8	3	10.2	1	2	28.8	0	10.2	0
3 ^a	1,569	1,519	33.0	500	8.9	134	50	33.0	17	8.9	5
4 ^a	815	64	14.0	9	23.7	15	214	14.0	30	23.7	51

Table FW3-49. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario B) (Continued)

Geographic Units Census BG (ROI)/COC	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1104.02											
5 ^a	626	15	23.2	3	32.4	5	2	23.2	1	32.4	0
CT 1105.00											
3 ^a	925	1	29.6	0	19.2	0	1	29.6	1	19.2	0
CT 1106.00											
1 ^a	617	85	18.2	15	0.0	0	17	18.2	4	0.0	0
2	900	0	14.2	0	22.6	0	14	14.2	2	22.6	3
CT 1107.01											
1 ^a	1,311	104	23.7	25	8.7	9	152	23.7	36	8.7	13
3 ^a	1,221	578	14.7	85	20.1	116	305	14.7	45	20.1	61
4 ^a	1,638	76	33.2	25	5.1	4	1112	33.2	369	5.1	57
6 ^a	970	970	8.9	86	17.4	168	0	8.9	0	17.4	1
CT 1107.03											
2 ^a	2830	34	25.0	8	12.2	4	39	25.0	10	12.2	5
3 ^a	810	173	24.8	43	8.6	15	462	24.8	115	8.6	40
CT 1107.4											
1 ^a	1,327	1,311	24.7	324	13.9	182	16	24.7	4	13.9	2
2 ^a	2,213	204	25.9	53	22.2	45	646	25.9	167	22.2	144
3 ^a	1,194	1,192	19.7	253	9.8	117	2	19.7	0	9.8	0
CT 1230.00											
1 ^a	640	31	23.6	8	36.3	11	1	23.6	0	36.3	0
2 ^a	1,538	445	5.7	25	30.0	133	47	5.7	2	30.0	15
3 ^a	1,984	819	10.8	89	37.3	306	581	10.8	62	37.3	216
4 ^a	1,452	221	14.3	31	5.3	12	131	14.3	19	5.3	7
ROI Totals	51,340	13,093	NA	2,856	NA	1,798	8,622	NA	2,192	NA	1,129
COC	79,481	NA	24.8	19,711	12.0	9,538	NA	24.8	19,711	12.0	9,538

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

FW3.10.2.3 Scenario C

Implementation of Scenario C would result in disproportionate noise impacts to minority and low-income populations in four additional ROIs (BGs) that were evaluated for this analysis (Table FW3-50 and Figure FW3-9). Implementation of this scenario would expose an additional estimated 2,200 children and 1,129 elderly persons to DNL of 65 dB or greater (Table FW3-51 and Figure FW3-10). Because implementation of Scenario C would result in disproportionate impacts, potential mitigation measures were evaluated. The USAF considered a number of different measures to mitigate noise impacts, but none of these measures were determined to be operationally feasible (Chapter 2, Section 2.5). Should additional mitigation measures be identified, they would be considered during preparation of the Final EIS and ROD.

Table FW3-50. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario C)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1006.01											
2 ^a	979	126	24.9	No	15.8	No	127	24.9	No	15.8	No
3	653	0	25.9	No ^c	10.1	No ^c	2	25.9	No	10.1	No
CT 1006.02											
2 ^a	2,866	1,122	50.2	Yes	10.3	No	22	50.2	Yes	10.3	No
CT 1023.01											
1	1,178	0	64.9	No ^c	18.6	No ^c	246	64.9	Yes	18.6	Yes
2 ^a	1,323	397	69.8	Yes	13.8	No	799	69.8	Yes	13.8	No
3 ^a	757	1	71.1	Yes	19.8	Yes	397	71.1	Yes	19.8	Yes
CT 1023.02											
1	2,259	0	60.8	No ^c	6.5	No ^c	767	60.8	Yes	6.5	No
4	953	0	63.4	No ^c	29.2	No ^c	536	63.4	Yes	29.2	Yes
CT 1024.02											
2	1,264	0	10.8	No ^c	1.0	No ^c	148	10.8	No	1.0	No
CT 1052.01											
1 ^a	1,566	683	91.1	Yes	57.1	Yes	649	91.1	Yes	57.1	Yes
2 ^a	1,346	157	73.4	Yes	36.1	Yes	184	73.4	Yes	36.1	Yes
3 ^a	1,796	660	47.0	Yes	9.1	No	153	47.0	Yes	9.1	No
4	751	0	65.5	No ^c	42.5	No ^c	119	65.5	Yes	42.5	Yes
CT 1052.05											
2 ^a	1,741	247	69.3	Yes	15.7	No	96	69.3	Yes	15.7	No
CT 1066.00											
1 ^a	1,541	457	62.0	Yes	41.0	Yes	57	62.0	Yes	41.0	Yes
2 ^a	808	564	34.3	No	10.6	No	12	34.3	No	10.6	No

Table FW3-50. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario C) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1067.00											
1	1,682	0	36.9	No ^c	12.1	No ^c	18	36.9	No	12.1	No
CT 1104.01											
1 ^a	1,255	827	27.3	No	11.0	No	428	27.3	No	11.0	No
2 ^a	1,259	10	51.3	Yes	12.7	No	2	51.3	Yes	12.7	No
3 ^a	1,569	1,519	35.3	No	5.1	No	50	35.3	No	5.1	No
4 ^a	815	64	17.9	No	8.5	No	214	17.9	No	8.5	No
CT 1104.02											
5 ^a	626	15	48.2	Yes	25.6	Yes	3	48.2	Yes	25.6	Yes
CT 1105.00											
3 ^a	925	1	41.3	No	8.6	No	1	41.3	No	8.6	No
CT 1106.00											
1 ^a	617	85	36.8	No	15.9	No	21	36.8	No	15.9	No
2 ^a	900	0	23.6	No ^c	10.1	No ^c	18	23.6	No	10.1	No
CT 1107.01											
1 ^a	1,311	104	15.9	No	7.6	No	158	15.9	No	7.6	No
3 ^a	1,221	578	32.4	No	11.5	No	308	32.4	No	11.5	No
4 ^a	1,638	76	57.1	Yes	4.3	No	1,137	57.1	Yes	4.3	No
6 ^a	970	970	39.0	No	33.6	Yes	0	39.0	No	33.6	No
CT 1107.03											
2 ^a	2,830	34	47.1	No	12.6	No	41	47.1	No	12.6	No
3 ^a	810	173	31.1	No	11.5	No	471	31.1	No	11.5	No

Table FW3-50. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario C) (Continued)

Geographic Units	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 1107.04											
1 ^a	1,327	1,311	27.9	No	13.5	No	16	27.9	No	13.5	No
2 ^a	2,213	204	31.9	No	19.5	Yes	660	31.9	No	19.5	Yes
3 ^a	1,194	1,192	55.3	Yes	14.0	No	1	55.3	Yes	14.0	No
CT 1230.00											
1 ^a	640	31	2.0	No	8.0	No	1	2.0	No	8.0	No
2 ^a	1,538	445	25.9	No	10.3	No	53	25.9	No	10.3	No
3 ^a	1,984	819	15.7	No	16.1	No	600	15.7	No	16.1	No
4	1,452	221	82.8	Yes	22.0	Yes	133	82.8	Yes	22.0	Yes
ROI Totals	51,340	13,093	NA	NA	NA	NA	8,648	NA	NA	NA	NA
COC	79,481	NA	47.6	NA	17.2	NA	79,481	47.6	NA	17.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour.

Notes: Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI).

Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

Table FW3-51. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions (Scenario A) at NAS Fort Worth JRB (Scenario C)

Geographic Units		Population in the Area Encompassed by DNL of 65 dB or Greater	Baseline				AFRC F-35A Mission (Newly Exposed)				
Census BG (ROI)/COC	Population in the Census Area		Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1006.01											
2 ^a	979	126	20.8	26	16.5	20	127	20.8	27	16.5	21
3	653	0	6.1	0	13.5	0	2	6.1	0	13.5	0
CT 1006.02											
2 ^a	2,866	1,122	8.0	89	6.9	77	22	8.0	1	6.9	0
CT 1023.01											
1	1,178	0	22.7	0	7.9	0	246	22.7	56	7.9	19
2 ^a	1,323	397	16.3	65	12.8	51	799	16.3	130	12.8	103
3 ^a	757	1	33.8	0	6.6	0	397	33.8	135	6.6	26
CT 1023.02											
1	2,259	0	24.8	0	6.6	0	767	24.8	190	6.6	50
4	953	0	29.1	0	14.5	0	536	29.1	156	14.5	78
CT 1024.02											
2	1,264	0	26.8	0	21.8	0	148	26.8	40	21.8	32
CT 1052.01											
1 ^a	1,566	683	44.3	303	2.4	16	649	44.3	287	2.4	15
2 ^a	1,346	157	33.2	52	9.5	15	184	33.2	61	9.5	17
3 ^a	1,796	660	35.4	233	13.7	90	153	35.4	55	13.7	21
4	751	0	13.2	0	6.5	0	119	13.2	16	6.5	8
CT 1052.05											
2 ^a	1,741	247	36.9	91	11.6	29	96	36.9	36	11.6	11
CT 1066.01											
1 ^a	1,541	457	31.9	146	7.5	34	57	31.9	18	7.5	4
2 ^a	808	564	22.5	128	4.6	26	12	22.5	2	4.6	0
CT 1067.00											
1	1,682	0	26.3	0	9.6	0	18	26.3	5	9.6	2
CT 1104.01											
1 ^a	1,255	827	18.8	156	19.8	163	428	18.8	80	19.8	85
2 ^a	1,259	10	28.8	3	10.2	1	2	28.8	0	10.2	0
3 ^a	1,569	1,519	33.0	500	8.9	134	50	33.0	17	8.9	5
4 ^a	815	64	14.0	9	23.7	15	214	14.0	30	23.7	51

Table FW3-51. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at NAS Fort Worth JRB (Scenario C) (Continued)

Geographic Units Census BG (ROI)/COC	Population in the Census Area	Baseline					AFRC F-35A Mission (Newly Exposed)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (< 18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 1104.02											
5 ^a	626	15	23.2	3	32.4	5	3	23.2	1	32.4	1
CT 1105.00											
3 ^a	925	1	29.6	0	19.2	0	1	29.6	1	19.2	0
CT 1106.00											
1 ^a	617	85	18.2	15	0.0	0	21	18.2	4	0.0	0
2	900	0	14.2	0	22.6	0	18	14.2	3	22.6	4
CT 1107.01											
1 ^a	1,311	104	23.7	25	8.7	9	158	23.7	37	8.7	14
3 ^a	1,221	578	14.7	85	20.1	116	308	14.7	46	20.1	62
4 ^a	1,638	76	33.2	25	5.1	4	1137	33.2	377	5.1	58
6 ^a	970	970	8.9	86	17.4	168	0	8.9	0	17.4	2
CT 1107.03											
2 ^a	2830	34	25.0	8	12.2	4	41	25.0	11	12.2	5
3 ^a	810	173	24.8	43	8.6	15	471	24.8	117	8.6	41
CT 1107.4											
1 ^a	1,327	1,311	24.7	324	13.9	182	16	24.7	4	13.9	2
2 ^a	2,213	204	25.9	53	22.2	45	660	25.9	171	22.2	147
3 ^a	1,194	1,192	19.7	253	9.8	117	1	19.7	0	9.8	0
CT 1230.00											
1 ^a	640	31	23.6	8	36.3	11	1	23.6	0	36.3	0
2 ^a	1,538	445	5.7	25	30.0	133	53	5.7	2	30.0	15
3 ^a	1,984	819	10.8	89	37.3	306	600	10.8	64	37.3	223
4 ^a	1,452	221	14.3	31	5.3	12	133	14.3	19	5.3	7
ROI Totals	51,340	13,093	NA	2,856	NA	1,798	8,648	NA	2,200	NA	1,129
COC	79,481	NA	24.8	19,711	12.0	9,538	NA	24.8	19,711	12.0	9,538

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Key: NA = Not applicable does not apply

Source: USCB 2017a-e

FW3.10.3 Summary of Impacts to Environmental Justice and Protection of Children

Based on the analysis shown in Table FW3-52, implementation of the AFRC F-35A mission would result in disproportionate impacts to minority and low-income populations. The estimated number of children and elderly people exposed to DNL of 65 dB or greater from each afterburner scenario are listed in Table FW3-52.

Table FW3-52. Summary of the Minority, Low-Income, Children, and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and the Three Afterburner Scenarios for the AFRC F-35A Mission at NAS Fort Worth JRB

Scenarios and Baseline/No Action	Disproportionate Impact		Newly Exposed Individuals	
	Minority Populations - Census BGs (ROIs)	Low-Income Populations - Census BGs (ROIs)	Children	Elderly Persons
Baseline/No Action ^a	13 of 38 ^a	8 of 38 ^a	2,856 ^a	1,798 ^a
Scenario A	17 of 38	10 of 38	2,188	1,126
Scenario B	17 of 38	10 of 38	2,192	1,129
Scenario C	17 of 38	10 of 38	2,200	1,129

^a Baseline/No Action is the existing conditions and does not include the values for any of the other scenarios.

FW3.11 INFRASTRUCTURE

FW3.11.1 Base Affected Environment

FW3.11.1.1 Potable Water System

Water is obtained from the City of Fort Worth. The installation’s housing area is required to follow the city’s policies with regard to water restrictions. The system is in fair to good condition. There are projects to replace laterals, and most of the mains were replaced in 2007 and 2008. Peak demand of the installation is approximately 1.6 million gallons per day (MGD), and the 3-year average demand of NAS Fort Worth JRB is 0.92 MGD (NAS Fort Worth JRB 2015a).

One potable water storage tank/tower (1449) with a 300,000-gallon capacity is located on NAS Fort Worth JRB. Several fire suppression tanks are located throughout the installation. The installation has the ability to close off incoming water from the city and use only water from the tower (NAS Fort Worth JRB 2015a).

FW3.11.1.2 Wastewater

There is no on-site wastewater treatment; all wastewater goes directly to the City of Fort Worth. The system consists of gravity-fed lines and lift stations that connect to the city mainline. The City of Fort Worth does not measure the outflow of wastewater from the base. NAS Fort Worth JRB is billed for wastewater based on potable water use. The wastewater system has been reported as being in adequate condition (NAS Fort Worth JRB 2015a).

FW3.11.1.3 Stormwater System

The majority of NAS Fort Worth JRB is drained by a system of swales, ditches, and canals. The system also consists of an underground storm drainage system that is reportedly in good condition. Routine maintenance is required, and no major issues have been reported (NAS Fort Worth JRB 2015a).

Development on the west side of the installation has been identified as a concern relative to stormwater runoff and increasing flow over the airfield. Two 15-foot culverts are located under the runway; however, flooding has occurred in this area in the past and flooding in these areas has the potential to impact runway operations (NAS Fort Worth JRB 2015a).

FW3.11.1.4 Electrical System

The local electric utility company in the Dallas-Fort Worth area is Oncor; however, with the deregulation that started in 2002, Texas residents can choose their electric company provider. Oncor delivers electricity that can be bought from different retail electric providers.

The installation's peak load is approximately 30.2 megawatts (MW), and the 3-year average load is 6.6 MW. Essential facilities on the installation have backup generators. The electrical capacity at NAS Fort Worth JRB is adequate for current needs. The electrical distribution system is in good physical condition (NAS Fort Worth JRB 2015a).

FW3.11.1.5 Natural Gas System

Natural gas at the installation is purchased from Atmos Energy Company. Use varies based on weather and is highest during winter months, when natural gas is used for heating. The 3-year average use is 7,800 million British thermal units (MMBTUs) per month and can peak at 25,000 MMBTUs per month. The natural gas mains were replaced in 2008, and the laterals will need to be replaced in the next 10 years. The natural gas distribution system is in good physical condition (NAS Fort Worth JRB 2015a).

FW3.11.1.6 Solid Waste Management

NAS Fort Worth JRB generates more than 1 ton of non-hazardous solid waste per day and thus must follow the solid waste reporting, management planning, recycling, and affirmative procurement requirements outlined in OPNAVINST 5090.1D, *Environmental Readiness Program*, Chapter 28, Solid Waste Management and Resource Recovery Ashore. Solid waste at the installation is managed according to the NAS Fort Worth JRB Integrated Solid Waste Management Plan (ISWMP) (NAS Fort Worth JRB 2015b), which complies with OPNAVINST 5090.1D; OPNAV M-5090.1, *Environmental Readiness Program Manual*; federal laws, regulations, and policies; and Texas and Tarrant County laws, ordinances, policies, and regulations.

The DoD goal for solid waste reduction is to divert 65 percent of non-hazardous solid waste by 2020 and 60 percent of C&D debris by 2018 (DoD 2012). NAS Fort Worth JRB solid waste and C&D debris diversion rates in 2016 were 23.85 and 84.41 percent, respectively.

Municipal solid waste generated at NAS Fort Worth JRB is collected by contractors. The contractors remove and dispose of the refuse in nearby off installation landfills (Southeast Landfill, Westside Transfer Station, etc.). There are no active municipal landfills on the installation. Collection of C&D debris generated during contracted facility demolition, renovations, or new construction activity is the responsibility of the contractor performing the work (NAS Fort Worth JRB 2015b).

FW3.11.1.7 Transportation

NAS Fort Worth JRB is located about 2 miles north of I-30 and is connected to it by State Highway 183. All active gates are located on local roads that can be accessed from Highway 183. I-30 connects into I-20, which is a major east/west connector, and I-35, which is a major north/south connector.

Dallas/Fort Worth International Airport is approximately 30 miles northeast of the installation and serves most major airlines.

Mass transit is available within the region through the Fort Worth Transit Authority. Ridgmar Mall is approximately 2 miles south of the installation's main gate and is a transfer center with access to multiple bus routes.

FW3.11.1.8 Gate Access

Vehicle access to the base is provided through the main gate and the East Gate. Main gate is north of the Pumphrey Drive and Nimitz Road intersection. The main gate is the major access point for the base and sees the majority of traffic. East Gate provides access from Carswell access road and connects the base to the City of River Oaks.

FW3.11.1.9 On-Base Traffic Circulation

Circulation on the installation is handled through a system of primary and secondary streets. Five roads make up the primary road system: Military Parkway, Carswell Avenue, Hensley Avenue, Burke Avenue/Boyington Drive, and Perimeter Road/Hercules Road. Secondary roads serve as connectors between these primary routes. There is minimal signage to direct traffic throughout the installation, and as a result, many parking lots are used as cut-throughs (NAS Fort Worth JRB 2015a).

The road network intersects active taxiways at two locations. There is a crossing at Taxiway Alpha to access the flight operations building and a crossing at Taxiway Charlie to access the Charlie District. The Taxiway Charlie crossing is the most problematic because of the amount of traffic that has to cross this active taxiway. This causes an increase in chances for foreign object debris damage to aircraft and creates a higher chance of mishaps between privately owned vehicles and planes on the flightline (NAS Fort Worth JRB 2015a).

Parking on the installation is generally adequate; however, because this is a Reserve installation, parking can become an issue on drill weekends. Parking lots are associated with every building on the installation and are generally sized appropriately for the size and functions of those buildings. However, with the transition from an Active Duty installation to a Reserve installation, some facilities were upgraded and capacities changed without the creation of additional parking (NAS Fort Worth JRB 2015a).

FW3.11.2 Base Environmental Consequences

The projected change in population that would result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB is a reduction of 102 base personnel or approximately 1.1 percent of the base population. This projected change in population and development was used to determine the impact on infrastructure. Since the proposed AFRC F-35A mission results in the loss of base personnel, it is assumed that the current demand for the potable water, wastewater, electric, and natural gas systems is sufficient to support the projected change in population. The impact of the proposed AFRC F-35A mission on the transportation infrastructure, would be negligible based on the potential minor reduction of on-base traffic.

FW3.11.2.1 Potable Water System

Based on the average usage rate of 130 gallons per day (GPD) (usgs.gov) per person, it is anticipated that the decrease in population (i.e., 102 people) associated with the proposed AFRC F-35A mission would reduce the water use demand by 13,260 GPD. This decrease would have no effect on the existing peak usage at NAS Fort Worth JRB and would not affect the City of Fort Worth water system capacity. Therefore, the impacts would not be significant.

FW3.11.2.2 Wastewater

The USEPA estimates that the average person generates approximately 120 GPD of wastewater between showering, toilet use, and general water use (USEPA 2014). Based on this rate, the proposed

decrease in population (i.e., 102 people) would result in a reduction of wastewater discharge from NAS Fort Worth JRB by 12,240 GDP. Since this is an anticipated reduction in wastewater generated, the City of Fort Worth has adequate capacity to handle the wastewater and the impacts of the proposed AFRC F-35A mission would not be significant.

FW3.11.2.3 Stormwater System

As described in Section FW3.5.2, all construction would comply with LID (as amended, 2016) and the EISA Section 438 (42 USC §17094), any potential increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features (i.e., use of porous materials, directing runoff to permeable areas and use of detention basins to release runoff over time). The existing stormwater system with the modifications required by the new construction is adequate to handle the stormwater runoff from the new facilities.

FW3.11.2.4 Electrical System

The U.S. Energy Information Administration (USEIA) estimates that the average household in Texas uses 13.6 megawatt hours (MWh) per year (USEIA 2014). Based on the anticipated reduction of personnel by 102, the annual reduction in electrical use at NAS Fort Worth JRB would be 1,387 MWh per year (13.6 MWh/year x 102). This decrease would not affect the peak load of approximately 30.2 MW and impacts would not be significant.

FW3.11.2.5 Natural Gas System

The USEIA estimates that the average person in Fort Worth, Texas uses 7.6 MCF of natural gas per year (USEIA 2016). Based on this rate, the proposed decrease in population of 102 would decrease natural gas use at NAS Fort Worth JRB by 7.75 MCF per year. This decrease represents a less than 0.01 percent change natural gas usage of and the impacts would not be significant.

FW3.11.2.6 Solid Waste Management

Solid waste would continue to be managed in accordance with the ISWMP with the implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB. Using methodology developed by the USEPA (USEPA 2009b), it is estimated that implementation of the proposed AFRC F-35A mission would generate approximately 1,054 tons of C&D debris for recycling or removal to landfills. Application of the 60 percent DoD target diversion rate (DoD 2012) for C&D debris would result in approximately 632 tons being reused or recycled, and approximately 422 tons being placed in regional landfills. However, NAS Fort Worth JRB's current C&D debris diversion rate is greater than 60 percent (84.4 percent in 2016) with the installation requiring their C&D contractors to properly dispose of all construction debris only after recyclable materials are segregated (NAS Fort Worth JRB 2015b). It is anticipated that the regional landfills would be able to accommodate this short-term minor increase in C&D debris.

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in a reduction of 102 personnel and their associated dependents resulting in a minor decrease in municipal solid waste generation having little effect on the municipal solid program (collection, disposal, etc.). The overall impacts would not be significant.

Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the base. C&D debris, including debris contaminated

with hazardous waste, ACM, lead-based paint (LBP), or other hazardous components, would be managed in accordance with OPNAVINST 5090.1D.

FW3.11.2.7 Transportation

Implementation of the facilities and infrastructure projects associated with the proposed AFRC F-35A mission at NAS Fort Worth JRB would require the delivery of materials to, and removal of construction-related debris from, demolition, renovation, and new construction sites. Construction-related traffic would comprise a small portion of the total existing traffic volume in the area and at the base. Increased traffic associated with these activities could contribute to increased congestion at the entry gates, delays in the processing of access passes, and degradation of the affected road surfaces. Traffic delays would be temporary in nature, ending once construction activities have ceased. As a result, no long-term impacts to on- or off-base transportation systems are anticipated.

Implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would result in a minor decrease of 102 on-base mission personnel, which would result in a slight reduction in daily commuting traffic to and from the base. No significant impacts to infrastructure are anticipated to result as a result from implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB.

FW3.11.3 Summary of Impacts to Infrastructure

Implementation of the AFRC F-35A mission would not result in changes to any of the utility infrastructure (potable water, wastewater, stormwater, electricity, natural gas, and solid waste) on NAS Fort Worth JRB. In addition, the new mission would also not require any changes to transportation resources including any of the base gates. Therefore, implementation of the new mission would result in negligible impacts to infrastructure.

FW3.12 HAZARDOUS MATERIALS AND WASTE

FW3.12.1 Base Affected Environment

FW3.12.1.1 Hazardous Materials

Hazardous materials used by Navy, USAF, and contractor personnel at NAS Fort Worth JRB are managed in accordance with OPNAVINST 5090.1D, which identifies requirements and responsibilities for the centralized control and management of hazardous materials within the Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). OPNAVINST 5090.1D and the CHRIMP also provide instruction and guidance for the procurement, handling, storage, and issuance of hazardous materials and turn-in, recovery, reuse, or recycling of hazardous materials at NAS Fort Worth JRB.

FW3.12.1.1.1 Aboveground and Underground Storage Tanks

Bulk Jet-A at NAS Fort Worth JRB is stored in three aboveground storage tanks (ASTs) at the Bulk Fuel Storage Tank Farm (Facility 1156). These three ASTs have a combined storage capacity of approximately 5,040,000 gallons. There are various other ASTs at NAS Fort Worth JRB that store Jet-A, gasoline, diesel, oil, and used oil. NAS Fort Worth JRB also manages two underground storage tanks (USTs). NAS Fort Worth JRB used approximately 9,725,000 gallons of Jet-A in 2017, with the 301 FW F-16 mission using approximately 4,550,000 gallons. NAS Fort Worth JRB receives fuel through commercial tank trucks with 40,000 to 50,000 gallons of Jet-A delivered per

day (Monday through Friday). Jet-A is delivered from the Bulk Fuel Storage Tank Farm to aircraft on the flightline via fourteen (14) 6,000-gallon fuel trucks. Six (6) of the fuel trucks are operated by the USAF (NAS Fort Worth JRB 2014).

All tanks at NAS Fort Worth JRB are managed in accordance with the base Spill Prevention, Control, and Countermeasures (SPCC) Plan (NAS Fort Worth JRB 2014). This plan addresses storage locations and proper handling procedures for all hazardous materials to minimize the potential for spills and releases. The Facility Response Plan (FRP) describes the response procedures for spills or discharges of petroleum products and other hazardous materials at NAS Fort Worth JRB (NAS Fort Worth JRB 2013a). Implementation of the SPCC and FRP provide measures to prevent petroleum product discharges from occurring and prepare the base to respond in a safe, effective, and timely manner to mitigate the impacts of an uncontrolled discharge. These plans also address roles, responsibilities, and response actions for all major spills (NAS Fort Worth JRB 2014 and 2013a).

FW3.12.1.1.2 Toxic Substances

Toxic substances at NAS Fort Worth JRB are managed in accordance with OPNAVINST 5090.1D which identifies the requirements and installation's responsibilities applicable to the protection of human health and the environment from substances regulated under the Toxic Substances Control Act (TSCA) (ACM, LBP, and PCBs). The Navy's policy for use, handling, maintenance, and removal of ACM is contained in OPNAVINST 5100.23G, *Navy Safety and Occupational Health Program Manual*. This instruction establishes management responsibilities and presents workplace control practices to ensure personnel and facilities are not exposed to excessive levels of airborne asbestos fibers. The Civil Engineering Squadron maintains a permanent file documenting asbestos-related activities. All proposed facility construction, repair, maintenance, demolition, and renovation or self-help projects must be reviewed, to the extent possible, to identify the presence of ACM prior to work beginning. Work on ACM projects would only be performed by individuals with current license from the TDSHS and training in accordance with OSHA and USEPA standards. For any project on base, ACM wastes are removed by the contractor performing the work and handled and disposed of in accordance with federal, state, and local regulations at a waste disposal site authorized to accept such waste.

OPNAVINST 5100.23G also contains the Navy's policy, with regards to industrial and construction work, to prevent lead intoxication and related injuries during the use, handling, removal and melting of materials containing lead. This includes any repair, renovation, or other activities that disturb lead-containing materials. The base complies with all federal, state, and local requirements regarding LBP and lead containing materials, activities, and hazards. NAS Fort Worth JRB is reportedly PCB-free (Jersey 2018).

FW3.12.1.2 Hazardous Waste Management

NAS Fort Worth JRB is classified as a Large-Quantity Generator. Typical hazardous wastes generated during O&M activities include flammable solvents, contaminated fuels and lubricants, stripping chemicals, waste oils, blast media, absorbents, adhesives, and other miscellaneous wastes.

Hazardous waste generated, stored, transported, or disposed of by NAS Fort Worth JRB is regulated by the State of Texas under authority granted to the state by the USEPA. The base is classified as a municipal waste generator by the TCEQ.

Hazardous wastes at NAS Fort Worth JRB are managed in accordance with the Hazardous Waste Management Plan (HWMP) (NAS Fort Worth JRB 2013b). This plan covers the control and management of hazardous wastes from the point the material becomes a hazardous waste to the point of ultimate disposal, as required by federal and state laws and regulations. In 2017, the base generated approximately 37,680 pounds of hazardous waste, which was disposed of at off-base permitted disposal facilities.

FW3.12.1.3 Environmental Restoration Program

Three active Environmental Restoration Program (ERP) sites (one former skeet range, one pistol range, and one former machine gun range) at NAS Fort Worth JRB are administered in accordance with the Department of the Navy Environmental Restoration Program Manual 2018. This manual is a policy and guidance tool that describes the organization, responsibilities, and procedures used to implement the ERP at NAS Fort Worth JRB. Environmental response actions are planned and executed under the ERP in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and other applicable laws. NAS Fort Worth JRB is not listed on the USEPA's National Priorities List but USAF Plant #4, on the Lockheed Martin F-35 manufacturing facility side of the airfield, was listed on August 30, 1990. The USAF Plant #4 Superfund Site is defined by a trichloroethylene (TCE) groundwater plume. There is a groundwater pump and treat system at the east parking lot on the Lockheed Martin side of the airfield and a USAF installed 1,170-foot long, 2-foot wide, and 35-foot deep Permeable Reactive Barrier wall across the leading edge of the southern lobe of the plume on the NAS Fort Worth JRB side of the airfield (USEPA 2015).

FW3.12.2 Base Environmental Consequences

FW3.12.2.1 Hazardous Materials Management

Implementation of the proposed AFRC F-35A mission at NAS Fort Worth JRB would not add any new hazardous materials that would exceed the base's current hazardous waste processes. Existing procedures for the centralized management of the procurement, handling, storage, and issuance of hazardous materials through the CHRIMP are adequate to accommodate the changes anticipated with the replacement of the F-16 mission with the AFRC F-35A mission.

The F-35A was designed to reduce the quantities and types of hazardous materials needed for maintenance of the aircraft. Unlike the F-16 aircraft, the F-35A aircraft does not use hydrazine, cadmium fasteners, chrome plating, copper-beryllium bushings, or primers containing cadmium and hexavalent chromium. No adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB. Long-term environmental benefits from the reduced use of hazardous materials are anticipated.

The F-35A aircraft is composed of composite materials, such as carbon fiber, which could pose a health risk under specific circumstances (e.g., when burned as a result of an aircraft crash). Section FW3.4.2.4.2 discusses composite materials and emergency crash response.

FW3.12.2.1.1 Aboveground and Underground Storage Tanks

New and remodeled facilities would require the addition of new ASTs to support generators, as well as new hazardous material and waste containers. The new and remodeled facilities would be constructed with berms and drains leading to oil-water separators (OWSs), if required, to contain potential uncontrolled releases of petroleum products. None of the proposed demolition or renovation projects would require the removal of existing ASTs. The NAS Fort Worth JRB SPCC

Plan and FRP would subsequently need to be revised to incorporate any changes in facility design, construction operation, or maintenance that materially affects the potential for an uncontrolled release of petroleum products (NAS Fort Worth JRB 2014 and 2013a).

FW3.12.2.1.2 Toxic Substances

Several demolition and renovation projects are planned as part of the proposed AFRC F-35A mission. Any construction, demolition, or renovation project proposed at NAS Fort Worth JRB would be reviewed to determine if ACM is present. As shown in Table FW3-53, Buildings 1602, 1604, 1628, 1643, 1648, 1650, 1655, 1790, and 1792 are proposed for modification and contain ACM. All handling and disposal of ACM wastes would be performed in compliance with federal, state, and local regulations. Before initiating any demolition or ACM work, required notifications to the TDSHS would be completed no less than 10 working days before beginning work. This notification can be made by using the online asbestos notification system or by completing and mailing the Asbestos Abatement/Demolition Notification Form. Work on ACM projects would only be conducted by persons with a current license from the TDSHS and training in accordance with standards established by OSHA and the USEPA. All ACM wastes would be disposed of at an approved landfill.

Table FW3-53. Toxic Substances Associated with Projects for the AFRC F-35A Mission at NAS Fort Worth JRB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 1604	1985	X	X	a
Building 1606	1998	b	b	a
Building 1608	2000	b	b	a
Building 1632	1994	b	b	a
Building 1641	1994	b	b	a
Renovation				
Building 1602 electrical upgrade	1942	X	X	a
Building 1628 electrical and ventilation upgrades	1981	X	X	a
Building 1637 renovate for logistics readiness, addition for battery storage	2006	b	b	a
Building 1643 electrical upgrade, classified storage, renovate egress shop	1953	X	X	a
Building 1648 renovate for gun maintenance and expand vault door	1981	X	b	a
Building 1650 renovate for Logistics Readiness Squadron parts storage	1963	X	X	a
Building 1655 replace hoist and expand door	1990	X	b	a
Building 1656 electrical upgrade	1991	b	b	a
Building 1790 electrical and ventilation upgrades	1970	X	c	a
Building 1792 renovate for logistics system	1978	X	X	a
Building 3355 expand trailer maintenance area	1951	d	c	a

^a NAS Fort Worth JRB is reportedly PCB-free (Jersey 2018).

^b Buildings constructed after 1980 are presumed to not contain ACM or LBP.

^c Buildings constructed before 1980 are presumed to contain LBP.

^d Buildings constructed before 1980 are assumed to potentially contain ACM (thermal system insulation and surfacing materials) (OPNAVINST 5100.23G).

Key: X = Toxic substance known to occur in the building

All construction, demolition, and renovation projects proposed at NAS Fort Worth JRB would be reviewed to determine if LBP or lead containing materials are present, and whether such materials would be disturbed. To the extent possible, the presence of lead within the work area would be identified prior to work beginning. Buildings 1602, 1604, 1628, 1643, 1650, and 1792 are proposed for modification and are known to contain LBP or lead-containing material. Table FW3-53 lists two

additional buildings (1790 and 3355) proposed for modification that have the potential to contain lead. If the presence of lead containing material in the project work area is unknown, the shop and real property records would be reviewed to determine the presence of lead. If the presence of lead containing material in the work area is still unknown, sampling and analysis for lead would be conducted. The handling and disposal of lead wastes would be conducted in compliance with federal, state, and local requirements and regulations. NAS Fort Worth JRB is reportedly PCB-free (Jersey 2018).

Although minor increases in the management requirements for ACM and LBP removal are anticipated, no adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB. Long-term environmental benefits from removal of toxic substances are anticipated.

FW3.12.2.2 Hazardous Waste Management

NAS Fort Worth JRB would continue to operate as a Large Quantity Generator and would generate hazardous wastes during various O&M activities associated with the proposed AFRC F-35A mission. Waste-associated maintenance materials include adhesives, sealants, conversion coatings, corrosion prevention compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, cleaners, strippers, tapes, and wipes. No new hazardous materials would be added that exceed the base's current hazardous waste processes. The NAS Fort Worth JRB HWMP (NAS Fort Worth JRB 2013b) would be updated to reflect any change in disposal procedures or hazardous waste generators and waste accumulation points. Implementation of the AFRC F-35A operational beddown and mission at NAS Fort Worth JRB would have a beneficial impact on hazardous waste management. Transition from the F-16 to the F-35A would decrease the volume and types of hazardous waste and waste streams because operations and maintenance involving hydrazine, cadmium and hexavalent chromium primer, and various heavy metals have been eliminated or greatly reduced. All hazardous wastes would be handled and managed in accordance with federal, state, and local regulations.

FW3.12.2.3 Environmental Restoration Program

None of the proposed construction, demolition, or renovation projects associated with the proposed AFRC F-35A mission at NAS Fort Worth JRB are on or directly adjacent to active ERP sites. However, there is the possibility that undocumented contaminated soils and/or groundwater from historical fuel spills may be present. If encountered during C&D-related excavations, storage/transport/disposal of contaminated groundwater/soils would be conducted in accordance with applicable federal, state, and local regulations; and base policies. Should soil or groundwater contaminants be encountered during C&D activities, health and safety precautions, including worker awareness training, would be required. ERP sites at NAS Fort Worth JRB would continue to be administered in accordance with the Department of the Navy Environmental Restoration Program Manual 2018.

FW3.12.3 Summary of Impacts to Hazardous Materials and Waste

Implementation of the new mission would not add any new hazardous materials that would exceed the base's current processes. No ASTs, USTs or OWSs would be removed. Nine of the buildings proposed for demolition or renovation could contain ACM and/or LBP. Prior to demolition or renovation, NAS Fort Worth JRB would complete the appropriate notifications and complete the abatement work in accordance with applicable plans and per all local, state and federal requirements. None of the construction would affect ERP sites. Should contaminated media be

encountered during construction, storage/transport/disposal of contaminated media would be conducted in accordance with base plans and applicable regulations. Implementation of the new mission would not result in significant impacts to hazardous materials and wastes.

FW4.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (federal or non-federal) undertakes such other actions” (40 *CFR* 1508.7). In this section, an effort has been made to identify past and present actions in the NAS Fort Worth JRB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the AFRC F-35A mission at NAS Fort Worth JRB are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the AFRC F-35A mission at NAS Fort Worth JRB and in associated airspace.

NAS Fort Worth JRB is an active military installation that undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analyses will be conducted, as necessary.

FW4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

The construction of an air base on the east side of Tarrant Field was authorized by Congress after Pearl Harbor was attacked by the Japanese. In 1948, the installation was named Carswell AFB and the first B-36 was delivered to the USAF at the base. In 1991, the Base Realignment and Closure (BRAC) Commission identified the base for closure and the base was officially closed on 30 September 1993. On 1 October 1993, the installation was established as an active Naval Air Reserve Base and renamed in 1994 as NAS Fort Worth JRB. Since 1994, the base has undergone substantial change and re-development. The 136 AW moved to the installation in 1998 and currently operates and maintains C-130H aircraft at NAS Fort Worth JRB. Since 2000, approximately 54 buildings have been constructed on the installation. The Lockheed Martin assembly plant is located on the west side of Runway 18/36 on government-owned and contractor-operated land. Since 2006, F-35 aircraft from the assembly plant have used NAS Fort Worth JRB for initial flight operations.

Table FW4-1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the AFRC F-35A mission at NAS Fort Worth JRB. Table FW4-1 briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the AFRC F-35A mission at NAS Fort Worth JRB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding NAS Fort Worth JRB and training airspace.

Table FW4-1. Past, Present, and Reasonably Foreseeable Actions at NAS Fort Worth JRB and Associated Region

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions				
NAS Fort Worth JRB IDP	Navy	Present and Future	The IDP includes 23 short-term projects, 12 medium-term projects and 17 long-term projects. Projects include expansion of munitions storage, reconstruction and relocation of the main gate, and various other renovation, repair, or demolition projects.	Noise, Air Quality, Safety, Soil and Water Resources, Transportation.
Relocate the Commissary and Base Exchange	Navy	Future	This project would move the base commissary and exchange to a larger facility.	Noise, Air Quality, Soil and Water Resources, Transportation, Land Use and Recreation
Repair the perimeter fence, remove vegetation and secure drainage culverts under airfield	Navy	Future	The perimeter fence at the base is in need of repair along with several drainage culverts that need to be secured.	Soil and Water, Transportation, Land Use and Recreation
Move CH-47 helicopter mission on NAS Fort Worth JRB	Texas Army National Guard	Future	The Texas Army National Guard CH-47 mission is currently located at an unsecure facility. This project would move the equipment and people to NAS Fort Worth JRB.	Noise, Airspace, Air Quality, Soil and Water Resources, Transportation, Land Use, Socioeconomics
Reconstruct the Main Gate	Navy	Past	This project would reconstruct the Entry Control Facility on the base.	Noise, Air Quality, Soil and Water Resources, Transportation, Land Use and Recreation
Lancer MOA Revision of the MOA floor.	Dyess AFB	Future	Proposal to change floor from 700 to 500 feet to allow B-1 bombers to fly at lower elevations	Airspace, Noise, Safety, Biological Resources, Land Use and Recreation
B-21 Bomber Mission	USAF	Future	Dyess AFB along with three other bases have been selected by the USAF as reasonable alternatives for the B-21 bomber mission. The B-21 mission would replace the B-1 mission that currently uses the Lancer MOA for training. Delivery of the first B-21 bombers is anticipated to begin in the mid-2020s.	Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Cultural Resources, Land Use and Recreation
Dyess AFB Airspace Revisions	USAF	Current	Dyess AFB is currently preparing and EA to convert an existing Military Training Route to a new reciprocal Instrument Route (IR)-187.	Airspace, Noise, Safety, Biological Resources, Land Use and Recreation
Reconstruct meandering road and construct traffic circle	Navy	Future	Transportation upgrades on the installation.	Noise, Air Quality, Soil and Water Resources, Transportation, Land Use and Recreation
Non-Military (Federal) Actions				
Crossroads of West Texas Connector Project	U.S. Department of Transportation	Future	This project would construct a new roadway to connect McMahon-Wrinkle Airpark to Highway 87.	Noise, Airspace, Air Quality, Transportation
Rio Grande Project	U.S. Bureau of Reclamation	Future	This is a full irrigation project for 178,000 acres of land in West Texas and South Central New Mexico.	Soil and Water Resources, Land Use and Recreation

Table FW4-1. Past, Present, and Reasonably Foreseeable Actions at NAS Fort Worth JRB and Associated Region (Continued)

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Non-Military (Private Actions)				
Lockheed Martin F-35 Production	Lockheed Martin	Past, Present and Future	In 2017, 66 F-35s were produced by Lockheed Martin. This number is planned to increase to 91 aircraft in 2018 in Fort Worth, reach as many as 160+ a year at the Fort Worth plant by 2023, and remain at that level for approximately 20 years. Production would depend on funding and purchases of F-35 aircraft by other nations and could be spread across other assembly facilities.	Noise, Air Quality, Safety, Land Use and Recreation
Monarch City Mixed-use development complex	Hughes Corporation/Allen	Future	This project consists of an 8.7 million square foot mixed-use development complex in the southwest corner of North Central Expressway and the Sam Rayburn Tollway	Noise, Air Quality, Socioeconomics
Panther Island Development	Encore Multi-Family LLC/Fort Worth	Present and Future	300-unit apartment community	Noise, Air Quality, Socioeconomics
State and Local				
Fort Worth Capital Improvement Plan	City of Fort Worth/Fort Worth, Texas	2018-2022	This plan includes more than two billion dollars' worth of projects planned from 2018 through 2022. These projects include new schools, utility (water) infrastructure, fire and police, parks, libraries and transportation projects. http://fortworthtexas.gov/PlanningandDevelopment/plans/compplan/pdf-2018/appendix-d-5-yr-cip.pdf	Noise, air quality, socioeconomics
Panther Island Bridges	TDOT-Trinity River Vision Authority/Fort Worth		New bridge to carry North Main street traffic over a re-routed portion of the Trinity River https://trinityrivervision.org/	Noise, Air Quality, Transportation, Biological Resources, Land Use and Recreation

FW4.2 CUMULATIVE IMPACTS

The following analysis considers how the impacts of the actions in Table FW4-1 might affect or be affected by the AFRC F-35A mission at NAS Fort Worth JRB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the AFRC F-35A mission at NAS Fort Worth JRB is considered alone. Table FW4-2 provides a summary of the cumulative effects. As shown in Table FW4-2, safety, cultural resources, infrastructure, and hazardous materials and waste are not anticipated to contribute to cumulative effects. Cumulative effects are described for airspace, noise, air quality, soil and water resources, biological resources, land use and recreation, socioeconomics, and environmental justice and protection of children. Climate change is also described in this section because changes in climate have the potential to cumulatively impact other resource areas.

Table FW4-2. Summary of Cumulative Effects for NAS Fort Worth JRB

Resource Area	AFRC F-35A Mission	Past, Present, and Reasonably Foreseeable Actions ^a	Cumulative Effects
Airspace	■	■	■
Noise	●	●	●
Air Quality	○	■	○
Safety	○	○	○
Soils and Water	■	■	■
Biological Resources	■	■	■
Cultural Resources	○	○	○
Land Use and Recreation	■	■	■
Socioeconomics	■	■	■
Environmental Justice and Protection of Children	■	■	■
Infrastructure	○	○	○
Hazardous Materials and Waste	○	○	○

^a When determining the potential for significance, past and ongoing actions in the region were considered as part of the baseline or existing conditions in the region surrounding NAS Fort Worth JRB and the airspace (e.g., the cumulative noise impact of past and present missions at NAS Fort Worth JRB were modeled under baseline conditions).

Key: ○ = not affected or beneficial impacts

- = affected but not significant, short to medium term, impacts that range from low to high intensity
- = significant impacts, high in intensity or are long-term

FW4.2.1 Airspace

FW4.2.1.1 Airfield Operations

Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would generate the operational changes shown in Table FW2-4. Airfield operations would increase by 12.1 percent at NAS Fort Worth JRB. The only known projects with the potential to increase airfield operations near NAS Fort Worth ARB are the beddown of a new helicopter mission and the projected increase in F-35A production at the nearby Lockheed Martin plant. The operations anticipated from these projects, in addition to the increase in operations that would result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB, would not present a significant impact to airspace use in an environment that experienced more than 650,000 air traffic operations in 2017.

Military actions with major changes in aircraft types or operations would undergo additional environmental analysis to determine the exact number of operations and the potential for additional impacts within the airspace.

No present and/or known reasonable foreseeable future actions, when combined with the increase in airfield operations that would result from the proposed AFRC F-35A mission at NAS Fort Worth JRB, would result in any cumulative impacts to airfield operations or the management and configuration of the airspace surrounding this airfield environment.

FW4.2.1.2 Training Airspace

The primary training airspace proposed for use by AFRC F-35A pilots would be the Lancer MOA. Dyess AFB is proposing to lower the lower altitude level of the Lancer MOA from 700 feet to 500 feet to expand additional training capabilities of the B-1 bomber. In addition, Dyess AFB is currently preparing an EA to convert an existing Military Training Route (MTR) to a new reciprocal Instrument Route (IR) called IR-187. The proposed IR would consist primarily of existing IR-178 (520 nautical miles) and a small portion (24 NM) of another existing MTR, IR-180 and its reciprocal IR-128 (referred to as IR-180/128). No new airspace is proposed for development with this proposal. The proposed IR is located southwest of the Lancer MOA and would primarily be used by B-1 bomber aircraft from Dyess AFB. The Draft EA for this project was released in April 2018 and completed during the summer of 2018. The FAA will initiate their NEPA process and the IR will potentially be established sometime in 2019 or later. Dyess AFB is also being considered for the beddown of the B-21 Bomber. Should Dyess AFB be selected for the bomber mission, it is anticipated that the training airspace would see a change in the number of operations conducted in that airspace.

The operations anticipated from these projects, in addition to the increase in operations that would result from implementation of the AFRC F-35A mission at NAS Fort Worth JRB, would not present a significant impact to airspace use. Any potential conflicts in the use of airspace would be deconflicted by the scheduling agency. Any changes to SUA or charting of new SUA would require separate environmental analysis.

No present and/or known reasonable foreseeable future actions, when combined with the minor increase in airfield operations that would result from the AFRC F-35A mission, would result in any cumulative impacts to airspace management in the SUAs proposed for use.

The primary range proposed for use by AFRC F-35A pilots would be the Falcon Range at Fort Sill. Although several airspace actions have been completed in the recent past above the Falcon Range and Fort Sill, none of them would have the potential to combine with the implementation of the AFRC F-35A mission to result in significant cumulative effects to airspace. In 2016, the FAA created R-5601G and R-5601H above Fort Sill to accommodate longer standoff weapons used at the Falcon Range. In 2017, Fort Sill completed an EA for the Temporary Creation of RA above Fort Sill for the demonstration of combat lasers. In 2018, Fort Sill completed a Supplemental EA to create additional permanent airspace above Fort Sill to be classified as R-5602A and R-5602B, and the FAA published this airspace in 2018.

In general, the resource management actions by the various federal land managers and tribal entities are implemented on the ground and would not overlap with the use of regional airspace. However, some projects could interact and require local coordination, such as controlled burning, which can cause localized smoke that could be hazardous to high-speed military flying operations. The planning and siting of future tall structures, such as transmission lines, wind farms, and communication towers, pose compatibility concerns. Nonetheless, impacts would be similar to those described in EIS resource sections (e.g., Noise and Land Use and Recreation). A military airspace regional coordinator could serve as a representative to assist with mutually compatible long-term sustainable solutions between responsible federal agencies.

FW4.2.2 Noise

Cumulative noise impacts were evaluated for construction related noise and for the impact of aircraft noise resulting from operations in the airfield and airspace environments near NAS Fort Worth JRB. C&D projects associated with the proposed AFRC F-35A beddown would occur near other ongoing and future C&D projects (e.g., IDP projects), during the same time periods. C&D projects are a regular occurrence on and near active DoD installations such as NAS Fort Worth JRB. C&D noise would be localized and temporary. Construction work is generally limited to normal working hours (i.e., 7:00 A.M. to 5:00 P.M.). Furthermore, the projects are or would be located in an acoustic environment that includes elevated aircraft operations noise levels. In the instance that multiple C&D projects affect a single area at the same time, construction noise would be a slightly more noticeable component of the acoustic environment. Several projects listed in Table FW4-1 have the potential to increase noise levels surrounding NAS Fort Worth JRB.

The aircraft noise analysis in this EIS is a cumulative analysis which includes those defined projects listed in Table FW4-1. Actions occurring within the present timeframe (e.g., Lockheed Martin production aircraft operations at a rate of 36 production aircraft per year) are accounted for in calculated baseline and AFRC F-35A mission aircraft noise levels. The rate at which Lockheed Martin produces F-35 aircraft at NAS Fort Worth JRB is planned to increase to 160 per year by 2023, resulting in increases in flying operations tempo and time-averaged noise levels (USAF 2015). Production rates at NAS Fort Worth JRB are dependent on Congressional funding levels, foreign purchases, and which of three possible Lockheed Martin plants is selected for aircraft assembly. Increases in time-averaged noise levels would scale with the rate of aircraft production. Although there is uncertainty about the rate of F-35 production at Fort Worth, production is expected to continue for approximately 20 years, depending on demand for the aircraft.

Moving the Texas Army National Guard CH-47 mission to NAS Fort Worth JRB could also increase noise levels around the installation. The number of annual helicopter operations that would result from this action is unknown at this time, but any increase in helicopter operations would increase noise levels. The helicopter flights would occur in an area dominated by jet aircraft noise.

As described in Section FW3.2.5, implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in significant noise impacts. The cumulative impact of aircraft noise from the planned growth in F-35 production and noise from the CH-47 mission, combined with noise from the AFRC F-35A mission, could be expected to increase the off-base land area and population exposed to DNL of 65 dB or greater beyond the land areas and populations identified in this EIS. This would result in significant noise impacts.

Regarding the airspace proposed for use, replacement of the B-1 mission at Dyess AFB with a B-21 mission would affect noise levels beneath training airspace units, such as Lancer MOA, that are used by Dyess-AFB-based aircraft and which would also be used by the proposed AFRC F-35A mission. Because the B-21 has not yet been designed, the nature of the changes in noise level are not known at this time.

An EA is currently in progress to document the environmental impacts, including noise impacts, associated with establishment of reciprocal IR-187. Because one of the endpoints of the proposed route would be located at the boundary of Lancer MOA, which is proposed for use by the AFRC F-35A mission, combined noise effects of the two projects are possible. Because the spatial overlap of the proposed route and airspace proposed for use by the AFRC F-35A mission is minimal, any cumulative effects would be limited in geographic scope.

Private and state/municipal government-sponsored land development actions could potentially affect noise impacts in the long-term by increasing the number of noise-sensitive locations in areas exposed to elevated noise levels. The JLUS contains guidance to have land development be compatible with expected noise conditions. Military planners assess such projects for mission compatibility on a case by case basis, and contribute the results of their assessment as part of the civilian development planning process. Noise generated on-site during the construction and operation of privately owned properties is localized and qualitatively consistent with surrounding existing noise environments in adjacent developed areas.

FW4.2.3 Air Quality

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as NAS Fort Worth JRB. These projects would generate the same types of construction related impacts as described for the proposed AFRC F-35A mission (e.g. fugitive dust emissions, increases in construction related criteria pollutant emissions). Although, implementation of the AFRC F-35A mission would result in minor increases in all air pollutant emission except VOCs, these increases, combined with air emission increases from past, present, and reasonably foreseeable future actions, would not be expected to prevent this area from maintaining NAAQS or result in significant cumulative impacts to the air quality.

FW4.2.4 Soil and Water Resources

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as NAS Fort Worth JRB. These construction projects would increase the amount of soil disturbed and have the potential to increase erosion and sedimentation into surface water features. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the soil and water resources at NAS Fort Worth JRB would not be significant.

FW4.2.5 Biological Resources

Operations of the AFRC mission at NAS Fort Worth JRB were found to have no significant impacts to wildlife including threatened and endangered species and migratory birds. Projects such as the proposed beddown of new missions with aircraft operations would have similar impacts to wildlife as those described in this EIS. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the biological resources at NAS Fort Worth JRB would not be significant.

FW4.2.6 Land Use and Recreation

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects, construction from private and state and local development) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as NAS Fort Worth JRB. Construction projects that occur inside the area of the latest AICUZ and noise contours would comply with applicable building codes for noise attenuation and Regional Coordination Committee Development Review Web Tool for land use compatibility. Land use compatibility is explained in the JLUS and land

use requirements have been implemented to minimize adverse impacts to land use from incompatible development. Cumulative impacts would not be expected as long as development is consistent with the JLUS guidelines.

Increased noise from flight operations of planned additional F-35 production could result in greater impacts to land use than identified in this EIS. There are existing noise impacts to land use from DNL greater than 65 dB and the AFRC F-35A mission, in conjunction with past, present, and reasonably foreseeable future actions (specifically increased flight operations of production F-35 aircraft), would result in cumulative impacts on land use and recreation at NAS Fort Worth JRB.

Under the training airspaces, the aircraft operations resulting from the proposed AFRC F-35A mission combined with the aircraft operations from the Lockheed Martin Assembly Plant could increase noise levels in some recreational areas in Texas. These increased noise levels would occur in areas that are currently exposed to military aircraft noise. Although some users of these recreational areas would be annoyed by these noise increases, significant impacts to these recreational areas would not result from these actions.

FW4.2.7 Socioeconomics

The C&D projects associated with the AFRC F-35A mission would provide short-term, economic benefits to surrounding areas through employment of construction workers and through the purchase of materials and equipment. The short-term impact of implementing the proposed mission combined with any or all of the projects listed in Table FW 4-1 would result in negligible cumulative impacts to socioeconomics in the area. In addition, the decrease in personnel associated with the proposed mission is also not anticipated to result in cumulative impacts to housing, schools, or other socioeconomic resources. The Fort Worth area is growing and the loss of 102 positions combined with other economic activity in the Fort Worth area would result in negligible impacts to socioeconomic resources. However, the noise increases to houses and schools would constitute adverse socioeconomic impacts.

FW4.2.8 Environmental Justice and the Protection of Children

Noise resulting from the operation of F-35A aircraft would affect people living near the installation. As discussed in Section FW3.10.2, there are existing disproportionate impacts to minority and low-income populations from aircraft operations at NAS Fort Worth JRB. Implementation of the AFRC F-35A mission at NAS Fort Worth JRB would result in disproportionate impacts to minority populations in four ROIs and to low-income populations in two ROIs (i.e., these populations would be newly exposed to DNL of 65 dB or greater). Section FW3.10.2 quantifies the existing and projected number of children and elderly exposed to DNL of 65 dB or greater. Implementation of the proposed action, combined with implementation of one or more of the past, present, and reasonably foreseeable future actions (specifically increased flight operations of production F-35 aircraft), would not be expected to result in cumulative impacts from noise to environmental justice and other sensitive populations beyond those described in this EIS as a result of the proposed action.

FW4.2.9 Climate Change

Texas and the surrounding region could experience a continuing of recent upward trends in average temperatures and extreme heat, an increase in extreme precipitation events, and an increase in drought intensity (USGCRP 2017).

Increases in temperature, extreme heat events, extreme precipitation events, and drought intensity could interact with resource areas such as air quality, water resources, and socioeconomics. Increasing temperatures have been shown to increase ground level ozone and particulates (Orru et al. 2017). Increases in drought intensity could impact water availability. Potential socioeconomic impacts could include increased costs associated with poor air quality and water availability.

While NAS Fort Worth JRB has operations to manage the recent temperature changes, exacerbation of climate conditions in the future could increase the cost of proposed operations and could impede operations during extreme events. Additional measures could be needed to mitigate such impacts over the operational life expectancy of the F-35A.

FW4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at NAS Fort Worth JRB, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term (e.g., air emissions from construction) or longer lasting but negligible (e.g., public service increases). Those limited resources that may involve a possible irreversible or irretrievable commitment are discussed as follows.

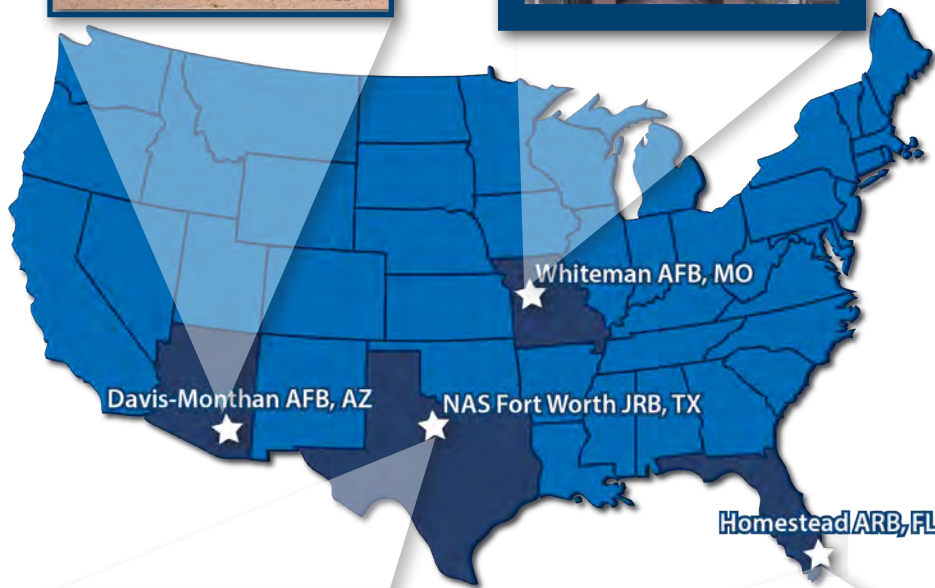
Should the AFRC F-35A mission be located at NAS Fort Worth JRB, some land in the cantonment area would be disturbed. Much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (e.g., wiring, insulation, windows, and drywall) and exterior construction (e.g., concrete, steel, sand, and brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and involve consumption of nonrenewable resources, such as gasoline used in vehicles and jet fuel used in aircraft. None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Privately owned vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase slightly; however, this additional use is not expected to significantly affect the availability of the resources.

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CHAPTER 4

BASE ALTERNATIVE: WHITEMAN AIR FORCE BASE



WH1.0 WHITEMAN AIR FORCE BASE OVERVIEW

Whiteman Air Force Base (AFB) is located in Johnson County, Missouri, approximately 2 miles south of the City of Knob Noster and 70 miles southeast of Kansas City, Missouri. The installation encompasses approximately 5,520 acres and is predominantly surrounded by agricultural land use, with some minor residential development to the east (Figure WH1-1). The primary runway at Whiteman AFB, Runway 01/19, is 12,400-foot long and 200-foot wide (Figure WH1-2).

The 509th Bomb Wing (509 BW) of the U.S. Air Force (USAF) Global Strike Command is the host unit at Whiteman AFB. As the host unit, the mission of the 509 BW is to: (1) develop and sustain the world's best stealth war fighting capability through innovative planning, training, and exercising; (2) develop and maintain the highest level of readiness to support worldwide contingency operation; (3) create and foster a 509 BW quality culture through leadership and teamwork; (4) make safety a priority in the air, on the ground, on or off duty; (5) provide resources, time, and opportunity to promote wellness and continually improve; and (6) improve the environment through comprehensive education and aggressive compliance. The 509 BW flies the B-2 Stealth bomber and T-38 Talon trainer at Whiteman AFB.

The primary tenants at Whiteman AFB include the Air Force Reserve Command (AFRC) 442nd Fighter Wing (442 FW), the 1-135th Attack Reconnaissance Battalion (1-135 ARB) of the Missouri Air National Guard (MO ANG), the 131st Bomb Wing (131 BW), the 72nd Test and Evaluation Squadron (72 TES), the 325th Weapons Squadron (325 WPS), the USAF Office of Special Investigations (OSI), and the 20th Reconnaissance Squadron (20 RS) Remote Split Operations. The 442 FW operates 24 A-10 Thunderbolt II aircraft and the 1-135 ARB flies AH-64 Apache helicopters at Whiteman AFB.

Refer to Chapter 1 for the purpose and need for the AFRC F-35A mission, a description of the F-35A aircraft characteristics, and information about public involvement and agency coordination. Refer to Chapter 2 for the description of the proposed action and alternatives, and a description of the strategic basing and alternative identification processes. In the base-specific sections that follow, Section WH2 presents the description of the proposed action at Whiteman AFB. Section WH3 addresses baseline conditions and environmental consequences that could result from implementation of the proposed action at Whiteman AFB. Section WH4 identifies other, unrelated past, present, and reasonably foreseeable future actions in the affected environment and evaluates whether these actions would cause cumulative effects when considered along with the AFRC F-35A beddown. This section also presents the irreversible and irretrievable resources that would be committed should the proposed action be implemented at Whiteman AFB.

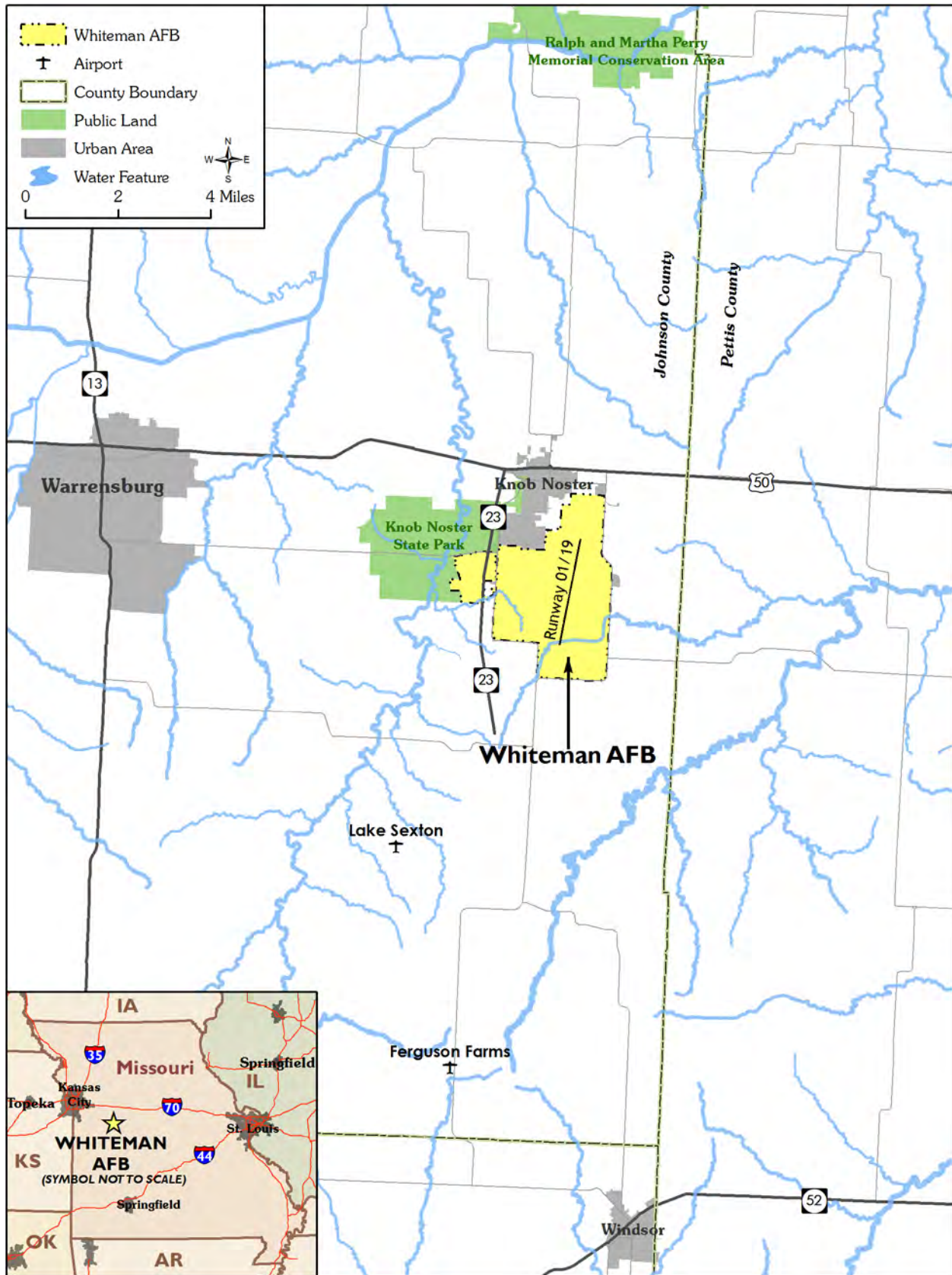


Figure WH1-1. Regional Location of Whiteman AFB

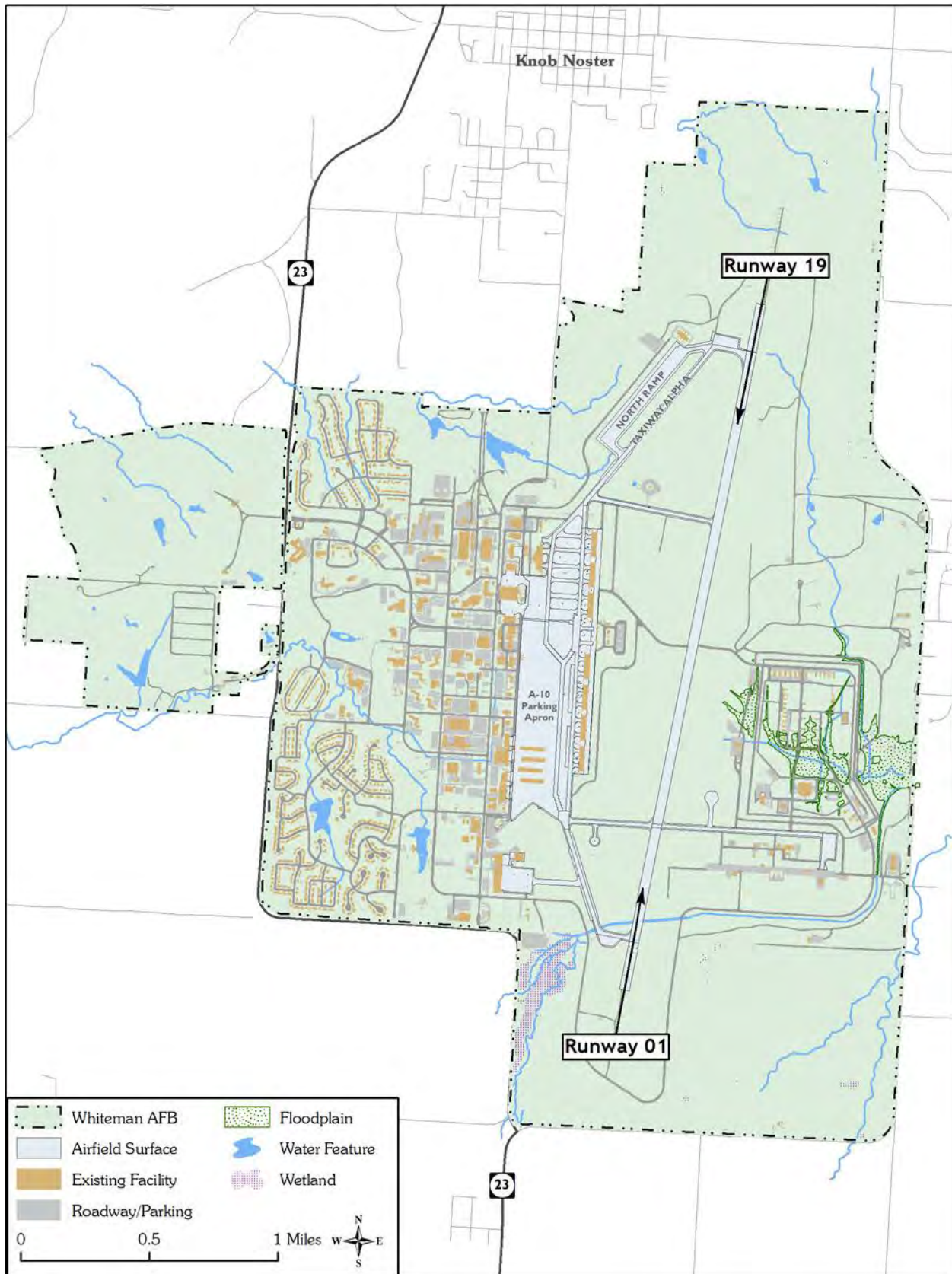


Figure WH1-2. Primary Runways at Whiteman AFB

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WH2.0 WHITEMAN AIR FORCE BASE ALTERNATIVE

This section presents the specifics of the proposed action at Whiteman AFB. Four elements of the proposed action have the potential to affect the base and associated airspace: (1) facility and infrastructure projects to support the F-35A beddown; (2) personnel changes necessary to meet F-35A requirements; (3) airfield operations conducted by AFRC F-35A pilots; and (4) airspace and range use by AFRC F-35A pilots. Each element is explained in the following subsections. In addition, this section also presents state and federal consultation efforts and associated permits that would be required should Whiteman AFB be selected to receive the AFRC F-35A mission.

Under the proposed action, 24 Primary Aerospace Vehicles Authorized (PAA) F-35A aircraft would start to arrive at Whiteman AFB in early 2024. Delivery of the full complement of 24 F-35A aircraft and 2 Backup Aircraft Inventory (BAI) is anticipated to take 2 years. At that time, the F-35A aircraft would completely replace the existing 24 A-10 aircraft assigned to the 442 FW. The A-10 aircraft that would be replaced by the F-35A aircraft would be reassigned or removed from the USAF inventory.

WH2.1 FACILITIES AND INFRASTRUCTURE

To support the AFRC F-35A mission, additional infrastructure and facility modifications would be required at Whiteman AFB (Table WH2-1). A total of 12 different improvement projects and 1 demolition project would be implemented in 2021 (Figure WH2-1). The USAF estimates that \$32.5 million in Military Construction (MILCON) expenditures would be required to implement the proposed AFRC F-35A mission at Whiteman AFB.

Table WH2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Whiteman AFB

Project ^a	Size (ft ²) ^b
Demolition	
Building 706	29,400
Demolition Total	29,400
Renovation	
Building 41 renovation for squadron operations	10,497 ^c
Building 91 renovation for engine repair	NA ^d
Building 1117 electrical and ventilation upgrades	NA ^d
Building 1118 electrical upgrade	NA ^d
Building 1119 egress shop – relocation from building 1117	NA ^d
Airfield pavement repair	500
A-10 parking apron repair	14,348
North ramp repair	699,654
Renovation Total	724,999
New Construction	
Recessed arresting cable and barriers	500
Construct an F-35A flight simulator building	13,650
Construct six sunshades	38,400
Construct a munitions maintenance building (not shown)	5,000
New Construction Total	57,500

^a Data in this table were obtained from interviews conducted at Whiteman AFB (Whiteman AFB 2017).

^b Size is the area covered by the footprint of the proposed facilities and consists of the designed limits of the structure, facility, apron, road, access, and/or parking lot.

^c Interior renovation only.

^d Includes minor interior upgrade projects that do not have a square footage.

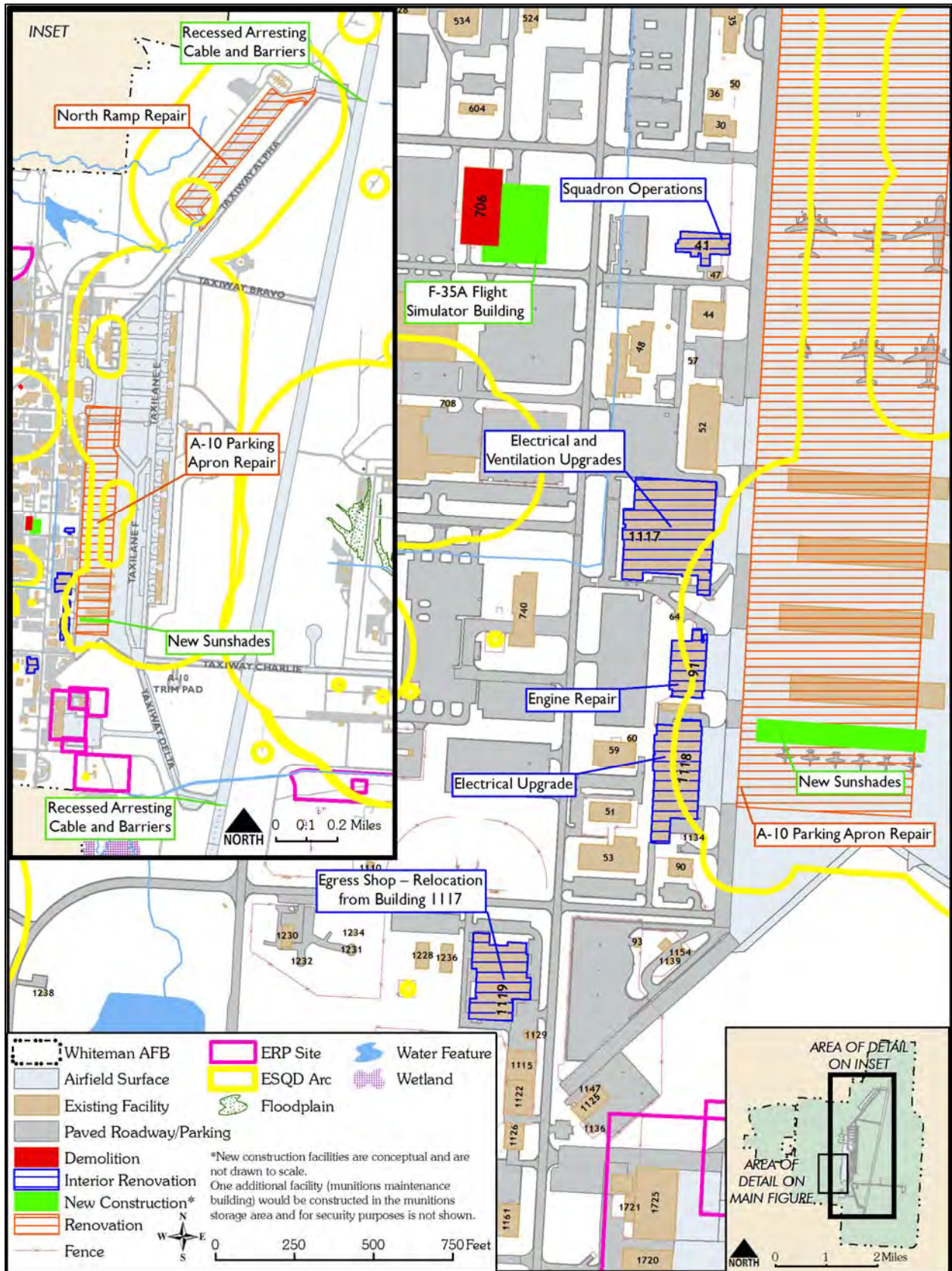


Figure WH2-1. Facilities and Infrastructure Projects for the AFRC F-35A Mission at Whiteman AFB

New construction and facility additions would require construction grading, clearing, and equipment laydown space. To account for this disturbance, this analysis also includes disturbance areas in addition to the facility size. These disturbance areas encompass 20 feet adjacent to linear features (e.g., roads, utility extensions, etc.) and 50 feet around the facility footprint for all other facilities. Repairs of existing aircraft concrete aprons or ramps are not included in these calculations because these repairs would occur on paved or concrete surfaces. Interior renovations are also not included in these calculations because these renovations would not create ground disturbance or a change in impervious surfaces.

New construction and facility additions would also result in changes to existing impervious surfaces. It is assumed that any demolition would include demolition of the building slab and result in a reduction in impervious surfaces. In some cases, demolished facilities would be replaced by new construction or pavements. This increase in impervious surfaces is accounted for in the new construction. Table WH2-2 provides a summary of the ground disturbance and changes in impervious surfaces.

Table WH2-2. Summary of Facility and Infrastructure Projects for Whiteman AFB

Project Type	Ground Disturbance (Acres)	Change in Impervious Surfaces (Acres)
Demolition	1.7	-0.7
Renovation ^a	0	0
New Construction ^b	1.2	+0.3
Total	2.9	-0.4

^a Does not include interior renovation, runway or ramp renovation projects.

^b Does not include the arresting barrier and cables or construction of the sunshades.

Facility siting on military installations is predominantly functional use-based (i.e., locating facilities with like functional uses adjacent to one another). However, safety and compliance with policies and regulations are also used as planning factors. During the planning phase for a new aircraft mission beddown, military planners consider a variety of alternatives necessary to meet the requirements of the new mission, including the use of existing facilities that can be partially or entirely used to meet mission requirements. Depending on available infrastructure, facilities, and, to some degree, personnel available to support the AFRC F-35A mission, proposed construction, demolition, and renovation projects vary between alternatives. The facility siting analysis for each alternative base considered the functional requirements of the AFRC F-35A mission and compared them with the existing infrastructure and environmental constraints at each alternative base.

New construction siting is a stepwise process that includes identifying suitable sites relative to existing facilities and base infrastructure to provide operational efficiencies and suitable cost-benefit values. Utility siting, including the re-routing of existing utilities or the installation of new utility infrastructure (e.g., power, water, sewer, and communication lines), could also be required to accommodate the new mission. The siting process for utilities focused on using existing conduits and previously disturbed areas or areas that would also be disturbed for facility modifications. Temporary construction laydown areas could also be required to support construction. Construction laydown areas would be located in developed or semi-developed areas, or previously disturbed or paved areas. Construction laydown areas not proposed for permanent disturbance would be returned to their pre-construction state upon completion of construction. All construction contracts would be managed under Unified Facilities Criteria (UFC) 3-101-01, *Best Management Practices*, and attainment of a Leadership in Energy and Environmental Design (LEED) Silver certification.

Construction and renovation projects within the 65-decibel (dB) noise contour would include acoustical design considerations for façade elements and interior design requirements per UFC 3-101-01. Land use would be consistent with Department of Defense Instruction (DoDI) 4165.57, *Air Installations Compatible Use Zones*, and Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager’s Guide*.

WH2.2 PERSONNEL

Implementation of the AFRC F-35A mission at Whiteman AFB would require sufficient and appropriately skilled military and civilian personnel to operate and maintain the F-35A aircraft and to provide other necessary support services. Implementation of the AFRC F-35A mission at Whiteman AFB would require an additional 11 positions. This would constitute a 0.1 percent increase in base staffing (Table WH2-3).

Table WH2-3. Personnel Changes for the AFRC F-35A Mission at Whiteman AFB

Baseline Personnel			Proposed F-35A Authorized Personnel			Percent Change to Total Personnel
Total Authorized Personnel	AFRC Authorized Personnel	Percent of Total Authorized Based Personnel	AFRC F-35A	Change to AFRC Unit Personnel Positions	Percent Change to AFRC Unit Personnel	
12,642	1,009	7.98%	1,020	11	1.09%	0.1%

WH2.3 AIRFIELD OPERATIONS

The 442 FW is an integral part of the Combat Air Forces (CAF). The CAF defends the homeland of the United States and deploys forces worldwide to meet threats and ensure the security of the nation. To fulfill this role, the 442 FW must train as it would fight.

The USAF anticipates that once the full complement of aircraft is received, the 24 F-35A aircraft would be used to fly 11,580 airfield operations per year from the airfield. Based on the proposed requirements and deployment patterns, AFRC F-35A pilots would fly additional operations during deployments, or at other locations for exercises or in preparation for deployments. In addition, AFRC F-35A pilots stationed at Whiteman AFB could participate in remote training exercises. Some of these missions could involve ordnance delivery training or missile firing exercises within the scope of existing (National Environmental Policy Act [NEPA] documentation) at ranges approved for such use (e.g. Cannon Range on Fort Leonard Wood, Missouri).

Conducting 11,580 F-35A operations per year at Whiteman AFB would represent an increase of 5,770 annual airfield operations compared to current A-10 aircraft operations (Table WH2-4). Of the 33,180 total airfield operations currently conducted at Whiteman AFB, 17.5 percent are conducted by the 442 FW. Implementation of the AFRC F-35A mission at Whiteman AFB would result in a 17.4 percent increase in annual total airfield operations.

Table WH2-4. Whiteman AFB Baseline A-10 and Proposed F-35A Annual Airfield Operations

Total Baseline Operations ^a		Proposed AFRC F-35A Mission
Based A-10	5,810	0
Proposed F-35A	0	11,580
Other Aircraft	27,370	27,370
Total Airfield Operations	33,180	38,950
Percent Change		17.4%

^a Total baseline operations is for the last year. Data in this table were collected from the operations staff at Whiteman AFB in 2017.

AFRC F-35A pilots would perform departure and landing procedures similar to those currently conducted by the A-10 pilots at the installation. Due to differences in aircraft characteristics and performance, the flight profiles and tracks used by AFRC F-35A pilots would slightly vary from those currently used by A-10 pilots. A-10 pilots from the 442 FW average 260 flying days per year. For the purposes of this analysis and to compare the alternatives on an equal basis, the total number of possible flying days for AFRC F-35A pilots is also assumed to be 260, including both Saturday and Sunday (on Unit Training Assembly [UTA] weekends).

Although the AFRC A-10 aircraft do not have afterburners, other military aircraft operating at Whiteman AFB use afterburners on occasion when additional power is needed. As described in Chapter 2, Section 2.3.3, the USAF evaluated three different scenarios for afterburner use. Scenario A is afterburner use on 5 percent of takeoffs. Scenario B is afterburner use on 50 percent of takeoffs. Scenario C is afterburner use on 95 percent of takeoffs.

AFRC F-35A pilots would operate similar to the A-10 pilots. Currently, A-10 operations primarily begin at 7:00 A.M. and conclude by 10:00 P.M. on weekdays and UTA weekends (except when weather contingencies or special exercises cause operations to occur after 10:00 P.M.). After-dark training is normally scheduled to be completed before 10:00 P.M. After-dark training for AFRC F-35A pilots would also be scheduled to be completed before 10:00 P.M. Because of the capabilities and expected tactics of the F-35A aircraft, AFRC F-35A pilots are predicted to generally follow the same night requirement as AFRC A-10 pilots depending on weather or special exercises.

WH2.4 AIRSPACE AND RANGE USE

Table WH2-5 identifies the Federal Aviation Administration (FAA)-designated airspace currently used by Whiteman AFB A-10 pilots that is also proposed for use by AFRC F-35A pilots. Implementation of the AFRC F-35A mission would not require any new airspace or changes to existing airspace boundaries, and the type and number of ordnance used at the any of the ranges approved for such use could decrease.

Table WH2-5. Whiteman AFB Training Airspace

FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Ada East & West MOAs	7,000	UTBNI 18,000
Bison MOA	1,000 AGL	UTBNI 18,000
Cannon A MOA	300 AGL	UTBNI 18,000
Cannon B MOA	100 AGL	UTBNI 18,000
Eureka Low MOA	6,000	UTBNI 18,000
Eureka High MOA	2,500	UTBNI 6,000
Lindbergh A MOA	7,000	UTBNI 18,000
Lindbergh B & C MOAs	8,000	UTBNI 18,000
Lindbergh D and West ATCAA ^c	39,000	UTBNI 43,000
Riley MOA	7,000	UTBNI 18,000
Salem MOA	Surface	UTBNI 7,000
Shirley A, B, & C MOAs	11,000	UTBNI 18,000
Smoky High MOA	5,000	UTBNI 18,000
Smoky Low MOA	500 AGL	UTBNI 5,000
Truman A & B MOAs	8,000	UTBNI 18,000
Truman C MOA	500 AGL	UTBNI 18,000
Cannon Range R-4501A	Surface	UTBNI 2,200
Cannon Range R-4501B	Surface	4,300
Cannon Range R-4501C	2,200	5,000

Table WH2-5. Whiteman AFB Training Airspace (Continued)

FAA-Designated Airspace ^a	Floor ^b (feet MSL unless otherwise noted)	Ceiling (feet MSL unless otherwise noted)
Cannon Range R-4501D	5,000	12,000
Cannon Range R-4501E	12,000	UTBNI 18,000
Cannon Range R-4501F & H	Surface	3,200 AGL
Fort Riley Range R-3602A & B	Surface	29,900
Smoky Hill Range R-3601A	Surface	UTBNI 18,000

^a Airspace used by F-35A pilots would include Air Traffic Control Assigned Airspaces (ATCAAs) that occur over the Military Operations Areas (MOAs) included in the table. The ATCAAs will accommodate training above 18,000 feet mean sea level (MSL).

^b Floor altitudes could exclude certain areas. See FAA Sectional Charts for exclusions.

^c Lindbergh ATCAAs are called out in the table and figures for reference because no MOAs are located beneath these areas.

Note: MSL is the elevation (on the ground) or altitude (in the air) of an object, relative to the average sea level. The elevation of a mountain, for example, is marked by its highest point and is typically illustrated as a small circle on a topographic map with the MSL height shown in either feet or meters or both. Because aircraft fly across vast landscapes, where points above the ground can and do vary, MSL is used to denote the “plane” on which the floors and ceilings of Special Use Airspace (SUA) are established and the altitude at which aircraft must operate within that SUA.

Key: AGL = above ground level; UTBNI = Up To But Not Including

Source: FAA Kansas City 2018 and Wichita 2018 Sectional Charts

WH2.4.1 Airspace Use

AFRC F-35A pilots would conduct missions and training activities necessary to fulfill the multi-role responsibility of this aircraft. All F-35A flight activities would occur in existing airspace. AFRC F-35A pilots would operate in the airspace used by A-10 pilots from the 442 FW, but at higher altitudes. A-10 pilots from the 442 FW use Military Operations Areas (MOAs), Restricted Areas (RAs), and Air Traffic Control Assigned Airspace (ATCAA) (Table WH2-5 and Figure WH2-2). To support realistic training, A-10 pilots schedule and use multiple adjacent airspaces together.

The FAA-designated airspace identified in Table WH2-4 is also used by other USAF pilots operating A-10, F-15, and F-16 aircraft. A-10 pilots from the 442 FW conduct approximately 35 percent of the total sorties flown in the airspace identified in Table WH2-5. Although AFRC F-35A pilots would conduct missions similar to those of A-10 pilots, the capabilities of the F-35A aircraft allow for supersonic and higher altitude flight. Regardless of the altitude structure and percent use indicated in Table WH2-6, AFRC F-35A pilots (as do existing military aircraft pilots) would adhere to all established floors and ceilings of existing FAA-designated airspace. For example, the floor of the Riley MOA is 7,000 feet mean sea level (MSL). While in this MOA, AFRC F-35A pilots would not fly below that altitude. Rather, AFRC F-35A pilots would adapt training to this and other airspace with lower floors.

Table WH2-6. Current and Proposed Aircraft Altitude Distribution in the Airspace

Altitude (feet)	Percentage of Use	
	A-10	AFRC F-35A
100 – 500 AGL	7%	0%
500 AGL – 2,000 AGL	30%	1%
2,000 – 5,000 AGL	26%	0%
5,000 AGL – 10,000 MSL	33%	5%
10,000 – 18,000 MSL	4%	23%
18,000 – 30,000 MSL	0%	60%
+30,000 MSL	0%	11%

A-10 pilots from the 442 FW generally operate 100 percent of the time at or below 18,000 feet MSL. In contrast, AFRC F-35A pilots would operate 71 percent of the time at or above 18,000 feet MSL, with 11 percent of the flight time above 30,000 feet MSL.

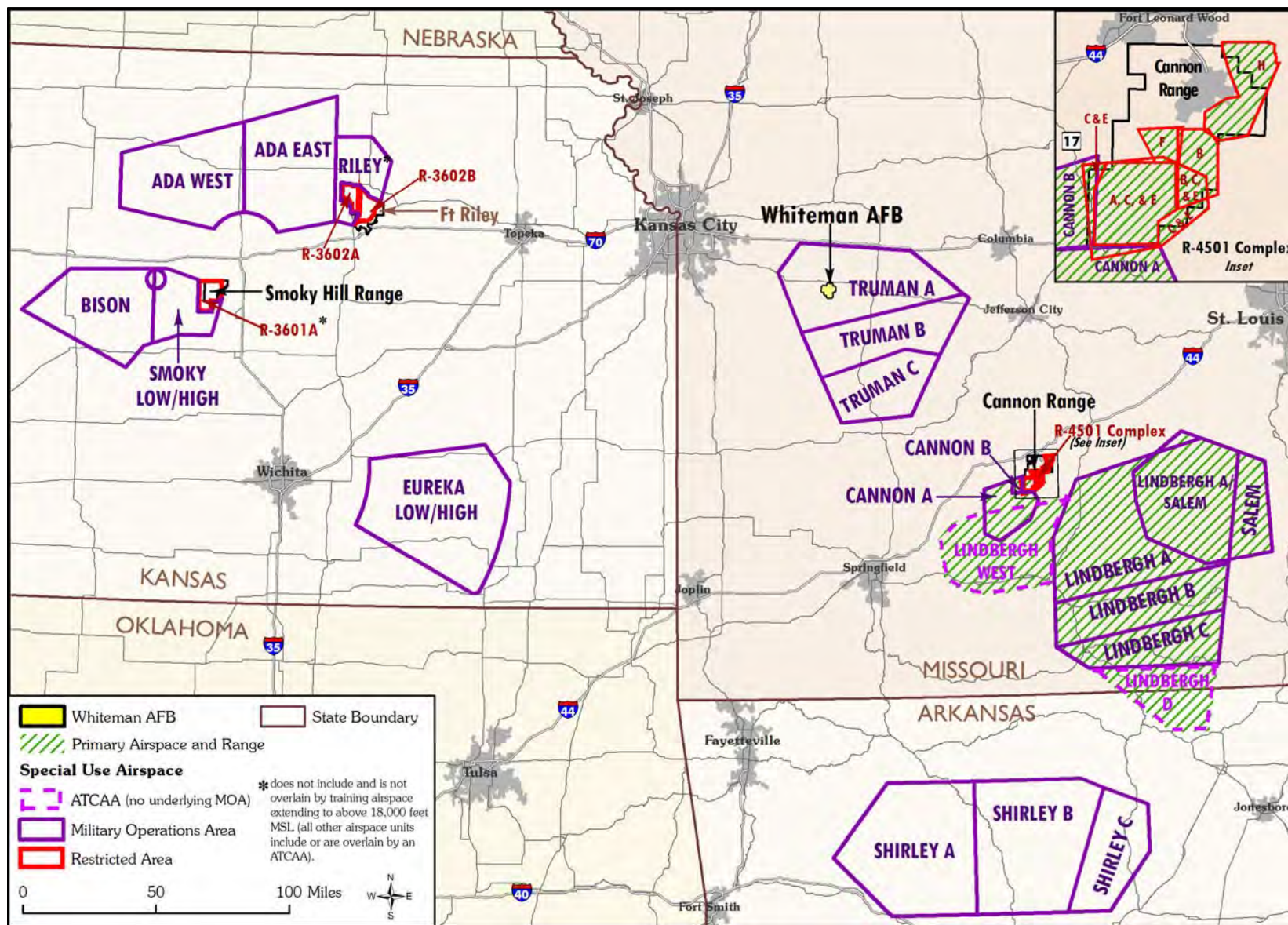


Figure WH2-2. Airspace Associated with Whiteman AFB

By 2030, total annual sorties would decrease by 5.9 percent from baseline levels (Table WH2-7).

Table WH2-7. AFRC F-35A Airspace Sorties Flown from Whiteman AFB

Airspace ^a	Total Baseline	A-10 Baseline	AFRC F-35A Sorties	Net Change (Total)	Percent Change (Total)
Central United States	15,739	5,563	4,632	-931	-5.9%
Total^b	15,739	5,563	4,632	-931	-5.9%

^a Includes all airspace identified in Table WH2-5.

To train with the full capabilities of the aircraft, AFRC F-35A pilots would conduct supersonic flight at altitudes and within airspace already authorized for such activities. Due to the capability of the F-35A aircraft, the USAF anticipates that approximately 10 percent of the time spent in air combat training would involve supersonic flight.

AFRC F-35A missions would last approximately 45 to 115 minutes, including takeoff, transit to and from the training airspace, training activities, and landing. Depending upon the distance and type of training activity, AFRC F-35A pilots would fly approximately 20 to 60 minutes in the training airspace. Occasionally, AFRC F-35A pilots could fly up to 90-minute long missions. AFRC F-35A pilots would not fly in Special Use Airspace (SUA) during environmental night (10:00 P.M. to 7:00 A.M.), except for rare contingencies and special mission training.

WH2.4.2 Range Use

AFRC F-35A pilots would only use existing ranges. AFRC F-35A pilots stationed at Whiteman AFB would use the Cannon Range at Fort Leonard Wood in Missouri and the Smoky Hill and Fort Riley Ranges in Kansas.

Most air-to-ground training would be simulated (i.e., nothing is released from the aircraft and electronic scoring is used). However, as described in Chapter 2, Section 2.3.4.2, the F-35A (like the A-10) is capable of carrying and using several types of air-to-air and air-to-ground ordnance, and pilots would require training in their use. The type and number of ordnance used by AFRC F-35A pilots could decrease from that currently used by A-10 pilots. If in the future the USAF identifies weapon systems that are either new or could exceed currently approved levels, appropriate NEPA documentation would be completed prior to their use.

Similar to A-10 pilots, AFRC F-35A pilots would use flares as defensive countermeasures in training. Flares are one of the defensive mechanisms dispensed by military aircraft to avoid attack by enemy aircraft and air defense systems. For the purposes of this analysis, it is estimated that flare use by AFRC F-35A pilots would be less than or equal to that of A-10 pilots. Chapter 2, Section 2.3.4.2.1, provides details on the composition and characteristics of flares. Flares would only be used in areas currently approved for such use. Current restrictions on the altitude of flare use would also apply. Use of flares by AFRC F-35A pilots would either increase or decrease in proportion to net changes in aircraft operations. Approximately 70 percent of F-35A flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete combustion of each flare.

WH2.5 PUBLIC, AGENCY, AND TRIBAL INVOLVEMENT

WH2.5.1 Scoping Process

The public scoping period for the AFRC F-35A Environmental Impact Statement (EIS) began on 22 March 2018 with publication of the Notice of Intent (NOI) in the *Federal Register*. During the

following weeks, notification letters were mailed to federal, state, and local agencies; elected officials; federally recognized tribes (tribes)¹; nongovernmental organizations; and interested individuals as a part of an interagency/intergovernmental coordination process. Through this process, concerned federal, state, and local agencies are notified and allowed sufficient time to evaluate potential environmental impacts of a proposed action.

Volume II, Appendix A, provides sample notification letters, the notification mailing lists, and the agency comments and concerns received by the USAF during the public scoping period. For the Whiteman AFB alternative, newspaper advertisements announcing the intent to prepare an EIS and hold a public scoping meeting were published in three different local newspapers. These advertisements were published in the weeks preceding the scheduled public scoping meeting.

For the Whiteman AFB alternative, one public scoping meeting was held on 26 April 2018 at Knob Noster High School (504 South Washington, Knob Noster, Missouri 65336). This meeting was held in an open-house format where attendees could sign in, if desired, review display boards about the proposed AFRC F-35A mission, and provide written comments on the project. During this meeting, USAF personnel presented information on the project through the use of display boards and fact sheets. The Whiteman AFB public scoping meeting was attended by 26 people, including residents, an elected official, local business leaders, military affairs committee members, base employees, local media, and others.

Throughout the public scoping period, the USAF offered multiple ways in which comments could be submitted. Comments were submitted at the public scoping meeting and through the project website, via email, and via regular mail or courier. The public scoping period closed on 11 May 2018, and seven comments were received regarding the Whiteman AFB alternative. Some comments were received after the public scoping period closed but were still considered during development of the Draft EIS.

After the public scoping period closed, the USAF was made aware that the address provided for submittal of courier-delivered (e.g., Federal Express or United Parcel Service) public scoping comments was incorrect. Consequently, the USAF provided the correct address and an additional 10 working days to resubmit scoping comments from the time resubmittal instructions were published in the *Federal Register* on 13 August 2018 and in three different local newspapers. During this second public scoping period, no additional comments were received regarding the Whiteman AFB alternative.

The majority of comments received for the Whiteman AFB alternative were generally supportive of the proposed mission. Some people expressed concerns about airspace, air quality, biological resources, hazardous materials and hazardous waste, infrastructure, land use, and soil and water resources.

WH2.5.1.1 Airspace Management and Use

Comments related to airspace included those that requested the EIS analyze any changes in airspace use, creation of new airspace, or alterations in flight paths.

¹ Per DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*, “tribe” refers to a federally recognized Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges (DoDI 4710.02, Section 3.5). Although not included as federally recognized tribes in the list, the USAF similarly must consult with Native Hawaiian organizations in accordance with DoDI 4710.03, *Consultation with Native Hawaiian Organizations (NHOs)*.

WH2.5.1.2 Air Quality

A comment was submitted expressing concern about jet fuel, exhaust, and the potential for adverse health effects to areas surrounding the base. The same commenter expressed concerns about tree removal and carbon footprint offsets.

WH2.5.1.3 Soil and Water Resources

A comment was received regarding stormwater run-off from the runway and potential impacts to water supplies, local creeks, and streams.

WH2.5.1.4 Biological Resources

A commenter expressed concern regarding the installation's carbon footprint and the potential for offsets through the creation of greenspace. Concern was expressed about light pollution and potential impacts to wildlife corridors.

WH2.5.1.5 Land Use and Recreation

One commenter expressed concern about the new mission potentially requiring land acquisition. The commenter wanted to know if land would be acquired through eminent domain.

WH2.5.1.6 Infrastructure

A commenter asked if the USAF would use solar power in the new construction to supply some of the power to the new facilities, and if buildings would incorporate green building practices and be LEED-certified.

WH2.5.1.7 Hazardous Waste

The Missouri Department of Natural Resources (MDNR) indicated that most of the legacy cleanup sites are at or nearing the response complete phase.

WH2.5.1.8 Socioeconomics

A commenter asked if there would be efforts to actively recruit local citizens for employment during and after construction.

WH2.5.2 Draft EIS Public and Agency Review

WH2.5.3 Consultation

WH2.5.3.1 Government-to-Government Consultation

In January 2012 the U.S. Department of Defense (DoD) updated its Annotated American Indian and Alaska Native Policy, which emphasizes the importance of respecting and consulting with tribal governments on a government-to-government basis. This policy requires an assessment, through consultation, of the effect of proposed DoD actions that may have the potential to significantly affect protected tribal resources, tribal rights, and Indian lands before decisions are made by the respective DoD services. In an ongoing effort to identify significant cultural resources, tribal resources, or other issues of interest to tribes, and as part of the NEPA scoping process, combined notification and Section 106 consultation letters were submitted to the federally-recognized American Indian tribes associated with Whiteman AFB.

Following standard USAF practice for government-to-government correspondence, tribal consultation was initiated by base Commanders who represent key leadership points of contact. Whiteman AFB initiated Section 106 government-to-government consultation with eleven tribes to identify traditional cultural properties. These tribes along with a record of consultations are listed in Volume II, Appendix A, Section A.7.2. Additional direct communication efforts (phone calls and emails) occurred for tribes that did not respond to USAF mailings. All communications with tribes will be completed in accordance with 54 *United States Code (USC)* 300101 *et seq.*, *National Historic Preservation Act of 1966, as amended* (NHPA); 36 *Code of Federal Regulations (CFR)* § 800, *Protection of Historic Properties*; Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*; and DoDI 4710.02, *DoD Interactions with Federally-Recognized Tribes*.

WH2.5.3.2 State Historic Preservation Officer Consultation

Whiteman AFB has determined that no historic properties would be affected by implementing the AFRC F-35A mission at the installation. The Missouri State Historic Preservation Officer (SHPO) concurred with this finding in a letter dated 13 June 2018 (Volume II, Appendix A, Section A.7.3).

WH2.5.3.3 U.S. Fish and Wildlife Service Consultation

Because no federal listed threatened, endangered, or candidate species and/or designated critical habitat occur in the Region of Influence (ROI) near Whiteman AFB, no impacts would result from implementation of the proposed AFRC F-35A mission in the areas surrounding Whiteman AFB. On 14 May 2018, the U.S. Fish and Wildlife Service (USFWS) indicated that should this project involve the removal of less than 10 acres of suitable bat habitat, and should the trees be cleared during the bat hibernation season (1 November to 31 March), the USFWS does not anticipate adverse effects to the three listed bat species. In a follow-up email dated 24 May 2018, the USFWS indicated that it was not within the USFWS's purview to concur with findings of no effect, but they had no concerns regarding the project (see email dated 14 May 2018, Volume II, Appendix A, Section A.2.7.4).

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WH3.0 WHITEMAN AIR FORCE BASE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

WH3.1 AIRSPACE MANAGEMENT AND USE

WH3.1.1 Base Affected Environment

WH3.1.1.1 Airfield Operations

Baseline annual airfield operations at Whiteman AFB are described in Section WH2.3 and shown in Table WH2-4. The primary runway at Whiteman AFB, Runway 01/19, is described in Section WH1.0 and shown on Figure WH1-2. Runway 19 is the primary use runway for noise abatement considerations.

The Whiteman AFB air traffic control (ATC) tower is responsible for controlling and managing airfield operations within the Class D airspace depicted on the FAA Kansas City Sectional Aeronautical Chart (FAA Kansas City 2018). The Whiteman AFB Class D airspace abuts or is within close proximity to Class E airspace surrounding the Skyhaven Airfield to the west and the Sedalia Regional Airport to the east. These charted airspace areas, along with the coordinated efforts of the respective airfield managers and ATC facilities, ensure the separation of the differing airfield flight activities.

The FAA Kansas City Air Route Traffic Control Center (ARTCC) manages the airspace in this region and has delegated terminal airspace to the Whiteman AFB Radar Approach Control (RAPCON) facility. The RAPCON is responsible for providing radar ATC services for all instrument flight rules (IFR) aircraft operations at Whiteman AFB and within 30-50 NM of the base from the surface up to 9,000 feet MSL. Control of this airspace reverts to the Kansas City ARTCC during those later periods when the RAPCON is not operational. Both runways 01 and 19 have Instrument Landing System (ILS) and Tactical Air Navigation (TACAN) navigational aid coverage that provide 10 published instrument approach procedures for this runway environment.

WH3.1.2 Base Environmental Consequences

WH3.1.2.1 Airfield Operations

The Whiteman AFB alternative for the AFRC F-35A mission would result in the changes to the airfield operational levels noted in Table WH2-4. Replacing the 5,810 A-10 operations with a projected 11,580 AFRC F-35A operations while other aircraft operations remain constant would increase overall airfield operations by about 17.4 percent. Such increase could be accommodated by the tower, RAPCON and Kansas City ARTCC within this airfield, Class D, and approach control airspace environment without adversely affecting other airspace uses. The percentage of operations flown during environmental night by AFRC F-35A pilots would be less than the percentage currently conducted by A-10 pilots. This beddown would not require any modifications to the current airspace structure nor those operating procedures that support present airfield and airspace operations at this location.

WH3.1.3 Airspace Affected Environment

WH3.1.3.1 Airspace and Range Use

The MOAs, ATCAAs, RAs, and range training areas currently used by pilots from Whiteman AFB and projected for AFRC F-35A operations are listed in Table WH2-5. This table also notes the floor and ceiling altitudes for each MOA, ATCAA, and RA in which all flight training activities must be

contained. Table WH3-1 notes the baseline and projected AFRC F-35A sortie operations for each airspace/range area. While the MOAs are in close proximity to the base with the Truman MOAs directly overlying this area, the ranges are approximately 100-200 NM from the base where Smoky Hill is the more highly used range. Kansas City ARTCC is the controlling agency for the airspace encompassing these training areas. Table WH3-1 notes the military agency responsible for coordinating and scheduling the airspace and range uses with the requesting units for meeting individual and joint training requirements.

Table WH3-1. Baseline and AFRC F-35A Annual Sorties

Training Airspace/Ranges ^b	Using/Scheduling Agency	Baseline Total	AFRC A-10	AFRC F-35A	Proposed Total	Percent Change
Ada East & West MOAs	ANG, 184th Intelligence Wing, Detachment 1, Smokey Hill	37	0	472	509	1,275.7
Eureka Low & High MOAs	ANG, 138 FW, Tulsa	1,208	0	157	1,365	13.0
Shirley A,B,C MOAs	Arkansas ANG, 188 FW, Ft. Smith	140	0	306	446	218.6
Truman A, B & C MOAs	509 BW, Whiteman AFB	6,554	-3,999	158	2,713	-58.6
Salem/Cannon/Lindbergh MOAs	131st Tactical Fighter Wing, MO ANG Lambert-St. Louis International	608	-280	459	787	29.4
Cannon Range R-4501A, B, C, D, E, F & H & Salem/Cannon/Lindbergh MOAs ^a	U.S. Army, Ft Leonard Wood/ 131st Tactical Fighter Wing	1,395	-1,284	2,031	2,142	53.5
Fort Riley Range R-3602A & B with Riley MOA	U.S. Army, Fort Riley	4	0	736	740	18,400.0
Smoky Hill Range R-3601A with Bison & Smoky Low and High MOAs	ANG, 184th Detachment 1, Air Refueling Wing, Salina	5,793	0	313	6,106	5.4
	Total	15,739	-5,563	4,632	14,808	-5.9

^a Primary Use Airspace and Ranges

^b AFRC F-35A training airspace and ranges also includes the high altitude ATCAA above the MOAs. Airspace areas in this table have been grouped due to similarity of training use and for noise modeling purposes.

WH3.1.4 Airspace Environmental Consequences

WH3.1.4.1 Airspace and Range Use

Table WH3-1 shows that the AFRC F-35A sorties projected for the different MOAs/ATCAAs, RAs, and ranges coupled with loss of the A-10 sorties would result in a 5.9 percent decrease in overall annual sorties. The projected distribution of those AFRC F-35A sorties would differ from how the A-10s currently use these areas. With the exception of the Truman MOAs, all airspace areas would experience an increase in annual sorties. The largest increases by percentage would be in the Fort Riley Range and Riley MOA and in the Ada MOAs. While the increases in these MOAs are large in terms of percentage, the actual number of sorties is small compared to the large areas available for training in these airspace areas. The percent increases are also inflated due to the small number of sorties currently occurring in the airspace. For example, the Fort Riley Range and Riley MOA currently have a baseline of four annual sorties. Since this MOA is currently used on an infrequent basis, the proposed increase of 736 sorties requirements could be effectively coordinated and scheduled to meet F-35A and other user training requirements.

The Canon Range, Shirley MOA, and the Salem/Cannon/Lindbergh MOAs would also see large percentage increases in the number of annual sorties. Mission requirements in these airspace areas

would require coordination and scheduling with existing USAF units to meet training requirements for both the AFRC F-35A mission and the mission of existing units.

Implementation of the AFRC F-35A mission would not result in the creation of new SUA or change the boundaries of existing SUA. Therefore, no major changes to civilian operations are anticipated. The Kansas City ARTCC would continue to manage all military and civilian aircraft within activated MOAs to ensure no conflicts with civil aviation.

WH3.1.5 Summary of Impacts to Airspace Management and Use

Implementation of the AFRC F-35A mission would involve a one-for-one exchange of A-10 aircraft with F-35A aircraft, and would not require any changes to airspace or to how the airfield is managed. Eventual replacement of A-10 aircraft at Whiteman AFB with F-35A aircraft would result in a 17.4 percent increase in airfield operations. This operational increase would not affect how local air traffic is managed. In addition, the AFRC F-35A sorties proposed for the airspace could be accommodated in the training airspace, ranges, and while en route to/from these areas without adversely affecting other airspace uses throughout the affected region. Therefore, impacts to airspace around Whiteman AFB and the airspace proposed for use would not be significant.

WH3.2 NOISE

Although noise can affect several resource areas, this section describes potential noise impacts on human annoyance and health, physical effects on structures, and potential impacts to animals in the care of humans. Noise impacts on biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomic (e.g., property values), and environmental justice /protection of children are discussed in sections dedicated to those resources. Chapter 3, Section 3.2, defines terms used to describe the noise environment as well as methods used to calculate noise levels and assess potential noise impacts. These terms and analytical methods are uniformly applied to all four bases. A summary of noise metrics used in this EIS is also provided in Table WH3-2.

For consistency, the dB unit is used throughout this EIS. However, all subsonic aircraft noise levels described in this EIS are measured in dBA. In compliance with current DoD Noise Working Group guidance, the overall noise environment is described in this EIS using the day-night average sound level (DNL) metric. During scoping, people submitted comments expressing concern about use of the DNL metric. The DNL metric is used because it is the preferred noise metric of the U.S. Department of Housing and Urban Development (HUD), FAA, U.S. Environmental Protection Agency (USEPA), and DoD. Studies of community annoyance in response to numerous types of environmental noise show that there is a correlation between DNL and the percent of the population that can be expected to be highly annoyed by the noise. In addition to the DNL metric, supplemental noise metrics are used to provide a more complete picture of noise and particular types of noise impacts (Table WH3-2). Operations occurring during environmental nighttime hours are assessed a 10-dB penalty applied in calculation of DNL (refer to Chapter 3, Section 3.2.3, for more detailed resource definition and methodology used to evaluate impacts).

Comments received during scoping indicated a broad range of concerns and requested a comprehensive presentation of noise impacts. Therefore, this analysis covers a wide variety of potential noise impact categories. Additional details are provided in Volume II, Appendix B.

Table WH3-2. Summary of Noise Metrics Used in this EIS

Different noise measurements (or metrics) quantify noise. These noise metrics are as follows:

- The A-weighted decibel (dBA) is used to reflect a weighting process applied to noise measurements to filter out very low and very high frequencies of sound in order to replicate human sensitivity to different frequencies of sound and reflect those frequencies at which human hearing is most sensitive. Environmental noise is typically measured in dBA.
- Day-Night Average Sound Level (DNL) combines the levels and durations of noise events, the number of events over a 24-hour period, and more intrusive nighttime noise to calculate an average noise exposure.
- Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.
- C-Weighted Day-Night Average Sound Level (CDNL) is a day-night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of impulsive noise.
- Sound Exposure Level (SEL) accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.
- Maximum Noise Level (L_{max}) is the highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight).
- Equivalent Noise Level (L_{eq}) represents aircraft noise levels decibel-averaged over a specified time period and is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$ and measured from 8:00 A.M. to 4:00 P.M.).

In this EIS, multiple noise metrics are used to describe the noise environment at each alternative base. This approach, which is in accordance with DoD policy, provides a more complete picture of the current and expected noise experience than can be provided by any one noise metric alone.

WH3.2.1 Base Affected Environment

This section discusses noise impacts near the installation. Noise generated in the training airspace and during training to and from the training airspace is discussed in Section WH3.1.

Under baseline conditions, 33,180 airfield operations are conducted annually at Whiteman AFB. This includes 5,810 operations by the 442 FW AFRC A-10 pilots. Pilots from the 509 BW and 131 BW conduct 6,198 B-2 operations and 15,284 T-38 operations annually. MO ANG pilots conduct 4,808 H-60 operations annually. Transient aircraft pilots conduct 1,080 operations annually. Transient aircraft pilots use the airfield for a variety of purposes (e.g., stop-over during cross country flights, unfamiliar airfield for practice approaches, divert landing location during severe weather), and transient aircraft could potentially include any aircraft type. Approximately 7 percent of total airfield operations are conducted between 10:00 P.M. and 7:00 A.M. Approximately 4 percent of 442 FW A-10 airfield operations are conducted between 10:00 P.M. and 7:00 A.M.

WH3.2.1.1 Noise Exposure

Several comments received during scoping requested the USAF provide individual overflight noise levels quantified using the sound exposure level (SEL) metric. The information on SELs shown in Table WH3-3 was calculated based on local flying procedures and conditions using methods described in Chapter 3, Section 3.2.3.1. Specifically, Table WH3-3 lists only the highest SEL generated by any flight procedure (e.g., departure, arrival or closed pattern) by any based or transient

aircraft type. The table also states the number of times per year that the flight procedure occurs during “acoustic day” (7:00 A.M. to 10:00 P.M.) and “acoustic night” (10:00 P.M. to 7:00 A.M). It is worth noting that the noise environment at a particular location is complex and the highest SEL is only one descriptor of this complex situation. In addition, actual flight paths vary, due to weather, winds, aircrew technique, and other factors, from the most-frequently followed (representative) flight paths used in noise modeling. Therefore, individual flight events could be closer to, or be farther away from, the representative noise-sensitive location, resulting in noise levels being slightly higher or lower than indicated in Table WH3-3.

Table WH3-3. Highest SEL at Representative Noise-Sensitive Locations near Whiteman AFB Under Baseline Conditions

Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{a,b}
Type	ID	Description	Aircraft Group	Aircraft	Operation Type	Annual Operations at this SEL		
						7:00 A.M. to 10:00 P.M.	10:00 PM to 7:00 AM	
Park	P01	Knob Noster State Park campground	T	F/A-18A/C	Departure	103	3	91
Residential	R01	Residential Area 1	B	B-2A	Closed Pattern	151	101	109
	R02	Residential Area 2	T	F/A-18A/C	Arrival	65	4	109
	R03	Residential Area 3	T	F/A-18A/C	Departure	103	3	102
School ^c	S01	Knob Noster Elementary	B	B-2A	Closed Pattern	41	27	109
	S02	Knob Noster High School	B	B-2A	Closed Pattern	41	27	99

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c For the purposes of this noise analysis, noise levels at schools are described throughout this EIS using representative schools; discussion of noise at schools may not include all schools in the area.

Key: T = Transient aircraft or non-Whiteman AFB-based aircraft involved in training exercise; B = Based aircraft

Several factors, including, but not limited to, weather conditions, the precise flight path followed, and whether the aircraft is flying in formation, affect the noise level of individual overflights (Chapter 3, Section 3.2.3). Formation flights involve multiple aircraft, usually of the same type, flying together. The maximum noise level experienced during a formation overflight depends on the spacing and arrangement of the formation’s member aircraft. If the aircraft are spaced close together, then doubling the number of aircraft would add as much as 3 dB to the maximum sound level (L_{max}) of the event. Since the SEL metric is an exposure-based metric, doubling the number of aircraft of a single aircraft type adds 3 dB to the event noise level.

Figure WH3-1 shows baseline DNL contours in 5-dB increments. Areas with the highest DNL are located along the runway, beneath the most heavily-used flight paths, and in areas near the airfield where aircraft static engine runs are conducted.

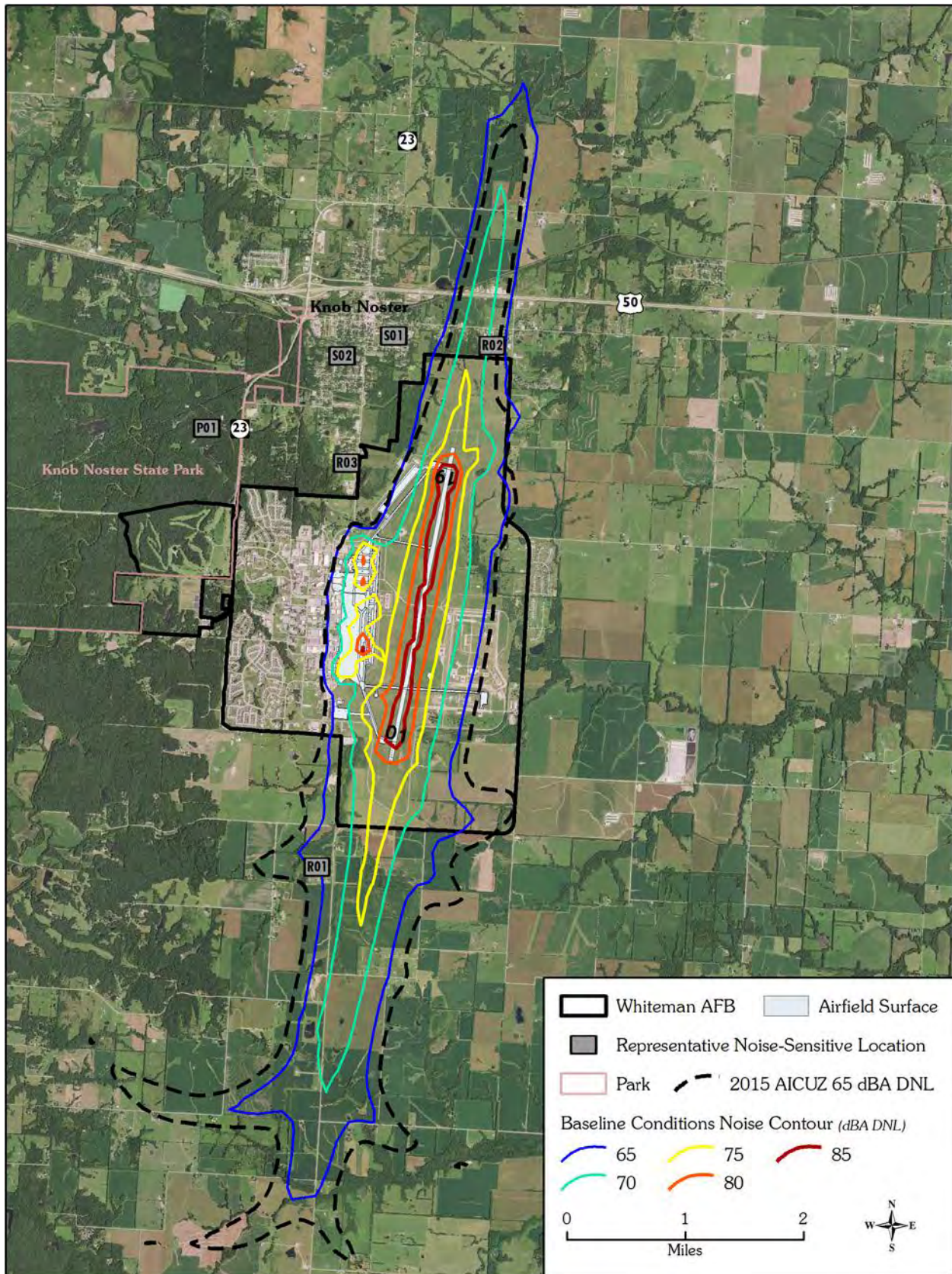


Figure WH3-1. Baseline DNL Contours at Whiteman AFB

Under baseline conditions, 2,089 acres and an estimated 580 residents are currently exposed to DNL of 65 dB or greater (Table WH3-4). People living in areas exposed to higher DNL are more likely to become highly annoyed by the noise. USAF land use guidelines state that residences are incompatible with DNL of 65 to 69 dB unless the structure provides at least 25 dB noise level reduction, and the same recommendations state that residences are incompatible with DNL of 70 to 74 dB unless the structure provides at least 30 dB noise level reduction. Additional details on annoyance and land use recommendations for areas exposed to elevated noise levels are contained in Chapter 3, Section 3.2.3, and Volume II, Appendix B.

Table WH3-4. Off-Base Acres and Population Exposed to DNL of 65 dB or Greater Under Baseline Conditions at Whiteman AFB

DNL (dB)	Acres	Estimated Population
65-69	1,500	462
70-74	537	118
75-79	52	0
80-84	0	0
≥85	0	0
Total	2,089	580

Table WH3-5 lists baseline DNL at several representative noise-sensitive locations, which include a state park, residential areas, and schools. Baseline DNLs at the representative noise-sensitive locations are similar to and indicative of DNLs in surrounding areas. The DNLs at Residential Area 1 and Residential Area 2 are 65 dB or greater.

Table WH3-5. DNL at Representative Noise-Sensitive Locations near Whiteman AFB Under Baseline Conditions

Type	ID	Description	DNL (dB)
Park	P01	Knob Noster State Park campground	48
Residential	R01	Residential Area 1	65
	R02	Residential Area 2	68
	R03	Residential Area 3	57
School	S01	Knob Noster Elementary School	61
	S02	Knob Noster High School	55

Areas outside the 65 dB DNL contour line could also experience noise that can be disturbing at times. Although noise events are less frequent and/or less intense in areas exposed to DNL less than 65 dB, loud and potentially disturbing noise events do occur. Some people are more noise-sensitive than others as a result of physical, psychological, and emotional factors. People with autism and people afflicted with post-traumatic stress disorder (PTSD) could be particularly sensitive to sudden loud noises such as those that occur near an airbase. The DNL metric is useful for describing the noise environment at a location with a single number, but it does not provide a complete description of the noise environment. In accordance with current DoD policy, this EIS makes use of several supplemental noise metrics (e.g., SEL, L_{max} , number of events exceeding dB threshold) to provide a more complete description of the noise experience.

WH3.2.1.2 Speech Interference

Speech interference is possible when noise levels exceed 50 dB. For the purposes of this analysis, any change to normal speech patterns is counted as an interference event. Table WH3-6 lists the number of events exceeding L_{max} of 50 dB in buildings with windows open, in buildings with windows closed, and outdoors. Flight paths are variable and speech interference events sometimes occur far from standard Whiteman AFB flight patterns.

Table WH3-6. Potential Speech Interference Under Baseline Conditions at Whiteman AFB

Type	ID	Description	Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour		
			Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Knob Noster State Park campground	1	<<1	3
Residential	R01	Residential Area 1	3	2	3
	R02	Residential Area 2	3	3	4
	R03	Residential Area 3	3	2	4

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

Key: <<1 indicates that the number of potential speech interference events (>50 dB) per hour resulting from Whiteman AFB-based aircraft overflights is low (rounding to zero)

WH3.2.1.3 Interference with Classroom Learning

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. When considering intermittent noise caused by aircraft overflights, guidelines for classroom interference indicate that an appropriate criterion is a limit of 35 to 40 dB (depending on classroom size) on indoor background equivalent noise levels during the school day ($L_{eq(SD)}$) and a 50 dB L_{max} limit on single events. The background $L_{eq(SD)}$ at Knob Noster Elementary School and Knob Noster High School both exceed 40 dB when windows are open, but do not exceed 40 dB with windows closed (Table WH3-7). Currently, at both schools, an average of one noise event per hour exceeds 50 dB indoors if windows are closed and an average of two events per hour exceed 50 dB indoors if windows are open. The number of outdoor events per hour with potential to interfere with speech between 7:00 A.M. and 10:00 P.M. is not directly related to classroom noise level, but is relevant during recess and to other activities that could occur outside the school building.

Table WH3-7. Indoor Classroom Learning Disruption Under Baseline Conditions at Whiteman AFB

Type	ID	Description	Windows Open ^a		Windows Closed ^a		Outdoor
			$L_{eq(SD)}$ (dB)	Events per Hour ^b	$L_{eq(SD)}$ (dB)	Events per Hour ^b	Events per Hour ^c
School	S01	Knob Noster Elementary School	43	2	<35	1	4
	S02	Knob Noster High School	40	2	<35	1	4

^a Assumes standard values of 15 dB and 25 dB of noise level reductions for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

Key: $L_{eq(SD)}$ is the equivalent noise level during a school day (defined as 8:00 A.M. to 4:00 P.M.).

WH3.2.1.4 Sleep Disturbance

Nighttime flying, which is required as part of training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (ANSI) (ANSI 2008). The method first predicts the probability of awakening associated with each type of flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects all flying events that occur between 10:00 P.M. and 7:00 A.M., when most people sleep (Table WH3-8). Sleep disturbance probabilities listed for parks and schools are not intended to imply that people regularly sleep in parks or schools, but instead are indicative of impacts in nearby residential areas.

Table WH3-8. Average Probability of Awakening Under Baseline Conditions at Whiteman AFB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)	
			Windows Open ^a	Windows Closed ^a
Park	P01	Knob Noster State Park campground	2	1
Residential	R01	Residential Area 1	7	4
	R02	Residential Area 2	9	6
	R03	Residential Area 3	5	2
School	S01	Knob Noster Elementary School	5	2
	S02	Knob Noster High School	5	2

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

WH3.2.1.5 Potential for Hearing Loss

Potential for Hearing Loss (PHL) applies to people living in high noise environments where they can experience long-term (40 years) hearing effects resulting from DNL greater than 80 dB (USD 2009). PHL is not an issue of concern because no residences are exposed to DNL greater than 80 dB.

WH3.2.1.6 Occupational Noise

In on-base areas with high noise levels, existing USAF occupational noise exposure prevention procedures, such as hearing protection and monitoring, are implemented to comply with all applicable Occupational Safety and Health Administration (OSHA) and USAF occupational noise exposure regulations.

WH3.2.1.7 Non-auditory Health Impact

During scoping, the question of the potential for non-auditory health effects from noise was raised. Several studies have been performed to see whether noise can cause health effects other than hearing loss. The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. Cantrell (1974) confirmed that noise can provoke stress, but noted that results on cardiovascular health have been contradictory. Some studies have found a connection between aircraft noise and blood pressure (e.g., Michalak *et al.* 1990; Rosenlund *et al.* 2001), while others have not (e.g., Pulles *et al.* 1990).

Kryter and Poza (1980) noted, “It is more likely that noise related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior, than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body.”

The connection from annoyance to stress to health issues requires careful experimental design and the resulting data are subject to different interpretations. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods under the approach path to Los Angeles International Airport. When the same data were subsequently analyzed by others (Frerichs *et al.* 1980), no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhood. But when the Centers For Disease Control performed a more thorough study near Hartsfield-Jackson Atlanta International Airport, no relationships were found for levels greater than 65 dB (Edmonds *et al.* 1979).

A carefully designed study, Hypertension and Exposure to Noise near Airports (HYENA), was conducted around six European airports from 2002 through 2006 (Jarup *et al.* 2005, 2008). There were 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires administered for health, socioeconomic, and lifestyle factors, including diet and physical exercise.

Hypertension was defined by World Health Organization blood pressure thresholds (WHO 2003). Noise from aircraft and highways was predicted from models.

The HYENA results were presented as an odds ratio (OR). An OR of 1 would mean no added risk exists, while an OR of 2 would mean risk doubles. An OR of 1.14 was found for nighttime aircraft noise, measured by the equivalent noise level during nighttime hours (L_{night}). For daytime aircraft noise, measured by 16-hour equivalent noise level (L_{eq16}), the OR was 0.93. For road traffic noise, measured by 24-hour equivalent noise level (L_{eq24}), the OR was 1.1.

Note that OR is a statistical measure of change, not the actual risk. Risk itself and the measured effects were small, and not necessarily distinct from other events. Haralabidis *et al.* (2008) reported an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise, and an increase of 7.4 mmHg for other indoor noises such as snoring. For the purpose of this EIS analysis, it is interesting to note that the studies demonstrated aircraft noise was a factor at night, while traffic noise was a factor for the full day.

Two recent studies examined the correlation of aircraft noise with hospital admissions for cardiovascular disease. Hansell *et al.* (2013) examined neighborhoods around London's Heathrow Airport. Correia *et al.* (2013) examined neighborhoods around 89 airports in the United States. Both studies included areas of various noise levels. They found associations that were consistent with the HYENA results that found nighttime noise to have a higher OR (greater impact) than daytime noise.

The current state of scientific knowledge cannot yet support inference of a causal or consistent relationship between aircraft noise exposure and non-auditory health consequences for exposed residents. The large-scale HYENA study (Jarup *et al.* 2005, 2008) and the recent studies by Hansell *et al.* (2013) and Correia *et al.* (2013) offer indications, but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

WH3.2.1.8 Structural Damage

Noise that does not exceed 130 dB in any 1/3-octave frequency band or last for more than 1 second does not typically have the potential to damage structures in good repair (CHABA 1977). The term “frequency bands” refers to noise energy in a certain range of frequencies and is similar in concept to frequency bands employed on home stereo equalizers to control relative levels of bass and treble. Noise energy in certain frequency bands has increased potential to vibrate and/or damage structures. Noise exceeding 130 dB in any 1/3-octave frequency band and lasting for more than 1 second of that intensity and duration does not occur except on the flightline immediately adjacent to jet aircraft.

Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects within structures can occur during loud overflights. Rattling of objects such as dishes, hanging pictures, and loose window panes can cause residents to fear damage. Rattling objects have the potential to contribute to annoyance along with other potential noise effects (e.g., speech interference, sleep disturbance).

WH3.2.1.9 Animals in the Care of Humans

Potential noise impacts on wildlife are discussed in Section WH3.6. However, pets, other domesticated animals, and animals kept in zoos live in different circumstances than wild animals and often react differently to human-generated noises, particularly when enclosed in small spaces. Negative reactions to loud overflights are possible under baseline conditions.

WH3.2.2 Base Environmental Consequences

Implementation of the AFRC F-35A mission would replace the 24 A-10 aircraft currently assigned to the 442 FW with 24 F-35A aircraft. The number of airfield operations flown annually by the

442 FW would increase from 5,810 to 11,580. The total number of airfield operations flown by all aircraft at Whiteman AFB would increase by 17.4 percent.

AFRC F-35A pilots would fly approximately 7 percent of initial approaches to the runway during the late-night time period between 10:00 P.M. and 7:00 A.M. This is the same percentage of initial approaches that are currently conducted by 442 FW A-10 pilots late at night. As is currently the case with A-10 pilots, AFRC F-35A pilots would not typically conduct departures or closed patterns (i.e., multiple practice approaches) between 10:00 P.M. and 7:00 A.M.

Based on context and intensity, noise impacts resulting from implementation of the proposed AFRC F-35A mission at Whiteman AFB would be considered significant. As described in Section 2.5, the USAF considered several potential noise mitigation measures. None of the measures considered were determined to be operationally feasible. Local flight procedures at Whiteman AFB are internally reviewed on a regular basis for changes that create the best balance between safety (paramount concern), mission and training effectiveness, and minimizing noise impacts. Furthermore, the base maintains open lines of communication with the City of Knob Noster and local community leaders to develop and implement potential noise abatement procedures when possible. Currently, no additional noise abatement procedures have been identified that would reduce noise impacts without also adversely affecting safety of flight and/or mission effectiveness.

Operating procedures already include several procedures to minimize noise impacts. These procedures, which have been developed over several years as part of regularly-occurring procedural review process, have been selected to minimize mission impacts while maintaining operational efficiency and flexibility; these procedures would be applied to any new aircraft at the installation, including the F-35A. Noise modeling conducted as part of this EIS analysis reflects the following procedures:

- Flying and static engine run activities are minimized between 10:00 P.M. and 7:00 A.M.;
- Flight paths are routed to avoid populated areas where practicable; and
- Aircraft conducting VFR second approach patterns must avoid direct overflight of the City of Knob Noster at less than 2,000 feet MSL.

Construction and demolition (C&D) projects in support of the proposed AFRC F-35 mission would generate short-term, localized increases in noise. However, the installation is currently exposed to elevated aircraft noise levels as well as noise generated by the day-to-day operation and maintenance (O&M) of vehicles and equipment. Construction would occur during normal working hours (i.e., 7:00 A.M. to 5:00 P.M.), and construction equipment would be equipped with mufflers. Workers would wear hearing protection in accordance with applicable regulations. Transportation of materials and equipment to and from the construction sites would generate noise similar to heavy trucks currently operating on base and along local roadways. In the context of ongoing frequent and intense aircraft noise events on an active military installation, construction noise generated by the AFRC F-35A mission would not result in significant impacts.

WH3.2.2.1 Noise Exposure

WH3.2.2.1.1 Scenario A

The F-35A aircraft is substantially louder than the A-10 aircraft, although the precise difference in noise level depends on the specific flight configurations being used by each aircraft and the aircraft's location relative to the listener (both of which are heavily dependent on the aircraft's performance characteristics). Table WH3-9 compares A-10 and F-35A individual overflight noise levels at a

representative noise-sensitive location northwest of the runway (Knob Noster Elementary School). The noise levels listed in Table WH3-9 reflect flight procedures at Whiteman AFB (e.g., pattern altitudes) and are not directly applicable to other installations. The specific types of flight departure, arrival, or closed pattern procedures listed in the table were selected because they generate the highest dB SEL of any departure, arrival, or closed pattern procedure flown by that aircraft at the location studied. The same set of Whiteman AFB-specific flight procedures used to calculate DNL noise contours was also used to calculate noise levels in Table WH3-9.

Table WH3-9. Comparison of A-10 and F-35A Noise Levels at the Knob Noster Elementary School near Whiteman AFB

Aircraft	Operation Type	Engine Power	Airspeed (knots)	Altitude (feet AGL)	Slant Distance (feet)	SEL (dB)	L _{max} (dB)
F-35A (Military Power)	Departure	100% ETR	300	2,305	3,865	102	94
F-35A (Afterburner Power) ^a		100% ETR	300	2,436	3,919	102	94
A-10 ^b		100% NC	240	1,681	5,939	79	70
F-35A (Overhead Break)	Arrival	50% ETR	200	2,370	2,892	97	84
A-10 ^b		85% NC	200	1,899	2,669	80	73
F-35A (VFR Low Approach)	Closed Pattern	60% ETR	190	1,787	1,747	105	94
A-10 ^b		N/A	N/A	N/A	N/A	N/A	N/A

Notes: Noise levels presented were calculated at Knob Noster Elementary School for the departure, arrival, and closed pattern flight that has the highest SEL at this location. Actual individual overflight noise levels vary from the noise levels listed because of variations in aircraft configuration, flight track, altitude, and atmospheric conditions. Representative noise levels were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^a For a detailed explanation of why F-35A afterburner departures might have lower SEL and L_{max} values than military power departures, see Chapter 3, Section 3.2.3.1. Essentially, during afterburner takeoffs, the aircraft reaches the required takeoff speed and leaves the ground sooner, and is at a slightly higher altitude throughout the flight profile. As a result, the aircraft altitude and slant distance at the location studied are both typically higher for the afterburner departure. Typically, the afterburner is turned off at approximately 10,000 feet from brake release, which occurs before the aircraft is over the location studied. The engine power (i.e., ETR) setting of the aircraft when it is above the location studied is the same for both the military power and the afterburner departure.

^b A-10 aircraft are not equipped with afterburner and do not regularly fly closed pattern (i.e., multiple practice approach) operations at Whiteman AFB.

ETR = Engine Thrust Request. NC = core engine speed

AFRC F-35A pilots conducting afterburner departures would only use the afterburner for a short period of time (see Chapter 3, Figure 3-1), and then continue their climb in military power (i.e., the same power setting used throughout the departure during non-afterburner departures). During afterburner departures, the afterburner would be de-selected long before the aircraft would overfly Knob Noster Elementary School. Because afterburner and non-afterburner departures are at the same power setting as they pass near the school, overflight noise levels generated by the two types of departures are the same at this school.

As noted in Chapter 3, Section 3.2.3, computer noise modeling was conducted in compliance with current USAF and DoD-approved methods. The modeling accounted for the effects of terrain relief (e.g., hills and valleys) near Whiteman AFB as well as surface type on the propagation of sound. In accordance with standard modeling procedures, noise modeling at Whiteman AFB used median atmospheric conditions for sound propagation based on local climate records. The modeling does not reflect possible future climates in Missouri, in part because the degree to which the climate will change and the timeframe in which change would occur are not known at this time. Noise levels were calculated for an average annual day, which is a day with 1/365th of annual total operations. The computer noise model NOISEMAP references a database of field-measured sound levels for aircraft in various flight configurations. The model also uses data on flight procedures for current and proposed aircraft operations (e.g., where, how often, what time of day, and what configurations are used) based on recent inputs provided by Whiteman AFB pilots and ATC.

Application of noise results generated for another airfield would be inappropriate because flight procedures, terrain, and several other factors are different at other airfields. F-35A flight parameters (e.g., altitude, airspeed, and engine power setting) that are expected to be used at Whiteman AFB were developed based on information provided by F-35A pilots at bases where the aircraft is operating currently, such as Luke, Hill, and Eglin AFBs. These flight parameters were used to generate results specific to Whiteman AFB.

Several comments received during scoping requested that the USAF provide individual predicted overflight noise levels using the SEL noise metric. Information is provided on the flight procedure with the highest SEL at several representative noise-sensitive locations in Table WH3-10. A flight procedure is a specific type of operation (e.g., afterburner departure) on a specific flight path, by a specific aircraft type. Actual flight paths vary as a result of weather, winds, aircrew technique, and other factors, and individual flights would deviate in position and noise level from those listed in Table WH3-10. In addition, the flight procedure with the highest SEL is one aspect of a complex sound environment which includes many other flight procedures (e.g., flaps or gear position) as well as other noise sources. At all of the representative noise-sensitive locations except for the Knob Noster Elementary School and the Knob Noster High School, the highest SEL would increase by 2 to 7 dB. The new procedure resulting in the highest SEL would be the arrival of an F-35A aircraft. At the Knob Noster Elementary School, the highest SEL is generated by a based B-2 departure and this would continue to be the case with implementation of the new mission. At the Knob Noster High School, the highest whole number SEL would remain the same, but a based F-35A arrival would generate a higher SEL (less than 1 dB higher) than the based B-2 closed pattern which generates the highest SEL at that location under baseline conditions.

Table WH3-10. Highest SEL at Representative Noise-Sensitive Locations near Whiteman AFB Under Baseline and AFRC F-35A Mission Conditions

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{a,b}
	Type	ID	Description	Aircraft Group	Aircraft	Operation Type	Annual Operations at this SEL		
							7:00 A.M. to 10:00 P.M.	10:00 P.M. to 7:00 A.M.	
Baseline	Park	P01	Knob Noster State Park campground	T	F/A-18A/C	Departure	103	3	91
	Residential	R01	Residential Area 1	B	B-2A	Closed Pattern	151	101	109
		R02	Residential Area 2	T	F/A-18A/C	Arrival	65	4	109
		R03	Residential Area 3	T	F/A-18A/C	Departure	103	3	102
	School	S01	Knob Noster Elementary School	B	B-2A	Closed Pattern	41	27	109
		S02	Knob Noster High School	B	B-2A	Closed Pattern	41	27	99

Table WH3-10. Highest SEL at Representative Noise-Sensitive Locations near Whiteman AFB Under Baseline and AFRC F-35A Mission Conditions (Continued)

Scenario	Representative Noise-Sensitive Location			Flight Procedure with the Highest SEL					SEL (dB) ^{a,b}
	Type	ID	Description	Aircraft Group	Aircraft	Operation Type	Annual Operations at this SEL		
							7:00 A.M. to 10:00 P.M.	10:00 P.M. to 7:00 A.M.	
AFRC F-35A Mission ^c	Park	P01	Knob Noster State Park campground	B	F-35A	Closed Pattern	3,465	0	96
	Residential	R01	Residential Area 1	B	F-35A	Closed Pattern	1,213	0	111
		R02	Residential Area 2	B	F-35A	Closed Pattern	397	0	114
		R03	Residential Area 3	B	F-35A	Closed Pattern	588	0	109
	School	S01	Knob Noster Elementary School	B	B-2A	Closed Pattern	41	27	109
		S02	Knob Noster High School	B	F-35A	Arrival	1,515	148	99

^a SELs were calculated using NOISEMAP Version 7.3 and the same operational data (e.g., flight tracks and flight profiles) used to calculate the DNL contours.

^b SEL accounts for the maximum sound level and the length of time a sound lasts by compressing the total sound exposure for an entire event into a single second.

^c Military power and afterburner power departure SELs at the noise-sensitive locations are within 1 dB of each other and the numbers of annual operations include all three afterburner scenarios.

Key: T = Transient or non-Whiteman AFB aircraft involved in training exercise; B = Based aircraft

Figure WH3-2 shows the DNL contours in 5-dB increments that would result from Scenario A overlain on the baseline noise contours for comparison. An additional 2,421 acres and an estimated 2,226 additional residents would be newly exposed to DNL of 65 dB or greater (Table WH3-11). As described in Chapter 3, Section 3.2.3, the affected population was estimated based on U.S. Census data at the Block Group (BG) level with adjustments to remove non-residential areas from calculations (USCB 2016b).

Table WH3-11. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario A at Whiteman AFB

DNL (dB)	Acres			Estimated Population		
	Baseline	Scenario A	Change	Baseline	Scenario A	Change
65-69	1,500	3,351	1,851	462	2,353	1,891
70-74	537	959	422	118	449	331
75-79	52	200	148	0	4	4
80-84	0	0	0	0	0	0
≥85	0	0	0	0	0	0
Total	2,089	4,510	2,421	580	2,806	2,226

As noted in Chapter 3, Section 3.2.3, the probability that an individual will become annoyed by noise is impossible to predict with confidence because of differing physical and emotional variables between individuals (Newman and Beattie 1985). These variables include, but are not limited to, the person’s feeling about the necessity or preventability of the noise, the person’s attitude about the environment, and any feelings of fear the person might have about the noise source. It can be said with confidence that people in communities exposed to increased DNL would

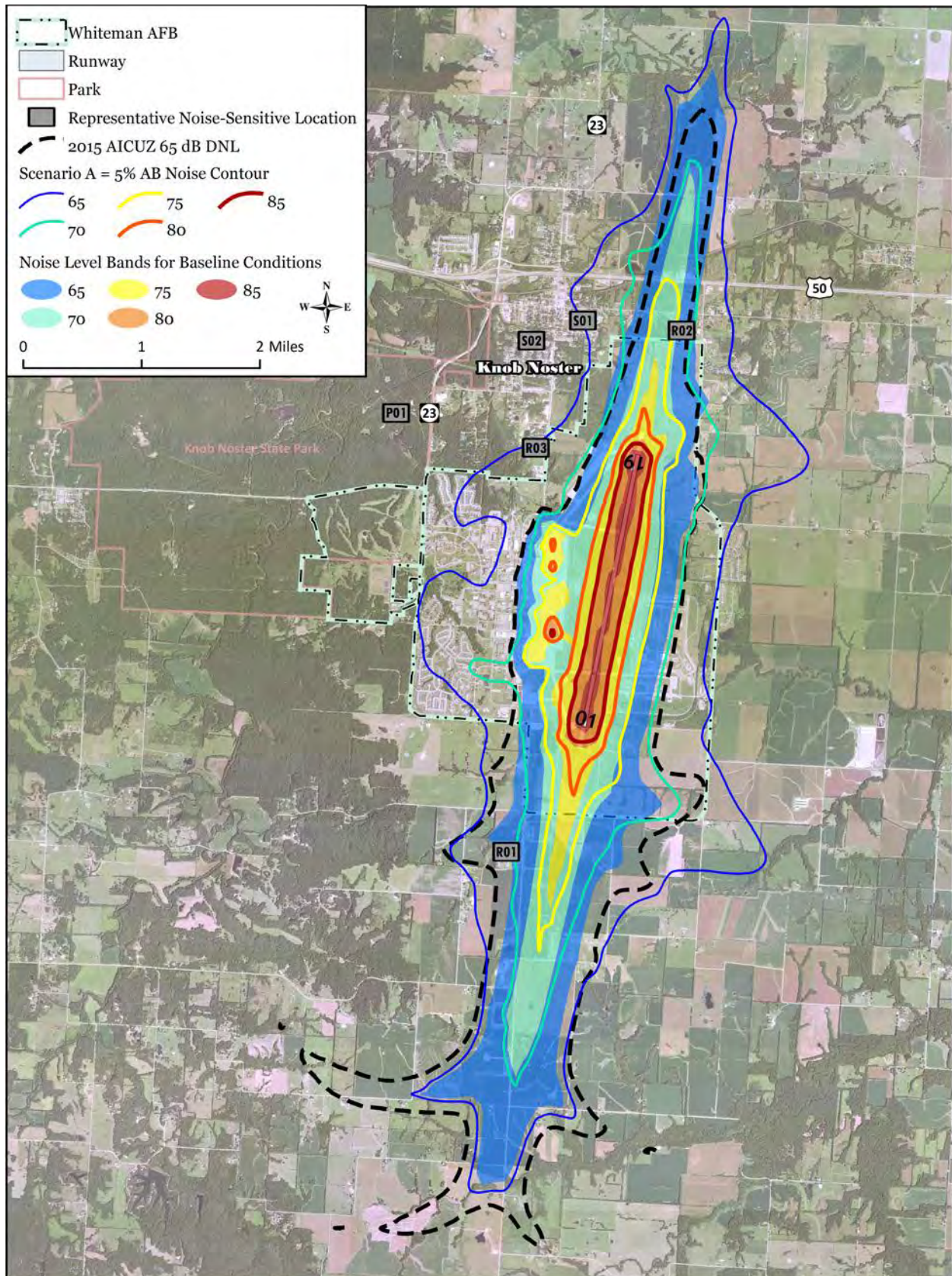


Figure WH3-2. AFRC F-35A Scenario A DNL Contours at Whiteman AFB

be more likely to become highly annoyed by the noise (Schultz 1978, Finegold et al. 1994, Meidema and Vos 1998). Studies conducted by Schultz in 1978 and Finegold et al. in 1994 indicated that approximately 12 percent of people exposed to DNL of 65 dB and 36 percent of people exposed to DNL of 75 dB could be expected to be highly annoyed by the noise (Schultz 1978, Finegold et al. 1994). More recent studies suggest that the percentage of people highly annoyed by noise—and aircraft noise in particular—might be higher than previously thought. A study conducted by Meidema and Vos in 1998 indicated that 28 percent of people could be expected to be annoyed by DNL of 65 dB, and 48 percent of people could be expected to be highly annoyed by DNL of 75 dB (Meidema and Vos 1998). Additional details on the prevalence of annoyance in high noise communities are contained in Volume II, Appendix B.

USAF land use compatibility guidelines classify residential land uses as incompatible with DNL of 65 to 69 dB unless the structure provides at least 25 dB noise level reduction. Residences are considered incompatible with DNL of 70 to 74 dB unless the structure provides at least 30 dB noise level reduction. Structural elements with better-than-average temperature insulation properties (e.g., double-paned windows) tend to also provide better-than-average noise level reduction. At DNL greater than 75 dB, residential land uses are always considered to be incompatible. A more detailed discussion of land use compatibility is contained in Section WH3.8.

The DNL changes that would result from the proposed new mission are shown in Table WH3-11. Noise levels resulting from the new mission at non-residential locations listed (e.g., schools) are similar to noise levels in any nearby residential areas. Increases in DNL at the locations studied would range from 4 to 9 dB. The DNL at Residential Area 3 and Knob Noster Elementary School would increase from less than 65 dB to 65 dB or greater and both would become incompatible land uses due to this level of noise. The DNL at Residential Area 1 would remain between 65 and 69 dB. The DNL at Residential Area 2 would increase from 65 to 69 dB to 70 to 74 dB.

Table WH3-12. DNL at Representative Noise-Sensitive Locations near Whiteman AFB Under Baseline and Scenario A Conditions

Type	ID	Description	DNL (dB)		
			Baseline	Scenario A	Change
Park	P01	Knob Noster State Park campground	48	54	6
Residential	R01	Residential Area 1	65	69	4
	R02	Residential Area 2	68	73	5
	R03	Residential Area 3	57	66	9
School	S01	Knob Noster Elementary School	61	65	4
	S02	Knob Noster High School	55	62	7

WH3.2.2.1.2 Scenario B

Under Scenario B, 50 percent of F-35A departures would use afterburner power, whereas 5 percent of F-35A departures would use afterburner power under Scenario A. All other aspects of the F-35A mission would be the same under Scenario B as Scenario A. There would be no difference in the highest SELs experienced at noise-sensitive locations under Scenario B relative to those listed for Scenario A in Table WH3-10. Military power and afterburner power departure SELs at the noise-sensitive locations are within 1 dB of each other, and the numbers of annual operations in Table WH3-10 include all three afterburner scenarios.

As discussed in Section WH3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. The Scenario B 65 dB DNL contour is slightly larger than the Scenario A 65 dB DNL contour

in areas to the right and left of the runway but slightly smaller in areas farther out along departure flight paths (Figure WH3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-28 in Appendix B, Section B.4. There would be 2,517 acres and an estimated 2,507 people newly exposed to DNL greater than 65 dB under Scenario B (Table WH3-13).

Table WH3-13. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario B at Whiteman AFB

DNL (dB)	Acres			Estimated Population		
	Baseline	Scenario B	Change	Baseline	Scenario B	Change
65-69	1,500	3,445	1,945	462	2,639	2,177
70-74	537	964	427	118	444	326
75-79	52	197	145	0	4	4
80-84	0	0	0	0	0	0
≥85	0	0	0	0	0	0
Total	2,089	4,606	2,517	580	3,087	2,507

The DNL at representative noise-sensitive locations under Scenario B would be the same as under Scenario A (see Table WH3-12) except at Knob Noster Park, where DNL would be 55 dB rather than 54 dB.

WH3.2.2.1.3 Scenario C

Under Scenario C, 95 percent of F-35A departures would use afterburner power, but all other aspects of the AFRC F-35A mission would be identical to Scenarios A and B. The highest SELs experienced at noise-sensitive locations would be the same under Scenario C as under Scenario A (see Table WH3-10).

As discussed in Section WH3.2.2.1.1, people exposed to increases in DNL are more likely to become highly annoyed by the noise, and some land uses are not considered compatible at DNL greater than 65 dB. In areas to the right and left of the runway, the Scenario C 65 dB DNL contour is slightly larger than the Scenario A or B contours, but the Scenario C 65 dB DNL contour is slightly smaller than the Scenario A or B 65 dB DNL contour farther out along departure flight paths (see Figure WH3-3). The DNL contours are shown in 5-dB intervals ranging from 65 to 85 dB on Figure B-29 in Appendix B, Section B.4. There would be 2,620 acres and an estimated 2,804 people newly exposed to DNL greater than 65 dB under Scenario C (Table WH3-14).

Table WH3-14. Off-Base Acres and Estimated Population Exposed to DNL of 65 dB or Greater from Scenario C at Whiteman AFB

DNL (dB)	Acres			Estimated Population		
	Baseline	Scenario C	Change	Baseline	Scenario C	Change
65-69	1,500	3,547	2,047	462	2,942	2,480
70-74	537	968	431	118	438	320
75-79	52	194	142	0	4	4
80-84	0	0	0	0	0	0
≥85	0	0	0	0	0	0
Total	2,089	4,709	2,620	580	3,384	2,804

The DNL at representative noise-sensitive locations under Scenario C would be the same as under Scenario A (see Table WH3-12) except at Knob Noster Park, where DNL would be 55 dB rather than 54 dB, and at Residential Area 3, where DNL would be 67 dB rather than 66 dB.

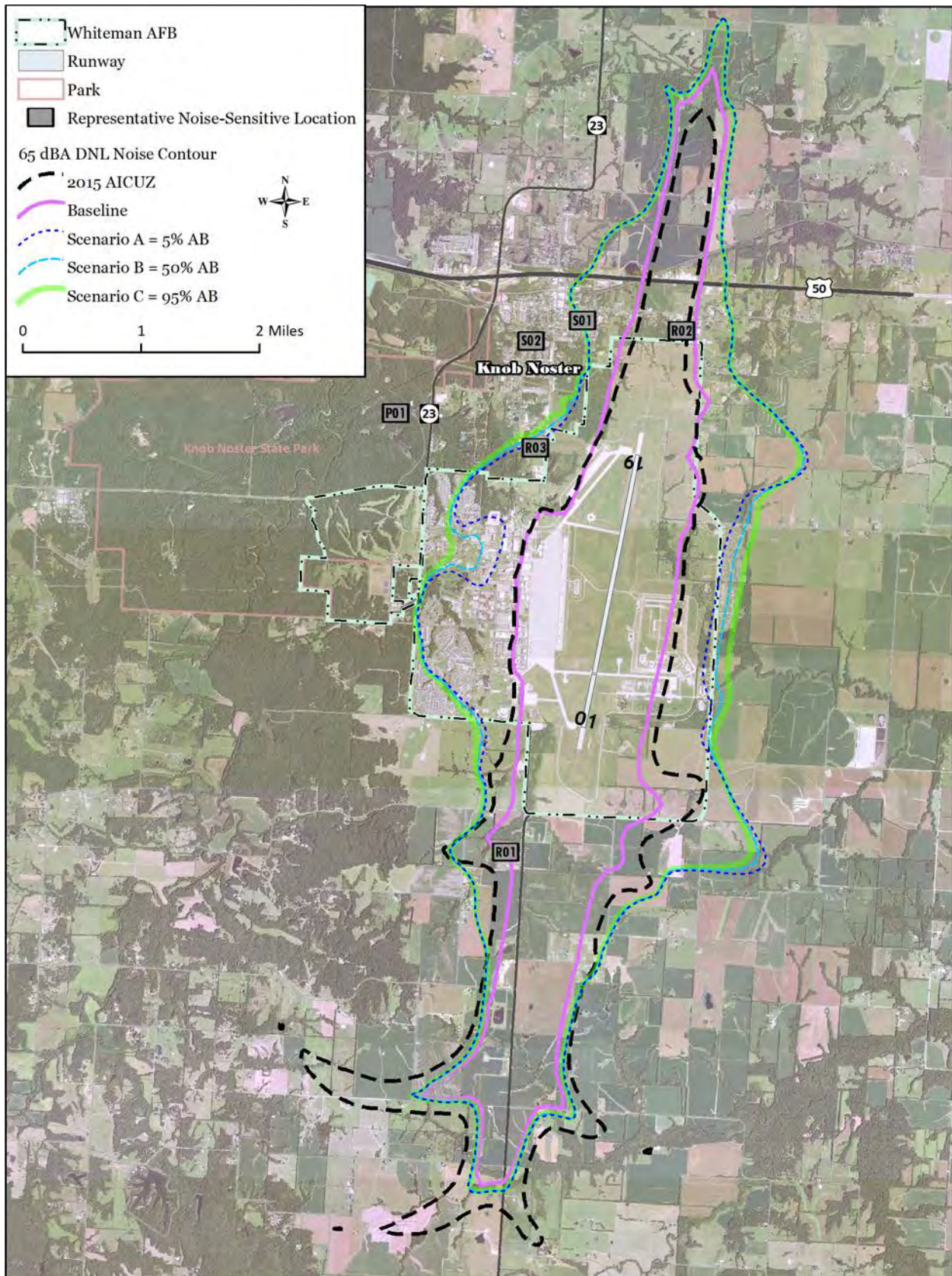


Figure WH3-3. AFRC F-35A Mission 65 dB DNL Contours (Scenarios A, B, and C) at Whiteman AFB

WH3.2.2.2 *Speech Interference*

WH3.2.2.2.1 Scenario A

The number of daytime (7:00 A.M. to 10:00 P.M.) events per hour that could potentially interfere with speech are listed in Table WH3-15. Any aircraft noise event exceeding 50 dB L_{max} was assumed to have some potential to interfere with speech. The interference would be for a few seconds for each overflight. Noise levels at the locations listed are similar to noise levels in nearby residential areas. The number of indoor events per hour with windows open, indoor events with windows closed, and outdoor events would increase by two or less. Any increases in the frequency of disruptions in communication have a high likelihood of being annoying.

Table WH3-15. Potential Speech Interference Resulting from Scenario A at Whiteman AFB

Type	ID	Description	Annual Average Daily Daytime (7:00 A.M. to 10:00 P.M.) Events per Hour					
			Scenario A			Change		
			Windows Open ^a	Windows Closed ^a	Outdoor	Windows Open ^a	Windows Closed ^a	Outdoor
Park	P01	Knob Noster State Park campground	3	1	4	2	1	1
Residential	R01	Residential Area 1	4	3	5	1	1	2
	R02	Residential Area 2	4	3	5	1	0	1
	R03	Residential Area 3	4	3	5	1	1	1

^a Number of events per average hour with an indoor L_{max} of at least 50 dB; assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

WH3.2.2.2.2 Scenario B

The number of potential speech interference events under Scenario B would be the same as under Scenario A (see Table WH3-15) except that Residential Area 2 would experience four rather than three potential speech interference events per hour with windows closed.

WH3.2.2.2.3 Scenario C

Under Scenario C, the number of potential speech interference events would be the same as under Scenario B. The number of speech interference events would differ from Scenario A (see Table WH3-15) only in that Residential Area 2 would experience four rather than three events per hour with windows closed.

WH3.2.2.3 *Interference with Classroom Learning*

WH3.2.2.3.1 Scenario A

Table WH3-16 presents changes in classroom noise levels with windows open and closed. As described in Section WH3.2.1.3, both the Knob Noster Elementary School and the Knob Noster High School with windows open are currently exposed to $L_{eq(SD)}$ greater than 40 dB. Under the proposed action, both schools would continue to be exposed to $L_{eq(SD)}$ greater than 40 dB when windows are open and the Knob Noster Elementary School would be exposed to $L_{eq(SD)}$ greater than 40 dB while windows are closed. Indoor background noise levels at Knob Noster High School would remain below 40 dB $L_{eq(SD)}$. The average number of events per hour that would exceed 50 dB would increase by one indoors with windows open, indoors with windows closed, and outdoors.

Table WH3-16. Indoor Classroom Learning Disruption Resulting from Scenario A at Whiteman AFB

ID	Description	Scenario A					Change				
		Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
		L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
S01	Knob Noster Elementary School	51	3	41	2	5	8	1	6	1	1
S02	Knob Noster High School	47	3	37	2	5	7	1	2	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reduction for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

WH3.2.2.3.2 Scenario B

Under Scenario B, the L_{eq(SD)} at Knob Noster High School would increase to 48 dB with windows open and to 38 dB with windows closed (Table WH3-17). The L_{eq(SD)} at Knob Noster Elementary School would be the same as under Scenario A with windows open or closed and the number of events with potential to interfere with speech would be the same under Scenario B as under Scenario A at both schools with windows open or closed.

Table WH3-17. Indoor Classroom Learning Disruption Resulting from Scenario B at Whiteman AFB

ID	Description	Scenario B					Change				
		Windows Open ^a		Windows Closed ^a		Outdoor	Windows Open ^a		Windows Closed ^a		Outdoor
		L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c	L _{eq(SD)} (dB)	Events per Hour ^b	L _{eq(SD)} (dB)	Events per Hour ^b	Events per Hour ^c
S01	Knob Noster Elementary School	51	3	41	2	5	8	1	6	1	1
S02	Knob Noster High School	48	3	38	2	5	8	1	3	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reduction for windows open and closed, respectively.

^b Average number of events per hour at or above an indoor L_{max} of 50 dB during an average 8-hour school day (8:00 A.M. to 4:00 P.M.).

^c Average number of events per hour at or above an outdoor L_{max} of 50 dB during daytime (7:00 A.M. to 10:00 P.M.).

WH3.2.2.3.3 Scenario C

Under Scenario C, L_{eq(SD)} and potential speech interference would be the same as under Scenario B (see Table WH3-17) except that the number of events per hour at Knob Noster High School with the potential to interfere with speech would be three rather than two.

WH3.2.2.4 Sleep Disturbance

As noted in Chapter 3, Section 3.2.3, the probability of sleep being disturbed at least once per night is estimated based on the number of overflight events and the SEL of each event. Although AFRC F-35A pilots would continue to conduct only initial approaches between 10:00 P.M. and 7:00 A.M., the noise level generated by the approaches would be higher and the number of sorties would increase. The probability of awakening would increase by 2 percent or less at the locations studied - and in any residential areas near the locations studied (Table WH3-18). Impacts to sleep

disturbance resulting from implementation of the AFRC F-35A mission would be the same regardless of which afterburner scenario is selected.

Table WH3-18. Average Probability of Awakening Resulting from the AFRC F-35A Mission at Whiteman AFB

Type	ID	Description	Annual Average Nightly (10:00 P.M. to 7:00 A.M.) Probability of Awakening (%)			
			AFRC F-35A Mission		Change	
			Windows Open ^a	Windows Closed ^a	Windows Open ^a	Windows Closed ^a
Park	P01	Knob Noster State Park campground	4	2	2	1
Residential	R01	Residential Area 1	8	5	1	1
	R02	Residential Area 2	11	7	2	1
	R03	Residential Area 3	6	3	1	1
School	S01	Knob Noster Elementary School	7	3	2	1
	S02	Knob Noster High School	6	3	1	1

^a Assumes standard values of 15 dB and 25 dB noise level reductions for windows open and closed, respectively.

WH3.2.2.5 *Potential for Hearing Loss*

Implementation of the AFRC-F-35A mission (with any of the three afterburner scenarios selected) would not expose any on-base or off-base residences to DNL greater than 80 dB. Therefore, PHL would not result from implementation of the AFRC F-35A mission.

WH3.2.2.6 *Occupational Noise*

USAF occupational noise exposure prevention procedures (e.g., hearing protection and monitoring) would be implemented under the AFRC F-35A mission, regardless of which afterburner scenario is selected. These procedures would comply with all applicable OSHA and USAF occupational noise exposure regulations.

WH3.2.2.7 *Non-auditory Health Impacts*

As noted in Section DM3.2.1.7, the current state of scientific knowledge does not yet support a consistent causal relationship between exposure to aircraft noise and non-auditory health impacts (i.e., impacts other than hearing loss). Several types of potential health impacts have been investigated in multiple studies with contradictory results (Meecham and Shaw 1979, Frericks *et al.* 1980, Jones and Tauscher 1978, Edmonds *et al.* 1979). The premise of the studies is that annoyance causes stress, and prolonged stress is known to be a contributor to a number of health disorders. The connection from annoyance to stress to health issues requires careful experimental design, and the resulting data are subject to different interpretations. A recent, large-scale study indicated that nighttime aircraft noise could be linked to increases in the likelihood of hypertension (Jarup *et al.* 2005, 2008), but it is not yet possible to establish a quantitative cause and effect based on the currently available scientific evidence.

WH3.2.2.8 *Structural Damage*

Damage to structures is not anticipated to result from AFRC F-35A subsonic noise because noise resulting from implementation of the AFRC F-35A mission would not exceed 130 dB in any 1/3-octave frequency band at distances of greater than 250 feet, (CHABA 1977).

Furthermore, studies conducted on vibrations induced by subsonic aircraft overflights generating noise levels similar to those that result from operation of the F-35A in ancient Anasazi ruins

indicate that vibrations would not occur at or near potentially damaging levels (Battis 1983). Additional discussion of the effects of noise on cultural resources is contained in Section WH3.7. Noise-induced structural vibration and secondary vibrations (i.e., “rattle”) of objects in structures would continue to occur. Induced vibrations do not normally result in structural damage, but the rattling of objects does have the potential to contribute to annoyance. Although the risk posed to structures by noise would be minimal, a process exists for dealing with any such damage. Any claims from USAF-related damage would begin by contacting the Whiteman AFB Public Affairs Office with details of the claim. The USAF would then investigate the claim to establish the exact nature and extent of the damage.

WH3.2.2.9 Animals in the Care of Humans

The reactions of animals in the care of humans (e.g., pets, other domesticated animals, and animals kept in zoos) to an increased number of loud overflight events was a concern raised in several scoping comments. An animal’s reaction to noise depends on several factors including the animal’s temperament, training, and past experiences associated with the noise. Certain domesticated animal species (e.g., horses) are more likely to have strong reactions to noise than others. Potential noise impacts on wildlife are discussed in Section WH3.6.

In the airfield environment, aircraft typically operate at slower speeds than are used in training airspace. Although these slower speeds mean that elevated overflight sound levels last longer, they also mean that there is a time lag between when the aircraft is first heard and maximum overflight noise level. Sounds with slow rise-times are less likely to induce panic than sudden onset noise (USAF 1994). Because F-35 and A-10 aircraft operate at similar speeds in the airfield environment, the rise times of noise generated by the two aircraft are similar.

One of the most important factors affecting an animal’s reaction to noise is the level of familiarity with the noise source. As described in Section WH2.0, the replacement of A-10 aircraft with F-35A aircraft would occur over approximately 2 years, and the tempo of F-35A operations would increase slowly as the new airframe gets established at the base. Around the base, AFRC F-35A pilots would use similar flight paths and altitudes to those currently used by A-10 pilots. For the purposes of this analysis, all noise impacts show the full impact of 24 aircraft. Because the reactions of domestic animals depends on several factors (e.g., species, situation, predisposition) there is no single noise level below which behavioral reactions would never occur. However, if it is assumed that noise events with the potential to interfere with human conversation could also be bothersome to animals, then the number of noise events per hour with potential to interfere with speech (Table WH3-15) could be an indicator of how frequently animals could be bothered by noise. It is recognized that this metric of noise events per hour with potential to interfere with speech is an arbitrary metric for determining how frequently animals would be bothered by noise. The metric is used purely as a measure of relative change between the No Action Alternative and proposed action.

WH3.2.3 Airspace Affected Environment

This section presents noise levels in training airspace and ranges that would be used by AFRC F-35A pilots. As described in Section WH2.4.1, Whiteman AFB-based AFRC F-35A pilots would operate in existing MOAs, RAs, and ATCAAs performing combat training missions similar to those currently conducted by Whiteman AFB-based A-10 pilots currently. Because no supersonic-authorized airspace is available, AFRC F-35A pilots would not conduct supersonic training within the ROI. As noted in Chapter 3, Section 3.2.1.1, subsonic noise in training airspace is quantified using the onset-rate adjusted day-night average sound level (L_{dnmr}). The location, types and number of munitions used during AFRC F-35A training would be similar to that used during A-10 training.

Therefore, munitions noise levels would remain approximately the same as under baseline conditions.

WH3.2.3.1 Subsonic Noise

Figure WH3-4 shows baseline subsonic noise levels beneath airspace proposed for use by AFRC F-35A pilots from Whiteman AFB. In the Smoky Low and High MOAs and R-3601, the noise levels are 48 and 53 dB L_{dnmr} , respectively. Noise levels beneath all of the other MOAs and RAs are below 45 dB L_{dnmr} .

WH3.2.3.2 Supersonic Noise

None of the airspace in the ROI is approved for supersonic flight. Therefore, sonic booms do not occur in the ROI under normal circumstances.

WH3.2.4 Airspace Environmental Consequences

WH3.2.4.1 Subsonic Noise

Changes in sortie tempo under the proposed action are discussed in Chapter 2, Section 2.3.4.1, and Section WH2.4.1. Late-night training (10:00 P.M. to 7:00 A.M.) by AFRC F-35A pilots would only be conducted in rare contingencies and as part of special mission training. Individual overflight noise levels (SEL) generated by A-10 and F-35A aircraft are listed in Chapter 3, Table 3-4. The proposed AFRC F-35A training sorties would occur in several large training airspace areas. Because training operations would be spread over a very large area, overflights of any particular location would be infrequent. As shown in Table WH2-6, approximately 94 percent of F-35A training time is spent at altitudes above 10,000 feet MSL. Because training would occur across a very large area, and because most of the training would be at high altitudes, the loudest of the overflights (i.e., overhead at low altitudes) would be rare. The L_{dnmr} in the Ada, Bison, Eureka, Lindbergh, Riley, Shirley, and Truman MOAs would remain below 45 dB because the number of training sorties is low relative to the size of the training airspace. The Smoky MOAs and R-3601 are currently used for 6,067 sorties annually, and in this context the addition of 313 F-35A sorties would not increase L_{dnmr} by more than 1 dB. In the Cannon and Salem MOAs and in R-4501, the number of sorties would increase by as much as 54 percent, and L_{dnmr} would increase by up to 2 dB. Overflight noise events have the potential to interfere with activities. An increase in the number of loud events, as reflected in increased L_{dnmr} , would be expected to increase the percentage of the population that is highly annoyed by noise.

During scoping, several comments expressed concerns about overflight noise while the aircraft are transiting from the airfield to and from the airspace proposed for use. Pilots transiting from the installation to training airspace and back again typically use a set of existing prescribed routes. Actual ground tracks of transiting aircraft vary based on several factors, and non-standard routing may be used, as needed, in response to air traffic, weather, or other time-varying conditions. AFRC F-35A pilots would typically transit at high altitudes and in cruise configuration using lowered engine power settings to reduce noise impacts and improve fuel efficiency. In addition, flight at these altitudes allows the aircraft to arrive at the training airspace at an appropriate altitude to begin training. Single overflight event noise levels generated by F-35A aircraft in cruise configuration are listed in Chapter 3, Tables 3-3 and 3-4.

Although AFRC F-35A pilots would implement measures to reduce noise, the noise generated by transiting aircraft can be disturbing, particularly when overflight noise affects national parks and other noise-sensitive places where ambient noise levels are low. Detailed discussion of recreation impacts is contained in Section WH3.8.

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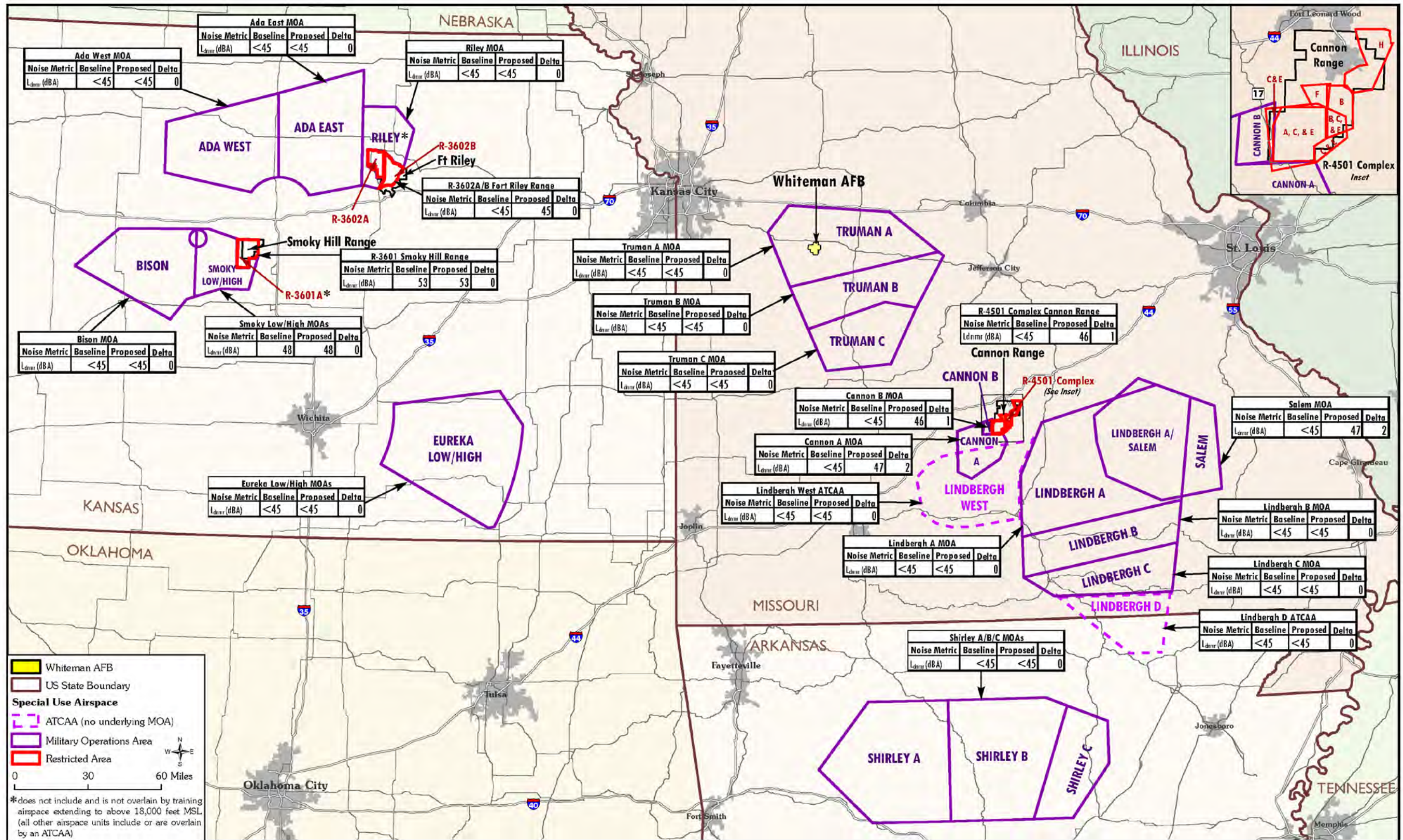


Figure WH3-4. Noise Levels in Training Airspace used by Whiteman AFB Pilots

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WH3.2.4.2 Supersonic Noise

No supersonic-authorized airspace is located in the ROI. Therefore, no supersonic training or sonic booms would occur in the ROI with implementation of the proposed action.

WH3.2.5 Summary of Noise Impacts

Implementation of the AFRC F-35A mission would expose an additional 2,421 acres, 2,517 acres, and 2,620 acres of land to DNL of 65 dB or greater, respectively, under Scenarios A, B, and C. The estimated additional people exposed to DNL of 65 dB or greater would be 2,226 under Scenario A, 2,507 under Scenario B, and 2,804 under Scenario C. The DNL at Knob Noster Elementary School would increase from less than 65 dB to 65 dB under all three scenarios, and would become an incompatible land use due to this level of noise unless special measures are taken to reduce interior noise levels. DNL would increase from 4 dB to 9 dB at the representative noise-sensitive locations around Whiteman AFB. DNL at 4 of the 6 representative noise-sensitive locations would increase to or exceed 65 dB under all three afterburner scenarios. Under Scenario A and B, both schools identified for evaluation in the EIS would experience an increase of one indoor event per hour causing speech interference (windows open and closed). Under Scenario C, Knob Noster High School would experience an additional two events per hour with windows closed that have the potential to interfere with speech.

Regarding noise under the airspace proposed for use, L_{dnmr} in the Ada, Bison, Eureka, Lindbergh, Riley, Shirley, and Truman MOAs would remain below 45 dB because the number of training sorties is low compared to the size of the training airspace. The Smoky MOAs and R-3601 are currently used for 6,067 sorties annually, and in this context the addition of 313 F-35A sorties would not increase L_{dnmr} by 1 dB. In the Cannon and Salem MOAs and in R-4501, the number of operations would increase by as much as 54 percent, and L_{dnmr} would increase by up to 2 dB. Overflight noise events have the potential to interfere with activities. An increase in the number of loud events, as reflected in increased L_{dnmr} , would be expected to increase the percentage of the population that is highly annoyed by noise. No supersonic-authorized airspace is located in the airspace proposed for use. Therefore, no supersonic training or sonic booms would occur.

Based on context and intensity, noise impacts to the area surrounding Whiteman AFB resulting from implementation of the proposed AFRC F-35A mission would be considered significant.

WH3.3 AIR QUALITY

The proposed AFRC F-35A mission at Whiteman AFB would result in net changes in air emissions due to the replacement of existing aircraft operations with operations from the proposed mission in the base region and associated airspace. The following section describes the air quality affected environment and estimations of impacts due to proposed construction and operational activities within these project regions.

WH3.3.1 Base Affected Environment

Air emissions resulting from implementation of the proposed AFRC F-35A mission at Whiteman AFB would primarily affect air quality within Johnson County and to lesser extent, Pettis County to the east. The MDNR has adopted standards that are the same as the National Ambient Air Quality Standards (NAAQS) for purposes of regulating criteria air pollutant levels within Missouri. Table 3-6 in Chapter 3, Section 3.3, of this Draft EIS presents the NAAQS.

WH3.3.1.1 *Region of Influence and Existing Air Quality*

Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as carbon monoxide [CO] and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as ozone (O₃) can extend much farther downwind than for inert pollutants. Ozone is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O₃ levels usually occurs several hours after they are emitted and many miles from their source.

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by the annual to tri-annual metrics described in Chapter 3, Section 3.3.1. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, Johnson County is in attainment of the NAAQS for all pollutants (USEPA 2018a).

WH3.3.1.2 *Regional Air Emissions*

Table WH3-19 summarizes estimates of annual emissions generated by activities in Johnson County for the year 2014. Emissions for Johnson County were obtained from the National Emissions Inventory (NEI) process (USEPA 2018b). The majority of emissions within this region occur from (1) on-road and nonroad mobile sources (VOCs, CO, NO_x, and carbon dioxide equivalent [CO₂e]), (2) prescribed fires (CO and sulfur oxides [SO_x]), (3) solvent/surface coating usages (VOCs), and (4) fugitive dust from unpaved roads and agricultural activities (particulate matter less than or equal to 10 micrometers in diameter [PM₁₀]/particulate matter less than or equal to 2.5 micrometers in diameter [PM_{2.5}]).

Table WH3-19. Annual Emissions for Johnson County, Missouri, 2014

Source Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO ₂ e (mt)
Stationary Sources	1,162	3,166	164	27	16,477	2,280	NA
Mobile Sources	792	7,655	1,633	6	101	74	224,743
Total Emissions^a	1,954	10,821	1,797	34	16,578	2,354	224,743

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO₂e (mt) = carbon dioxide equivalent in metric tons; NA = not available

Source: USEPA 2018b

WH3.3.1.3 *Whiteman AFB Emissions*

The AFRC F-35A mission at Whiteman AFB would replace activities associated with the 442 FW. This unit operates 24 A-10 aircraft at Whiteman AFB. The proposed AFRC F-35A aircraft replacement action at Whiteman AFB would primarily affect existing emissions from (1) A-10 operations, (2) A-10 engine maintenance and testing, and (3) Aerospace Ground Equipment (AGE). While the addition of 11 personnel that would result from implementation of the AFRC F-35A mission at Whiteman AFB would result in virtually inconsequential changes in emissions from other base sources associated with the 442 FW (e.g., onsite government motor vehicles or privately-owned vehicles), those changes have been calculated as part of the build-out emission calculations for the action. Nonetheless, the main focus of the project air quality analysis remains emissions from

existing and proposed aircraft-specific source categories to determine the net changes in emissions from the AFRC F-35A mission.

To estimate emissions from A-10 aircraft operations and AGE usages associated with the 442 FW mission at Whiteman AFB, the analysis employed the USAF Air Conformity Applicability Model (ACAM) version 5.0.13a (Solutio Environmental, Inc. 2019). Table WH3-20 summarizes the annual emissions estimated for the existing A-10 operations of the 442 FW. Volume II, Appendix C, presents details of the emission calculations presented in Table WH3-20. The net emissions change from the increase of 11 personnel (e.g., emissions from government and privately owned vehicle miles traveled by those 11 personnel) were included as part of the build-out emission calculations for the action.

Table WH3-20. Annual Emissions of Existing 442 FW A-10 Operations at Whiteman AFB

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Flight Operations and Engine Trim Tests - A-10s	1.59	44.14	3.21	1.14	7.36	3.53	3,167
Aircraft Engine Test Cells – A-10	0.02	0.54	0.18	0.03	0.16	0.09	90
Aerospace Ground Equipment	27.25	37.95	57.86	2.83	7.38	7.15	1,860
Total Emissions^a	28.86	82.63	61.26	4.01	14.90	10.76	5,117

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons

WH3.3.1.4 Regional Climate

Meteorological data collected at Sedalia and Concordia, approximately 17 miles east and 17 miles north, respectively, of Whiteman AFB, are used to describe the climate of the Whiteman AFB project region (Midwestern Region Climate Center 2018).

Temperature. Johnson County is known for warm summer months and cool conditions during the winter. The average high and low temperatures during the summer months at Whiteman AFB range from about 87 to 55 degrees Fahrenheit (°F). The average high and low temperatures during the winter months range from 54 to 19 °F.

Precipitation. Average annual precipitation for Whiteman AFB is 44.3 inches. Annual precipitation in the region peaks in the last spring. The peak monthly average rainfall of 5.6 inches occurs in June. Winter is the driest season, as the lowest monthly average of 1.6 inches occurs in January. The region averages 15 inches of snow per year.

Prevailing Winds. Wind data collected in the Kansas City area, about 55 miles west-northwest of Whiteman AFB, are used to describe the wind climate of the Whiteman AFB project region (National Climatic Data Center 1998). The annual average wind speed at Whiteman AFB is 11 miles per hour. March and April are the windiest months of the year and have monthly average speeds of 12 miles per hour. The winds prevail from the south for most of the year, except in January and February, when they prevail from the south-southwest.

WH3.3.1.5 Applicable Regulations and Standards

The MDNR Air Pollution Control Program is responsible for enforcing air pollution regulations in Missouri. The Air Pollution Control Program enforces the NAAQS by monitoring air quality, developing rules to regulate and to permit stationary sources of air emissions, and overseeing air quality attainment planning processes. The air quality regulations for the State of Missouri are found

in Title XL, Chapter 643 (Air Conservation) of the State of Missouri Revisor of Statutes and Title 10, Division 10 (Air Conservation Commission) of the Missouri *Code of State Regulations (CSR)*.

WH3.3.2 Base Environmental Consequences

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the proposed AFRC F-35A mission at Whiteman AFB. The estimation of operational impacts is based on the net change in emissions due to the replacement of existing A-10 aircraft operations with those of the proposed AFRC F-35A mission. Volume II, Appendix C, of this Draft EIS presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources at Whiteman AFB.

The air quality analysis for the AFRC mission at Whiteman AFB evaluates F-35A takeoff operations based on the three afterburner scenarios. Activity levels and resulting emissions for all other proposed operational activities would remain the same under each afterburner scenario.

The immediate area surrounding Whiteman AFB within Johnson and Pettis Counties currently attains all of the NAAQS. Therefore, the analysis compares the annual net change in emissions to the 250 tons per year prevention of significant deterioration permitting threshold. The prevention of significant deterioration permitting threshold represents the level of potential new emissions below which a new or existing minor, non-listed, stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for a project alternative is below 250 tons per year in the context of an attainment criteria pollutant, the indication is the air quality impacts would be insignificant for that pollutant.

WH3.3.2.1 Construction

The AFRC F-35A mission at Whiteman AFB would require C&D and/or renovation of airfield facilities such as training facilities, airfield surfaces, and maintenance facilities. Air quality impacts resulting from the proposed construction activities would occur from (1) combustive emissions due to the use of fossil fuel-powered equipment and (2) fugitive dust emissions (PM₁₀/PM_{2.5}) from the operation of equipment on exposed soil.

Construction activity data were developed to estimate construction equipment usages and areas of disturbed ground due to the proposed mission. These data were used as inputs to ACAM, which was used to estimate air emissions from proposed construction activities at Whiteman AFB. The air quality analysis assumed that all construction activities for the proposed AFRC F-35A mission would begin in 2021 and be completed in 2023.

During scoping, one commenter expressed concern about green building practices. As part of the beddown process, the USAF would require LEED Silver certification into proposed construction activities. Requiring LEED Silver certification along with standard construction practices would potentially reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. Chapter 3, Section 3.3.3.1, of this Draft EIS describes the standard construction practices that would control fugitive dust.

Table WH3-21 presents estimates of emissions from the infrastructure improvements for the AFRC F-35A mission at Whiteman AFB. These data show that even if total construction emissions occurred in one year, the construction emissions would be well below the annual indicator thresholds. Therefore, temporary construction emissions associated with the proposed AFRC F-35A mission would not result in significant air quality impacts.

Table WH3-21. Total Construction Emissions from the AFRC F-35A Mission at Whiteman AFB

Construction Activity	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Demolish Buildings	0.02	0.11	0.12	0.00	0.19	0.00	28
Renovate/Construct Buildings	0.47	2.42	2.15	0.01	0.19	0.09	470
Street/Ramp/Runway Repairs	0.28	1.54	1.77	0.00	4.06	0.08	411
Total Emissions^a	0.77	4.07	4.04	0.01	4.45	0.18	909
Annual Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable

WH3.3.2.2 Operations

The proposed AFRC F-35A mission at Whiteman AFB would primarily generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, and (3) AGE. The analysis also includes emissions that would occur from the net change in commuting activities between the proposed F-35A and existing A-10 missions at Whiteman AFB. Because the mission would result in a net increase of 11 personnel, this would produce a net increase in emissions from commuting activities. To estimate emissions from the AFRC F-35A mission at Whiteman AFB, the analysis employed the ACAM. The air quality analysis assumed that the proposed mission would reach full operations and resulting emissions in 2024 after the completion of all required infrastructure improvements.

The analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer, where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

During scoping, people submitted comments regarding the air pollutant impacts that could result from implementation of the proposed AFRC F-35A mission. Table WH3-22 summarizes the annual operational emissions that would result from implementation of the proposed AFRC F-35A mission at Whiteman AFB. The data in Table WH3-22 show that the replacement of existing A-10 aircraft operations with the proposed F-35A operations would result in reductions of VOC, CO, and PM₁₀, emissions and increases in all other pollutant emissions for the three afterburner scenarios. The data in Table WH3-22 also show that scenario emissions would increase with increasing afterburner use rates. Implementation of Scenario C (95 percent afterburner rate) would result in the most emissions, but the emissions would increase by less than 6 percent for any criteria pollutant compared to Scenario A (5 percent afterburner rate). The emission increases of NO_x, SO_x, and PM_{2.5} would not exceed any annual indicator threshold. Therefore, operational emissions associated with the proposed AFRC F-35A mission at Whiteman AFB would not result in significant air quality impacts.

Table WH3-22. Projected Annual Emissions from AFRC F-35A Mission Operations at Whiteman AFB, 2024 – All Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Scenario A							
Flight Operations and Engine Trim Tests - F-35A	0.14	61.22	55.35	6.14	9.76	8.77	16,975
Aircraft Engine Test Cells – F-35A	0.00	0.41	1.95	0.13	0.17	0.15	375
Aerospace Ground Equipment	8.20	14.39	23.60	1.65	2.43	2.36	1,130
Net Commuting Activities (F-35A - A-10 staff)	0.02	0.22	0.02	0.00	0.00	0.00	17

Table WH3-22. Projected Annual Emissions from AFRC F-35A Mission Operations at Whiteman AFB, 2024 – All Afterburner Scenarios (Continued)

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Scenario A (Continued)							
Total AFRC F-35A Mission Emissions	8.36	76.24	80.92	7.91	12.36	11.28	18,497
Existing 442 FW Emissions	28.86	82.63	61.26	4.01	14.90	10.76	5,117
AFRC F-35A Mission Minus 442 FW Emissions	(20.50)	(6.38)	19.67	3.91	(2.54)	0.51	13,380
Scenario B							
Total F-35A Mission Emissions	8.29	77.61	81.17	8.01	12.45	11.37	18,368
F-35A Mission Minus 442 FW Emissions	(20.50)	(4.27)	19.97	4.01	(2.45)	0.60	13,318
Scenario C							
Total F-35A Mission Emissions	8.29	79.73	81.55	8.11	12.55	11.46	18,322
F-35A Mission Minus 442 FW Emissions	(20.50)	(2.15)	20.35	4.11	(2.35)	0.69	13,272
Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e}(mt) = carbon dioxide equivalent in metric tons; NA = not applicable. () = negative values and net reductions in emissions

The VOC, CO, and PM₁₀ emission reductions estimated to result from the proposed AFRC F-35A mission at Whiteman AFB would result in the following positive effects within the Johnson/Pettis County region:

- VOC emission reductions would result in a net benefit to ambient O₃ levels, because the decrease in VOC emissions that would result from implementation of the proposed mission would be greater than the resulting increase in NO_x emissions.
- Reductions in VOC and PM₁₀ emissions would reduce the potential for people off base to be exposed to odors from fuel combustion.
- CO and PM₁₀ emission reductions would result in net benefits to these ambient pollutant levels.
- Proposed operations would generate hazardous air pollutants (HAPs), primarily in the form of VOCs and particulates from the combustion of aviation fuel in F-35A aircraft and AGE. The reduction in VOC and PM₁₀ emissions would result in a corresponding net reduction of HAPs. These emission reductions would result in similar net benefits to ambient HAP levels.

WH3.3.3 Airspace Affected Environment

Projected AFRC F-35A aircraft operations in the airspace proposed for use and along the flight routes between these locations and Whiteman AFB would affect air quality within these portions of Missouri, eastern Kansas, and northern Arkansas. All of the regions below and adjacent to these areas currently attain all of the NAAQS, except that the immediate area surrounding the intersections of Iron, Dent, and Reynolds Counties in Missouri currently does not attain the NAAQS for lead (known as the Buick/Viburnum Trend lead nonattainment area) (DNR 2009 and USEPA 2018a).

WH3.3.4 Airspace Environmental Consequences

AFRC F-35A pilots operating from Whiteman AFB would operate in the same airspace and training areas as existing 442 FW pilots, but at higher altitudes. The proposed AFRC F-35A operations in these areas would occur above 3,000 feet above ground level (AGL) about 99 percent of the time (Table WH2-6) and therefore these operations would not appreciably affect ground-level

air quality. Compared to existing 442 FW operations, A-10 operations occur below 3,000 feet AGL 46 percent of the time.

To quantify the air quality effects of the F-35A mission within the Whiteman AFB airspaces and training areas, the analysis employed the ACAM to estimate the net change in emissions between the replacement of existing A-10 aircraft operations with proposed F-35A aircraft operations within these areas. The analysis used aircraft flight profiles developed by the project noise analyses as inputs to the ACAM. The analysis focused on operations within the lowest 3,000 feet of the atmosphere.

Table WH3-23 presents the annual operational emissions that would result from implementation of the F-35A mission within the Whiteman AFB airspaces and training areas. These data show that the proposed changes in aircraft operations within these areas would result in net reductions in all air pollutant emissions within 3,000 feet AGL. Therefore, the AFRC F-35A mission at Whiteman AFB would result in a net improvement to ground-level air quality in the existing airspace and training areas, which would not result in significant air quality impacts. This also would be the case for potential impacts from the AFRC F-35A mission to the Buick/Viburnum Trend lead nonattainment area.

Table WH3-23. Projected Annual Emissions from the AFRC F-35A Mission Operations within Whiteman AFB Airspaces and Training Areas - 2024

Activity Type	Air Pollutant Emissions (tons per year) ^a						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Existing 442 FW Flight Operations - A-10	(0.90)	(17.19)	(83.59)	(8.36)	(20.78)	(13.13)	(25,266)
AFRC Mission Flight Operations – F-35A	0.00	0.22	11.89	0.58	0.63	0.57	1,748
F-35A Mission Minus 442 FW Emissions	(0.90)	(16.97)	(71.70)	(7.78)	(20.15)	(12.56)	(23,518)
Indicator Threshold	250	250	250	250	250	250	NA

^a Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions

WH3.3.5 Summary of Impacts to Air Quality

Johnson County is in attainment for all criteria pollutants. As shown in Table WH3-24, calendar year annual emissions from construction activities and the net change in aircraft operations around the base would not exceed the indicator threshold levels. Emissions would decrease in training airspace. Impacts to air quality resulting from the AFRC F-35A beddown would not be significant.

Table WH3-24. Summary of Calendar Year Annual Emissions from the AFRC F-35A Mission at Whiteman AFB

Activity/Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO _x	SO _x	PM ₁₀	PM _{2.5}	CO _{2e} (mt)
Construction – Year 2021	0.14	0.99	0.90	0.00	0.32	0.04	203
Construction – Year 2022	0.63	3.08	3.14	0.01	4.12	0.14	705
Construction – Year 2023	0.00	0.00	0.00	0.00	0.00	0.00	0
Net Change in Operations – Most Emissive Afterburner Scenario C -Year 2024+	(20.50)	(2.15)	20.35	4.11	(2.35)	0.69	13,272
Annual Indicator Threshold	250	250	250	250	250	250	NA

Key: CO_{2e} (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; () = negative values and net reductions in emissions.

WH3.4 SAFETY

Air Force Instruction (AFI) 90-801 *Environment, Safety, and Occupational Health Councils*, implements the risk management guidance within Air Force Policy Directive (AFPD) 90-8, *Environment, Safety, and Occupational Health Management and Risk Management*. All USAF missions and daily routines involve risk. Requirements outlined in this document provide for a process to maintain readiness in peacetime and achieve success in combat while safeguarding people and resources. The safety analysis contained in the following sections addresses issues related to the health and well-being of both military personnel and civilians living on or near Whiteman AFB and under the training airspace.

Specifically, this section provides information on explosive safety; fire risk and management; hazards associated with aviation safety (Accident Potential Zones [APZs]); aircraft mishaps; and Bird/Wildlife Aircraft Strike Hazard [BASH]).

The FAA is responsible for ensuring safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. To fulfill these requirements, the FAA has established safety regulations, airspace management guidelines, a civil-military common system, and cooperative activities with the DoD. The primary safety concern with regard to military training flights is the potential for aircraft mishaps (i.e., crashes) to occur, which could be caused by mid-air collisions with other aircraft or objects, weather difficulties, mechanical failures, pilot error, or bird-aircraft strikes.

WH3.4.1 Base Affected Environment

WH3.4.1.1 Explosive Safety

Two explosive safety quantity-distance (ESQD) arcs at Whiteman AFB cover approximately 1,490 acres (28 percent) of the installation and include the munitions storage area. The ESQD arcs are shown on Figure WH2-1.

WH3.4.1.2 Fire Risk and Management

Day-to-day O&M activities conducted at the base are performed in accordance with applicable USAF safety regulations, published USAF Technical Orders (TOs), and standards prescribed by Air Force Occupational Safety and Health (AFOSH) requirements including AFI 91-202, *The US Air Force Mishap Prevention Program*. Aircraft Rescue Firefighting services are available on a 24-hour basis. Upon notification of an in-flight or ground emergency, the crash and rescue services personnel would coordinate emergency services.

Whiteman AFB Fire Emergency Services responds to many different types of emergencies within their area of responsibility. These include, but are not limited to, aircraft and rescue firefighting emergencies, structural response, emergency medical services, hazardous material and technical rescue response such as confined space emergencies. The base is equipped with three structural fire engines, four ARFF units, one 5,000-gallon water tanker, two 1,000-gallon foam trailers, a specialized rescue vehicle, a special operations vehicle, a hazardous materials response trailer, and two command vehicles. The Fire Emergency Services Flight also has local mutual-aid agreements with the Johnson County and Pettis County Fire Protection Districts and the cities of Warrensburg, Knob Noster, and Sedalia.

Whiteman AFB adheres to specific emergency-response procedures contained in TO 00-105E-9, *Aerospace Emergency Rescue and Mishap Response Information*, for aircraft mishaps involving

composite materials (USAF 2018). TO 00-105E-9 contains a section (Chapter 3) on Mishap Composite Awareness.

WH3.4.1.3 Accident Potential Zones

In accordance with DoDI 4165.57, APZs are established at military airfields to delineate recommended compatible land uses for the protection of people and property on the ground. APZs define the areas of a military airfield that would have the highest potential to be affected if an aircraft mishap were to occur. Air Installations Compatible Use Zones (AICUZ) guidelines identify three types of APZs for airfields based on aircraft mishap patterns: the Clear Zone (CZ), APZ I, and APZ II. The standard USAF CZ for Class B runways such as Runway 01/19 at Whiteman AFB is a rectangle area that extends 3,000 feet from the end of a runway, is 3,000 feet wide, and identifies the area with the highest probability for mishaps. APZ I, which typically extends 5,000 feet from the end of the CZ, has a lower mishap probability, and APZ II, which typically extends 7,000 feet from the end of APZ I, has the lowest mishap probability of the three zones. If needed, to reflect different departure and arrival patterns, both the shape and size of APZs can be modified.

The northern CZ is entirely within installation boundaries. Land in the northern APZ I consists primarily of open space/low-density use with some residential, commercial, and public/quasi-public uses. Residential land use is incompatible with APZ I. Commercial land use is conditionally compatible. Land in the northern APZ II consists primarily of open space/low-density use but includes a large commercial parcel just north of Missouri Highway 50, which is conditionally compatible. The residential land in the northern APZ II along Highway NE 175 is compatible because it has density of less than one to two dwellings per acre (USAF 2015).

The southern CZ is entirely within installation boundaries. The majority of the southern APZs consist of open space/low-density land, which are compatible and however there are 37 acres of conditionally compatible residential land use in APZ II (USAF, 2015). Figure WH3-5 depicts the CZs and APZs at Whiteman AFB.

WH3.4.1.4 Aircraft Mishaps

Mishaps are defined as any damage that occurs on the ground or in flight. As shown in Table WH3-25, mishaps are classified into four categories, based on the severity of the mishap relative to property damage or personnel injury. Class A mishaps are the most severe with total property damage of \$2 million or more or a fatality and/or permanent total disability. Comparison of Class A mishap rates for various engine types, as calculated per 100,000 flying hours provide the basis for evaluating risks among different aircraft and levels of operations. This safety section analyzes existing and projected Class A mishap potentials based on flying hours and aircraft types.

Table WH3-25. Aircraft Class Mishaps

Mishap Class	Total Property Damage	Fatality/Injury
A	\$2,000,000 or more and/or aircraft destroyed	Fatality or permanent total disability
B	\$500,000 or more but less than \$2,000,000	Permanent partial disability or three or more persons hospitalized as inpatients
C	\$50,000 or more but less than \$500,000	Nonfatal injury resulting in loss of 1 or more days from work beyond day/shift when injury occurred
D	\$20,000 or more but less than \$50,000	Recordable injury or illness not otherwise classified as A, B, or C

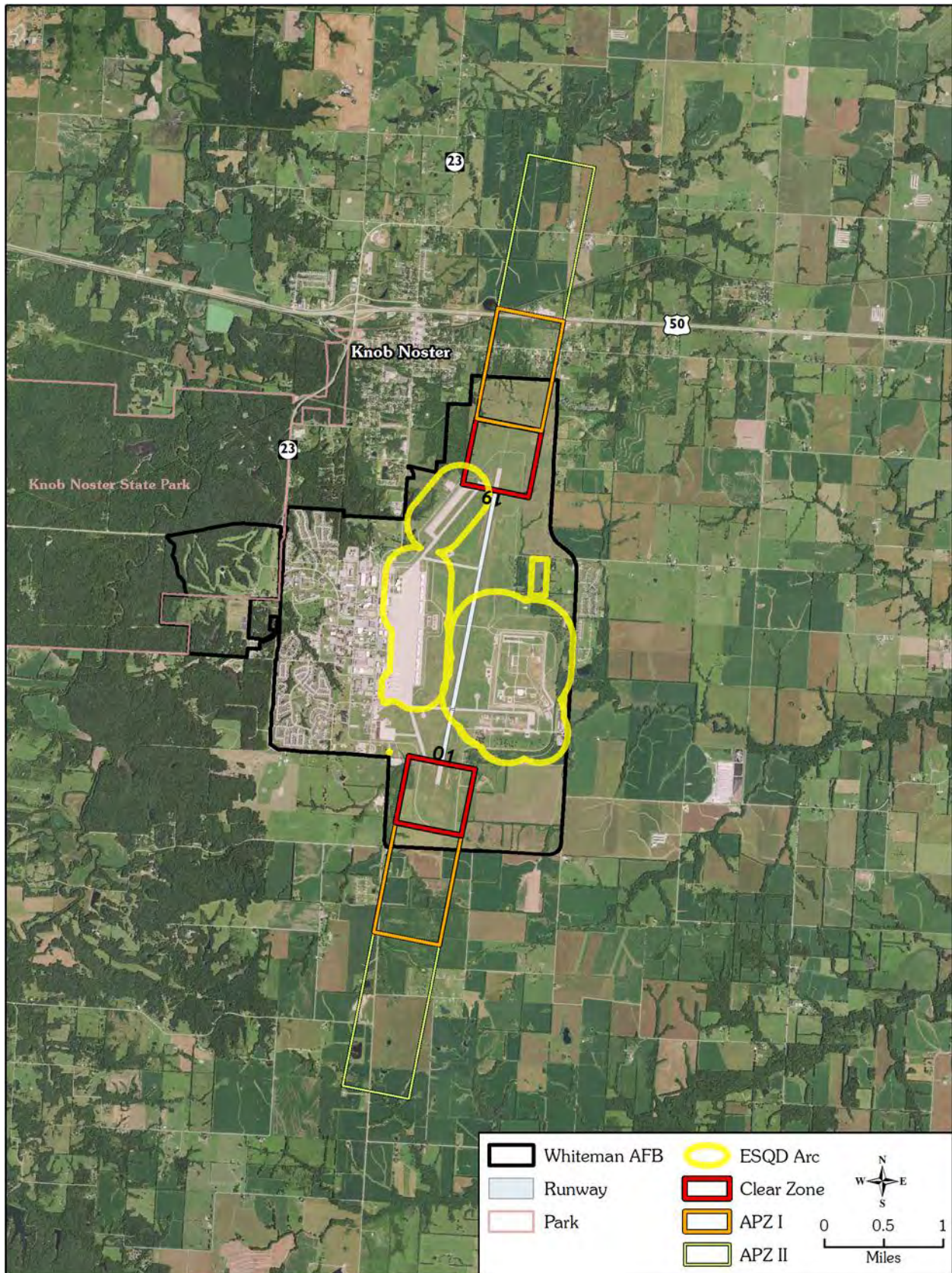


Figure WH3-5. CZs and APZs at Whiteman AFB

Aircraft flight operations at Whiteman AFB are governed by standard flight rules. Aircrews ensure flight safety when operating at the airfield by complying with all safety and aircraft operating requirements. No Class A or B mishaps have occurred during the past 3 years at Whiteman AFB. The lifetime Class A mishap rate for the A-10 is 1.93 for every 100,000 hours of flight time (USAF 2018).

WH3.4.1.5 Bird/Wildlife-Aircraft Strike Hazard

Bird and wildlife-aircraft strikes and the hazards they present form another safety concern for aircraft operations. Bird/wildlife-aircraft strikes constitute a safety concern because of the potential for damage to aircraft or injury to aircrews or local populations if an aircraft crash should occur in a populated area.

According to the Air Force Safety Center BASH statistics, from 1995 to 2016, where altitude at time of strike was known, more than 50 percent of the strikes occurred below 400 feet AGL, and 90 percent occurred below 2,000 feet AGL (USAF 2017). Waterfowl generally present the greatest BASH potential due to their flocking flight patterns and because, when migrating, they can be encountered at altitudes up to 20,000 feet AGL. Raptors also present a substantial hazard due to their size and soaring flight patterns. In general, the threat of bird-aircraft strikes increases during April and May and from August through November due to migratory activities. The USAF BASH Team maintains a database that documents all reported bird/wildlife-aircraft strikes. Historic information across the USAF for the past 20 years indicates that 11 USAF aircraft have been destroyed and five fatalities have occurred from bird/wildlife-aircraft strikes, with the last Class A mishap occurring in 2016 (USAF 2017).

The USAF BASH program was established to minimize the risk for collisions of birds and aircraft and the subsequent loss of life and property. AFI 91-202 requires each flying unit in the USAF to develop a BASH plan to reduce hazardous bird/animal activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard abatement program through awareness, avoidance, monitoring, and actively controlling bird and animal population movements. Some of the procedures outlined in the plan include monitoring the airfield for bird activity, issuing bird hazard warnings, initiating bird avoidance procedures when potentially hazardous bird activities are reported, and submitting BASH reports for all incidents. The Whiteman AFB BASH Plan provides specific guidance and assigns responsibilities in developing an effective bird strike hazard reduction program for Whiteman AFB (509 BW 2014).

The concentration of birds at and around Whiteman AFB poses a risk to flying operations. Whiteman AFB specific wildlife hazards to air operations historically include small perching birds, black birds, pigeons, waterfowl, and raptors (hawks and falcons). Whiteman AFB is also home to other wildlife including turkey, deer, and coyotes (509 BW 2014).

The Whiteman AFB BASH Plan is implemented in two phases. The first phase is implemented outside of migration season. During this phase aircraft are operated according to current Bird Watch Conditions (BWC), which are categorized as Low, Moderate, or Severe. BWC Severe or Moderate requires action from the installation's wildlife dispersal team to reduce the BWC to Low as soon as possible. BASH Phase II is implemented during migratory bird seasons and is in effect during the spring (1 April- 30 May) and fall (15 August-15 November). Phase II periods could be adjusted from year to year due to seasonal weather changes and migratory bird movement. Phase II elements include procedures for operations that occur one hour before to one hour after sunrise/sunset and or any other designated BASH window (509 BW 2014).

The BASH Plan also establishes implementation procedures and actions to minimize the potential of bird-aircraft strikes. Such measures include eliminating broad-leaf weeds, maintaining grass heights between 7 and 14 inches, planning of bare areas, removing dead vegetation and animals. BASH reduction techniques currently employed by the base include abating nuisance avian species, pyrotechnics, and depredation when necessary (509 BW 2014).

WH3.4.2 Base Environmental Consequences

O&M activities conducted on Whiteman AFB would continue to be performed in accordance with all applicable safety directives. No specific aspects of F-35A O&M would create any unique or extraordinary safety issues. Refer to Chapter 3, Section 2.3.4.2 for a discussion of the types of defensive countermeasures and ordnance that would be used by AFRC F-35A pilots. Only approved weapons systems would be used by AFRC F-35A pilots on the impact training ranges and pilots would adhere to all flare and live-fire use restrictions.

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All renovation and construction activities would be completed in compliance with all applicable OSHA regulations to protect workers. In addition, the newly constructed buildings would be built in compliance with antiterrorism/force protection requirements and explosives safety requirements. The USAF does not anticipate any significant safety impacts to result from construction, demolition, or renovation if all applicable AFOSH and OSHA requirements are implemented. In addition, O&M of the new munitions buildings would not result in significant safety impacts.

Although emergency and mishap response plans would be updated, the proposed AFRC F-35A mission at Whiteman AFB is not expected to create new or unique ground safety issues. Emergency and mishap response plans would be updated to include procedures and response actions necessary to address a mishap involving AFRC F-35A aircraft and associated equipment. With this update, airfield safety conditions would remain similar to baseline conditions. As indicated in Section WH3.5.2.1, base fire and emergency services would continue to participate in mutual-aid support agreements with nearby communities.

WH3.4.2.1 Explosive Safety

The construction and operation of the new munitions maintenance building would comply with Department of Defense Explosives Safety Board (DDESB) Standard 6055.09, *DoD Ammunition and Explosives Safety Standards* (DoD 2008), Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards* and AFMAN 32-1084, *Facility Requirements*. The new buildings' ESQD arcs would be calculated and sited to remain within current ESQD arcs as well as be compatible with existing facilities. No changes to explosive safety would result from the construction and operation of the proposed facilities at Whiteman AFB.

WH3.4.2.2 Fire Risk and Management

Fire and crash response would continue to be provided by Whiteman AFB Fire and Emergency Services. TO 00-105E-9 provides guidance on fire response to aircraft containing composite materials, including the F-35A. Firefighters would continue to be fully trained and appropriately equipped for crash and rescue response and the proposed AFRC F-35A beddown would not change these abilities. Aircraft pre-incident plans would be developed for the F-35A. Aircraft pre-incident plans are required to be reviewed, validated and/or updated annually or anytime there is a change to TO 00-105E-9 for the applicable aircraft. Equipment and training specific to addressing F-35A mishaps would be obtained and conducted prior to beddown. Additionally, Whiteman AFB would

keep local firefighting departments informed about any new information or firefighting techniques associated with composite materials should an accident occur.

WH3.4.2.3 Accident Potential Zones

No changes to existing APZs or CZs would be required to accommodate AFRC F-35A operations. For the reasons described in Section WH3.4.2.3, implementation of the AFRC F-35A mission would not increase the safety risk to these or other off-base areas. Whiteman AFB would continue to work with communities and developers to apply the AICUZ guidelines.

WH3.4.2.4 Aircraft Mishaps

Implementation of the proposed AFRC F-35A mission at Whiteman AFB would replace the existing A-10 mission operated by the 442 FW. During public scoping, several commenters were concerned with the flight safety of the single-engine F-35A, as well as the increased use of composite aerospace materials in the construction of the F-35A. Although the A-10 does have some composite material in wing leading edges, composites were not extensively used in A-10 construction. Approximately 42 percent of the F-35A, by weight, is comprised of composite materials (Air Force Research Laboratory 2015).

WH3.4.2.4.1 Flight Safety

In general, twin-engine aircraft have a lower mishap rate than single-engine aircraft. However, it is also true that aircraft with newer engines and designs have a lower mishap rate than aircraft with older engines and designs (Table WH3-26) and that the safety and reliability of single-engine USAF fighter aircraft has increased substantially over time. Table WH3-26 demonstrates the decreases in engine-related and lifetime mishap rates for 11 historic and current single-engine aircraft. The Pratt & Whitney F135 engine used in the F-35A was derived from the F119 engine, which is used in the F-22 Raptor. The F-22 features a 0.54 lifetime engine-related Class A flight mishap rate.

Table WH3-26. Class A Flight Mishap Rates

Decade Introduced	Aircraft/Engine	Engine-Related Cumulative Class A Mishap Rate	Engine-Related Class A Mishap Rate Last 6 Quarters	Lifetime Class A Mishap Rate
1950s	F-100/ J57	5.61	No longer in service	21.22
	F-102/ J57	3.41	No longer in service	Not available
	F-104/ J79	9.48	No longer in service	Not available
	F-105/ J75	4.56	No longer in service	12.15
	F-106/ J75	2.04	No longer in service	Not available
1960s	A-7/TF41	1.73	No longer in service	5.71
1970s	F-16/ F100-200	1.84	No longer in service	3.43
1980s	F-16/ F110-100	1.06	0.76	
	F-16/ F100-220	0.96	0	
1990s	F-16/ F110-129	0.85	0	
	F-16/ F100-229	0	0	

Historical trends of USAF aircraft show that mishaps of all types decrease the longer an aircraft is operational. For example, when the last single-engine fighter fielded by the USAF (F-16) surpassed 100,000 hours in 1982, its Class A rate was 15.83 with four fatal mishaps (USAF 2018).

Since then, the mishap rate for the F-16 has decreased substantially. In 2017, the F-16 had a lifetime Class A mishap rate of 3.39, and its rate for the last 10 years is 1.83 (USAF 2019).

Similarly, in 1979, when the A-10 surpassed 100,000 hours, its Class A rate was 9.24 with four fatalities recorded (USAF 2019). The A-10 has a lifetime Class A mishap rate of 1.90, and its rate for the last 10 years is 0.55 (USAF 2019).

As of March 2019, the F-35A has amassed more than 76,000 hours of flight time with three Class A mishaps, resulting in a mishap rate of 3.94 (Table WH3-27). These mishaps included an engine failure during takeoff preparation (the aircraft was safely brought to a halt), an aborted takeoff with damage confined to the engine, and a hydraulic failure resulting in collapsed nose landing gear that occurred after landing and parking. No injuries occurred during these events. Because the F-35A has not yet reached 100,000 hours, this rate is not directly comparable to other aircraft (Chapter 3, Section 3.4.3) with more flying hours. However, this mishap rate does provide some indication of the overall safety of the F-35A aircraft. For example, this rate is much lower than the 18.65 rate of the F-16 after a comparable amount of hours. The mishap rate for the F-35A is expected to decline as the aircraft becomes operationally mature.

Table WH3-27. F-35A Class A Flight Mishap History

Fiscal Year	Class A		Destroyed		Fatal		Hours Flown Per Year	Cumulative Flight Hours
	Number of Mishaps	Rate	Aircraft	Rate	Pilot	All		
2010	0	0.00	0	0.00	0	0	0	0
2011	0	0.00	0	0.00	0	0	0	0
2012	0	0.00	0	0.00	0	0	215	215
2013	0	0.00	0	0.00	0	0	1,283	1,498
2014	1	37.54	0	0.00	0	0	2,664	4,162
2015	0	0.00	0	0.00	0	0	7,467	11,629
2016	0	0.00	0	0.00	0	0	11,343	22,972
2017	0	0.00	0	0.00	0	0	22,714	45,686
2018	2	11.90	0	0.00	0	0	30,514	76,200
Lifetime	3	3.94	0	0.00	0	0	-	76,200

Note: Flight "rates" are number of mishaps per 100,000 flight hours. Only Aviation "Flight" mishaps are reported here. An aviation "Flight" mishap is any mishap in which there is intent for flight and reportable damage to a DoD aircraft.

Source: USAF 2019

During scoping, some comments were received regarding safety deficiencies of the F-35A aircraft. In a review of the production program for all models of the F-35 (A, B, and C), the Government Accountability Office, has noted various deficiencies as this advanced aircraft is developed and brought into production (GAO 2018). These deficiencies are being addressed as full-rate production is approached. The USAF recognizes that certain components have yet to reach full capability. The USAF would not operate any aircraft should safety-of-flight concerns be present.

WH3.4.2.4.2 Composite Aerospace Materials

Advanced composites have been used in aircraft construction since the late 1960s, when a boron-epoxy rudder was installed on the F-4 jet. As composite technology has advanced, the percentage of composite material used in modern aircraft has increased. Types of composites include carbon fiber (e.g., graphite used in sporting equipment), metal-matrix composites (e.g., materials used on spacecraft and racing bicycles), and ceramic-matrix composites (e.g., medical implants). As noted by members of the public during scoping, one disadvantage of certain composites is that these materials can degrade under extreme temperatures, resulting in the production of toxic fumes and airborne fibers. Because of these characteristics, composite aerospace materials present unique hazards to mishap responders. A burning aircraft could release toxic products, exposing personnel and the environment. Individuals exposed to a crash site could experience dermatological and

respiratory problems. Exposure to these hazards would not necessarily end when a fire is extinguished; exposure to recovery crews, site security, the surrounding population, and others could continue (Navy 2016). Sampling at mishap sites of aircraft containing composite materials indicated the presence of respirable fibers/dusts in the air. In addition, laboratory studies have identified respirable fiber products and toxic gases (including high levels of CO, NO_x, and hydrogen cyanide) from burning composite materials (Navy 2016).

Due to the rarity of mishaps involving composite aerospace materials, no epidemiological data are available on personnel exposure to burning composites. Similarly, no studies have assessed the toxicology of carbon fibers generated in a fire scenario with extended post-exposure duration. Synergistic interactions between the solid, vapor, and gaseous combustion products have also not been determined. However, research and experience during several crash responses do indicate that composite fiber release is relatively low (Air Force Research Laboratory 2015).

In the event of a crash of an aircraft containing composite materials, the USAF would follow the guidance contained in the *Mishap Response Checklist for Advanced Aerospace Materials/Composites* (USAF Advanced Composites Program Office 1993).

- Areas in the immediate vicinity of the mishap site affected by direct and dense fallout from the fire/explosion-generated smoke plume would be evacuated, along with easily mobile critical equipment. Aircraft and flight operations exposed to the immediate fallout area would be altered or moved. All unprotected personnel would be restricted from assembling downwind of the crash site.
- The fire would be extinguished and composites cooled to below 300°F. Only firefighters equipped with a self-contained breathing apparatus would be authorized in the immediate vicinity of a burning/smoking mishap site until the fire chief declares the area safe. If possible, high-pressure water break-up and dispersal of composite structures would be avoided.
- The mishap site would be roped or cordoned off and a single entry/exit point would be established upwind of the wreckage. Only sufficiently protected individuals would be authorized in the immediate mishap site and peripheral areas.
- Should personnel other than those at the accident site be directly and substantially exposed to adverse material hazards, the medical staff would be consulted for evaluation and tracking. Time permitting, the otherwise un-threatened populace in affected or fallout areas would be advised to do the following:
 - Remain indoors;
 - Shut external doors and windows;
 - Turn off forced air intakes; and
 - Await further notification.
- Specific aircraft hazards would be identified by inspection and consultation with the crew chief or aircraft specialists. Composite and other hazardous materials would be identified to mishap response personnel. The On-Scene Commander would be advised of all findings and recommendations.
- When exiting the crash site, personnel would use a high-efficiency particulate air-filtered vacuum, if available, to remove asbestos-containing materials (ACM) from their outer clothing, work gloves, boots, headgear, and equipment. If unavailable, efforts would be made to wipe or brush off as much contamination as possible. Clean sites (i.e., tent or trailer) would be set up for donning/removal of personal protective equipment if practical.

- Non-disposable clothing involved with crash/fire-damaged composite parts would be removed and laundered as determined by the base environmental engineer. Personnel should shower (in cool water) prior to going off-duty to preclude injury from loose fibers. Portable showers would be provided, if necessary.
- Burned/mobile composite fragments and loose ash/particulate residue would be secured with firefighting foam or a fine water mist until a hold-down fixant material is applied to immobilize the fibers. Initial actions should concentrate on debris containment. Investigators, specific aircraft authority, and the base environmental engineer would be consulted before applying any fixant.

WH3.4.2.4.3 Aircraft Mishap Summary

Aviation in all forms has inherent risk and it is not possible to guarantee the future flight-safety risk of any aircraft. However, due to the current F-35A record, the increasing safety trend for single-engine fighter aircraft, and increases in safety as an airframe matures operationally, it is reasonable to expect nominal changes in flight-safety risk to result from implementation of the AFRC F-35 mission at Whiteman AFB.

WH3.4.2.5 *Bird/Wildlife-Aircraft Strike Hazards*

The 17.4 percent airfield operations increase resulting from the AFRC F-35A mission could increase the risk of bird/wildlife-aircraft strikes. However, strict adherence to the BASH plan and continuation of active BASH program activities would minimize these risks. The BASH plan would remain in place to reduce the risk of bird/wildlife-aircraft strikes.

WH3.4.3 **Airspace Affected Environment**

The airspace proposed for use by AFRC F-35A pilots from Whiteman AFB includes RAs, MOAs, and ATCAAs (Table WH2-5 and Figure WH2-2). Aircraft flight operations are governed by standard flight rules. The volume of airspace encompassed by the combination of airspace elements constitutes the ROI for airspace safety. These training areas allow military flight operations to occur without exposing civil aviation users, military aircrews, or the general public to hazards associated with military training and operations. This section describes the existing safety procedures in the airspace proposed for use and the following section evaluates changes that would occur with the introduction of the F-35A.

WH3.4.3.1 *Fire Risk and Management*

Fires attributable to flares are rare for three reasons. First, the altitude and other restrictions on flare use minimize the possibility for burning material to contact the ground. Second, to start a fire, burning flare material must contact vegetation that is susceptible to burning at the time. The probability of a flare igniting vegetation is expected to be equally minimal. Third, the amount and density of vegetation, as well as climate conditions, must be capable of supporting the continuation and spread of fire.

Aircraft based at Whiteman AFB utilize three live fire ranges, the Cannon Range at Fort Leonard Wood in Missouri and the Smoky Hill and Fort Riley Ranges in Kansas. Fort Riley manages fires in accordance with an Integrated Wildland Fire Management Plan. The Directorate of Emergency Services, Fire and Emergency Services Division, is responsible for controlling wildland fires. The primary goal of the plan is to provide a safe, sustainable training platform. All prairie areas on post are burned at least two years out of every five to reduce wildfire likelihood and to maintain tall grass prairie (Fort Riley 2016).

WH3.4.3.2 Aircraft Mishaps

Aircraft flight operations are governed by standard flight rules. Specific safety requirements are contained in standard operating procedures that must be followed by all aircrews operating from the airfield to ensure flight safety.

WH3.4.3.3 Bird/Wildlife-Aircraft Strike Hazard

The primary threat to military aircraft operating in the airspace is migratory birds. The exact number of birds struck in the airspace areas is difficult to assess because small birds are not detected until post-flight maintenance checks and the location of such strikes cannot be determined. Refer to Section WH3.4.1.5 for more information regarding BASH and the actions that are implemented to minimize bird strikes.

WH3.4.4 Airspace Environmental Consequences

The addition of F-35A aircraft to the airspace would not require changes to the management or structure of the airspace. AFRC F-35A pilots would fly mission profiles similar to those currently flown by A-10 pilots operating from Whiteman AFB, only at substantially higher average altitudes, including air-to-ground ordnance delivery and air combat training operations. Implementation of the AFRC F-35A mission would result in a 5.9 percent decrease in overall airspace sorties in the existing airspace proposed for use. As described in Section WH3.1.4, total sorties would remain within the capability and capacity of the airspace and ranges proposed for use.

WH3.4.4.1 Fire Risk and Management

Flare and ordnance deployment in authorized ranges and airspace is governed by a series of regulations based on safety and environmental considerations and limitations. These regulations establish procedures governing the use of flares over ranges, other government-owned and -controlled lands, and nongovernment-owned or -controlled areas. Chapter 2, Section 2.3.4.2, details the flares and ordnance proposed for use by AFRC F-35A pilots.

The frequency of flare use would decrease or stay the same as baseline conditions. AFRC F-35A pilots would only use flares in compliance with existing airspace altitude and seasonal restrictions to ensure fire safety. Based on the emphasis of flight at higher altitudes, roughly 90 percent of F-35A flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires. Lands surrounding the air-to-ground training impact areas underlying airspace ensure public protection by restricting access to areas associated with laser use, emitters, and ordnance delivery. All guidance, regulations, and instructions for ordnance delivery at the ranges would be adhered to by AFRC F-35A pilots. Mutual fire response and suppression agreements would continue.

WH3.4.4.2 Aircraft Mishaps

Continued maintenance of situational awareness and use of available communications for tracking the scheduled and near real-time status of the SUAs would help maintain a safe flying environment for all concerned. Any changes to those capabilities and the current or future areas in which this service is provided would be appropriately addressed and communicated through those same venues. The majority of flight operations would be conducted over remote areas; however, in the unlikely event that an aircraft accident occurs, existing response, investigation, and follow-on procedures would be enforced to ensure the health and safety of underlying populations and lands. Implementation of flight safety procedures and compliance with all flight safety requirements would minimize the chances for aircraft mishaps.

WH3.4.4.3 Bird/Wildlife-Aircraft Strike Hazards

AFRC F-35A pilots would operate the aircraft in the same airspace environment as other pilots from Whiteman AFB, albeit at a higher altitude than current aircraft. Therefore, the overall potential for bird-aircraft strikes would be reduced following the beddown of the F-35A. When BASH risk increases due to time of year, limits are and would continue to be placed on low-altitude flights. Briefings are provided to pilots when the potential exists for greater bird-strike risks within the airspace; AFRC F-35A pilots would also be subject to these procedures. Implementation of the AFRC F-35A mission would not result in significant BASH risks in the airspace proposed for use.

WH3.4.5 Summary of Impacts to Safety

No unique construction practices or materials would be required as part of any of the demolition, renovation, or construction projects associated with the proposed AFRC F-35A mission. All new construction incorporates antiterrorism/force protection requirements. All construction would be conducted in compliance with DDESB Standard 6055.09, AFMAN 91-201, and AFMAN 32-1084, and the ESQD arcs would not change. As of September 2017, the F-35A has amassed more than 36,000 hours of flight time with one Class A mishap resulting in a mishap rate of 2.73. Since the F-35A has not yet reached 100,000 hours, this rate is not directly comparable to other aircraft. As the F-35A becomes operationally mature, the F-35 mishap rate would be expected to continue to decline, as supported by the documented decline in mishap rates for the F-16 and A-10. Whiteman AFB has an active BASH program and the 17.4 percent increase in aircraft operations at Whiteman AFB could increase BASH incidents near the airfield. However, this increase is not anticipated to be significant. With regard to airspace, AFRC F-35A pilots would use the same airspace used by 442 FW pilots. Impacts to safety resulting from implementation of the new mission are not anticipated to be significant.

WH3.5 SOIL AND WATER RESOURCES

WH3.5.1 Base Affected Environment

WH3.5.1.1 Soil Resources

Whiteman AFB is located in the Central Lowlands physiographic province. This area is characterized by flat to gently rolling topography with soils that are composed of alluvium, loess, and residuum (Whiteman AFB 2015a). The alluvium consists of unconsolidated stratified sand and gravel, silty clay and silt loam. Silt, silty clay, and fine sandy silt comprise the loess. Weathering of bedrock has produced clayey silt or sandy silty clay soils derived from residuum (Whiteman AFB 2015a). The most common soil type found on Whiteman AFB is the Haplaquents-Urban land complex. Other common soils include Haig silt loam, Mandeville silt loam, and Sampsel silty clay loam. All these soils, except Mandeville silt loam, are deep, poorly drained soils. The Mandeville silt loam is a moderately deep, well-drained soil (Soil Survey Staff 2018). All these soils have a slight susceptibility to wind and water erosion. More detailed descriptions of the soils types on the base are available from the Web Soil Survey (Soil Survey Staff 2018).

WH3.5.1.2 Water Resources

WH3.5.1.2.1 Surface Water

The base is located within the Missouri River Drainage Basin and the Missouri River-Blackwater Subregion. A north south ridge divides the installation with the west side of the installation draining to Brewer's Branch and an unnamed creek. These drainages flow off the base and into

Clear Fork Creek and eventually into the Blackwater River. The east side of the installation drains to Long Branch which then flows off base into Muddy Creek. Other surface water features on the installation include Nugent, Skelton, North West, and North Lakes.

Whiteman AFB has a general stormwater National Pollutant Discharge Elimination System (NPDES) permit issued to the installation under Permit No. MO-R80F035 by the State of Missouri. The MDNR Missouri Clean Water Commission administers the state's NPDES program. The MDNR requirements for stormwater permitting are contained in 10 *CSR* 20-6.200 and are not substantially different from the federal guidelines contained in 40 *CFR* 122 (Whiteman AFB 2010b). To satisfy the requirements of the NPDES permit the USAF has prepared and currently implements a Stormwater Pollution Prevention Plan (SWPPP) (Whiteman 2010). The plan is annually reviewed and revised as necessary. The Whiteman AFB SWPPP references the NPDES Permit No. MO-R10A000 which is a land disturbance permit that applies, in part, to construction or other projects that will have a land disturbance greater than 1 acre.

WH3.5.1.2.2 Groundwater

Whiteman AFB is located within the Central Midwest Regional Aquifer System and the Deep Ordovician and Cambrian aquifers provide the primary water source for Whiteman AFB and the surrounding areas. Whiteman AFB draws its water from nine wells drilled into these aquifers at depths down to 1,171 feet (Whiteman AFB 2015a).

WH3.5.1.2.3 Floodplains

No Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) are available for Whiteman AFB. A floodplain study conducted in 2006 concluded that portions of the installation near Long Branch are within the 100-year floodplain (Figure WH1-2). No other floodplains are known to occur on the installation.

WH3.5.2 Base Environmental Consequences

WH3.5.2.1 Soil Resources

Implementation of the projects identified in Table WH2-1 would disturb approximately 2.9 acres of land, most of which has been previously disturbed. Impacts to soil resources near each of the project sites would result from ground disturbance (e.g., compaction; vegetation removal; and excavation for foundations, footings or utilities). Onsite soils (predominantly Haplaquents-Urban land complex) have a slight potential for wind and water erosion (Soil Survey Staff 2018). Implementation of management practices would minimize impacts to soil resources. These actions could include, but would not be limited to, installation of silt fencing and sediment traps, application of water sprays to keep soil from becoming airborne, and revegetation of disturbed areas as soon as possible, as appropriate. Therefore, potential impacts to soil resources would be minimal, and no significant impacts to soil resources would result from implementation of the new mission.

WH3.5.2.2 Water Resources

WH3.5.2.2.1 Surface Water

During scoping, one individual submitted a comment regarding run-off from the runways and the resulting impacts to local creeks and streams. No changes to the runway stormwater management system would result from implementation of the AFRC F-35A mission. Stormwater runoff from construction sites would be managed as described below.

Impacts to surface water can result from land clearing, grading, and moving soil, resulting in localized increases in stormwater runoff volume and intensity. In accordance with UFC 3-210-10, *Low Impact Development (LID)* (as amended, 2016) and the Emergency Independence and Security Act (EISA) Section 438 (42 USC §17094), any increase in surface water runoff as a result of the proposed construction would be attenuated through the use of temporary and/or permanent drainage management features (i.e., use of porous materials, directing runoff to permeable areas, and use of detention basins to release runoff over time). The integration of LID concepts incorporates site design and stormwater management principles to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts. Implementation of the AFRC F-35A mission would result in a 0.4-acre net decrease in impervious surfaces.

Prior to construction, the contractor would be required to obtain coverage under NPDES Permit No. MO-R10A000 by filing a NOI with the MDNR and preparing a site-specific SWPPP to manage stormwater discharges during and after construction until the area is revegetated. Upon revegetation, the contractor would file the Notice of Termination with the MDNR to terminate permit coverage. The USAF would specify compliance with the stormwater discharge permit in all of the contractor construction requirements. Other management practices that would be considered include the use of water sprays during construction to keep soil from becoming airborne, use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials, and revegetating the site in a timely manner.

The existing Whiteman AFB SWPPP also identifies control practices to be followed for spill prevention and response, routine inspection of discharges at sites, and proper training of employees. As part of the SWPPP, the base has identified individuals to be part of the Stormwater Pollution Prevention Team (SWPPT). The SWPPT meets annually, is responsible for all aspects of the SWPPP, and provides recommendations to the Environment, Safety, and Occupational Health Leadership Committee regarding the SWPPP status, any deficiencies, and deicing usage and outfall monitoring data.

No changes to the existing aircraft deicing operations would be necessary with implementation of the new mission. F-35A deicing activities would be conducted away from storm drains to prevent deicing effluent from entering the stormwater system.

WH3.5.2.2.2 Groundwater

Implementation of the AFRC F-35A mission would result in an increase (11) in personnel and a negligible increase in demand for potable water. No additional requirements for groundwater withdrawals are expected. Groundwater wells would not be disturbed as part of the proposed mission. No impacts to groundwater are anticipated.

WH3.5.2.2.3 Floodplains

No floodplains are located near any of the areas proposed for infrastructure development on Whiteman AFB. Therefore, no impacts to floodplains would result from implementation of the new mission.

WH3.5.3 Summary of Impacts to Soil and Water Resources

Implementation of the AFRC F-35A mission would disturb approximately 2.9 acres of land with a reduction of approximately 0.4 acres of impervious surface. No floodplains would be impacted and a SWPPP would be prepared for the proposed construction. Implementation of management practices would minimize impacts to soil resources, and projects would be designed and implemented in accordance with LID and EISA to minimize impacts to soil and water resources.

Therefore, potential impacts to soil and water resources would be minimal, and no significant impacts to soil or water resources would result from implementation of the proposed action.

WH3.6 BIOLOGICAL RESOURCES

The ROI for biological resources is defined as the land area (habitats) that could be affected by the infrastructure and construction projects on the base, and the primary airspace where AFRC F-35A pilots would predominantly fly. For the purposes of this biological resources analysis, the ROI for the proposed action and No Action Alternative includes Johnson County, Missouri.

WH3.6.1 Base Affected Environment

WH3.6.1.1 Vegetation

Whiteman AFB is located in the Prairie Division of the Humid Temperate Domain ecoregion. Vegetation associated with this ecoregion includes a mosaic of oak-hickory woodland and bluestem prairie. Historical land use of the area included a mosaic of woodland, cropland, and grassland or rangeland habitat.

Current vegetative surface areas at Whiteman AFB are either improved or semi-improved grounds, primarily consisting of landscaped areas and mowed former agricultural fields. Unimproved grounds at the installation include open prairie, mixed wood and hardwood urban forests, green belt areas, streams and ponds. Vegetation management at Whiteman AFB is guided by the Integrated Natural Resources Management Plan (INRMP), Urban Forest Management Plan, and the BASH Plan (Whiteman AFB 2014, 2015a).

WH3.6.1.2 Wildlife

Information on wildlife occurring on Whiteman AFB is provided in the INRMP (Whiteman AFB 2015a). Whiteman AFB supports a diversity of wildlife species common to an agricultural landscape. Common wildlife species include deer mice (*Peromyscus maniculatus*), fox (*Vulpes vulpes*), white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), coyote (*Canis latrans*), blackbirds (*Turdus merula*), robins (*Turdus migratorius*), crows (*Corvus brachyrhynchos*), barn swallows (*Hirundo rustica*), blue jays (*Cyanocitta cristata*), turkey vultures (*Cathartes aura*), downy woodpeckers (*Picoides pubescens*) and field sparrows (*Spizella pusilla*). Hardwood forests and riparian habitats support a wide variety of amphibian and reptile species, including toads, frogs, lizards, turtles, and snakes. Fish species are limited to the installation ponds that are periodically stocked with largemouth bass (*Micropterus salmoides*), crappie (*Pomoxis* spp.), and bluegill (*Lepomis macrochirus*) for recreational fishing.

WH3.6.1.3 Threatened, Endangered, and Special Status Species

WH3.6.1.3.1 Federally Listed Species

The USFWS's Information for Planning and Consultation (IPaC) online system was accessed on 8 February 2018 to identify current USFWS trust resources (e.g., migratory birds, species proposed or listed under the Endangered Species Act (ESA), inter-jurisdiction fishes, specific marine mammals, wetlands, and USFWS National Wildlife Refuge System lands) with potential to occur in the ROI for biological resources at Whiteman AFB.

On 8 February 2018, the USFWS provided an automated *Official Species List* via a letter that identified three threatened and endangered species protected under the ESA (16 USC § 1531 et

seq.) and one USFWS National Wildlife Refuge near Johnson County, Missouri. Table WH3-28 presents these species.

Table WH3-28. Federally Listed Species with Potential to Occur in Johnson County, Missouri

Common Name	Scientific Name	Federal Listing Status	Habitat	Historically Observed at Whiteman AFB?
<i>Mammals</i>				
Gray Bat	<i>Myotis grisescens</i>	Endangered	Gray bats roost in caves or mines year-round and use water features and forested riparian corridors for foraging and travel.	No
Indiana Bat	<i>Myotis sodalis</i>	Endangered	The Indiana bat and northern long-eared bat hibernate in caves or mines during the winter. During the active season in Missouri (April 1 to October 31), these species roost in forest and woodland habitats. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and could also include some adjacent and interspersed non-forested habitats (e.g., emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures). This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags that are 5 inches in diameter at breast height for the Indiana bat and 3 inches in diameter at breast height for the northern long-eared bat, and that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. Northern long-eared bats have also been observed roosting in human-made structures (e.g., buildings, barns, bridges, and bat houses); therefore, these structures should also be considered potential summer habitat and evaluated for use by bats.	No
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened		

Key: FE = federally endangered; FT = federally threatened

Source: Whiteman AFB 2015a; USFWS 2016a,b; USFWS 2017; USFWS 2018

No federally listed threatened, endangered, or candidate species are currently known to occur on Whiteman AFB. This assessment is based on historical surveys completed by the U.S. Department of Agriculture (USDA) in 1992, the Missouri Department of Conservation (MDC) in 1994, and subsequent survey work conducted in part of the INRMP (Whiteman AFB 2015a). Additionally, no critical habitat occurs on or near Whiteman AFB (USFWS 2018).

WH3.6.1.3.2 Migratory Birds

Migratory bird species protected under the Migratory Bird Treaty Act (MBTA) (16 USC §§ 703–712) could occur as residents or migrants near Whiteman AFB. Migratory birds, including waterfowl, raptors, and neo-tropical migrants, have been observed on base (Whiteman AFB 2015a). Under AFI 91-202 and AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*, Whiteman AFB maintains a BASH Plan that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes. The BASH Plan delineates responsibilities for minimizing potential hazards in the areas where tasked units assigned to Whiteman AFB conduct flying operations. In coordination with the

MDC, Whiteman AFB annually reports to the USFWS Migratory Bird Office regarding migratory bird activity and other wildlife control at the installation (Donaldson 2018). Additionally, a USDA wildlife biologist employed at Whiteman AFB manages potential wildlife hazards by removal, dispersal, and wildlife control methods to avoid any BASH incidents. Commonly controlled avian species include turkey vultures, pigeons (*Columba livia*), blackbirds, and wild turkeys (Whiteman AFB 2014). BASH habitat is managed intensively around the airfield environment to reduce the threat to human health and safety.

WH3.6.1.3.3 Bald and Golden Eagles

No bald or golden eagles protected under the Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668-668c) have been observed at Whiteman AFB. Although suitable bald eagle habitat is present in the mixed forest and open water habitats near the vicinity of the base, bald eagles have not been reported in Johnson County, Missouri (MDC 2018a). Golden eagles do not live in Missouri year-round, but could occur as winter migrants in small numbers.

WH3.6.1.3.4 USFWS National Wildlife Refuge System Lands

The USFWS IPaC report identified the Big Muddy National Fish and Wildlife Refuge as a natural resource area of potential concern (USFWS 2018). The refuge encompasses more than 17,000 acres of riverine area along the Missouri River and provides valuable bottomland and wet prairie habitat to a wide variety of fish, amphibians, reptiles, migratory birds, and mammals (USFWS 2013).

WH3.6.1.3.5 State-Listed Species

The MDC Missouri Natural Heritage Program was accessed to identify state-listed species (protected under the Rule 3 CSR 10-4.111 of the Wildlife Code of Missouri) with potential to occur within the ROI for biological resources at Whiteman AFB (MDC 2018b). Two state-listed species have been historically observed at Whiteman AFB. Neither species has been seen at the installation since the early 1990s. These species include the northern crawfish frog (*Lithobates areolatus circulosus*) and the greater prairie-chicken (*Tympanuchus cupido*). In 1994 the MDC collected a northern crawfish frog from a mowed field within the cantonment area. The greater prairie-chicken was also observed and known to establish leks on the flightline; however, no occurrences have been confirmed since the spring of 1993 (Whiteman AFB 2015a; Donaldson 2018).

WH3.6.1.4 Wetlands

Wetland delineations were completed at Whiteman AFB in 1995 and 1999 (Whiteman AFB 2015a). Approximately 88.29 acres of wetlands were identified on the installation. The wetlands occur primarily within the airfield between the runway and the parking apron. Drainage ditches associated with the airfield and the ammunition storage area, two holding ponds, and two large lakes on the base were previously identified as non-jurisdictional wetland habitats. Bear Lake is the only jurisdictional wetland on the base (Whiteman AFB 2015a).

WH3.6.2 Base Environmental Consequences

WH3.6.2.1 Vegetation

Activities associated with construction, demolition, and renovation projects would occur in developed or disturbed areas within the Community Commercial land use area of Whiteman AFB. Revegetation of temporarily disturbed areas would be conducted as directed by the base natural resource manager to minimize the potential for erosion and dust generation. No significant impacts to vegetation are anticipated to result from implementation of the AFRC F-35A mission at Whiteman AFB.

WH3.6.2.2 Wildlife

Potential impacts to wildlife could include ground disturbance and construction noise from the associated facility and infrastructure projects. In addition, airfield operations can result in bird/wildlife-aircraft strikes and noise impacts.

The areas planned for development for the proposed AFRC F-35A mission at Whiteman AFB are highly disturbed and provide little habitat for wildlife species. The existing turfgrass and landscaped areas provide some urban adapted wildlife species with limited habitat. This habitat would be lost with construction of the proposed facilities and infrastructure projects.

Noise resulting from the proposed construction, demolition, and renovation activities would be localized, short-term, and only occur during daylight hours. Areas proposed for construction are in a military industrial land use with frequent elevated noise levels. Impacts to wildlife from construction noise would be minimal.

Annual airfield operations are anticipated to increase by approximately 17.4 percent (Section WH2.3). Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Whiteman AFB would continue to adhere to the installation's BASH Plan and annually coordinate with the MDC regarding migratory bird activity and other wildlife control at the installation. Wildlife would continue to be controlled per the recommendations of MDC in coordination with the USFWS Migratory Bird Office and BASH habitat would be managed intensively around the airfield environment to minimize the risk of strikes.

Impacts to wildlife and domestic animals that could result from aircraft noise are summarized below and discussed in more detail in Section WH3.2.2 and in Volume II, Appendix B. As described in Section WH3.2.2, the number of acres exposed to DNL greater than 65 dB would increase. Because additional land would be exposed to DNL greater than 65 dB, additional animals would also be exposed to this noise. Animals hear noise at different levels, in different frequency ranges, and tolerate noise differently than humans. These differences make comparing the noise metrics created for evaluating human impacts to animal impacts difficult. However, the number of noise events per hour with potential to interfere with speech (Table WH3-15) can be used as an indicator of changing frequency noise events that could affect animals. For example, under baseline conditions, animals near the Knob Noster State Park campground currently experience four events per hour that are at a sufficient level to interfere with human speech. Implementation of the new mission would increase this number by one event per hour.

Volume II, Appendix B, summarizes a number of scientific studies that have been conducted on the effects of aircraft noise on animals. These studies have shown that animal species have a wide range of responses to aircraft noise. One conclusion of these studies is that a general response to noise by domestic animals and wildlife is a startle response. These responses vary from flight, trampling, stampeding, jumping, or running, to the movement of the head in the directions of the noise. These studies report that the intensity and duration of the startle response decreases with time, suggesting no long-term, adverse effects. The majority of the studies suggest that domestic animal species and wildlife show behaviors characteristic of adaptation, acclimation, and habituation to repeated aircraft noise (Volume II, Appendix B). Therefore, significant impacts to animals in the ROI would not result from implementation of the AFRC F-35A mission at Whiteman AFB.

WH3.6.2.3 Threatened, Endangered, and Special Status Species

WH3.6.2.3.1 Federally Listed Species

On 14 May 2018 the USFWS indicated that if this project involves the removal of less than 10 acres of suitable bat habitat and the trees would be cleared during the bat hibernation season (1 November to 31 March), they do not anticipate adverse effects to the three listed bat species. Because no trees would be cleared and no federally listed threatened, endangered, or candidate species and/or designated critical habitat occurs in the ROI near Whiteman AFB, no impacts to protected species are anticipated to result from implementation of the proposed AFRC F-35A mission.

WH3.6.2.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at Whiteman AFB would result in a 17.4 percent increase in annual total airfield operations. Any increase in operations could result in an increased opportunity for bird-aircraft strikes to occur. Adherence to the existing BASH program would minimize the risk of bird-aircraft strikes including those for migratory birds to negligible levels (Section 3.4.1.5). Noise-related impacts to migratory birds nesting near Whiteman AFB would be the same as those described for other wildlife. Minimal impacts to migratory birds would result from implementation of the proposed AFRC F-35A mission in the ROI near Whiteman AFB.

WH3.6.2.3.3 Bald and Golden Eagles

No bald or golden eagles occur on Whiteman AFB and therefore, no impacts to eagles would result from implementation of the proposed AFRC F-35A mission.

WH3.6.2.3.4 USFWS National Wildlife Refuge System Lands

The Big Muddy National Fish and Wildlife Refuge was identified by the USFWS IPaC report as an area near the base. None of the airspace proposed for training use overlies the Big Muddy National Fish and Wildlife Refuge. No impacts to this refuge would result from implementation of the proposed AFRC F-35A mission.

WH3.6.2.3.5 State-Listed Species

No state-listed species are known to occur on Whiteman AFB and therefore, no impacts to state-listed species would result from implementation of the proposed AFRC F-35A mission.

WH3.6.2.4 Wetlands

Construction, demolition, and renovation projects associated with the proposed action would not occur within or near any wetland areas. Therefore, there would be no impacts to wetlands at Whiteman AFB.

WH3.6.3 Airspace Affected Environment

The ROI for biological resources under airspace is defined as the primary airspace and ranges where AFRC F-35A pilots would predominantly fly.

WH3.6.3.1 Vegetation

The airspace proposed for use by AFRC F-35A pilots from Whiteman AFB covers approximately 23,514 square miles of land over Missouri, Kansas, and Arkansas. Primary range and airspace proposed for use covers approximately 7,805 acres of land over Missouri (Figure WH2-2).

Vegetation communities under the primary airspace proposed for use includes those of the Ozark Highlands ecoregion. Vegetation communities are dominated by open oak-hickory and shortleaf pine woodlands and forests, including an assemblage of various types of fens, forests, wetlands, fluvial features, and carbonate and siliceous glades (USGS 2009).

WH3.6.3.2 Wildlife

The Ozark Highlands ecoregion supports more than 200 species of terrestrial and aquatic fauna (USGWS 2009). Common mammal species known to the region include vole (*Microtus* sp.), chipmunks (*Tamias striatus*), squirrels (*Sciurus niger*, *S. carolinensis*), white-tailed deer, bobcats (*Lynx rufus*), coyotes, and multiple species of mice and bats. The region supports a wide diversity of avian species including flycatchers, vireos, larks, wrens, finches, warblers, woodpeckers, and various waterfowl such as ducks, geese, and teals. Wooded and open habitats support a range of raptor species such as hawks, falcons, and various owl species. A wide variety of reptiles and amphibians are present including various species of turtles, snakes, lizards, frogs, toads, salamanders, and newts.

WH3.6.3.3 Threatened, Endangered, and Special Status Species

WH3.6.3.3.1 Federally Listed Species

Federally listed threatened, endangered, and/or candidate species that could occur within the 22 counties included in the analysis of primary airspace and range areas proposed for use are presented in Table WH3-29. Due to the limited nature of ground disturbance in the areas under the primary airspace, plant, invertebrate, and fish species were excluded from further analysis. No critical habitat was identified under the primary airspace and range areas.

Table WH3-29. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Whiteman AFB

Common Name	Scientific Name	Federal Listing Status	Habitat
<i>Mammals</i>			
Gray Bat	<i>Myotis grisescens</i>	Endangered	Gray bats roost in caves or mines year-round and use water features and forested riparian corridors for foraging and travel.
Indiana Bat	<i>Myotis sodalis</i>	Endangered	Indiana bats and northern long-eared bats hibernate in caves or mines during the winter. During the active season in Missouri (April 1 to October 31) these species roost in forest and woodland habitats. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and travel and could also include some adjacent and interspersed non-forested habitats (e.g., emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures). This includes forests and woodlots containing potential roosts (i.e., live trees and/or snags 5 inches in diameter at breast height for the Indiana bat and 3 inches in diameter at breast height for northern long-eared bat, and that have exfoliating bark, cracks, crevices, and/or hollows), as well as linear features such as fencerows, riparian forests, and other wooded corridors. Northern long-eared bats have also been observed roosting in human-made structures (e.g., buildings, barns, bridges, and bat houses); therefore, these structures should also be considered potential summer habitat and evaluated for use by bats.
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	Threatened	

Table WH3-29. Federally Listed Species with Potential to Occur Under Primary Airspace and Primary Ranges Associated with the Proposed Action at Whiteman AFB (Continued)

Common Name	Scientific Name	Federal Listing Status	Habitat
<i>Birds</i>			
Red-cockaded Woodpecker	<i>Picoides borealis</i>	FE	The red-cockaded woodpecker prefers relatively open, parklike stands of pure pine with sparse hardwood midstories. Active colonies can be found in pine stands with a wide range of overstory stocking, but the birds do not tolerate dense hardwood stocking in the midstory. The species typically forages in pine or pine hardwood stands 30 years old or older.
<i>Amphibians</i>			
Ozark Hellbender	<i>Cryptobranchus alleganiensis bishopi</i>	FE	Ozark hellbenders need cool, clear streams and rivers with many large rocks.

Key: FE = federally endangered; FT = federally threatened

Source: USDA 2018; USFWS 2011, 2016a,b, 2017, 2018; Whiteman AFB 2015a

WH3.6.3.3.2 Migratory Birds

The primary airspace and range areas proposed for use are located in the USFWS-designated Bird Conservation Region 24 Central Hardwoods under the Mississippi Flyway (USFWS 2008). Under AFI 91-202 and AFI 91-212, Whiteman AFB employs a BASH Program that establishes an overall bird/wildlife control program to minimize aircraft exposure to potentially hazardous wildlife strikes.

WH3.6.3.3.3 Bald and Golden Eagles

Bald eagles are common migrants and winter residents throughout Missouri. Habitat includes estuaries, large lakes, reservoirs, and rivers. During winter, eagles congregate near rivers and reservoirs with open water and often near large concentrations of waterfowl. Golden eagles are also winter migrants in Missouri, but occur in much smaller numbers than bald eagle populations. Wintering eagles are known to perch near open water that provides favorable foraging habitat (MDC 2015).

WH3.6.4 Airspace Environmental Consequences

Impacts to biological resources occurring under the airspace proposed for use by AFRC F-35A pilots could result from overflights and associated noise, the use of munitions and flares, and bird-aircraft collisions. A review of current literature evaluating potential noise effects on wildlife is presented in Volume II, Appendix B.

WH3.6.4.1 Vegetation

Ground disturbance beneath the airspace proposed for use would be limited to the use of flares and munitions, which would be less than or the same as what is currently being used by A-10 pilots from Whiteman AFB and would only occur in areas that are currently approved for such use. Significant impacts to vegetation would not result from implementation of the AFRC F-35A mission in the areas under the airspace proposed for use by AFRC F-35A pilots stationed at Whiteman AFB.

WH3.6.4.2 Wildlife

All airspace proposed for use by AFRC F-35A pilots is currently used as active military airspace by military jet aircraft; therefore, no new types of impact would be introduced into these areas as a result of introducing the F-35A aircraft. Potential impacts are described below for overflights and associated noise, munitions and flares, and bird-aircraft collisions.

As shown on Figure WH3-4, L_{dnmr} would remain less than 45 dB beneath the Ada, Bison, Eureka, Lindbergh, Riley, Shirley, and Truman MOAs. Wildlife that are under the path of training overflights would be exposed to short, but intense noise events from overflights. These training airspace areas are very large, and training sorties are sufficiently spread out such that intense overflight noise events at any one location are infrequent. The L_{dnmr} would not change below the Smoky MOAs and R-3601. In the Cannon and Salem MOAs and in R-4501, the number of sorties would increase by as much as 54 percent, and L_{dnmr} would increase by up to 2 dB.

Low time-averaged noise levels (e.g., L_{dnmr}) do not imply that loud overflights do not or would not occur. Rather, they should be interpreted to mean that intense overflight noise events occur less frequently than in other areas. Wildlife in the MOAs and airspace where the L_{dnmr} is unchanged with the implementation of the proposed action would be exposed to noise events less frequently than those where the L_{dnmr} is increasing. In the Cannon and Salem MOAs and in R-4501 wildlife would have a greater frequency of exposure to aircraft noise that is potentially of high intensity and short duration. AFRC F-35A pilots would train at higher altitudes than the current A-10 pilots and this would tend to reduce the noise exposure.

Some physiological/behavioral responses (from both subsonic and supersonic noise) 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 could be more sensitive than other species and/or could exhibit different forms or intensities of behavioral responses. For instance, the results of one study indicate that wood ducks appear to be more sensitive to noise and more resistant to acclimation to jet aircraft noise than Canada geese (Edwards et al. 1979). Similarly, wild ungulates (e.g., deer) seem to be more easily disturbed than domestic animals.

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. Other factors influencing response to jet aircraft noise could 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. Proposed AFRC F-35A training would primarily occur at high altitudes, with 94 percent of total training time being spent at altitudes above 10,000 feet MSL. The higher flight profile could reduce the response of wildlife to aircraft noise.

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.

In summary, adverse behavioral responses ranging from mild to severe could occur in individual animals as a result of loud overflights. Mild responses include head raising, body shifting, or

turning to orient toward the aircraft. Moderate responses could include nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Volume II, Appendix B).

None of the airspace proposed for use by AFRC F-35A pilots operating from Whiteman AFB is approved for supersonic flight. Therefore, AFRC F-35A pilots operating from Whiteman AFB would not conduct supersonic flights in the airspace proposed for use and no impacts related to supersonic noise would occur.

Flares would be used as a defensive countermeasure by AFRC F-35A pilots during training operations. Flares would only be used in airspace areas currently approved for such use. Flare use by AFRC F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of flares released throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires or adverse impacts to underlying land areas and habitats. Ordnance delivery would only occur in ranges authorized for use. AFRC F-35A pilots would use the same amount of flares and ordnance as the current A-10 pilots, resulting in no change to the potential for adverse impacts to wildlife under the training airspace.

AFRC F-35A pilots would fly at higher altitudes than A-10 pilots, with the majority (99 percent) of operations occurring above 5,000 feet AGL (operations under 5,000 feet AGL would occur less frequently than baseline operations). Most birds fly below 500 feet, except during migration (Section WH3.6.4.3.2). No F-35A low-level flight training is expected to occur below 500 feet AGL and the potential for bird-aircraft collisions would be minor.

WH3.6.4.3 Threatened, Endangered, and Special Status Species

WH3.6.4.3.1 Federally Listed Species

Potential impacts to federally listed species and critical habitats that could occur under the airspace proposed for use would be the same as those described for wildlife. Therefore, it is anticipated that significant adverse impacts to federally listed species would not result from implementation of the AFRC F-35A mission.

WH3.6.4.3.2 Migratory Birds

Implementation of the AFRC F-35A mission at Whiteman AFB would result in a 5.9 percent decrease in aircraft sorties. A decrease in sorties could result in a decreased opportunity for bird-aircraft strikes. The chances of such bird-aircraft strikes are considered unlikely for the following reasons. AFRC F-35A pilots would predominantly fly above 5,000 feet AGL. Most bird strikes (95 percent) occur below 5,000 feet AGL. Except during migration most birds spend the majority of their time below 500 feet. Migrations typically occur in ranges from 500 to 2,000 feet. The highest known flight of a North American migratory bird species is that of the mallard duck (*Anas platyrhynchos*), which has been observed to fly as high as 21,000 feet (World Atlas 2016). Vultures (*Aegypius monachus*) sometimes rise to elevations higher than 10,000 feet in order to scan larger areas for food and to watch the behavior of distant vultures for clues to the location of food sources (Stanford University 1988). Due to the predominant use of higher altitudes, implementation of the proposed AFRC F-35A mission would result in minimal impacts to migratory birds protected under the MBTA.

WH3.6.4.3.3 Bald and Golden Eagles

Potential impacts to bald and golden eagles and habitats that occur in areas under the primary airspace and range areas would be similar to those described in Section WH3.6.4.3.2. AFRC F-35A pilots would fly at higher altitudes than A-10 pilots, reducing the potential for BASH. As such, no impacts to eagles would result from implementation of the proposed AFRC F-35A mission at Whiteman AFB.

WH3.6.5 Summary of Impacts to Biological Resources

Construction activities on the base would occur in previously disturbed areas. Impacts to wetlands and protected species would not result from implementation of the proposed action. Noise resulting from construction activities would not affect wildlife or protected species because areas where construction is proposed are currently exposed to high noise levels. Aircraft operations near Whiteman AFB and in the airspace proposed for use would expose some wildlife species to increased levels of noise and the 17.4 percent increase in aircraft operations near the base could result in increased bird-aircraft strikes. However, because these species are currently exposed to military and commercial aircraft noise, impacts to biological resources are not anticipated to be significant.

WH3.7 CULTURAL RESOURCES

Cultural resources are historic districts, sites, buildings, structures, or objects considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. They include archaeological resources, architectural/engineering resources, and traditional resources. Cultural resources that are eligible for listing on the National Register of Historic Places (NRHP) are known as historic properties.

WH3.7.1 Base Affected Environment

WH3.7.1.1 Architectural Resources

Historical building inventories at Whiteman AFB (Weitze et al. 2009; Klinger and Smith 1997) have identified two buildings that are eligible for listing in the NRHP, Building 1230 and Building 4017. Building 1230 is designated as Site Oscar-01 and is a former Minuteman missile alert facility. Building 1230 is located in the southern portion of the main installation, north of Skelton Lake. Building 4017 is designated as a Strategic Air Command special storage facility and was an ordnance storage igloo associated with the Cold War-era. Building 4017 is located east of the airfield. Whiteman AFB has concluded that no other NRHP-eligible buildings are present on the installation.

WH3.7.1.2 Archaeological Resources

Numerous archaeological surveys have been conducted on Whiteman AFB (Klinger and Smith 1997). No NRHP-eligible sites were identified in these surveys and the survey reports have concluded that there is a low probability for significant archaeological resources in the developed portions of the installation.

WH3.7.1.3 Traditional Resources

Eleven (11) tribes have been identified that are potentially affiliated with the installation. These tribes, listed in Table A-1 in Volume II, Appendix A, Section A.7.2, have been asked to provide information on any properties to which they attach religious and cultural significance. No known tribal sacred sites or properties of traditional religious and cultural importance are located on Whiteman AFB.

WH3.7.2 Base Environmental Consequences

Implementation of the proposed AFRC F-35A mission at Whiteman AFB would include the construction of four new facilities, demolition of one building, and eight renovation projects (Table WH2-1 and Figure WH2-1). All buildings within the Area of Potential Effects (APE) have been evaluated for NRHP eligibility and determined non-eligible and Whiteman AFB has made a finding of no historic properties affected for this action. The Missouri SHPO has concurred with these findings (see letter dated 13 June 2018, Volume II, Appendix A, Section A.7.3).

No impacts to known archaeological resources would result from implementation of the proposed AFRC F-35A mission at Whiteman AFB. All portions of the base with proposed construction are either in areas that have already been disturbed by previous construction or have been inventoried for archaeological resources. No NRHP-eligible archaeological resources have been identified in the APE. Because ground-disturbing activities would occur in previously disturbed and inventoried areas, it is extremely unlikely that any previously undocumented archaeological resources would be encountered during facility demolition, renovation, addition, or construction. In the case of unanticipated or inadvertent discoveries, the USAF would comply with NHPA and Native American Graves Protection and Repatriation Act (NAGPRA) regulations.

NRHP-eligible facilities located on the installation (Buildings 1230 and 4017) are located outside the APE and there would be no direct impact to historic properties. Indirect impacts on cultural resources from population changes, noise or visual intrusions would be extremely unlikely. The total authorized personnel at Whiteman AFB would increase (11 persons) with the proposed action. This small population change would not have an indirect impact on cultural resources at the installation. Both Buildings 1230 and 4017 would be located between the 70 and 75 dB DNL contour lines. As described in Section WH3.2.3 the noise levels in these zones would not be at high enough levels to cause structural impacts to buildings. Visual intrusion from the proposed action would not be a significant issue. Both NRHP-eligible buildings derive their historical significance from association with military activities and their setting within a military installation. New construction would occur in the context of an active USAF base, where changes in the infrastructure are common. The viewshed of remaining historic properties would not be affected by the proposed construction.

No Section 106 impacts to tribal resources or traditional cultural properties are anticipated to result from implementation of the AFRC F-35A mission. As required by Sections 101(d)(6)(B) and 106 of the NHPA; implementing regulations prescribed in 36 *CFR* Section 800.2(c)(2); EO 13175, *Consultation and Coordination with Indian Tribal Governments*; DoDI 4710.02; and AFI 90-2002, *Air Force Interactions with Federally Recognized Tribes*, Whiteman AFB initiated Section 106 government-to-government consultation with eleven tribes to identify traditional cultural properties. Volume II, Appendix A, Section A.2.7.2, contains a record of these consultations. The consultation correspondence included an invitation to participate in the NEPA process, and an invitation to consult directly with the Whiteman AFB Commander regarding any comments, concerns, and suggestions.

WH3.7.3 Airspace Affected Environment

Table WH3-30 presents the NRHP-listed sites and Native American Reservation lands under the airspace proposed for use. The Whiteman AFB training airspace overlies at least part of 29 Missouri counties (Benton, Camden, Carter, Cooper, Crawford, Dent, Henry, Hickory, Howell, Iron, Johnson, Laclede, Lafayette, Moniteau, Morgan, Oregon, Pettis, Phelps, Pulaski, Reynolds, Ripley, Saline, Shannon, St. Clair, St. Francois, Texas, Washington, Wayne, and Wright); 27 Kansas counties (Barton, Butler, Chautauqua, Clay, Cloud, Crowley, Dickinson, Elk, Ellsworth, Geary, Greenwood, Lincoln, McPherson, Mitchell, Montgomery, Osborne, Ottawa, Pottawatomie, Republic, Rice, Riley, Rush, Russell, Saline, Washington, Wilson, and Woodson) and 15 Arkansas counties (Baxter, Cleburne, Conway, Faulkner, Independence, Izard, Jackson, Johnson, Newton, Pope, Searcy, Sharp, Stone, Van Buren, and White).

Four hundred thirteen (413) NRHP-listed properties have been identified under the Whiteman AFB airspace. Fifty-five (55) of these are located under the primary airspace and range areas. No known traditional cultural resources have been identified under the airspace. It is possible that such resources could exist in the area as the exact location of some traditional cultural resources is confidential.

Table WH3-30. NRHP-Listed Sites and Native American Reservation Lands Under Whiteman AFB Training Airspace

Airspace Designations	Number of NRHP Properties Under Airspace ^a	Native American Reservation Lands Under Airspace ^a
Ada East and West MOAs	18	None
Bison MOA	14	None
Eureka High/Low MOAs	19	None
Lindbergh A/B/C MOAs	33	None
Riley MOA	2	None
Salem MOA	14	None
Shirley A/B/C MOAs	227	None
Smoky MOA	7	None
Truman A/B/C MOAs	62	None
Lindbergh West ATCAA	7	None
Lindbergh D ATCAA	10	None

^a Due to the sensitivity of the locations, archaeological sites are not included in this table or shown on any figures.

WH3.7.4 Airspace Environmental Consequences

Implementation of the proposed action would result in a 5.9 percent decrease in the total sortie-operations conducted annually in the airspace proposed for use. As described in Section WH3.2.4, L_{dnmr} under the training airspace would remain the same (0 dB increase) or slightly increase (1 to 2 dB), and the highest L_{dnmr} would remain at 53 dB. No supersonic flights would occur in the Whiteman AFB training airspace. No impacts on historic properties under the Whiteman AFB training airspace are expected. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (see Volume II, Appendix B, Section B.2.10).

WH3.7.4.1 Native American Concerns

During scoping, the USAF contacted 11 federally affiliated Native American tribes to invite them to attend the public meetings and express their concerns about the potential AFRC F-35A mission at Whiteman AFB. During the scoping process, including the public meetings, no comments regarding potential impacts on traditional cultural resources or traditional cultural properties were received.

In accordance with Section 106 of the NHPA and EO 13175, USAF also has contacted the 11 tribes to consult on a government-to-government basis regarding their concerns about potential impacts on traditional cultural resources and traditional cultural properties under airspace associated with Whiteman AFB. Four tribes have responded to the request for consultation. Three of the tribes indicated concurrence, approval, or no interest in the project. One tribe requested a copy of the Draft EIS. USAF coordination with interested tribes regarding airspace actions will continue throughout the EIS process.

WH3.7.5 Summary of Impacts to Cultural Resources

No archaeological sites are located in any of the proposed construction footprints at Whiteman AFB. In the case of unanticipated or inadvertent discoveries, the USAF would comply with Section 106 of the NHPA. All buildings within the APE have been evaluated for NRHP eligibility and determined non-eligible and the Missouri SHPO has concurred with this finding. Section 106 consultation is considered complete and Whiteman AFB will continue to coordinate with interested tribes throughout the EIS process. No impacts to historic properties under the airspace proposed for use

are expected. Implementation of the AFRC F-35A mission is not anticipated to result in significant impacts to cultural resources.

WH3.8 LAND USE AND RECREATION

WH3.8.1 Base Affected Environment

WH3.8.1.1 Land Use

On-base construction would be consistent with established base land uses. Because potential land use consequences would primarily be noise-related, the discussion in this section focuses on noise-related land use regulations and compatibility constraints. The following paragraphs address federal, state, and local statutes, regulations, programs, and plans that are relevant to the analysis of land use for Whiteman AFB and the surrounding areas.

Installation Development Plan (IDP). The Whiteman AFB IDP guides future development and land use decisions at Whiteman AFB (USAF 2015).

Joint Land Use Study (JLUS). The JLUS for Whiteman AFB was published in 2008 with the City of Knob Noster and Johnson County serving as participating communities. The JLUS was developed to encourage cooperative land use planning between the military and surrounding civilian land uses, to seek a cooperative means to anticipate and minimize the impacts of military operations on adjacent lands, and to protect and promote the future operational mission of Whiteman AFB.

The 2009 Military Airport Comprehensive Plan for the Unincorporated Area of Johnson County, Missouri. In 2009, after the JLUS was completed, the Johnson County Airport Zoning Commission published the comprehensive plan to focus on the necessary restrictions to allow for the safe and secure daily activities of both the public and the government (JCAZC 2009).

Local Regulations and Ordinances. Whiteman AFB and surrounding communities have been working on compatibility planning since the 2008 JLUS. The Johnson County Military Airport Zoning Commission was developed to provide encroachment protection for the base by limiting population density near the base and establishing reasonable limits for acreage minimums for residential development. The base actively participates in providing information to support ongoing community planning initiatives. Similarly, two surrounding communities have adopted regulatory overlays to address noise and air safety impacts. The Whiteman AFB compatibility menu identifies 39 strategies for land use planning.

On-Base Land Use. Whiteman AFB occupies approximately 5,419 acres (3,879 owned and 362 leased) with 1,178 acres of easements of federally owned or leased land at the eastern edge of Johnson County, Missouri. Land use on the base is generally divided into six planning districts. The Airfield District, which encompasses approximately 2,423 acres of the base, is the largest.

Surrounding Land Use. Whiteman AFB is located in west-central Missouri, directly south of Knob Noster and 7 miles east of Warrensburg. Land use surrounding the base is generally rural, agricultural land with wooded, flat, and rolling terrain.

As identified in Table WH3-31, under baseline conditions, land uses exposed to DNL of 65 dB or greater primarily consist of open areas, followed by residential, commercial and industrial areas. Approximately 98 acres of residential land is currently exposed to DNL of 65 dB or greater, resulting in incompatible use.

Table WH3-31. Off-Base Acres Currently Exposed to DNL of 65 dB or Greater at Whiteman AFB

Land Use Category ^a	DNL (dB)					Total
	65–69	70–74	75–79	80–84	≥ 85	
Commercial	17	12	0	0	0	29
Industrial	23	2	0	0	0	25
Open	1,381	504	52	0	0	1,937
Public/Quasi-Public	0	0	0	0	0	0
Recreational	0	0	0	0	0	0
Residential	79	19	0	0	0	98
Water	0	0	0	0	0	0
Total	1,500	537	52	0	0	2,089

^a All numbers are in units of acres

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Source: USAF 2015

WH3.8.1.2 Recreation

Whiteman AFB hosts an outdoor track, a 16-lane bowling center, an 18-hole golf course, two basketball courts, several baseball and soccer fields, tennis courts, and two swimming pools. The fitness center hosts state-of-the-art exercise machines and a gym with a basketball court. Although Whiteman AFB offers a variety of both indoor and outdoor recreational facilities, the IDP identified a need to pursue a consolidated recreation complex to leverage connections with the adjacent Knob Noster State Park (Whiteman AFB 2015b). Fishing, skeet, and archery are the only activities actively managed by the outdoor recreation office on base. Three ponds are open to recreational fishing on the base. The ponds are not regularly stocked but host a variety of species, including catfish, bluegill, and bass.

Knob Noster State Park is adjacent to the base and offers opportunities for camping, hiking, fishing, picnic areas, horseback riding, bicycle trails, and boating (Table WH3-32). Whiteman AFB is located in close proximity to multiple other recreational areas such as Truman Lake and Lake of the Ozarks. Multiple MDC Wildlife Areas offer hunting and fishing opportunities along with areas for hosting picnics and hiking.

Table WH3-32. Recreation Facilities near Whiteman AFB

ID	Recreational Facility	Activities	Current DNL (dB)	Compatibility (Y/N)
P01	Knob Noster State Park campground	Picnic areas, fishing, hiking, camping, bicycling, horseback riding	48	Y

WH3.8.2 Base Environmental Consequences

WH3.8.2.1 Land Use

WH3.8.2.1.1 Physical Development

The physical development associated with the proposed AFRC F-35A mission at Whiteman AFB would primarily occur in previously disturbed areas near the flightline where airfield and aircraft O&M support activities occur on a daily basis. None of the physical development associated with implementation of the proposed mission at Whiteman AFB would impact land use because the proposed construction and renovation would occur in land uses designated for the proposed use.

Subsequent O&M activities for the proposed mission would conform to current and future land uses on the base and traffic, noise, dust, and similar effects from construction equipment would be reduced through construction plans and practices agreed to by contractors. During scoping one commenter expressed concern about possible base expansion. No plans to expand the base or acquire land are part of the proposed AFRC F-35A mission. The physical changes and daily activities on the ground would be confined to the base. The proposed on-base development would have no impact to off-base areas. Impacts associated with physical development would be the same regardless of which afterburner scenario is selected.

WH3.8.2.1.2 Aircraft Operations

This analysis includes an evaluation of the potential noise impacts to on- and off-base land uses resulting from the proposed AFRC F-35A mission at Whiteman AFB. Volume II, Appendix B, Section B.2.2, presents the USAF noise compatibility guidelines for noise exposure to various land uses.

Scenario A

Implementation of Scenario A would increase the area surrounding Whiteman AFB exposed to DNL of 65 dB or greater by approximately 2,421 acres (Table WH3-33 and Figure WH3-6). This would result in an increase of approximately 3,045 off-installation estimated residents and an additional 307 acres of residential land exposed to DNL of 65 dB or greater.

Table WH3-33. Off-Base Acres Exposed to DNL of 65 dB or Greater at Whiteman AFB under Scenario A

Land Use Category ^a	DNL (dB)																	
	65–69			70–74			75–79			80–84			≥ 85			Total		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b
Commercial	17	22	5	12	22	10	0	0	0	0	0	0	0	0	0	29	44	15
Industrial	23	57	34	2	11	9	0	1	1	0	0	0	0	0	0	25	69	44
Open	1,381	2,925	1,544	504	844	340	52	198	146	0	0	0	0	0	0	1,937	3,967	2,030
Public/Quasi-Public	0	25	25	0	0	0	0	0	0	0	0	0	0	0	0	0	25	25
Recreational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	79	322	243	19	82	63	0	1	1	0	0	0	0	0	0	98	405	307
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,500	3,351	1,851	537	959	422	52	200	148	0	0	0	0	0	0	2,089	4,510	2,421

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Source: USAF 2015

The JLUS identifies residential (except for mobile home parks), commercial, industrial, open, and public/quasi-public land uses as compatible, or generally compatible, with DNL from 65 to 75 dB when measures to achieve overall noise level reduction are included in the facility design and

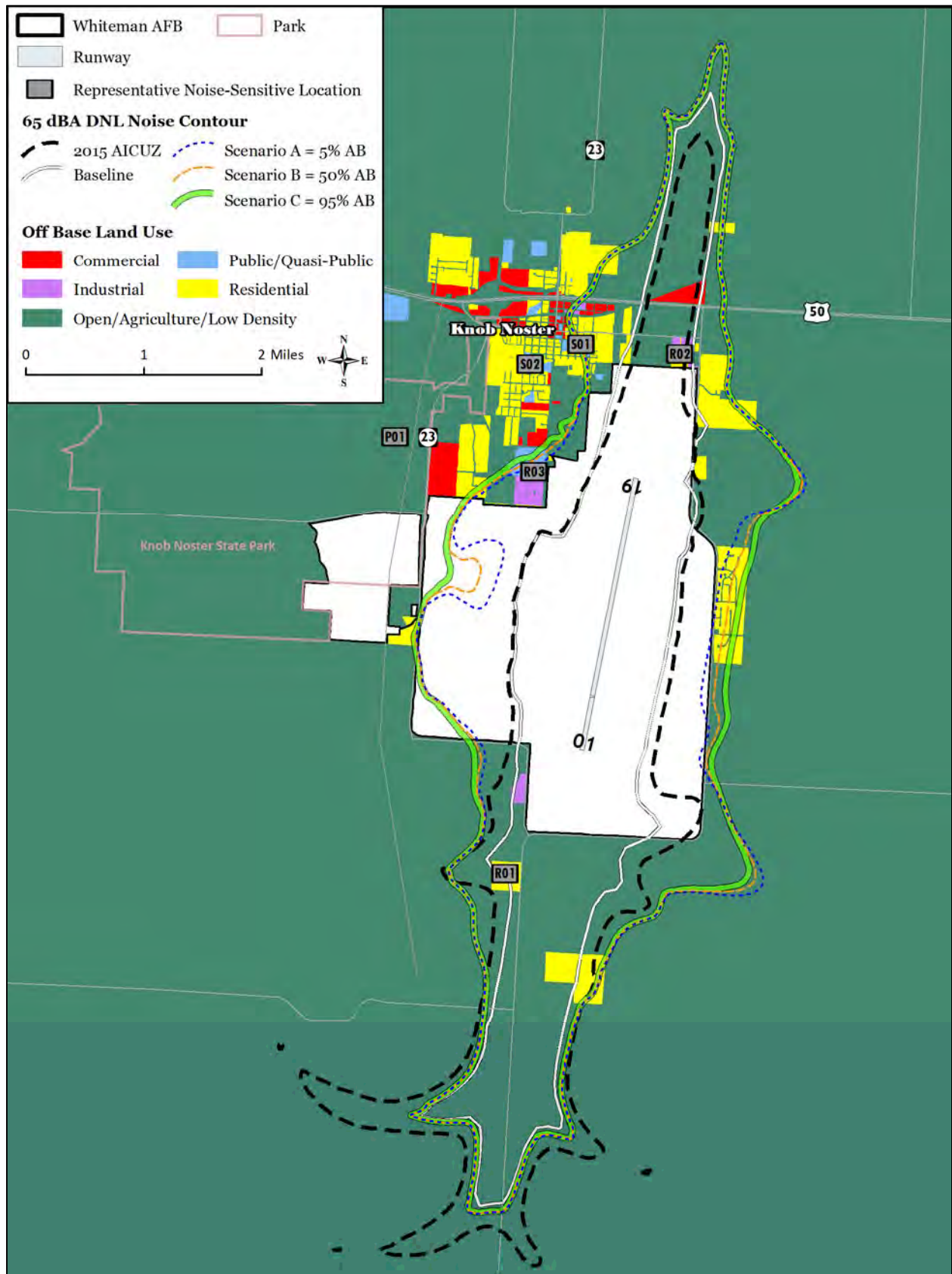


Figure WH3-6. Baseline, JLUS, and AFRC F-35A Mission DNL Contours Relative to Land Use at Whiteman AFB

construction. Two mobile home parks would be impacted by increased noise from the AFRC F-35A mission. One park represented by point R02 is currently exposed to 68 dB DNL under baseline conditions. Implementation of Scenario A would result in a 5 dB DNL increase. A second mobile home park, represented by point R03, would be exposed to an increase of 9 dB DNL (66 dB DNL). The baseline and proposed action noise levels are and would be incompatible with this land use. As described in Section WH3.2.2, there would be significant noise-related impacts to residents in these areas. Land impacts are assessed in part on the change in the suitability of a location for its current or planned use (see Chapter 3, Section 3.8.3.1). The EIS identifies potential significant noise-related impacts to people in the vicinity of the base. However, from a land use perspective, the land use compatibility of the points represented by R02 and R03 would remain unchanged.

No recreational land would be exposed to DNL of 65 dB or greater. The largest increase in acreage exposed to additional noise would be open areas, followed by residential, commercial, industrial, and other land uses. Implementation of the AFRC F-35A mission (Scenario A) would not result in significant impacts to land use.

Scenario B

Implementation of Scenario B would increase the area surrounding Whiteman AFB exposed to DNL of 65 dB or greater by approximately 2,517 acres (Table WH3-34 and Figure WH3-6). This would result in an increase of an estimated 3,341 off-installation residents and an additional 354 acres of residential land exposed to DNL of 65 dB or greater. The same mobile home parks impacted by implementation of Scenario A would also be impacted by implementation of Scenario B..

Table WH3-34. Off-Base Acres Exposed to DNL of 65 dB or Greater at Whiteman AFB under Scenario B

Land Use Category ^a	DNL (dB)															Total				
	65–69			70–74			75–79			80–84			≥ 85			Baseline	AFRC F-35A Mission	Change ^b		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b					
Commercial	17	22	5	12	22	10	0	0	0	0	0	0	0	0	0	0	0	29	44	15
Industrial	23	55	32	2	12	10	0	1	1	0	0	0	0	0	0	0	0	25	68	43
Open	1,381	2,963	1,582	504	849	345	52	195	143	0	0	0	0	0	0	0	0	1,937	4,007	2,070
Public/Quasi-Public	0	35	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	35
Recreational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	79	370	291	19	81	62	0	1	1	0	0	0	0	0	0	0	0	98	452	354
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,500	3,445	1,945	537	964	427	52	197	145	0	0	0	0	0	0	0	0	2,089	4,606	2,517

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Source: USAF 2015

No recreational land would be exposed to DNL of 65 dB or greater. The largest increase in acreage exposed to additional noise would be open areas, followed by residential, commercial, industrial,

and other land uses. Implementation of the AFRC F-35A mission (Scenario B) would not result in significant impacts to land use.

Scenario C

Implementation of Scenario C would increase the area surrounding Whiteman AFB exposed to DNL of 65 dB or greater by approximately 2,620 acres (Table WH3-35 and Figure WH3-6). This would result in an increase of an estimated 3,699 off-installation residents and an additional 405 acres of residential land exposed to DNL of 65 dB or greater. The same mobile home parks impacted by implementation of Scenarios A or B would also be impacted by implementation of Scenario C.

Table WH3-35. Off-Base Acres Exposed to DNL of 65 dB or Greater at Whiteman AFB under Scenario C

Land Use Category ^a	DNL (dB)																	
	65–69			70–74			75–79			80–84			≥ 85			Total		
	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b	Baseline	AFRC F-35A Mission	Change ^b
Commercial	17	22	5	12	22	10	0	0	0	0	0	0	0	0	0	29	44	15
Industrial	23	54	31	2	13	11	0	1	1	0	0	0	0	0	0	25	68	43
Open	1,381	3,003	1,622	504	853	349	52	192	140	0	0	0	0	0	0	1,937	4,048	2,111
Public/Quasi-Public	0	46	46	0	0	0	0	0	0	0	0	0	0	0	0	0	46	46
Recreational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Residential	79	422	343	19	80	61	0	1	1	0	0	0	0	0	0	98	503	405
Water	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1,500	3,547	2,047	537	968	431	52	194	142	0	0	0	0	0	0	2,089	4,709	2,620

^a All numbers are acres.

^b Change equals the difference between baseline acreage and acres exposed to noise resulting from the AFRC F-35A mission.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, acreage numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw number of acres. The resulting summations and change calculations are then rounded to whole numbers.

Source: USAF 2015

No recreational land would be exposed to DNL of 65 dB or greater. The largest increase in acreage exposed to additional noise would be open areas, followed by residential, commercial, industrial, and other land uses. Implementation of the AFRC F-35A mission (Scenario C) would not result in significant impacts to land use.

WH3.8.2.2 Recreation

Construction in support of the AFRC F-35A mission would occur in the existing cantonment area. Surrounding parks, schools, and recreational facilities are too far from the installation to be affected by construction noise. Increased truck traffic to the installation during the 2-year construction period could cause temporary effects to traffic flow on local roads, but this is not anticipated to interfere with access to recreational areas near Whiteman AFB. New facilities would not alter any sensitive views that have important recreational value.

Implementation of the AFRC F-35A mission at Whiteman AFB would result in a net increase of 11 personnel with dependents as a result of the drawdown of the AFRC A-10 mission as the F-35A

aircraft arrive. This change in the number of people would have no discernable effect on recreational resources.

Implementation of Scenario A would result in a DNL increase of 6 dB at the Knob Noster State Park campground. Implementation of Scenarios B or C would result in the same DNL at recreational facilities as implementation of Scenario A, except at Knob Noster State Park, where DNL would be 55 dB rather than 54 dB for both Scenarios B and C. Noise modeling results summarized in Table WH3-36 indicate that implementation of the AFRC F-35A mission at Whiteman AFB would not result in DNL greater than 65 dB at the Knob Noster State Park campground. However, a DNL increase of 6 dB above baseline conditions would be noticeable.

Table WH3-36. Noise Effects on Recreation Facilities Around Whiteman AFB Resulting from Scenario A

Recreational Facility	DNL (dB)	
	Baseline Conditions	AFRC F-35A Mission
Knob Noster State Park campground	48	54

The use of some outdoor recreational facilities such as outdoor sports fields and ball courts is compatible with DNL below 75 dB, with the installation of special sound buffering, although noise increases could reduce the quality and enjoyment of outdoor activities for some persons. One measure of annoyance is the potential for speech interference. As described in Section WH3.2.2.2, 50 dB L_{max} is the metric used to determine potential speech interference. As shown in Table WH3-15, recreational users at the Knob Noster State Park campground would experience one additional outdoor noise event (an increase from three to four) per hour at L_{max} greater than 50 dB.

Another noise metric that can be used to evaluate potential impacts to recreational uses is SEL. The SEL of the loudest overflight event experienced regularly at the Knob Noster State Park campground would increase by 5 dB (Table WH3-10). Recreational users at the Knob Noster State Park campground would experience an increase in the number of these loudest overflight events from less than 1 per day to up to nearly 10 per day at the highest SEL.

WH3.8.3 Airspace Affected Environment

WH3.8.3.1 Land Use

This section summarizes land ownership and identifies affected Special Use Land Management Areas (SULMAs) under the airspace currently used by pilots from Whiteman AFB. SULMAs include selected areas managed by federal and state agencies that provide recreational and scenic opportunities (e.g., parks, monuments, and scenic river corridors), solitude or wilderness experiences (e.g., forests and wilderness areas), conservation of natural or cultural resources (e.g., wildlife refuge areas and national monuments), and other special management functions (e.g., Native American reservation lands). SULMAs often provide a combination of these attributes. Some SULMAs could include recreation-oriented sites such as campgrounds, canoeing opportunities, trails, and visitor centers; recreation is addressed separately in Section WH3.8.3.2.

Pilots from Whiteman AFB use airspace in Missouri, Arkansas, and Kansas with most areas being in Missouri (see Figure WH3-7). The SULMAs under the airspace used by pilots stationed at Whiteman AFB include wilderness areas, National Forests, National Wildlife Refuges, state Wildlife Management Areas and parks, and Native American reservation lands. The majority of federal land under the airspace used is administered by the U.S. Forest Service (USFS), followed by the USFWS. Figure WH3-7 identifies the airspace currently used along with the SULMAs aggregated by ownership (i.e., USFS, USFWS, state land, etc.).

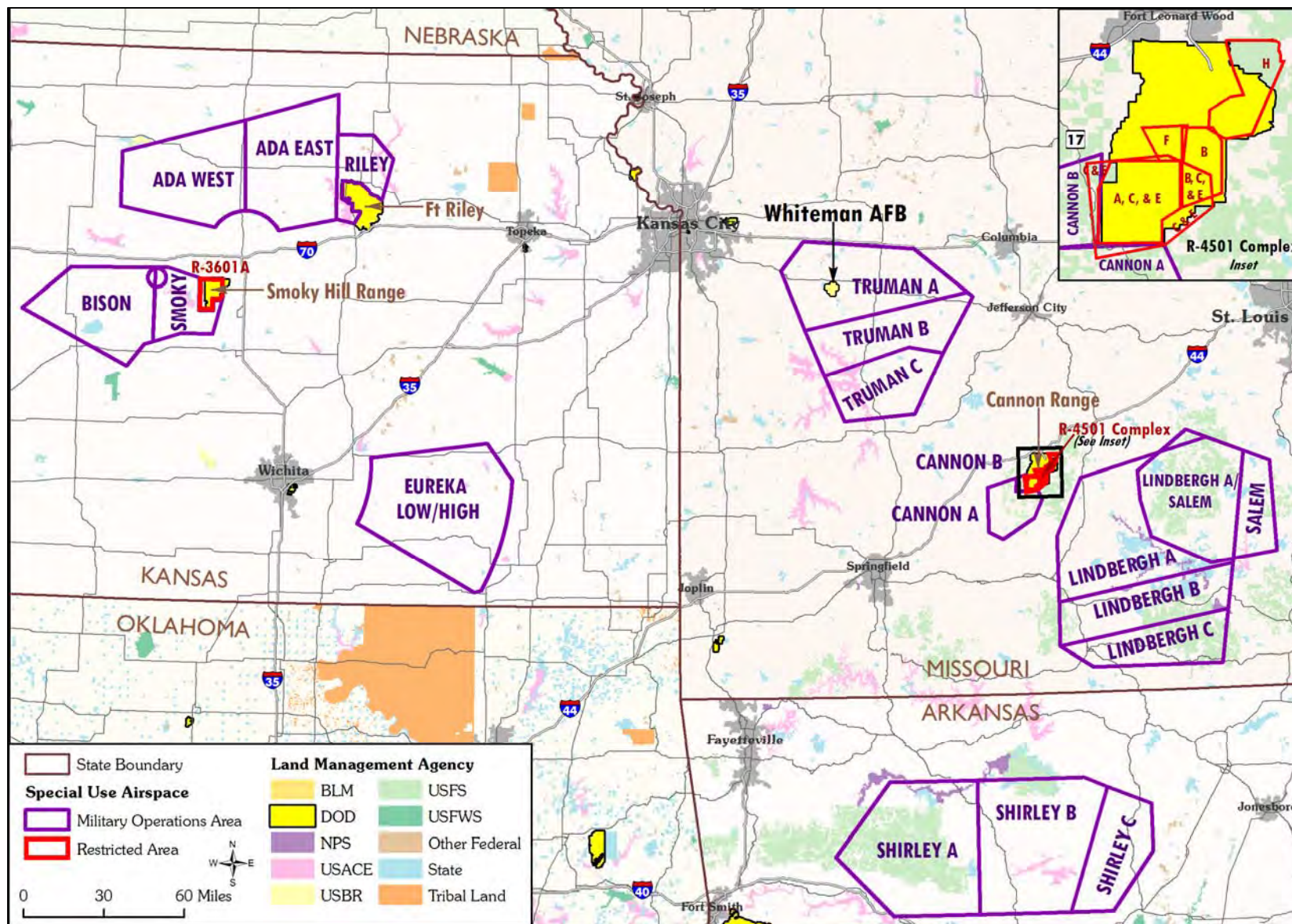


Figure WH3-7. SULMAs Beneath Whiteman AFB Airspace

WH3.8.3.2 Recreation

Recreational opportunities under the airspace currently used are similar to those described in Section WH3.8.1.2. The underlying land reflects the same mosaic of federal, state, and private ownership, with a similar range of outdoor recreational activities. The public lands support a variety of recreational opportunities and activities, with some areas having particular qualities or recreational purposes.

Examples of these include one National Forest, one National Wildlife Refuge and numerous state parks, lakes and conservation areas. Southern Missouri and Northern Arkansas host habitats that support a wide variety of species, particularly throughout the oak-hickory woodlands that dominate this area. These areas are popular for recreational bird watching. In addition, many of the national forests and state lands offer opportunities for hunting and fishing and a variety of different outdoor recreational opportunities. Eastern and central Kansas also offers numerous recreational opportunities and habitats for a wide variety of both game and non-game species. Public access is permitted to limited portions of both Fort Leonard Wood and Fort Riley for recreation. The Sikes Act stipulates that access for wildlife-oriented recreation shall be provided to the extent possible with military use, while maintaining the priority of the military purpose and safety of public users. Recreational activities within the designated areas of Fort Leonard Wood and Fort Riley include camping, driving, fishing, hunting, off-highway vehicle uses in designated areas, and viewing natural resources of interest.

WH3.8.4 Airspace Environmental Consequences

WH3.8.4.1 Land Use

Table WH3-37 identifies the SULMAs that occur under the airspace proposed for use by AFRC F-35A pilots operating from Whiteman AFB that would be exposed to subsonic noise that would increase L_{dnmr} up to 2 dB above baseline conditions. In all cases, SULMAs under the airspace proposed for use would not experience subsonic L_{dnmr} greater than 47 dB.

Table WH3-37. Special Use Areas Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at Whiteman AFB

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L_{dnmr}	L_{dnmr}	Change
Cannon A MOA					
Allen (Wilbur) Memorial Conservation Area	383	100	<45	47	2
Mark Twain National Forest	1,505,503	3	<45	47	2
Cannon B MOA					
Mark Twain National Forest	1,505,503	<1	<45	46	1
R-4501					
Mark Twain National Forest	1,505,503	<1	<45	46	1
Salem MOA					
Anderson Mountain Rare II Study Area	2,741	7	<45	47	2
Bell Mountain Wilderness	9,183	100	<45	47	2
Bismarck Conservation Area	1,159	94	<45	47	2
Buford Mountain Conservation Area	3,919	100	<45	47	2
Cedar Mountain Conservation Area	117	100	<45	47	2
Champion Springs Conservation Area	173	100	<45	47	2
Clearwater Recreation Area	1,8714	39	<45	47	2
Current River Conservation Area	29,734	19	<45	47	2

Table WH3-37. Special Use Areas Land Management Areas Exposed to Subsonic Noise Increases of 1 dB or Greater from the AFRC F-35A Mission at Whiteman AFB (Continued)

SULMA Name	SULMA Acreage	Percentage of SULMA Under Airspace	Baseline Conditions	AFRC F-35A Mission	
			L _{dnmr}	L _{dnmr}	L _{dnmr}
Salem MOA					
Dillard Mill State Historic Site	131	100	<45	47	2
Elephant Rocks State Park	128	100	<45	47	2
Fort Davidson State Historic Site	68	100	<45	47	2
Funk Memorial State Forest And Wildlife Area	182	100	<45	47	2
Graves Mountain Conservation Area	3,236	34	<45	47	2
Indian Trail Conservation Area	12,863	100	<45	47	2
Johnson's Shut-Ins State Park	8,304	100	<45	47	2
Ketcherside Mountain Conservation Area	3,451	100	<45	47	2
Logan Creek Conservation Area	11,985	94	<45	47	2
Lower Taum Sauk Lake	1,347	100	<45	47	2
Mark Twain National Forest	1,505,503	23	<45	47	2
Pilot Knob National Wildlife Refuge	118	100	<45	47	2
Riverside Conservation Area	2,696	100	<45	47	2
Rocky Creek Conservation Area	37,652	3	<45	47	2
Sunklands Conservation Area	3,2407	6	<45	47	2
Taum Sauk Mountain State Park	2,125	100	<45	47	2

AFRC F-35A operations would result in minor subsonic L_{dnmr} increases of 2 dB above baseline. Subsonic L_{dnmr} would remain below 65 dB under all of the airspace proposed for use. None of the airspace proposed for use is approved for supersonic aircraft operations.

WH3.8.4.2 Recreation

A synopsis of issues and methodology for addressing potential impacts from military training on recreational resources under training airspace are provided in Chapter 3, Section 3.8.2. In general, a diverse range of active and passive recreational activities occurring throughout the region already coexists within a context of some exposure to military overflight. Increased number of sorties in some airspaces would continue exposure of recreational participants to subsonic noise and potential startle effects from overflights. This could cause some degradation in enjoyment for those affected and loss of opportunity for quiet recreational environments in the region. Subsonic noise could diminish opportunities for visitors to experience natural soundscapes in national forests, and could affect the qualities of natural quiet that are intrinsic to recreational opportunities in wilderness areas, national wild and scenic rivers, and other remote locations.

Average subsonic noise levels under the airspace proposed for use would remain the same, except for areas under the Canon and Salem MOAs, where L_{dnmr} increases of 1 to 2 dB would occur. These increases would be barely discernable and would not result in substantial effects on the noise environment or recreation in underlying areas.

Federal agencies are generally mandated to manage wilderness areas for their wilderness qualities. This includes maintaining the natural setting and allowing minimal human disturbance and development. Although the noise increases are small, wilderness management goals could be negatively affected by increased noise and visual effects associated with military overflights. Increased noise in wilderness areas, recreation areas, and other specially managed lands could also be perceived by some recreational users as affecting their recreation experience.

WH3.8.5 Summary of Impacts to Land Use and Recreation

Land use and recreational resources would not be impacted by any of the construction because all of the construction would be conducted on the base in compatible land use areas. Implementation of Scenarios A, B or C would expose an additional 2,421, 2,517, or 2,620 acres, respectively, of off-installation land to DNL of 65 dB or greater. The JLUS identifies the residential areas (except for the mobile home parks) within this area as compatible, or generally compatible, with DNL from 65 to 75 dB when measures to achieve overall noise level reductions are included in the facility design and construction. Impacts to land use would not be considered significant under any of the afterburner scenarios.

None of the recreational areas identified for study around the base would be exposed to DNL greater than 65 dB. However, under Scenario A, DNL would increase at Knob Noster State Park campground by 6 dB (from 48 dB to 54 dB), which would be noticeable. Under Scenarios B or C, the DNL would increase to 55 dB. Regarding impacts to land use and recreation under the airspace proposed for use, DNL would remain below 47 dB beneath all of the airspace proposed for use and the increase in aircraft operations would be minor. In addition, none of the airspace proposed for use is approved for supersonic aircraft operations and therefore no sonic booms would occur.

WH3.9 SOCIOECONOMICS

Socioeconomics refers to features or characteristics of the social and economic environment. The factors affecting socioeconomic resources are the change in personnel, construction of new facilities, renovations and modifications to existing facilities, and noise from F-35A aircraft at Whiteman AFB. These factors are evaluated relative to population, employment, earnings, housing, education, and public and base services. Whiteman AFB is located approximately 2 miles south of Knob Noster in Johnson County, Missouri. Impacts to socioeconomic resources would extend beyond the base boundaries. Therefore, for the purposes of this socioeconomic analysis, the ROI for the proposed action and No Action Alternative is Johnson County, with an emphasis on Whiteman AFB.

WH3.9.1 Base Affected Environment

WH3.9.1.1 Population

Population estimates for Johnson County totaled 53,897 persons in 2017 (USCB 2018). Between 2010 and 2017, the county population increased at an average annual rate of 0.3 percent, with a total increase of approximately 1,302 persons over the 7-year period (USCB 2018). The State of Missouri has an estimated population of 6.1 million (USCB 2018). Average annual population growth in the county has been the same as the state (Table WH3-38).

Table WH3-38. Population in the ROI for Whiteman AFB

Location	2010 Census	2017 Estimates	Annual Percent Change (2010–2017)
Johnson County	52,595	53,897	0.3
Missouri	5,988,927	6,113,532	0.3

Source: USCB 2018

As shown in Table WH2-3, the total current authorized personnel at the base is 12,642 persons. Of the total authorized base personnel, 7.98 percent (1,009 persons) are associated with AFRC.

WH3.9.1.2 Economic Activity (Employment and Earnings)

In 2016, employment in Johnson County totaled 27,086 jobs (BEA 2017a). The largest employment sector in Johnson County was government and government enterprises (40.6 percent), followed by retail trade (8.4 percent), and accommodation and food services (7.3 percent) (BEA 2017a). Construction accounted for 4.1 percent of total employment. Over the last several years, the average annual unemployment rate in the county has steadily declined from 7.2 percent in 2013 to 4.4 percent in 2017 (BLS 2018a). During this same time, the state average annual unemployment rate also declined annually but remained lower than the county. Per capita personal income in Johnson County is estimated at \$33,236, which is less than the estimated \$42,926 per capita personal income in the state (BEA 2017b).

Whiteman AFB is an important economic contributor to the region through employment of military and civilian personnel, and expenditures for goods and services. The total economic impact of the base on the surrounding communities (defined within a 50-mile radius) in fiscal year 2016 was more than \$668 million (Whiteman AFB 2016). Of the total economic impact estimated, approximately 19 percent was for annual expenditures. These included construction; services; and materials, equipment, and supplies procurement (Whiteman AFB 2016). The total payroll for military, DoD civilians, and other base personnel exceeded \$346 million (Whiteman AFB 2016). Based on the Impact Analysis for Planning (IMPLAN) economic model, the on-base authorized employment of 12,642 personnel supports an estimated additional 3,448 secondary jobs in the community.

WH3.9.1.3 Housing

Table WH3-39 presents census-derived housing data for Johnson County. The county has an estimated 21,803 total housing units (houses), of which 9 percent (1,869 units) were vacant in 2016 (USCB 2016a). Less than half (40.6 percent) of the occupied houses in the county are renter-occupied and the remaining 59.4 percent are owner-occupied. The median value of owner-occupied houses in Johnson County is estimated at \$142,800. The median monthly gross rent was \$744 in 2016 (USCB 2016a). As described in Section WH3.2.1.1, an estimated 580 residents and approximately 174 houses are currently exposed to DNL of 65 dB or greater from aircraft operations at Whiteman AFB.

Table WH3-39. Housing Data in the ROI for Whiteman AFB

Location	Houses	Occupied	Vacant
Johnson County	21,803	19,934	1,869

Source: USCB 2016a

As of April 2018, the median listing price of a home in Knob Noster, Missouri, was \$165,000. This is more than the nearby city of Odessa, which has a median list price of \$160,000, and less than the nearby city of Warrensburg, which has a median list price of \$175,000 (Realtor.com 2018). Data collected in 2015 and 2018 show that housing sale prices increased by approximately 16 percent during this timeframe. This is consistent with the state growth in housing sale prices following the preceding economic recession. Recent upward price trends in the local real estate market are expected to continue into the near future.

Accompanied and unaccompanied housing is available on base at Whiteman AFB. Military family housing is privatized and owned by Balfour Beatty Communities. Eight neighborhoods on base are for service members. Estimated waiting times for family housing varies depending on the size of the unit and the rank (Balfour Beatty Communities 2018).

WH3.9.1.4 Education

One elementary school, Whiteman Elementary, is located on base and is part of the Knob Noster Public School District. The Knob Noster Public School District serves more than 1,800 students. Children of school age that reside on base most likely attend one of the off-base schools in the Knob Noster Public School District, the Warrensburg School District, or Sedalia School District 200. Whiteman AFB contains one child development center with a capacity of 169 children ages 6 weeks to 5 years (MyBaseGuide 2018). No schools on or off base are known to be currently exposed to DNL of 65 dB or greater.

WH3.9.1.5 Public Services

Fire and emergency services, law enforcement and protection, and medical services are available throughout Johnson County. The Johnson County Fire Protection District provides rescue and fire suppression to the eastern two-thirds of Johnson County not including the Cities of Knob Noster and Warrensburg, which each have their own fire departments. The Johnson County Fire District has 11 fire departments/fire stations and 130 volunteers (JCFPD 2018). Sheriff and police departments throughout the county provide law enforcement and public safety to the residents of Johnson County. The Western Missouri Medical Center is located in Johnson County and has 75 licensed beds available (Health 2018).

WH3.9.1.6 Base Services

Base services at Whiteman AFB include shopping and dining facilities, airman and family services, a community activity center, an exchange shop, a family support building, education and training facilities, and outdoor and indoor recreational facilities (MyBaseGuide 2018).

WH3.9.2 Base Environmental Consequences

WH3.9.2.1 Population

The current personnel at Whiteman AFB and the projected change anticipated to support the AFRC F-35A mission are provided in Table WH2-3. Implementation of the AFRC F-35A mission would potentially add up to 11 full-time mission personnel. This increase in personnel would increase the existing base population by approximately 0.1 percent and increase the existing county population by less than 0.1 percent. No increase in population would result from the estimated three secondary jobs associated with the increase in base personnel. Implementation of the AFRC F-35A mission would have no discernible effect on population.

WH3.9.2.2 Economic Activity (Employment and Earnings)

As shown in Table WH2-3, implementation of the AFRC F-35A mission at Whiteman AFB would increase the full-time work force assigned to Whiteman AFB by 11 total personnel. Using the IMPLAN model, the direct effect of 11 full-time personnel at Whiteman AFB would have an estimated indirect and induced effect of up to three jobs. During scoping, one commenter asked if the USAF would actively recruit local citizens for employment during and after construction. It is anticipated that the local labor force would be sufficient to fill these new secondary jobs.

Construction activities provide economic benefits to the surrounding areas through the employment of construction workers and the purchase of materials and equipment. Construction activities would be temporary and provide a limited amount of economic benefit. Noise associated with construction activities would be limited to within the base boundaries and would not impact economic activity.

The USAF estimates that a total of \$32.5 million in MILCON expenditures during 2021-2023 would be associated with implementation of the AFRC F-35A mission at Whiteman AFB. The total expenditures could generate up to 120 jobs, primarily in the construction industry or related industries, and to a lesser extent in wholesale trade, retail stores (i.e., non-store retailers, miscellaneous store, general merchandise, and gasoline stations), hospitals, and limited-service and full-service restaurants. Construction activities would occur during a 2-year period. With a labor force of 23,157 and an unemployment rate of 4.4 percent, it is expected that the local labor force in the ROI and in the surrounding areas would be sufficient to fill these new jobs. Implementation of the AFRC F-35A mission and projected total MILCON expenditures of \$32.5 million at Whiteman AFB would generate an estimated \$8.0 million in direct, indirect and induced income in the ROI. The jobs and related income generated would be temporary (i.e., during the construction activity).

WH3.9.2.3 Housing

Assuming all incoming full-time personnel would require off-base housing, there would be a potential need for 11 off-base houses. Based on the number of vacant houses in the ROI, it is anticipated that the housing market in the ROI and surrounding communities and counties would support this need. These impacts would be the same regardless of which afterburner scenario is selected.

During scoping, people raised concerns about the potential impact of noise on surrounding property values. As discussed in more detail in Chapter 3, Section 3.9.3, studies have shown a relation between noise and property values. A study conducted by Trojanek et al (2017) summarized the results from 79 studies; the majority of those studies found that housing values decreased from 0.26 to 1.00 percent for every decibel increase in DNL above 65 dB. Some of the studies had values that decreased less than this range and others decreased more. It is a reasonable assumption, based on these studies, that increases in noise could cause some reduction in the rate of increase in housing prices. The percent of effect is dependent upon a number of factors, including the noise indicators used, thresholds, types of properties evaluated, and other factors. The general impact on home pricing would be the same regardless of which afterburner scenario is selected.

Table WH3-40 shows the total estimated number of houses that would be exposed to DNL of 65 dB or greater compared to the existing conditions. The estimated number of residents exposed to this level of noise is from each afterburner scenario is identified in Tables WH3-11, WH3-13, and WH3-14. The JLUS identifies residential land use (except for mobile home parks) to be generally compatible with DNL between 65 and 70 dB with noise attenuation. Residential land exposed to DNL of 70 to 75 dB can be compatible uses, although the JLUS notes that measures to achieve an overall noise level reduction do not solve all noise annoyance issues. Residential land use is incompatible with DNL greater than 75 dB.

Table WH3-40. Estimated Houses Exposed to DNL of 65 dB or Greater from Baseline and AFRC F-35A Mission Conditions at Whiteman AFB

DNL (dB)	Estimated Houses						
	Baseline	Scenario A	Change	Scenario B	Change	Scenario C	Change
65-69	163	864	701	960	797	1,060	897
70-74	40	164	124	161	121	160	120
75-79	0	2	2	2	2	2	2
80-84	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0
Total	203	1,030	827	1,123	920	1,222	1,019

WH3.9.2.4 Education

As described in Chapter 3, Section 3.9.3, the total number of dependents, including spouse and children, was estimated at 2.5 times 65 percent of full-time active associate, active reserve, dual status technician, and non-dual status technician. The total number of children was estimated at 1.5 times 65 percent of full-time personnel, because it was assumed each military member would be accompanied by a spouse. Thus, it is estimated that 11 dependents would be of school age and would enter any of the schools in the three surrounding school districts. The projected number of incoming students would represent a 0.61 percent increase of the current total enrollment in the Knob-Noster Public School District. Based on the size of the school district in the ROI, schools in Johnson County would not be noticeably affected by the increase of 11 students.

During scoping, people submitted comments regarding the potential noise impacts on children and education facilities. One off-base childcare facility (Rau’s Day Care) and one off-base school (Knob Noster Elementary) would be newly exposed to DNL of 65 to 69 dB (Section WH3.2.2.1). Educational services are identified in the JLUS as a generally compatible use with sound attenuation measures within the 65 to 70 dB DNL contour. Results of recent reviews on how chronic aircraft noise exposure at school or at homes has been associated with children having poorer reading and memory skills (Basner et al., 2018). Studies also suggest that “children exposed to chronic aircraft noise at school have poorer performance on standardized achievement tests compared to children who are not exposed to aircraft noise” (Basner et al., 2018). Implementation of Scenarios A, B, or C would expose students at Knob Noster Elementary School and Knob Noster High School to an increase in overflight events per hour (see Section WH3.2.2.3), which would disrupt classroom learning.

WH3.9.2.5 Public Services

The estimated addition of 11 USAF-related personnel and dependents would represent less than a 0.1 percent increase of the existing Johnson County population. This would be an indiscernible increase in the county population and would have no measurable effect on county services.

During scoping, people submitted comments regarding the potential impact that noise from the F-35A aircraft would have on the quality of life and health of residents. Aircraft noise has the potential to cause a variety of effects such as annoyance, speech interference, sleep interference, hearing loss, and non-auditory health effects (Section WH3.2.2). Potential non-auditory health impacts due to aircraft noise are discussed in more detail in Section WH3.2.2.7 and Volume II, Appendix B. The USAF continually works with local governments and communities to assess and manage aircraft noise in the environment and attempts to reduce, where possible, the potential impacts of noise to people. When possible, the AFRC F-35A pilots would intentionally avoid overflying identified noise-sensitive locations.

WH3.9.2.6 Base Services

Base services would have adequate capacity to support 11 additional personnel on base associated with the AFRC F-35A mission.

WH3.9.3 Summary of Impacts to Socioeconomics

The personnel increase (11 full-time mission personnel) and community service requirements of the AFRC F-35A mission (Scenario A, B, or C) at Whiteman AFB would not result in significant impacts to population, economic activity, housing availability, or public services. Implementation of Scenario A, B, or C would result in an estimated 827, 920, or 1,019 houses exposed to DNL greater than 65 dB from AFRC F-35A aircraft operations. One school would be exposed to DNL greater

than 65 dB from AFRC F-35A aircraft operations under Scenarios A, B, or C. Implementation of the AFRC F-35A mission would not result in significant socioeconomic impacts.

WH3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

The environmental justice analysis considers affected populations that meet certain characteristics based on income and age. Analysis of environmental justice and other sensitive receptors is conducted pursuant to EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, and EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*. Environmental justice addresses impacts to minority and low-income populations. This analysis focuses on increased noise resulting from the proposed action as the primary impact to these populations. The USAF guidelines for environmental justice analysis use census data (i.e., percentages of populations identifying themselves as minority, low-income, etc.) to determine potential impacts to these populations. The guidelines also address children (under 18) and elderly (65 and older) as additional sensitive populations. (Minority, low-income, children, and elderly populations are henceforth referred to as environmental justice populations). Tables WH3-11, WH3-13, and WH3-14 list the number of people exposed to DNL of 65 dB or greater from baseline and the three afterburner scenario conditions at Whiteman AFB.

This analysis is completed to determine if there are existing disproportionate noise impacts to environmental justice populations (i.e., baseline DNL of 65 dB or greater) and if implementation of the proposed action would result in disproportionate noise impacts to environmental justice populations (i.e., AFRC F-35A mission DNL of 65 dB or greater).

Environmental justice analysis overlays the 65 dB DNL contour on the census data polygons. The smallest census data which has the information necessary for analysis of potential impacts to environmental justice populations is used to determine potential impacts. The smallest group of census data which contain the needed information for this analysis is the Census BG. Each BG that is partially or wholly encompassed by the 65 dB DNL contour is defined as an ROI. There could be few or many ROIs for a specific environmental justice analysis, depending on the extent of the noise contour and the size of the BGs. The next higher level of census data is the Census Tract (CT). Each CT contains a number of BGs (ROIs).

In order to identify disproportionate impacts from baseline or proposed action noise levels, a Community of Comparison (COC) is needed. The COC is defined by summing the population in all the CTs which contain any part of an ROI affected by the 65 dB DNL contour. The percentages of minority and low-income persons are calculated for each ROI (i.e., BG). The ROI and COC percentages are then compared. If the percentage of minorities or low-income persons in an ROI is equal to or greater than the percentage of minorities or low-income persons in the COC, there is a disproportionate impact to the environmental justice population in that ROI (USAF 2014). Chapter 3, Section 3.10.3, provides a description of the method applied to calculate the proportion of the population in the ROIs.

Census blocks are the smallest unit for which the USCB collects census information. **Block Groups (BGs)** are comprised of a combination of census blocks and are a subdivision of **census tracts (CTs)**. Census tracts are a small, relatively permanent statistical subdivision of a county delineated by a local committee of census data users for the purpose of presenting census data. This EIS uses **BGs** and **CTs** in the environmental justice analysis. The **BGs** also comprise the **Region of Influence (ROI)** analyzed in the EIS.

For Whiteman AFB, there are three CTs containing the five ROIs (BGs) which are partially or wholly affected by DNL of 65 dB or greater from the AFRC F-35A mission. Figure WH3-8 presents an overlay of the baseline and AFRC F-35A mission 65 dB DNL contour on the ROIs and the COC.

WH3.10.1 Base Affected Environment

Table WH-41 provides baseline demographic conditions in Johnson County, where Whiteman AFB is located. Table WH3-41 includes minority, low-income, children, and elderly population numbers and percentages for county, state, and nation census categories to show context and to help determine the intensity of impacts. The three CTs are the COC for the environmental justice analysis. The COC has a higher proportion of minority and children populations than Johnson County, but lower than the State of Missouri or the nation. The COC has a lower low-income and elderly population than the county, state, or the nation.

Table WH3-41 shows that under baseline conditions three ROIs (BGs) have higher percentages of low-income populations and two ROIs (BGs) have higher percentages of minority populations than the percentage of those populations living in the COC. This means that there are existing disproportionate impacts to low-income and minority populations living in these ROIs.

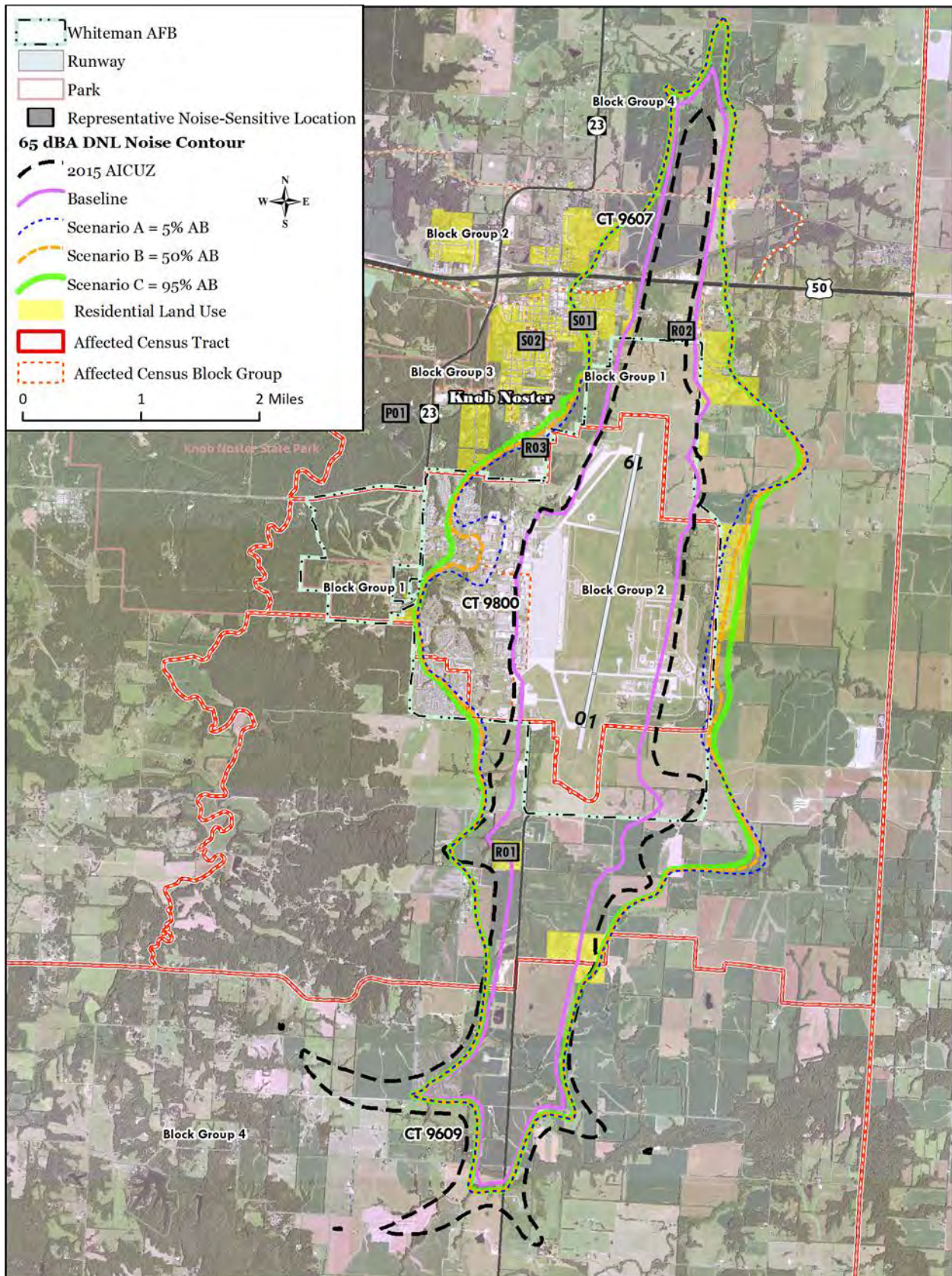


Figure WH3-8. Whiteman AFB Census Tracts and Block Groups Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions

Table WH3-41. Environmental Justice Populations and Demographics for Whiteman AFB

Geographic Unit	Total Population	Population for Whom Poverty is Determined ^a	Minority		Low-Income		Children		Elderly	
			Number	Percent	Number	Percent	Number	Percent	Number	Percent
CT 9607.00	5,621	5,603	1,115	19.8	512	9.1	1,627	28.9	359	6.4
CT 9609.00	4,826	4,812	222	4.6	650	13.5	1,184	24.5	742	15.4
COC	10,447	10,415	1,337	12.8	1,162	11.2	2,811	26.3	1,101	10.5
Johnson County	53,941	49,182	7,467	13.8	7,953	16.2	11,696	21.7	6,348	11.8
State of Missouri	6,075,300	5,891,760	1,226,232	20.2	861,679	14.6	1,389,409	22.9	956,032	15.7
United States	321,004,407	313,048,563	38.5	123,726,618	14.6	45,650,345	22.9	73,601,279	14.9	47,732,389

^a Poverty status was determined for all people except institutionalized people, people in military group quarters, people in college dormitories, and unrelated individuals under 15 years of age.

Note: Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

WH3.10.2 Base Environmental Consequences

WH3.10.2.1 Scenario A

The analysis of environmental justice populations at Whiteman AFB identified three ROIs with disproportionately high minority populations and one ROI with disproportionately high low-income populations. These populations are currently exposed to DNL of 65 dB or greater and would continue to be exposed to DNL of 65 dB or greater after implementation of the proposed action. Therefore, implementation of the AFRC F-35A mission would not result in disproportionate impacts to minority or low-income populations. The areas where these populations are located are shown on Figure WH3-9.

The other sensitive populations evaluated in this analysis are children and elderly. As shown in Table WH3-43, an additional estimated 669 children and an additional estimated 196 elderly persons who reside in the ROIs would be exposed to DNL of 65 dB or greater with implementation Scenario A. The areas where these populations are located are shown on Figure WH3-10. Implementation of Scenario A would expose one off-base childcare facility (Rau's Day Care) and one off-base school (Knob Noster Elementary) to DNL of 65 to 69 dB.

Sections WH3.2.2.2 and WH3.2.2.3 describe speech interference and classroom learning disruption associated with increased overflight and noise levels, which would adversely impact children and elderly populations.

Implementation of the Scenario A would not expose any hospitals (on base or off base) or parks to DNL of 65 dB or greater. The Trails Regional Library Knob Noster Branch would be exposed to DNL of 65 to 69 dB. Noise-sensitive locations such as libraries are included in education services and are identified in the JLUS as a compatible use, with sound attenuation, in areas exposed to DNL of 65 to 70 dB. For more information about potential noise impacts to schools, refer to Section WH3.2.2.3.

Table WH3-42. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario A)

Geographic Unit	Population in the Census Area	Baseline					Proposed (newly affected)				
Census BG (ROI)/COC		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 96070.00											
1 ^a	1,136	97	18.7	Yes	22.1	Yes	363	18.7	Yes	22.1	Yes
2 ^a	939	5	29.7	Yes	9.3	No	69	29.7	Yes	9.3	No
4 ^a	2,596	474	13.7	Yes	2.3	No	1,191	13.7	Yes	2.3	No
CT 96090.00											
4 ^a	984	4	0.8	No	8.2	No	603	0.3	No	8.2	No
ROI Totals	5,655	580	NA	NA	NA	NA	2,226	NA	NA	NA	NA
COC	10,447	NA	12.8	NA	11.2	NA	NA	12.8	NA	11.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply

2. Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI)

3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

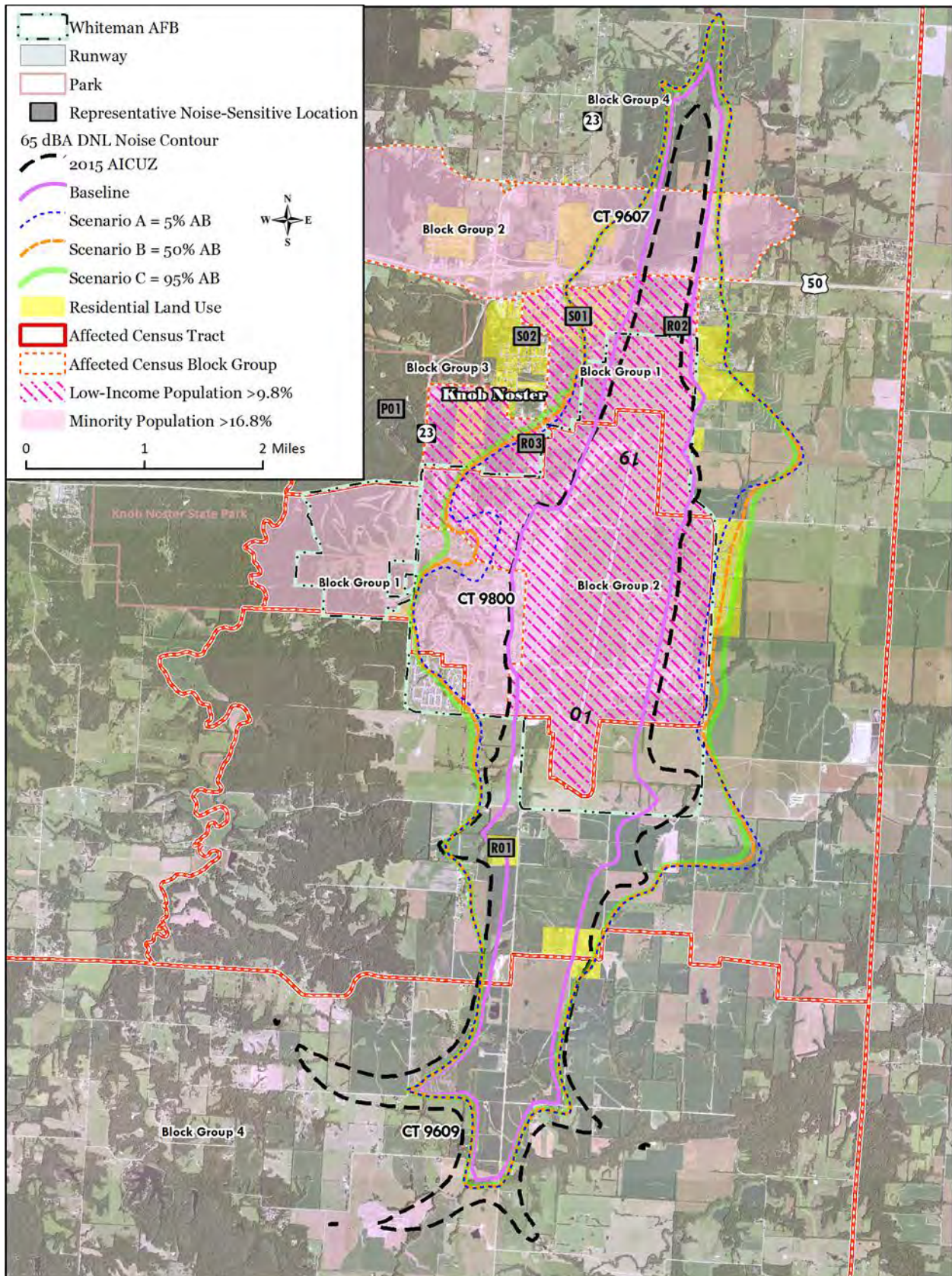


Figure WH3-9. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB

Table WH3-43. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario A)

Geographic Units		Baseline					Proposed (Newly Affected)				
Census BG (ROI)/COC	Population in the Census Area	Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 96070.00											
1	1,136	97	25.1	24	6.3	6	373	25.1	91	6.3	24
2	939	5	32.4	2	12.4	1	67	32.4	22	12.4	9
4	2,596	474	33.2	157	5.0	24	1,482	33.2	395	5.0	61
CT 96090.00											
4	984	4	26.7	1	15.0	1	585	26.7	161	14.8	90
Total	5,655	580	NA	144	NA	32	2,226	NA	669	NA	196
COC	10,447	NA	26.9	2,811	10.5	1,101	NA	26.9	3,349	10.5	1,281

Notes:

1. NA = Not applicable does not apply
2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

WH3.10.2.2 Scenario B

Implementation of Scenario B would not result in disproportionate noise impacts to minority or low-income populations (Table WH3-44 and Figure WH3-9). This scenario would expose an additional estimated 764 children and 194 elderly persons to DNL of 65 dB or greater (Table WH3-45 and Figure WH3-10).

Implementation of Scenario B would expose one off-base childcare facility (Rau’s Day Care) and one off-base school (Knob Noster Elementary) to DNL of 65 to 69 dB. This scenario would not expose any hospitals (on base or off base) or parks to DNL of 65 dB or greater. The Trails Regional Library Knob Noster Branch would be exposed to DNL of 65 to 69 dB. For more information about potential noise impacts to schools and a description of speech interference and classroom learning disruption, refer to Sections WH3.2.1.3, WH3.2.2.2 and WH3.2.2.3.

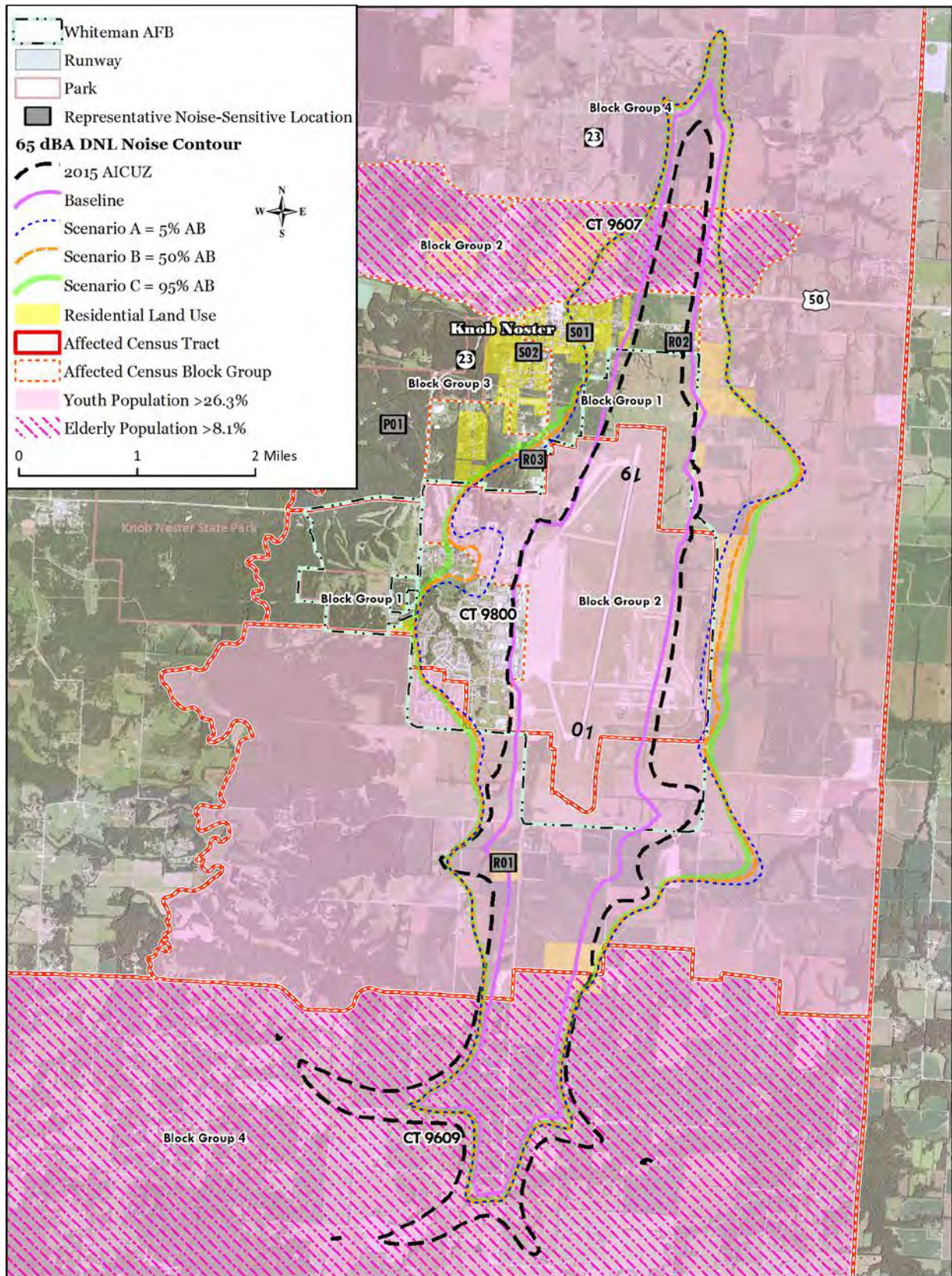


Figure WH3-10. Youth and Elderly Populations and Noise-Sensitive Receptors Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB

Table WH3-44. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario B)

Geographic Unit	Population in the Census Area	Baseline					Proposed (newly affected)				
Census BG (ROI)/COC		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 96070.00											
1 ^a	1,136	98	18.7	Yes	22.1	Yes	373	18.7	Yes	22.1	Yes
2 ^a	939	6	29.7	Yes	9.3	No	67	29.7	Yes	9.3	No
4 ^a	2,596	368	13.7	Yes	2.3	No	1,482	13.7	Yes	2.3	No
CT 96090.00											
4 ^a	984	4	0.8	No	8.2	No	585	0.8	No	8.2	No
ROI Totals	5,655	580	NA	NA	NA	NA	2,507	NA	NA	NA	NA
COC	10,447	NA	12.8	NA	11.2	NA	NA	12.8	NA	11.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply

2. Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI)

3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table WH3-45. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario B)

Geographic Units	Population in the Census Area	Baseline					Proposed (Newly Affected)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 96070.00											
1	1,136	97	25.1	24	6.3	6	373	25.1	94	6.3	24
2	939	5	32.4	2	12.4	1	67	32.4	22	12.4	8
4	2,596	474	33.2	157	5.0	24	1,482	33.2	492	5.0	74
CT 96090.00											
4	984	4	26.7	1	15.0	1	585	26.7	156	14.8	88
Total	5,655	580	NA	184	NA	32	2,507	NA	764	NA	194
COC	10,447	NA	26.9	2,811	10.5	1,101	NA	26.9	3,349	10.5	1,281

Notes:

1. NA = Not applicable does not apply
2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

WH3.10.2.3 Scenario C

Implementation of Scenario C would not result in disproportionate noise impacts to minority or low-income populations (Table WH3-46 and Figure WH3-9). All of the ROIs currently exposed to DNL of 65 dB or greater would continue to be exposed to this noise level under Scenario C. This scenario would expose an additional estimated 863 children and 207 elderly persons to DNL of 65 dB or greater (Table WH3-47 and Figure WH3-10).

Implementation of Scenario C would expose one off-base childcare facility (Rau’s Day Care) and one off-base school (Knob Noster Elementary) to DNL of 65 to 69 dB. This scenario would not expose any hospitals (on base or off base) or parks to DNL of 65 dB or greater. The Trails Regional Library Knob Noster Branch would be exposed to DNL of 65 to 69 dB. For more information about potential noise impacts to schools and a description of speech interference and classroom learning disruption, refer to Sections WH3.2.1.3, WH3.2.2.2 and WH3.2.2.3.

Table WH3-46. Minority and Low-Income Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario C)

Geographic Unit	Population in the Census Area	Baseline					Proposed (newly affected)				
Census BG (ROI)/COC		Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate	Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Minority (%)	Disproportionate	Low-Income (%)	Disproportionate
CT 96070.00											
1 ^a	1,136	97	18.7	Yes	22.1	Yes	386	18.7	Yes	22.1	Yes
2 ^a	939	5	29.7	Yes	9.3	No	67	29.7	Yes	9.3	No
4 ^a	2,596	474	13.7	Yes	2.3	No	1,793	13.7	Yes	2.3	No
CT 96090.00											
4 ^a	984	4	0.8	No	8.2	No	558	0.3	No	8.2	No
ROI Totals	5,655	580	NA	NA	NA	NA	2,804	NA	NA	NA	NA
COC	10,447	NA	12.8	NA	11.2	NA	NA	12.8	NA	11.2	NA

^a Indicates this ROI (BG) is currently encompassed by the baseline 65 dB or greater DNL contour.

^b Although the percentage of environmental justice populations in this ROI (BG) is higher than the COC, there are no persons affected in this area, thus no disproportionate impact to people.

^c No disproportionate impacts because this ROI (BG) is not encompassed by the baseline 65 dB or greater DNL contour

Notes:

1. NA = Not applicable does not apply

2. Shading indicates that implementation of the AFRC F-35A mission and or baseline conditions result in disproportionate noise impacts to the BG (ROI)

3. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

Table WH3-47. Children and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and AFRC F-35A Mission Conditions at Whiteman AFB (Scenario C)

Geographic Units	Population in the Census Area	Baseline					Proposed (Newly Affected)				
		Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)		Additional Population in the Area Encompassed by DNL of 65 dB or Greater	Children (<18 years)		Elderly (65 years or >)	
			Percent	Number	Percent	Number		Percent	Number	Percent	Number
CT 96070.00											
1	1,136	97	25.1	24	6.3	6	386	25.1	97	6.3	25
2	939	5	32.4	2	12.4	1	67	32.4	22	12.4	8
4	2,596	474	33.2	157	5.0	24	1,793	33.2	595	5.0	90
CT 96090.00											
4	984	4	26.7	1	15.0	1	588	26.7	149	14.8	84
Total	5,655	580	NA	144	NA	32	2,804	NA	863	NA	207
COC	10,447	NA	26.9	2,811	10.5	1,101	NA	26.9	3,349	10.5	1,281

Notes:

1. NA = Not applicable does not apply

2. Numbers may not sum due to rounding. To best represent the level of accuracy achieved, population group numbers are displayed as whole numbers in the text and tables, whereas calculations are based on the raw population group numbers containing multiple decimal points. The resulting summations and change calculations are then rounded to whole numbers.

Source: USCB 2017a-e

WH3.10.3 Summary of Impacts to Environmental Justice and Protection of Children

Implementation of the AFRC F-35A mission would not result in disproportionate noise impacts to minority or low-income populations. The estimated number of children and elderly people exposed to DNL of 65 dB or greater from each afterburner scenario are listed in Table WH3-48.

Implementation of any of the three afterburner scenarios would expose one off-base childcare facility (Rau’s Day Care) and one off-base school (Knob Noster Elementary) to DNL of 65 to 69 dB. This scenario would not expose any hospitals (on base or off base) or parks to DNL of 65 dB or greater. The Trails Regional Library Knob Noster Branch would be exposed to DNL of 65 to 69 dB.

Table WH3-48. Summary of the Minority, Low-Income, Children, and Elderly Populations Exposed to DNL of 65 dB or Greater Under Baseline and the Three Afterburner Scenarios for the AFRC F-35A Mission at Whiteman AFB

Scenarios and Baseline/No Action	Disproportionate Impact		Newly Exposed Individuals	
	Minority Populations - Census BGs (ROIs)	Low-Income Populations - Census BGs (ROIs)	Children	Elderly Persons
Baseline/No Action ^a	3 of 4 ^a	1 of 4 ^a	144 ^a	32 ^a
Scenario A	3 of 4	1 of 4	669	196
Scenario B	3 of 4	1 of 4	764	194
Scenario C	3 of 4	1 of 4	863	207

^a Baseline/No Action is the existing conditions and does not include the values for any of the other scenarios.

WH3.11 INFRASTRUCTURE

WH3.11.1 Base Affected Environment

WH3.11.1.1 Potable Water System

Whiteman AFB obtains potable water from 10 active water supply wells installed within the Gasconade and Roubideaux Formations. The base has a permit through MDNR to dispense drinking water. The supply capacity of the aquifer poses no limits to the amount of drinking water that could be supplied to the base. Whiteman AFB has adequate water supply and supporting infrastructure. The water system at Whiteman AFB consists of 331,227 linear feet of distribution pipes, 29,297 linear feet of supply mains, 1,250,000 gallons of storage, and a 26,000-gallon treatment facility (Whiteman AFB 2015b).

According to the 2009 Natural Infrastructure Assessment (NIA), the water distribution system is capable of supporting the mission. The water meets the primary and secondary drinking water standards (Whiteman AFB 2009a).

WH3.11.1.2 Wastewater

One government-owned Wastewater Treatment Plant (WWTP) is located on the installation. According to the 2009 NIA for Whiteman AFB, the WWTP capacity is fully capable of supporting the mission. This plant handles all industrial and domestic wastewater. It operates under a USEPA NPDES permit, administered by the MDNR. The treatment plant is monitored on a daily, weekly, or periodic basis for different point source discharges (Whiteman AFB 2015b).

The sanitary sewer system collects sewage and sends it to the treatment plant through a series of lift stations. The treatment plant is located west of Missouri Route 23, adjacent to the golf course. The capacity of the treatment plant is approximately 2.2 million gallons per day (MGD), and it currently treats an average of 0.58 MGD, which is approximately 26 percent of its capacity (Whiteman AFB 2015b).

The wastewater infrastructure is well maintained and in operable condition. Wastewater is discharged into a receiving body that is not degraded (Whiteman AFB 2015b).

Requirements to improve the system include replacing original aging equipment in the WWTP. Original pumps, valves, and piping require replacing in the following processes: trickling filter, grit removal, sludge transfer, and anaerobic digester (Whiteman AFB 2015b).

WH3.11.1.3 Stormwater System

Whiteman AFB is in the Clear Fork of the Blackwater River and Long Branch watersheds. Stormwater from Whiteman AFB flows to the Missouri River Drainage Basin in the Gasconade-Osage Rivers subregion. The 2010 SWPPP states that surface drainage flows through drainage basins and 47 associated outfalls that collect and drain stormwater from Whiteman AFB. The SWPPP was updated in 2016 and new drainage basins and outfalls were catalogued at that time (Whiteman AFB 2015b).

The southeastern corner of Whiteman AFB is within the 100-year floodplain of Long Branch Creek. Annual storms cause localized flooding and ponding on several parts of the installation, though no significant flooding has been reported in recent years. Frequent flooding from Long Branch Creek affects certain uses of low-lying areas of the base, including the Weapons Storage Area. Forecasted increases in the intensity and/or frequency of severe weather events could escalate the flooding challenge (Whiteman AFB 2015b).

Stormwater is monitored on Whiteman AFB through a USEPA NPDES permit administered by MDNR. The SWPPP requires a monthly inspection of stormwater discharge. Noncompliance has not been an issue under this permit (Whiteman AFB 2015b).

According to the 2009 NIA, the stormwater discharge system is fully capable of supporting the mission with no system failures occurring in the 36-month evaluation period. The stormwater system meets the demands of normal rainfall (Whiteman AFB 2015b).

WH3.11.1.4 Electrical System

The West Central Electric Cooperative (Touchstone) supplies electrical power to Whiteman AFB. Two 30-megawatt (MW) substations provide electricity to Whiteman AFB with excess capacity. There are two separate feeds for the substations. One is from Sedalia, the other from Warrensburg. The electrical distribution system has a maximum capacity of 525,600,000 kilowatt hours (kWh) per year. Whiteman AFB purchased 86.6 million kWh in 2013, approximately 16.5 percent of capacity. Whiteman AFB's mission necessitates a redundant power supply for mission-critical loads. Several areas on the base have been identified for adding redundancy. The electrical system condition is adequate. All installation electrical lines are underground (Whiteman AFB 2015b).

WH3.11.1.5 Natural Gas System

There are approximately 174,000 linear feet of natural gas distribution lines installed on the base. The system has two regulatory stations. The natural gas system on Whiteman AFB is adequate. The system is capable of providing 26,702 million British thermal units (MMBTUs)/day. Current usage is 1,075 MMBTU/day, 4 percent of system capacity. Missouri Gas Company provides natural gas to Whiteman AFB. During times of peak demand, Whiteman AFB uses alternative systems for industrial purposes. Variations in the supply and cost of natural gas could necessitate further consideration of alternative forms of heating in the future (Whiteman AFB 2015b).

WH3.11.1.6 Solid Waste Management

Solid waste at Whiteman AFB is managed in accordance with AFI 32-7042, *Waste Management*. In general, AFI 32-7042 establishes the requirements for installations to have a solid waste management program to incorporate a solid waste management plan; procedures for handling, storage, collection and disposal of solid waste; record-keeping and reporting; and pollution prevention. Whiteman AFB's Integrated Solid Waste Management Plan (ISWMP) provides guidance for managing municipal solid waste, compostable materials, C&D debris, and industrial solid waste to ensure compliance with applicable requirements for solid waste disposal, waste minimization, recycling, and reuse (Whiteman AFB 2013).

In accordance with the AFI 32-7042, Whiteman AFB strives to divert as much of their solid waste stream in the most cost-effective manner possible, keeping in mind the cost savings and cost avoidance that result from diverting solid waste from landfill disposal. The installation's nonhazardous solid waste and C&D debris diversion rates in 2012 were 45.11 and 99.4 percent, respectively (Whiteman AFB 2013).

Municipal solid waste generated at Whiteman AFB is collected by a contractor. Solid waste that is not reused or recycled is removed by the contractor and landfilled at the Show-Me Landfill located South off DD highway, east of Warrensburg, Missouri. No operating sanitary or C&D debris landfills are located on the installation. C&D contracts include requirements that C&D debris be recycled at off-site facilities (Whiteman AFB 2013).

WH3.11.1.7 Transportation

The transportation network is adequately handling the current level of traffic on base. Whiteman AFB has 45.7 miles of paved roads. Missouri Route 23 provides access to Whiteman AFB and connects the installation to U.S. Highway 50 to the north (Whiteman AFB 2015b).

Some of the high-traffic streets such as Arnold Avenue are showing alligator cracking and rutting from loading stresses. There are local ponding areas where storm runoff does not flow to the stormwater runoff system along Flightline Road, resulting in pavement deterioration from standing water. However, the transportation systems on Whiteman AFB are capable of supporting the mission (Whiteman AFB 2015b).

WH3.11.1.7.1 Gate Access

Three entry control facilities provide access to Whiteman AFB. An arterial street network connects the installation gates: Spirit Gate on the west, Arnold Gate on the north, and LeMay Gate on the south (Whiteman AFB 2015b).

WH3.11.1.7.2 On-Base Traffic Circulation

Missouri Route 23 divides the base to the west and provides access through Spirit Gate. The presence of Missouri Route 23 and its division of the base property remains a security concern. Secondary access to the base is provided through Arnold Gate, located on the north side of the base on Highway J. Arnold Gate is used for access to and from Knob Noster. Secondary access is also provided on a limited basis via LeMay Gate, located on the south side of the base on Highway D. LeMay Gate is also the contractor and commercial delivery gate (Whiteman AFB 2015b).

During peak access hours and under heightened security, traffic at Spirit Gate causes delays on Missouri Route 23 and Spirit Boulevard. Apart from this interference, the gates adequately accommodate the current volume of base traffic (Whiteman AFB 2015b).

WH3.11.2 Base Environmental Consequences

The projected change in population that would result from implementation of the proposed AFRC F-35A mission at Whiteman AFB is an increase of 11 base personnel or approximately 0.1 percent of the base population. This projected change in population and development was used to determine the impact on infrastructure. The maximum demand or impact on capacity was calculated for the potable water, wastewater, electric, and natural gas systems based on the projected change in population. To identify maximum demand or impact on these systems, any change in population was assumed to reside on base. The impact of the proposed AFRC F-35A mission on the transportation infrastructure, was considered negligible based on the potential minor increase of base personnel and on-base traffic.

WH3.11.2.1 Potable Water System

Based on the average usage rate of 94 gallons per day (GPD) (USGS 2018) per person in Johnson County, Missouri, it is anticipated that the increase in population associated with the proposed AFRC F-35A mission (i.e., 11 persons) would create an additional water use demand of 0.001 MGD. This increase, combined with the existing peak usage at Whiteman AFB, would not exceed the water system capacity and impacts would not be significant.

WH3.11.2.2 Wastewater

The USEPA estimates that the average person generates approximately 120 GPD of wastewater between showering, toilet use, and general water use (USEPA 2014). Based on this rate, the proposed increase in population (i.e., 11 persons) would increase wastewater discharge from Whiteman AFB by 0.001 MGD. The capacity of the treatment plant is approximately 2.2 MGD, and it currently treats an average of 0.58 MGD. Therefore, the increase in wastewater discharge would be well below the treatment plant's maximum capacity and the impacts would not be significant.

WH3.11.2.3 Stormwater System

The proposed AFRC F-35A mission would require demolition of facilities and construction of new facilities near the existing developed flightline and cantonment areas. The total disturbed area associated with these projects would not exceed 5 acres (approximately 2.9 acres) and impacts would not be significant.

During the short-term construction period, all contractors would be required to comply with applicable statutes, standards, regulations, and procedures regarding stormwater management. During the design phase, a variety of stormwater controls could be incorporated into construction plans. These could include planting vegetation in disturbed areas as soon as possible after construction; constructing retention facilities; and implementing structural controls (e.g., interceptor dikes, swales [excavated depressions], silt fences, straw bales, and other storm drain inlet protection), as necessary, to prevent sediment from entering inlet structures.

WH3.11.2.4 Electrical System

The West Central Electric Cooperative (Touchstone) reports the average household used 17.1 MWh per year (1.425 MWh per month). Converting this rate to an hourly rate and assuming 11 new households (i.e., one new household for each new authorized personnel on base), the proposed increase in population would increase electrical use at Whiteman AFB by 188.1 MWh per year. The electrical distribution system has a maximum capacity of 525,600 MWh per year. The increase due to implementing the proposed action would not exceed the West Central Electric Cooperative energy supply limit or the capacity of the base distribution system and impacts would not be significant.

WH3.11.2.5 Natural Gas System

The U.S. Energy Information Administration (USEIA) estimates that the average person in Missouri uses 6.4 MCF of natural gas per year (USEIA 2016). Based on this rate, the proposed increase in population (11) would increase natural gas use at Whiteman AFB by approximately 70.4 MCF per year. The current system is operating at approximately 4 percent of maximum capacity; therefore, implementation of the proposed AFRC F-35A mission would result in a very minor increase in usage and the impacts would not be significant.

WH3.11.2.6 Solid Waste Management

Solid waste would continue to be managed in accordance with AFI 32-7042 and the ISWMP with the implementation of the proposed AFRC F-35A mission at Whiteman AFB. Using methodology developed by the USEPA (USEPA 2009), it is estimated that implementation of the proposed AFRC F-35A mission would generate approximately 2,504 tons of C&D debris for recycling or removal to landfills. Application of the 60 percent DoD target diversion rate (DoD 2012) for C&D debris would

result in approximately 1,503 tons being reused or recycled, and approximately 1,002 tons being placed in the Show-Me Landfill or other landfills in the region. However, Whiteman AFB's current C&D debris diversion rate is greater than 99 percent, with the installation requiring their C&D contractors to recycle C&D debris at off-site facilities (Whiteman AFB 2015b). Regardless, the Show-Me Landfill has an estimated life span of 42 years, has more than 3,500,000 tons of remaining capacity, and would be able to accommodate the material resulting from the proposed AFRC F-35A mission (Stevens 2018). Additionally, solid waste generated from the proposed renovation and repair of the airfield pavement, apron, and ramp projects (Table WH2-1), would be recycled and reused as aggregate for the concrete and asphalt used in those projects.

The addition of 11 personnel and their associated dependents would generate additional municipal solid waste but have little effect on the municipal solid program (collection, disposal, etc.). The overall impacts would not be significant.

Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the base. C&D debris, including debris contaminated with hazardous waste, ACM, lead-based paint (LBP), or other hazardous components, would be managed in accordance with AFI 32-7042 and the installation's ISWMP.

WH3.11.2.7 Transportation

The addition of 11 personnel to the base as a result of implementing the proposed AFRC F-35A mission would have an almost imperceptible change in the traffic on the base. Therefore, no significant impacts to infrastructure are anticipated to result as a result from implementation of the proposed AFRC F-35A mission at Whiteman AFB.

WH3.11.3 Summary of Impacts to Infrastructure

Implementation of the AFRC F-35A mission would not result in changes to any of the utility infrastructure (i.e., potable water, wastewater, stormwater, electricity, natural gas, and solid waste) on Whiteman AFB. In addition, the new mission would also not require any changes to transportation resources including any of the base gates. Therefore, implementation of the new mission would result in negligible impacts to infrastructure.

WH3.12 HAZARDOUS MATERIALS AND WASTE

WH3.12.1 Base Affected Environment

WH3.12.1.1 Hazardous Materials

Hazardous materials used by USAF and contractor personnel at Whiteman AFB are managed in accordance with the Hazardous Materials Management Plan (Whiteman AFB 2003). This plan is written in accordance with AFI 32-7086, *Hazardous Materials Management*. Hazardous materials are controlled through the base Hazardous Materials Storage Facility. The purpose of the Hazardous Materials Storage Facility is to minimize and track the ordering, storage, distribution, use, reuse, recycling, and disposal of hazardous materials through the use of single point control.

WH3.12.1.1.1 Aboveground and Underground Storage Tanks

Bulk Jet-A+ at Whiteman AFB is stored in eight aboveground storage tanks (ASTs) at the Bulk Fuel Storage Area and Type IV Hydrant Tank Area. These eight ASTs have a combined storage capacity of approximately 4,440,160 gallons. Various other ASTs at Whiteman AFB are used to store Jet-A+, gasoline, diesel, oil, and used oil. Whiteman AFB also manages eight underground storage tanks

(USTs) (Whiteman AFB 2015c). Whiteman AFB used approximately 17,500,000 gallons of Jet-A+ in 2017 with approximately annual capacity of 36,000,000 gallons. Whiteman AFB receives all liquid fuels via commercial tank trucks. Jet-A+ is delivered from the Bulk Fuel Storage Area to the A-10 aircraft parking ramp via six R-11 6,000-gallon refueling trucks (Whiteman AFB 2015b).

All tanks at Whiteman AFB are managed in accordance with the base Spill, Prevention, Control, and Countermeasure (SPCC) Plan and Facility Response Plan (FRP) (Whiteman AFB 2015a). This plan addresses storage locations and proper handling procedures for all hazardous materials to minimize the potential for spills and releases. This plan also describes the response procedures for spills or discharges of petroleum products and other hazardous materials at Whiteman AFB. Implementation of the SPCC Plan and FRP provide measures to prevent petroleum product discharges from occurring, and prepare the base to respond in a safe, effective, and timely manner to mitigate the impacts of an uncontrolled discharge. The SPCC Plan and FRP also address roles, responsibilities, and response actions for all major spills (Whiteman AFB 2015c).

WH3.12.1.1.2 Toxic Substances

The Asbestos Management and Operating Plan outlines management roles and responsibilities and establishes procedures to protect personnel who live and work on Whiteman AFB from exposure to excessive levels of airborne asbestos fibers. The plan also describes how the base will carry out ACM-related work and ensures compliance with all USAF, federal, state, and local regulation dealing with ACM (Whiteman AFB 1997). The Civil Engineering Squadron maintains an electronic asbestos database documenting asbestos-related activities. Based on the plan, all proposed facility construction, demolition, and renovation or self-help projects must be reviewed, to the extent possible, to identify the presence of ACM prior to work beginning. Work on ACM projects would only be performed by a Missouri-registered asbestos abatement contractor trained in accordance with OSHA and USEPA standards. For any project on base, ACM wastes are removed by the contractor performing the work and handled and disposed of in accordance with federal, state, and local regulations at a waste disposal site authorized to accept such waste.

The Whiteman AFB Lead-Based Paint Management Plan (Whiteman AFB 2009b) was designed to bring the base into compliance with USEPA and MDNR policies and laws governing LBP management. The plan also provides guidance and establishes procedures for the management of LBP and the implementation of the LBP program. The Lead-Based Paint Management Plan also defines management and organizational responsibilities and procedures for ensuring that personnel at Whiteman AFB are not exposed to lead poisoning. The Civil Engineering Squadron maintains permanent LBP records to document the location of LBP. These records are updated after each abatement project. The design of building alteration projects, demolitions, and requests for self-help projects are reviewed to determine if lead-containing materials are present in the proposed work area. For every project on Whiteman AFB, LBP wastes are removed by the contractor and disposed of in accordance with the Whiteman AFB Hazardous Waste Management Plan and state and federal regulations at a permitted off-base landfill (Whiteman AFB 2017b). Whiteman AFB is reportedly free of polychlorinated biphenyls (PCBs) (Golson 2018).

WH3.12.1.2 Hazardous Waste Management

Whiteman AFB is classified as a Large-Quantity Generator. Typical hazardous wastes generated during O&M activities include flammable solvents, contaminated fuels and lubricants, paint/coating, stripping chemicals, waste oils, blast media, waste paint-related materials, and other miscellaneous wastes.

Hazardous waste generated, used, treated, stored, transported, or disposed of by Whiteman AFB is regulated by the State of Missouri under authority granted to the state by the USEPA. The base is registered as a hazardous waste generator with the MDNR.

Hazardous wastes at Whiteman AFB are managed in accordance with the U.S. Air Force Hazardous Waste Management Plan (Whiteman AFB 2017b). This plan describes the handling and management of hazardous wastes from the point the material becomes a hazardous waste to the point of ultimate disposal, as required by federal and state laws and regulations. In 2017, the base generated approximately 20,100 pounds of hazardous waste, which was disposed of at off-base permitted disposal facilities.

WH3.12.1.3 Environmental Restoration Program

There are 44 Environmental Restoration Program (ERP) sites at Whiteman AFB. Thirty-three (33) of these sites are closed with no further action or with additional actions that have been completed. The remaining 11 ERP sites have been closed with long-term management activities and institutional controls under the authority of both the state and USEPA (Whiteman AFB 2010a, Whiteman AFB 2015b). Environmental response actions at Whiteman AFB are planned and executed under the ERP in a manner consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resource Conservation and Recovery Act (RCRA), and other applicable laws. Whiteman AFB is not listed on the USEPA's National Priorities List.

WH3.12.2 Base Environmental Consequences

WH3.12.2.1 Hazardous Materials Management

Implementation of the proposed AFRC F-35A mission at Whiteman AFB would not add any new hazardous materials that would exceed the base's current hazardous waste processes. Existing procedures for the centralized management of the ordering, storage, distribution, use, reuse, recycling, and disposal of hazardous materials through the base Hazardous Materials Storage Facility are adequate to accommodate the changes anticipated with the replacement of the A-10 mission with the AFRC F-35A mission.

The F-35A was designed to reduce the quantities and types of hazardous materials needed for maintenance of the aircraft. Unlike the A-10 aircraft, the F-35A aircraft does not use cadmium fasteners, chrome plating, copper-beryllium bushings, or primers containing cadmium and hexavalent chromium. No adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at Whiteman AFB. Long-term environmental benefits from the reduced use of hazardous materials are anticipated.

The F-35A aircraft is composed of composite materials, such as carbon fiber, which could pose a health risk under specific circumstances (e.g., when burned as a result of an aircraft crash). Section WH3.4.2.4.2 discusses composite materials and emergency crash response.

WH3.12.2.1.1 Aboveground and Underground Storage Tanks

New and remodeled facilities would require the addition of new ASTs to support generators, as well as new hazardous material and waste containers. The new and remodeled facilities would be constructed with berms and drains leading to oil-water separators (OWSs), if required, to contain potential uncontrolled releases of petroleum products. The Whiteman AFB SPCC Plan and FRP would subsequently need to be revised to incorporate any changes in facility design, construction operation, or maintenance that materially affects the potential for an uncontrolled release of petroleum products (Whiteman AFB 2015c).

WH3.12.2.1.2 Toxic Substances

Several demolition and renovation projects are planned as part of the proposed AFRC F-35A mission. Any construction, demolition, or renovation project proposed at Whiteman AFB would be reviewed to determine if ACM is present. As shown in Table WH3-49, Building 706 is proposed for demolition and could potentially contain ACM. All handling and disposal of ACM wastes would be performed in accordance with the Whiteman AFB *Asbestos Management and Operating Plan* (Whiteman AFB 1997) and in compliance with federal, state, and local regulations. Before initiating any demolition or ACM work, required notifications to the MDNR, Air Pollution Control Program, would be completed. This notification (MO 780-1923, if applicable) will be submitted 20 working days before beginning work. MDNR requires a 10-working-day notification, but the Asbestos Management and Operating Plan requires a 20-working-day notification. Work on ACM projects would only be conducted by a Missouri registered asbestos abatement contractor with current certificates of training in accordance with standards established by OSHA and the USEPA. All ACM wastes would be disposed of at an approved landfill (Whiteman AFB 1997).

Table WH3-49. Toxic Substances Associated with Projects for the AFRC F-35A Mission at Whiteman AFB

Project	Year Constructed	ACM	LBP	PCBs
Demolition				
Building 706	1980	a	b	c
Renovation				
Building 41 renovation for squadron operations	2009	d	d	c
Building 91 renovation for engine repair	1991	d	d	c
Building 1117 electrical and ventilation upgrades	1995	d	d	c
Building 1118 electrical upgrade	1995	d	d	c
Building 1119 egress shop – relocation from building 1117	1995	d	d	c

^a Buildings constructed before 1980 are assumed to potentially contain ACM (AFI 32-1052, *Facility Asbestos Management*).

^b Buildings constructed before 1980 are presumed to potentially contain LBP (Whiteman AFB 2009b).

^c Whiteman AFB is reportedly PCB-free (Golson 2018).

^d Buildings constructed after 1980 are presumed to not contain ACM or LBP.

All construction, demolition, and renovation projects proposed at Whiteman AFB would be reviewed to determine if LBP or lead-containing materials are present, and whether such materials would be disturbed. To the extent possible, the presence of lead within the work area would be identified prior to work beginning. As shown in Table WH3-49, Building 706 is proposed for demolition and could potentially contain LBP or lead-containing material. If the presence of lead-containing material in the project work area is unknown, the shop and real property records would be reviewed to determine the presence of lead. If the presence of lead-containing material in the work area is still unknown, sampling and analysis for lead would be conducted. The handling and disposal of lead wastes would be conducted in accordance with the Whiteman AFB Hazardous Waste Management Plan (Whiteman AFB 2017b), and in compliance with federal, state, and local requirements and regulations.

Although minor increases in the management requirements for ACM and LBP removal are anticipated, no adverse impacts are anticipated to result from implementation of the AFRC F-35A mission at Whiteman AFB. Long-term environmental benefits from removal of toxic substances are anticipated.

WH3.12.2.2 Hazardous Waste Management

Whiteman AFB would continue to operate as a Large-Quantity Generator and would generate hazardous wastes during various O&M activities associated with the proposed AFRC F-35A mission. Waste-associated maintenance materials include adhesives, sealants, conversion coatings, corrosion prevention compounds, hydraulic fluids, lubricants, oils, paints, polishes, thinners, cleaners, strippers, tapes, and wipes. No new hazardous materials would be added that exceed the base's current hazardous waste processes. The U.S. Air Force Hazardous Waste Management Plan (Whiteman AFB 2017b) would be updated to reflect any change in disposal procedures or hazardous waste generators and waste accumulation points. Implementation of the AFRC F-35A operational beddown and mission at Whiteman AFB would potentially have a beneficial impact on hazardous waste management. Transition from the A-10 to the F-35A would decrease the volume and types of hazardous waste and waste streams because O&M involving cadmium and hexavalent chromium primer, and various heavy metals have been eliminated or greatly reduced. All hazardous wastes would be handled and managed in accordance with federal, state, and local regulations.

WH3.12.2.3 Environmental Restoration Program

There are 44 ERP sites at Whiteman AFB that are closed with no further action or closed with long-term management activities and institutional controls under the authority of both the state and USEPA (Whiteman AFB 2010a, Whiteman AFB 2015b). None of the proposed construction, demolition, or renovation projects associated with the proposed AFRC F-35A mission at Whiteman AFB are on or directly adjacent to the ERP sites. However, there is the possibility that undocumented contaminated soils and/or groundwater from historical fuel spills could be present. If encountered during C&D-related excavations, storage/transport/disposal of contaminated groundwater/soils would be conducted in accordance with applicable federal, state, and local regulations; AFIs; and base policies. Should soil or groundwater contaminants be encountered during C&D activities, health and safety precautions, including worker awareness training, would be required.

WH3.12.3 Summary of Impacts to Hazardous Materials and Waste

Implementation of the new mission would not add any new hazardous materials that would exceed the base's current processes. No ASTs, USTs or OWSs would be removed. The building proposed for demolition is assumed to be free of ACM and LBP. However, prior to any demolition or renovation, plans are reviewed and if ACM or LBP are identified, Whiteman AFB would complete the appropriate notifications and complete the abatement work in accordance with applicable plans and per all local, state and federal requirements. None of the construction would affect ERP sites. Should contaminated media be encountered during construction, storage/transport/disposal of contaminated media would be conducted in accordance with base plans and applicable regulations. Implementation of the new mission would not result in significant impacts to hazardous materials and wastes.

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WH4.0 CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Council on Environmental Quality (CEQ) regulations stipulate that the cumulative effects analysis should consider the potential environmental impacts resulting from “the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person (federal or non-federal) undertakes such other actions” (40 *CFR* 1508.7). In this section, an effort has been made to identify past and present actions in the Whiteman AFB region and those reasonably foreseeable actions that are in the planning phase or unfolding at this time. Actions that have a potential to interact with the AFRC F-35A mission at Whiteman AFB are included in this cumulative analysis. This approach enables decision makers to have the most current information available so that they can evaluate the environmental consequences of the AFRC F-35A mission at Whiteman AFB and in associated airspace.

Whiteman AFB is an active military installation that undergoes changes in mission and training requirements in response to defense policies, current threats, and tactical and technological advances. As a result, the installation requires new construction, facility improvements, infrastructure upgrades, and other maintenance/repairs on a nearly continual basis. Although known construction and upgrades are a part of the analysis contained in this document, some future requirements cannot be predicted. As those requirements surface, future NEPA analyses will be conducted, as necessary.

WH4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

Whiteman AFB was activated in 1942 as Sedalia Army Airfield during the mobilization efforts following the Japanese attack on Pearl Harbor. The base closed in 1947 as part of the post-World War II demobilization. In 1951, the base returned to serve as Sedalia AFB under the Strategic Air Command, beginning with two years of reconstruction. The first aircraft arrived at Whiteman AFB in 1953. These included the B-47 Stratojet and the KC-97 tankers in 1954. In 1955 the base was redesignated as Whiteman AFB in honor of Lieutenant George A. Whiteman, a Sedalia native killed at Pearl Harbor. Construction continued through the 1950s. The period of 1960-1970 was stable for Whiteman AFB, but construction began again in the late 1980s when the base was identified as the future home of the B-2 Stealth Bomber. The AFRC operating the A-10 moved to the base in 1994 from Richards-Gebaur AFB near Kansas City. The primary mission at Whiteman AFB is to maintain pilot proficiency and combat readiness for the 509 BW flying the B-2 bomber and the AFRC 442 Fighter Wing operating the A-10. The 1-135 ARB is an ANG unit that provides ground forces with air support and direct close combat attack.

Table WH4-1 summarizes past, present, and reasonably foreseeable actions within the region that could interact with the AFRC F-35A mission at Whiteman AFB. The table briefly describes each identified action, presents the proponent or jurisdiction of the action and the timeframe (e.g., past, present/ongoing, future), and indicates which resources potentially interact with the AFRC F-35A mission at Whiteman AFB. Recent past and ongoing military actions in the region were considered as part of the baseline or existing conditions in the region surrounding Whiteman AFB and training airspace.

Table WH4–1. Past, Present, and Reasonably Foreseeable Actions at Whiteman AFB and Associated Region

Action	Proponent/Location	Timeframe	Description	Resource Interaction
Military Actions				
Whiteman AFB IDP	509 BW	Present and Future	The IDP includes 17 short-range projects, 12 medium-range projects, and 3 long-range projects. The short-range projects range in size from as large as the construction of a new Joint Mobility Center to an addition on the Fitness Center. Medium-range development projects include large projects such as the construction of a consolidated sports complex. Long range development project include a consolidated base exchange/commissary complex, fuels hydrant system extensions and a depot-level maintenance facility. The top MILCON project for the facility is the construction of a Stealth Operations Facility to replace the current squadron operations and mission planning facilities.	Noise, Air Quality, Safety, Soil and Water Resources, Transportation, Infrastructure
B-21 Bomber Mission	USAF	Future	Whiteman AFB along with three other bases has been selected by the USAF as a reasonable alternative for the B-21 bomber mission. The B-21 mission could replace the current B-2 mission at Whiteman AFB. Delivery of the first B-21 Bombers is anticipated to begin in the mid-2020s.	Noise, Air Quality, Safety, Soil and Water Resources, Biological Resources, Cultural Resources, Land Use and Recreation
Non-Military (Federal) Actions				
None				
Non-Military (Private Actions)				
Cahill Residential Development	Private Developer/City of Warrensburg	Present and Future	This project includes the construction of 231 single-family, two-story homes on 130 acres.	Noise, Air Quality, Land Use and Recreation
Timber Glen at Hawthorne Estates Development	Private Developer/City of Warrensburg	Present and Future	This project includes the development of 48 single-family homes.	Noise, Air Quality, Land Use and Recreation
Construction of a \$42 million mixed use facility	University of Central Missouri	Past	This facility will feature apartments, a Starbucks, a restaurant, the university store, and a convenience store.	Noise, Air Quality, Land Use and Recreation
Construction of a steel rebar manufacturing plant	Nucor Steel	Present and Future	Approximately 250 acres of land on the northeast side of Sedalia has been annexed by the City for Nucor to construct a new steel plant to be fully functional in 2019.	Noise, Air Quality, Land Use and Recreation, Socioeconomics
State and Local				
Warrensburg Capital Projects	City of Warrensburg	Present and Future	These projects will include street, curb, and sidewalk repair, maintenance, and improvement projects, as well as Veterans Road extension, traffic signal upgrades, Hawthorne & Maguire Round-About, and ongoing Downtown Revitalization.	Noise, Air Quality, Land Use, Infrastructure, Socioeconomics
Warrensburg Capital Projects	City of Warrensburg	Future	This project includes the development of a new Industrial-Business Park.	Noise, Air Quality, Land Use, Infrastructure, Socioeconomics
Warrensburg Capital Projects	City of Warrensburg	Future	This project includes the installation of a new fiber optic communication system.	Noise, Air Quality, Land Use, Infrastructure, Socioeconomics

WH4.2 CUMULATIVE IMPACTS

The following analysis considers how the impacts of the actions in Table WH4-1 might affect or be affected by the AFRC F-35A mission at Whiteman AFB. The analysis considers whether such a relationship would result in potentially significant impacts not identified when the AFRC F-35A mission at Whiteman AFB is considered alone.

Table WH4-2 provides a summary of the cumulative effects. As shown in Table WH4-2, safety, cultural resources, infrastructure, and hazardous materials and waste are not anticipated to contribute to cumulative effects. Cumulative effects are described for airspace, noise, air quality, soil and water resources, biological resources, land use and recreation, socioeconomics, and environmental justice and protection of children. Climate change is also described in this section because changes in climate have the potential to cumulatively impact other resource areas.

Table WH4-2. Summary of Cumulative Effects for Whiteman AFB

Resource Area	AFRC F-35A Mission	Past, Present, and Reasonably Foreseeable Actions ^a	Cumulative Effects
Airspace	■	■	■
Noise	●	■	■
Air Quality	○	■	○
Safety	○	○	○
Soil and Water Resources	■	■	■
Biological Resources	■	■	■
Cultural Resources	○	○	○
Land Use and Recreation	■	■	■
Socioeconomics	■	■	■
Environmental Justice and Protection of Children	■	■	■
Infrastructure	○	○	○
Hazardous Materials and Waste	○	○	○

^a When determining the potential for significance, past and ongoing actions in the region were considered as part of the baseline or existing conditions in the region surrounding Whiteman AFB and the airspace (e.g., the cumulative noise impact of past and present missions at Whiteman AFB were modeled under baseline conditions).

Key: ○ = not affected or beneficial impacts
 ■ = affected but not significant, short to medium term, impacts that range from low to high intensity
 ● = significant impacts, that are high in intensity or are long-term

WH4.2.1 Airspace

WH4.2.1.1 Airfield Operations

As noted in Section WH2.3, implementation of the AFRC F-35A mission at Whiteman AFB would increase overall airfield operations by approximately 17.4 percent. Should Whiteman AFB be selected for the B-21 Bomber mission, additional impacts to airfield operations would be anticipated. The number of operations could increase or decrease based on the new mission requirements. Based on the best available information at this time, no known present and/or reasonable foreseeable future actions, when combined with the increased AFRC F-35A operations, would result in any significant cumulative impacts to airfield operations or the management and configuration of the airspace currently surrounding this airfield environment.

Military actions with major changes in aircraft types or operations would undergo additional environmental analysis to determine the exact number of operations and the potential for additional impacts within the airspace.

WH4.2.1.2 Training Airspace

Several of the SUA areas proposed for use by the AFRC F-35A mission at Whiteman AFB would see increased use should the mission be located at Whiteman AFB. The increased use is not anticipated to have significant impacts to military training or civilian aircraft in these areas.

Of the projects described in Table WH4-1, only the potential beddown of the B-21 Bomber mission at Whiteman AFB would have a potential to increase airspace usage. The number of sorties for this unit is not known at this time and additional NEPA analysis would occur prior to a change in mission at Whiteman AFB. Because the mission would be a replacement mission, it is not anticipated that there would be a significant change in airspace use. Any potential conflicts in the use of airspace would be deconflicted by the scheduling agency. Any changes to SUA or charting of new SUA would require separate environmental analysis.

No present and/or known reasonable foreseeable future actions, when combined with the increase in airspace sorties that would result from the AFRC F-35A mission at Whiteman AFB, would result in any cumulative impacts to airspace management in the SUAs proposed for use.

WH4.2.2 Noise

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) occurring during the same time periods. C&D projects are a regular occurrence on and near active USAF installations such as Whiteman AFB. C&D noise would be localized and temporary. Construction work is generally limited to normal working hours (i.e., 7:00 A.M. to 5:00 P.M.). Furthermore, the projects are or would be located in an acoustic environment that includes elevated aircraft operations noise levels. In the instance that multiple C&D projects affect a single area at the same time, construction noise would be a slightly more noticeable component of the acoustic environment.

As described in Section WH3.2.2, the AFRC F-35A mission at Whiteman AFB would result in increased noise from the proposed aircraft operations. It was determined that the increase in noise would be a significant impact to the environment surrounding Whiteman AFB. The hypothetical future beddown of a B-21 bomber mission (Table WH4-1) would also affect noise levels near the installation. However, the B-21 bomber has not yet been designed, and noise levels that would be generated by the aircraft during flight are not known.

Private and state/local government-funded land development projects have the potential to increase noise impacts by increasing the noise-sensitivity of areas exposed to elevated aircraft noise levels. However, major development projects listed in in Table WH4-1 are located in Warrensburg, which is more than 5 miles from Whiteman AFB, and would not be exposed to DNL of 65 dB or greater from the AFRC F-35A mission. Implementation of the AFRC F-35A mission, combined with past, present, and reasonably foreseeable projects, would not result in significant cumulative noise impacts.

WH4.2.3 Air Quality

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Whiteman AFB. These

projects would generate the same types of construction related air quality impacts as described for the proposed AFRC F-35A mission (e.g. fugitive dust emissions, increases in construction related criteria pollutant emissions). Although implementation of the AFRC F-35A mission would result in minor increases in emissions of NO_x, SO_x, PM_{2.5} and CO_{2e}, these increases, combined with air emission increases from past, present, and reasonably foreseeable future actions, would not prevent this area from maintaining NAAQS or result in significant cumulative impacts to the air quality.

The implementation of the proposed AFRC F-35A mission at Whiteman AFB would not result in significant impacts to air quality. No known projects, when added to the emissions from the AFRC F-35A mission, would result in significant impacts to air quality.

WH4.2.4 Soil and Water Resources

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Whiteman AFB. These construction projects would increase the amount of soil disturbed and have the potential to increase erosion and sedimentation into surface water features. Impacts to soil and water resources resulting from implementing the AFRC F-35A projects at Whiteman AFB, combined with impacts to soil and water resources from past, present, and reasonably foreseeable future actions, would not result in significant cumulative impacts to the soil and water resources.

WH4.2.5 Biological Resources

The additional C&D projects described in Table WH4-1 would be anticipated to have similar types of impacts to vegetation, wildlife, and special status species as those impacts described for the construction impacts for the proposed AFRC F-35A mission. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on biological resources at Whiteman AFB would not be significant.

The aircraft operations associated with implementation of the AFRC F-35A mission at Whiteman AFB would not result in significant impacts to wildlife, including threatened and endangered species and migratory birds. Projects such as the B-21 Bomber mission could result in similar impacts to wildlife as those described in this EIS. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on the biological resources at Whiteman AFB would not be significant.

WH4.2.6 Land Use and Recreation

C&D projects associated with the proposed AFRC F-35A mission would occur near other ongoing and future C&D projects (e.g., IDP projects, construction from private and state and local development) during the same time periods. C&D projects have been and will continue to be a regular occurrence on and near installations such as Whiteman AFB. Construction projects would continue to comply with existing zoning ordinance. Cumulative impacts resulting from implementation of the proposed AFRC F-35A mission in conjunction with past, present, and reasonably foreseeable future actions on land use and recreation at Whiteman AFB would not be significant.

Aircraft operations associated with implementation of the AFRC F-35A mission at Whiteman AFB would not result in significant impacts to land use and recreation. Increased noise would impact

some recreational facilities and could reduce the enjoyment of those facilities for some persons. Projects such as the B-21 Bomber mission could increase noise in the region surrounding Whiteman AFB and add to the impacts from the AFRC F-35A mission. Additional NEPA analysis would be conducted for future beddown missions to quantify any additional impacts.

WH4.2.7 Socioeconomics

The C&D projects associated with the AFRC F-35A mission would provide short-term, economic benefits to surrounding areas through employment of construction workers and through the purchase of materials and equipment. The short-term impact of implementing the proposed mission combined with any or all of the projects listed in Table WH 4-1 would result in negligible cumulative impacts to socioeconomics in the area. The addition of 11 personnel associated with the proposed mission is also not anticipated to result in cumulative impacts to housing, schools, or other socioeconomic resources in this area.

WH4.2.8 Environmental Justice and the Protection of Children

The proposed C&D projects on and near Whiteman AFB would not result in any cumulative impacts to environmental justice populations. Noise resulting from the operation of F-35A aircraft would affect people living near the installation. As discussed in Section WH3.10.2, implementation of the AFRC F-35A mission at Whiteman AFB would not result in disproportionate impacts to minority or low-income populations. Projects such as the B-21 Bomber mission could increase noise in the region surrounding Whiteman AFB and add to the impacts from the AFRC F-35A mission. Additional NEPA analysis would be conducted for future beddown missions to quantify any additional impacts.

WH4.2.9 Climate Change

Missouri and the surrounding region could experience a continuing of recent upward trends in average temperatures and below average occurrence of extremely cold days, an increase in heavy rain events and winter precipitation, and an increase in the intensity of naturally occurring droughts (USGCRP 2017).

Increases in temperature, heavy precipitation events, and drought intensity could interact with resource areas such as air quality, water resources, and socioeconomics. Increasing temperatures have been shown to increase ground level ozone and particulates (Orru et al 2017). Increases in heavy precipitation events lead to increased risk of flooding and spring planting delays. Increases in drought intensity could impact water availability. Potential socioeconomic impacts could include increased costs associated with poor air quality, flooding damage, and decreased harvests.

While the recent impacts of climate change have been minor in the Missouri region and operations at Whiteman AFB have remained relatively unchanged, exacerbation of climate conditions in the future could increase the cost of proposed operations and could impede operations during extreme events. Additional measures could be needed to mitigate such impacts over the operational life expectancy of the F-35A.

WH4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals)

that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

For the beddown of F-35A aircraft at Whiteman AFB, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term (e.g., air emissions from construction) or longer lasting but negligible (e.g., public service increases). Those limited resources that could involve a possible irreversible or irretrievable commitment are discussed below.

Should the AFRC F-35A mission be located at Whiteman AFB, some land in the cantonment would be disturbed. However, much of this land has been previously disturbed and is heavily influenced by airfield development. Construction and renovation of base facilities would require the consumption of limited amounts of material typically associated with interior renovations (e.g., wiring, insulation, windows, and drywall) and exterior construction (e.g., concrete, steel, sand, and brick). An undetermined amount of energy to conduct renovation, construction, and operation of these facilities would be expended and irreversibly lost.

Training operations would continue and involve consumption of nonrenewable resources (e.g., gasoline used in vehicles and jet fuel used in aircraft). None of these activities are expected to significantly decrease the availability of minerals or petroleum resources. Privately owned vehicle use by the personnel continuing to support the existing missions would consume fuel, oil, and lubricants. The amount of these materials used would increase; however, this additional use is not expected to significantly affect the availability of the resources.

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CHAPTER 4

NO ACTION ALTERNATIVE



NA1.0 NO ACTION ALTERNATIVE

Analysis of the No Action Alternative provides a benchmark, enabling decision makers to compare the magnitude of the environmental effects of the proposed action or alternatives. Section 1502.14(d) of the National Environmental Policy Act (NEPA) requires an Environmental Impact Statement (EIS) to analyze the No Action Alternative. No action for this EIS means that the proposed Air Force Reserve Command (AFRC) F-35A beddown would not occur at any base at this time. Implementation of the No Action Alternative would not establish the AFRC F-35A mission at any base.

The No Action Alternative has been carried forward in the EIS per Council on Environmental Quality (CEQ) regulations and as a baseline of existing impact continued into the future against which to compare impacts of the action alternatives.

Under the No Action Alternative:

- AFRC would not be provided a location to operate the F-35A aircraft; AFRC would not be able to efficiently and effectively maintain combat capability and mission readiness; and AFRC would not integrate F-35A squadrons into the existing U.S. Air Force (USAF) structure. In addition, AFRC would not be able to organize, train, equip, and support F-35A pilots to meet a full range of military operations.
- There would be no change in based aircraft at Davis-Monthan Air Force Base (AFB); operations at Davis-Monthan AFB and in the airspace would continue. The 924th Fighter Group (924 FG) would continue to operate the existing A-10 aircraft, there would be no F-35A-related changes to infrastructure or personnel.
- There would be no change in based aircraft at Homestead Air Reserve Base (ARB) and aircraft operations around Homestead ARB and in the associated airspace would continue. The 482nd Fighter Wing (482 FW) would continue to fly air missions with the existing F-16 aircraft. The Special Operations Command South and other major units at the base would continue operating as described in baseline conditions.
- At Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), there would be no change in based aircraft and aircraft operations around the installation and in the airspace would continue. The 301st Fighter Wing (301 FW) would continue to fly the existing F-16 aircraft. Twenty-four [24]-hour equivalent noise levels (L_{eq24}) greater than or equal to 80 decibels (dB) would continue to affect off-base residential areas, posing some long-term risk of noise-induced permanent threshold shift (NIPTS) for the affected population.
- The A-10 mission would continue at Whiteman AFB and aircraft operations around the base and in the associated airspace would remain unchanged. The 442nd Fighter Wing (442 FW) and the 509th Bomb Wing (509 BW) would continue to fly missions.

Implementation of the No Action Alternative is explained by resource area below. For some resource areas, implementing the No Action Alternative would be the same for all four bases and is generally described for those resource areas. For other resource areas, implementing the No Action Alternative would be base-specific and is described separately by base.

NA1.1 AIRSPACE MANAGEMENT AND USE

Under the No Action Alternative at all four alternative bases, the Air Force would continue to use and manage airspace as it is today. Flying operations and airspace use would continue with no F-35A-related increase or decrease in air traffic.

NA1.2 NOISE

Under the No Action Alternative at Davis-Monthan AFB, Homestead ARB, NAS Fort Worth JRB and Whiteman AFB, existing aircraft operations would continue and construction associated with the AFRC F-35A beddown would not occur. Noise levels at each of the four installations would remain as they are today and there would be no new F-35A-related noise impacts. At NAS Fort Worth JRB, Lockheed Martin would continue to build F-35 aircraft at the adjacent assembly facility and Lockheed Martin pilots would continue to conduct F-35 test flights for the new aircraft.

NA1.3 AIR QUALITY

Under the No Action Alternative, air quality conditions at Davis-Monthan AFB, Homestead ARB, NAS Fort Worth JRB and Whiteman AFB would remain as described in Sections DM3.3.1 and DM3.3.3, HS3.3.1 and HS3.3.3, FW3.3.1 and FW3.3.3 and WM3.3.1 and WM3.3.3. No F-35A-related changes that could affect air quality would occur at any of the base or in the associated airspace.

NA1.4 SAFETY

Under the No Action Alternative, no F-35A aircraft would be based at any of the four bases. In addition, no F-35A-related personnel changes would occur and construction would not be completed. The AFRC and the other flying units at each base would continue their existing missions. All aspects of ground safety and safety in the airspace would remain as described in Sections DM3.4.1 and DM3.4.3, HS3.4.1 and HS3.4.3, FW3.4.1 and FW3.4.3 and WM3.4.1 and WM3.4.3.

NA1.5 SOIL AND WATER RESOURCES

Under the No Action Alternative, soil and water resources at each base would remain as described in Sections DM3.5.1, HS3.5.1, FW3.5.1 and WM3.5.1. None of the proposed construction to support the AFRC F-35A mission would occur, and no F-35A-related impacts to soil and water resources would occur.

NA1.6 BIOLOGICAL RESOURCES

Under the No Action Alternative, biological resources at each of the four bases and associated airspace would remain as described in Sections DM3.6.1 and DM3.6.3, HS3.6.1 and HS3.6.3, FW3.6.1 and FW3.6.3 and WM3.6.1 and WM3.6.3. Vegetation and wildlife habitat would not be disturbed as a result of not implementing the proposed AFRC F-35A mission. No F-35A-related impacts on biological resources are anticipated. At Homestead ARB, biological resources would continue to be managed in accordance with the new Biological Opinion (BO) and in coordination with the U.S. Fish and Wildlife Service (USFWS).

NA1.7 CULTURAL RESOURCES

Under the No Action Alternative, no F-35A-related building renovation, demolition, or construction would occur at any of the four bases. In addition, there would be no F-35A-related changes in the airspace resulting in no changes to cultural resources under the airspace currently used by pilots from each of the four bases. Implementation of the No Action Alternative would result in no effect to cultural resources and/or historic properties.

NA1.8 LAND USE AND RECREATION

Under the No Action Alternative, land use and recreational resources at each base and under the airspace would remain as described in Sections DM3.8.1 and DM3.8.3, HS3.8.1 and HS3.8.3, FW3.8.1 and FW3.8.3 and WM3.8.1 and WM3.8.3. Residential land at NAS Fort Worth JRB and Whiteman AFB would continue to remain incompatible with existing noise levels and noise levels at recreational areas near each of the bases and below the airspace proposed for use would remain unchanged.

NA1.9 SOCIOECONOMICS

Under the No Action Alternative, socioeconomic conditions would remain as described in Sections DM3.9.1, HS3.9.1, FW3.9.1 and WM3.9.1. No personnel increases or decreases would occur at any of the bases. No F-35A-related construction would occur.

NA1.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

Under the No Action Alternative, there would be no F-35A-related changes that would result in impacts to environmental justice or child populations. Conditions at Davis-Monthan AFB, Homestead ARB, NAS Fort Worth JRB and Whiteman AFB would remain as described in Sections DM3.10.1, HS3.10.1, FW3.10.1 and WM3.10.1.

Disproportionate impacts to minority and low income populations would continue to occur at NAS Fort Worth JRB and Whiteman AFB and children and elderly persons would continue to be exposed to day-night average sound levels (DNL) of 65 dB or greater at both of these installations.

NA1.11 INFRASTRUCTURE

Under the No Action Alternative, the infrastructure at each base would remain as described in the Sections DM3.11.1, HS3.11.1, FW3.11.1 and WM3.11.1. No new F-35A-related construction would occur and no F-35A-related personnel would arrive or decrease at any of the bases. No impacts on the infrastructure system at any of the bases would occur.

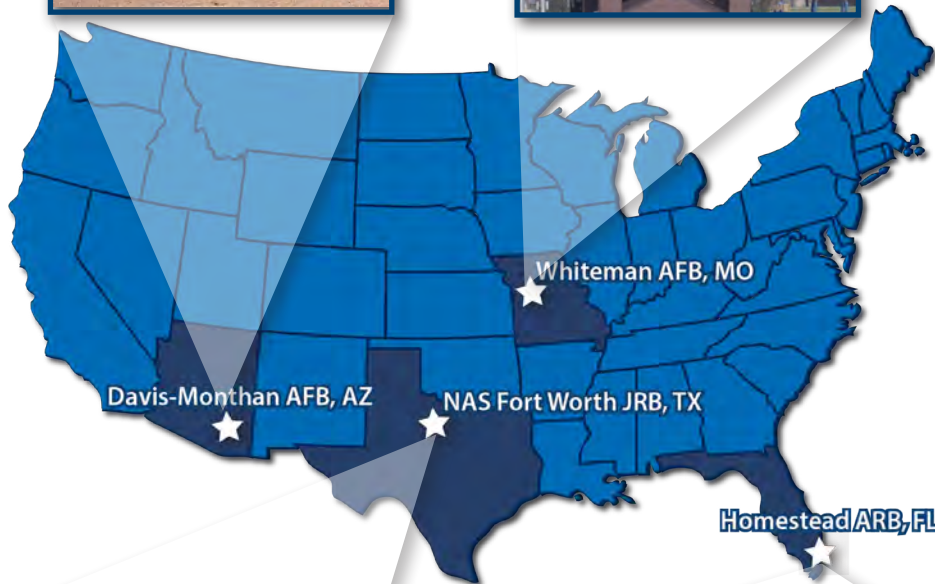
NA1.12 HAZARDOUS MATERIALS AND WASTE

Under the No Action Alternative, hazardous materials would continue to be used and hazardous wastes would continue to be generated at each base as described in Sections DM3.12.1, HS3.12.1, FW3.12.1, and WM3.12.1. Implementation of the No Action Alternative would result in no F-35A-related changes to hazardous materials and waste at any of the bases.

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CHAPTER 5

REFERENCES



5.0 REFERENCES

5.1 CHAPTER 1: PURPOSE AND NEED FOR THE AIR FORCE RESERVE COMMAND F-35A OPERATIONAL BEDDOWN

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5.1.1 Chapter 1 Public Documents

5.1.1.1 Code of Federal Regulations (CFRs)

32 *CFR* 775 – Procedures for Implementing the National Environmental Policy Act

32 *CFR* 989 – Environmental Impact Analysis Process (EIAP)

40 *CFR* 1500-1508 – CEQ Regulations for Implementing the Procedural Provisions of NEPA

40 *CFR* 1508.5 – Cooperating Agency

5.1.1.2 Executive Orders (EOs)

EO 13175 – Consultation and Coordination with Indian Tribal Governments

5.1.1.3 United States Code (USCs)

42 *USC* 4331 et seq. – Congressional Declaration of National Environmental Policy

5.2 CHAPTER 2: DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

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5.2.1 Chapter 2 Public Documents

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ACC Supplement to AFI 11-214, Change 1, 2016 – Flying Operations; Air Operations Rules and Procedures

5.2.1.2 Code of Federal Regulations

14 *CFR* 91.119 – Minimum Safe Altitudes: General

40 *CFR* 1502.14(d) – Environmental Impact Statement; Alternatives Including the Proposed Action; Include the Alternative of No Action

5.2.1.3 Unified Facilities Criteria (UFCs)

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5.3 CHAPTER 3: DEFINITION OF RESOURCES AND METHODOLOGY FOR ANALYSIS

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5.3.1 Chapter 3 Public Documents

5.3.1.1 Air Force Documents

AFH 32-7084 – AICUZ Program Manager’s Guide

AFMAN 91-201 – Explosives Safety Standards

Air Force Policy Directive 13-2 – Space, Missile, Command, and Control; Air Traffic, Airfield, Airspace, and Range Management

5.3.1.2 Air Force Instructions

AFI 13-201 – Space, Missile, Command, and Control; Airspace Management

AFI 13-212 – Nuclear Space, Missile, or Command and Control Operations; Range Planning and Operations

AFI 32-7042 – Solid and Hazardous Waste Compliance

AFI 32-7062 – Air Force Comprehensive Planning

AFI 32-7063 – Civil Engineering; Air Installations Compatible Use Zones Program

AFI 32-7064 – Integrated Natural Resources Management

AFI 32-7065 – Cultural Resources Management

AFI 48-127 – Occupational Noise and Hearing Conservation Program

AFI 90-2002 – Air Force Interactions with Federally Recognized Tribes

5.3.1.3 Code of Federal Regulations

14 *CFR* 77 – Objects Affecting Navigable Airspace

29 *CFR* 1910.95 – Occupational Noise Exposure

33 *CFR* 323.3 – Discharges Requiring Permits

33 *CFR* 328.3 – Definition of Waters of the United States

30 *CFR* 329 – Definition of Navigable Waters of the United States

36 *CRF* 60 – National Register of Historic Places

36 *CFR* 60.4 – National Register of Historic Places

- 36 *CFR* 63 – Determinations of Eligibility for Inclusion in the National Register
- 36 *CFR* 79 – Curation of Federally Owned and Administered Archaeological Collections
- 36 *CFR* 800 – Protection of Historic Properties
- 36 *CFR* 800.16(d) – Definition of Area of Potential Effects
- 36 *CFR* 800.16(l) – Protection of Historic Properties; definition of “Effect”
- 40 *CFR* 61 – National Emission Standards for Hazardous Air Pollutants
- 40 *CFR* 93, Subpart B – Determining Conformity of General Federal Actions to State or Federal Implementation Plans
- 40 *CFR* 112 – Spill Prevention, Control and Countermeasure (SPCC) Rule
- 40 *CFR* 225.1 to 233.71 – Ocean Dumping
- 40 *CFR* 240 through 244 – Guidelines for Solid Waste
- 40 *CFR* 257 – Criteria for Classification of Solid Waste Disposal Facilities and Practices
- 40 *CFR* 258 – Criteria for Municipal Solid Waste Landfills
- 40 *CFR* 261 – USEPA Regulation on Identification and Listing of Hazardous Waste
- 40 *CFR* 279 – USEPA Regulation on Standards for the Management of Used Oil
- 40 *CFR* 302 – USEPA Regulation on Designation, Reportable Quantities, and Notification
- 40 *CFR* 700–766 – Toxic Substances Control Act (TSCA) of 1976
- 40 *CFR* 1508.27 – Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA; definition of “Significantly”
- 40 *CFR* 1508.27(b) – Council on Environmental Quality
- 43 *CFR* 7 – Protection of Archaeological Resources

5.3.1.4 Department of Defense Directives and Instructions

- DoD Directive 5030.19 – DoD Responsibilities on Federal Aviation
- DoDI 4165.57 – Air Installations Compatible Use Zones (AICUZ)
- DoDI 4710.02 – Department of Defense Interactions with Federally-Recognized Tribes
- DoDI 4715.16 – Cultural Resources Management
- DoDI 6055.12 – Hearing Conservation Program
- DoDI 6055.09, DoD Ammunition and Explosives Safety Standard

5.3.1.5 Federal Aviation Administration (FAA) Orders

- FAA Order 7400.2L 2017 – Procedures for Handling Airspace Matters

5.3.1.6 Executive Orders

- EO 11593 – Protection and Enhancement of the Cultural Environment
- EO 11988 – Floodplain Management
- EO 11990 – Protection of Wetlands

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 13007 – Indian Sacred Sites

EO 13045 – Protection of Children from Environmental Health Risks and Safety Risks

EO 13175 – Consultation and Coordination with Indian Tribal Governments

EO 13287 – Preserve America

EO 13514 – Federal Leadership in Environmental, Energy, and Economic Performance

5.3.1.7 United States Code

15 *USC* 2651 – Asbestos Hazard Emergency Response Act

16 *USC* 668-668d – Protection of Bald and Golden Eagles; Availability of Appropriations for Migratory Bird Treaty Act

16 *USC* 703-712 – Migratory Bird Treaty Act

16 *USC* 1536 – Interagency Cooperation

33 *USC* 1251 et seq. – Congressional declaration of goals and policy

42 *USC* 6901 et seq. – Resource Conservation and Recovery Act (RCRA) of 1976

42 *USC* 7506(c) – Limitations on Certain Federal Assistance; Activities Not Conforming to Approved or Promulgated Plans

42 *USC* 9601-9675 – Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986

42 *USC* 9620 – Community Environmental Response Facilitation Act of 1992

42 *USC* 11001-11050 – Emergency Planning and Community Right-to-Know (EPCRA) Act of 1986

42 *USC* §17094 – Storm Water Runoff Requirements for Federal Development Projects

49 *USC* 40102 – Transportation; Definitions

5.4 CHAPTER 4: DAVIS-MONTHAN AIR FORCE BASE

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5.4.1 Chapter 4 Davis-Monthan Air Force Base Public Documents

5.4.1.1 Fighter Wing Documents

354 FW Instruction 11-250 – Local Flying Procedures

5.4.1.2 Air Force Documents

AFH 32-7084 – AICUZ Program Manager’s Guide

AFPAM 91-212 – Bird Aircraft Strike Hazard (BASH) Management Techniques

AFPD 32-10 – Installations and Facilities

5.4.1.3 Air Force Instructions

AFI 90-801 – Environment, Safety, and Occupational Health Councils

AFI 91-201 – Explosives Safety Standards

AFI 91-202 – The U.S. Air Force Mishap Prevention Program

AFI 32-1052 – Facility Asbestos Management

AFI 32-7042 – Solid and Hazardous Waste Compliance

AFI 32-7062 – Air Force Comprehensive Planning

5.4.1.4 Arizona Revised Statutes (ARSs)

ARS 28-8480 Title 28, Article 7, Airport Zoning & Regulation, Section 8480 Military airport continuation; land acquisition

ARS 28-8481 Title 28, Article 7, Airport Zoning & Regulation, Section 8481 Planning and zoning; military airport and ancillary military facility's operation compatibility; compliance review; penalty; definitions

ARS 28-8482 Title 28, Article 7, Airport Zoning & Regulation, Section 8482 Incorporation of sound attenuation standards in building codes

5.4.1.5 Code of Federal Regulations

36 *CFR* 800 – Protection of Historic Properties

40 *CFR* 112.20(e) – Facility Response Plans - Determination and Evaluation of Required Response Resources for Facility Response Plans

40 *CFR* 1508.7 – Cumulative Impact

5.4.1.6 Department of Defense Instructions

DoDI 4165.57 – Air Installations Compatible Use Zones (AICUZ)

DoDI 4710.02 – Department of Defense Interactions with Federally-Recognized Tribes

5.4.1.7 Executive Orders

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 13045 – Protection of Children from Environmental Health Risks and Safety Risks

EO 13175 – Consultation and Coordination with Indian Tribal Governments

5.4.1.8 Technical Orders (TOs)

TO 00-105E-9 – Aerospace Emergency Rescue and Mishap Response Information

5.4.1.9 Unified Facilities Criteria

UFC 2-100-29-01 – Installation Master Planning

UFC 3-101-01 – Architecture

5.4.1.10 United States Code

16 *USC* 668-668c – Bald and Golden Eagle Protection Act

16 *USC* §§ 703-712 – Migratory Bird Treaty Act

16 *USC* § 1531 et seq. – Endangered Species Act - Congressional Findings and Declaration of Purposes and Policy

42 *USC* §17094 – Storm Water Runoff Requirements for Federal Development Projects

54 *USC* 300101 et seq. – National Historic Preservation Act

5.5 CHAPTER 4: HOMESTEAD AIR RESERVE BASE

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5.5.1 Chapter 4 Homestead Air Reserve Base Public Documents

5.5.1.1 Local Legal Documents

Miami-Dade Code of Ordinances, Chapter 33, Article XXXV – Homestead Air Force Base Zoning

5.5.1.2 Air Force Documents

AFH 32-7084 – AICUZ Program Manager’s Guide

AFPAM 91-212 – Bird Aircraft Strike Hazard (BASH) Management Techniques

AFPD 90-8 – Environment, Safety, and Occupational Health

5.5.1.3 Air Force Instructions

AFI 11-2F-16V3, 482 Fighter Wing Supplement – F-16 Operations Procedures

AFI 32-7063 – Air Installations Compatible Use Zones Program

AFI 32-7086 – Hazardous Material Management

AFI 32-1052 – Facility Asbestos Management

AFI 90-801 – Environment, Safety, and Occupational Health Councils

AFI 90-901 – Operational Risk Management

AFI 90-2002 – Air Force Interactions with Federally Recognized Tribes

AFI 91-201 – Explosives Safety Standards

AFI 91-202 – The U.S. Air Force Mishap Prevention Program

5.5.1.4 Chief of Naval Operations (OPNAV) Instructions

OPNAVINST 3550.1A – Range Air Installations Compatible Use Zones (RAICUZ) Program

5.5.1.5 Code of Federal Regulations

36 *CFR* 800 – Protection of Historic Properties

40 *CFR* 1508.7 – Cumulative Impact

50 *CFR* 21.15 – Authorization of Take Incidental to Military Readiness Activities

5.5.1.6 Department of Defense Instructions

DoDI 4165.57 – Air Installations Compatible Use Zones (AICUZ)

DoDI 4710.02 – Department of Defense Interactions with Federally-Recognized Tribes

5.5.1.7 Executive Orders

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 13045 – Protection of Children from Environmental Health Risks and Safety Risks

EO 13175 – Consultation and Coordination with Indian Tribal Governments

5.5.1.8 Chief of Naval Operations (OPNAV) Instructions

OPNAVISNT 3550.1A – Chief of Naval Operations Instruction (OPNAVINST) 3550.1A “Range Air Installations Compatible Use Zones (RAICUZ) Program”

5.5.1.9 Technical Orders

TO 00-105E-9 – Aerospace Emergency Rescue and Mishap Response Information

5.5.1.10 Unified Facilities Criteria

UFC 3-101-01 – Architecture

UFC 3-210-10 – Low Impact Development

UFC 3-230-03 – Water Treatment

5.5.1.11 United States Code

16 *USC* 668-668c – Bald and Golden Eagle Protection Act

16 *USC* §§ 703-712 – Migratory Bird Treaty Act

16 *USC* § 1531 et seq. – Endangered Species Act - Congressional Findings and Declaration of Purposes and Policy

42 *USC* §17094 – Storm Water Runoff Requirements for Federal Development Projects

54 *USC* 300101 et seq. – National Historic Preservation Act

5.6 CHAPTER 4: NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE

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5.6.1 Chapter 4 Naval Air Station Fort Worth Joint Reserve Base Public Documents

5.6.1.1 Air Force Documents

AFH 32-7084 – AICUZ Program Manager’s Guide

AFPAM 91-212 – Bird Aircraft Strike Hazard (BASH) Management Techniques

AFPD 90-8 – Environment, Safety, and Occupational Health

5.6.1.2 Air Force Instructions

AFI 11-2F-16V3 – Flying Operations – F-16 Operations Procedures

AFI 90-801 – Environment, Safety, and Occupational Health Councils

AFI 90-901 – Operational Risk Management

AFI 90-2002 – Air Force Interactions with Federally Recognized Tribes

AFI 91-201 – Explosives Safety Standards

AFI 91-202 – The U.S. Air Force Mishap Prevention Program

5.6.1.3 Chief of Naval Operations (OPNAV) Instructions

OPNAVINST 11010.36C – Air Installations Compatible Use Zones (AICUZ) Program

OPNAVINST 5090.1D – Environmental Readiness Program

OPNAVINST 5100.23G – Navy Safety & Occupational Health (SOH) Program Manual

5.6.1.4 Code of Federal Regulations

36 *CFR* 800 – Protection of Historic Properties

40 *CFR* 1508.7 – Cumulative Impact

50 *CFR* 21.15 – Authorization of Take Incidental to Military Readiness Activities

5.6.1.5 Department of Defense Instructions

DoDI 4165.57 – Air Installations Compatible Use Zones (AICUZ)

DoDI 4710.02 – Department of Defense Interactions with Federally-Recognized Tribes

5.6.1.6 Executive Orders

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 13045 – Protection of Children from Environmental Health Risks and Safety Risks

EO 13175 – Consultation and Coordination with Indian Tribal Governments

5.6.1.7 Technical Orders

TO 00-105E-9 – Aerospace Emergency Rescue and Mishap Response Information

5.6.1.8 Unified Facilities Criteria

UFC 3-101-01 – Architecture

UFC 3-210-10 – Low Impact Development

5.6.1.9 United States Code

16 *USC* 668-668c – Bald and Golden Eagle Protection Act

16 *USC* § 1531 et seq. – Endangered Species Act - Congressional Findings and Declaration of Purposes and Policy

42 *USC* §17094 – Storm Water Runoff Requirements for Federal Development Projects

54 *USC* 300101 et seq. – National Historic Preservation Act

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5.7.1.1 Air Force Documents

AFH 32-7084– AICUZ Program Manager’s Guide

AFPAM 91-212 – Bird Aircraft Strike Hazard (BASH) Management Techniques

AFPD 90-8 – Environment, Safety, and Occupational Health

5.7.1.2 Air Force Instructions

AFI 32-7086 – Hazardous Material Management

AFI 32-1052 – Facility Asbestos Management

AFI 90-801 – Environment, Safety, and Occupational Health Councils

AFI 90-901 – Operational Risk Management

AFI 90-2002 – Air Force Interactions with Federally Recognized Tribes

AFI 91-201 – Explosives Safety Standards

AFI 91-202 – The U.S. Air Force Mishap Prevention Program

5.7.1.3 Code of Federal Regulations

36 *CFR* 800 – Protection of Historic Properties

40 *CFR* 122 – EPA Administered Permit Programs: The National Pollutant Discharge Elimination System

40 *CFR* 1508.7 – Cumulative Impact

50 *CFR* 21.15 – Authorization of Take Incidental to Military Readiness Activities

5.7.1.4 Code of State Regulations (CSR)

3 *CSR* 10-4.111 – Department of Conservation Division: Conservation Commission - Wildlife Code: General Provisions – Endangered Species

10 *CSR* 20-6.200 – Department of Natural Resources Division: Clean Water Commission - Permits - Storm Water Regulations

5.7.1.5 Department of Defense Instructions

DoDI 4165.57 – Air Installations Compatible Use Zones (AICUZ)

DoDI 4710.02 – Department of Defense Interactions with Federally-Recognized Tribes

5.7.1.6 Executive Orders

EO 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

EO 13045 – Protection of Children from Environmental Health Risks and Safety Risks

EO 13175 – Consultation and Coordination with Indian Tribal Governments

5.7.1.7 Technical Orders

TO 00-105E-9 – Aerospace Emergency Rescue and Mishap Response Information

5.7.1.8 Unified Facilities Criteria

UFC 3-101-01 – Architecture

UFC 3-210-10 – Low Impact Development

5.7.1.9 United States Code

16 *USC* 668-668c – Bald and Golden Eagle Protection Act

16 *USC* §§ 703-712 – Migratory Bird Treaty Act

16 *USC* § 1531 et seq. – Endangered Species Act - Congressional Findings and Declaration of Purposes and Policy

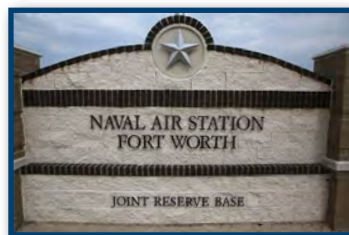
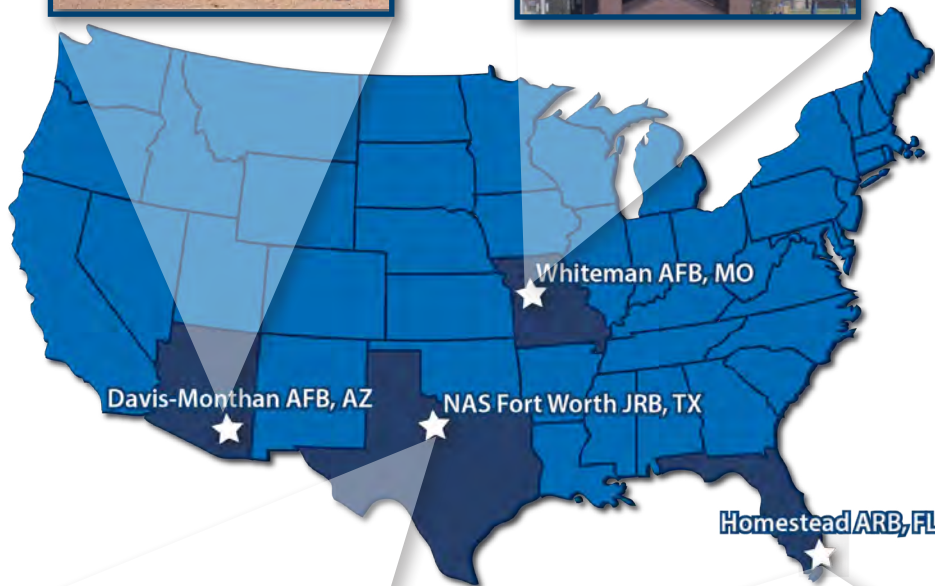
42 *USC* §17094 – Storm water runoff requirements for Federal development projects

54 *USC* 300101 et seq. – National Historic Preservation Act

5.8 CHAPTER 4: NO ACTION ALTERNATIVE

No citations.

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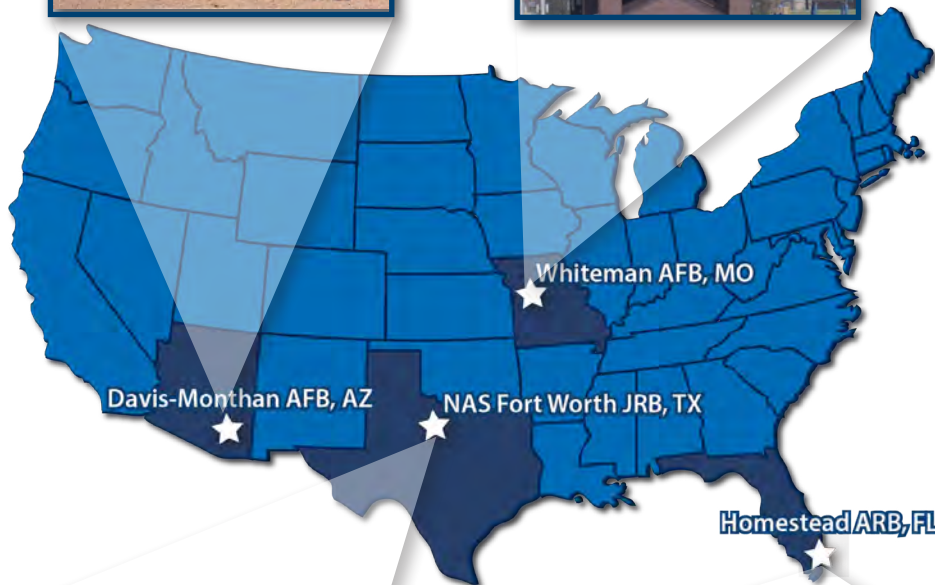
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LIST OF REPOSITORIES —



LIST OF REPOSITORIES

DAVIS-MONTHAN AIR FORCE BASE REPOSITORIES

- Eckstrom-Columbus Branch Library, 4350 E 22nd Street, Tucson, AZ 85711
- Murphy-Wilmont Library, 530 N Wilmont Road, Tucson, AZ 85711
- Joel D Valdez Main Library, 101 N Stone Avenue, Tucson, AZ 85701
- Quincie Douglas Library, 1585 East 36th Street, Tucson, AZ 85713
- El Pueblo Library, 101 W Irvington Road, Tucson, AZ 85714

DAVIS-MONTHAN AIR FORCE BASE AIRSPACE REPOSITORIES

- Sierra Vista Public Library, 2600 E Tacoma Street, Sierra Vista, AZ 85635
- Yuma County Main Library, 2951 S 21st Drive, Yuma, AZ 85364
- Douglas Public Library, 560 E 10th Street, Douglas, AZ 85607
- Salazar-Ajo Library, 15 W Plaza St, #179, Ajo, AZ 85321

HOMESTEAD AIR RESERVE BASE REPOSITORIES

- Homestead Branch Library, 700 N Homestead Boulevard, Homestead, FL 33030

HOMESTEAD AIR RESERVE BASE AIRSPACE REPOSITORIES

- Avon Park Library, 100 N Museum Avenue, Avon Park, FL 33825

NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE REPOSITORIES

- Fairmount Community Library, 1310 W Allen Avenue, Fort Worth, TX 76110
- Fort Worth Central Library, 500 W 3rd Street, Fort Worth, TX 76102
- Ridglea Library, 3628 Bernie Anderson Avenue, Fort Worth, TX 76116
- White Settlement Public Library, 8215 White Settlement Road, Fort Worth, TX 76108
- NAS Fort Worth JRB Library, 1802 Doolittle Avenue, Fort Worth, TX 76127

NAVAL AIR STATION FORT WORTH JOINT RESERVE BASE AIRSPACE REPOSITORIES

- Scurry County Library, 1916 23rd Street, Snyder, TX 79549
- Lawton Public Library, 110 SW 4th Street, Lawton, OK 73501

WHITEMAN AIR FORCE BASE REPOSITORIES

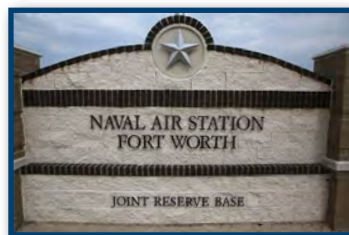
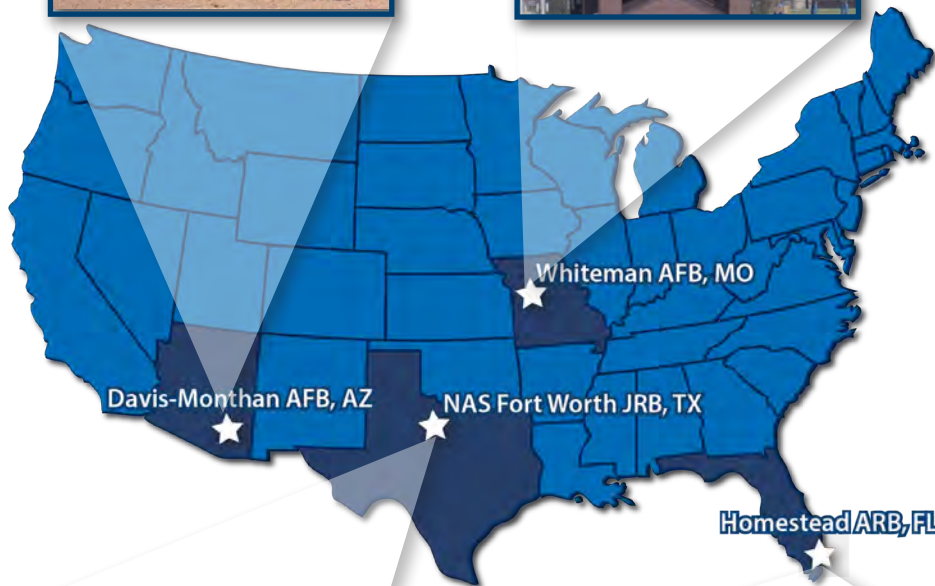
- Knob Noster Branch Library, 202 N Adams, Knob Noster, MO 65336
- Warrensburg Branch Library, 432 N Holden, Warrensburg, MO 64093
- Whiteman AFB Library, 511 Spirit Boulevard, Whiteman AFB, MO 65305

WHITEMAN AIR FORCE BASE AIRSPACE REPOSITORIES

- Waynesville Library, 306 Historic 66 West, Waynesville, MO 65583

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GLOSSARY



GLOSSARY

A-weighted decibel (dBA): The dBA metric is used to reflect a weighting process applied to noise measurements to filter out very low and very high frequencies of sound in order to replicate human sensitivity to different frequencies of sound and reflect those frequencies at which human hearing is most sensitive. Environmental noise is typically measured in dBA.

Above Ground Level (AGL): Altitude expressed in feet measured above the ground surface.

Accident Potential Zone (APZ): An area near a runway that is based on historical military accident and operations data and the application of a margin of a safety that represents those areas where an accident is most likely to occur. APZs are normally 3,000 feet wide and extend up to 15,000 feet from the end of the runway.

Acoustic Night: The period between 10:00 P.M. and 7:00 A.M. when 10 decibels is added to aircraft noise levels due to increased sensitivity to noise at night.

Afterburner: A device present on some jet engines that provides additional power to an aircraft. This additional power can be used to quickly lift an aircraft from the runway or to increase the speed of an aircraft during training or combat situations.

Asbestos-containing Material (ACM): Any material containing more than 1 percent asbestos.

Air Force Instruction (AFI): Instructions implementing U.S. laws and regulations, and providing policy for USAF personnel and activities.

Air Combat Command (ACC): The U.S. Air Force Command that operates combat aircraft assigned to bases within the contiguous 48 states, except those assigned to Air National Guard and the Air Force Reserve Command.

Air Installations Compatible Use Zones (AICUZ): A land-use-planning program, used by the military, to protect the health, safety, and welfare of those living near military airfields while preserving the defense flying mission. AICUZ presents noise zones and accident potential zones for military airfields and recommendations for compatible land use.

Air Force Reserve Command (AFRC): AFRC, a major command with headquarters at Robins Air Force Base, Georgia. AFRC is the federally controlled Air Reserve Component of the U.S. Air Force.

Air Quality: The degree to which the ambient air is pollution-free, assessed by measuring a number of indicators of pollution.

Beddown: The provision of facilities and other necessary infrastructure to support a new mission or weapon system.

Bird/Wildlife-Aircraft Strike Hazard (BASH): A U.S. Air Force program to reduce the possibilities of bird or wildlife collisions with aircraft.

Composite aerospace materials (composite materials): Generally a composite is a combination of two or more different materials that results in a superior product (e.g. reinforced concrete). As used in the EIS this term most often refers to advanced composite materials which are generally characterized by the use of more modern materials that combine a strong, stiff fiber within a resin matrix (e.g., carbon fiber and plastic).

C-Weighted Day-Night Average Sound Level (CDNL): CDNL is a day-night average sound level computed for impulsive noise such as sonic booms. Peak overpressure, measured in pounds per square foot (psf), characterizes the strength of impulsive noise.

Clean Air Act (CAA): This Act empowered the U.S. Environmental Protection Agency to establish standards for common pollutants that represent the maximum levels of background pollution that are considered safe, with an adequate margin of safety to protect public health and safety.

Clean Water Act (CWA): The primary federal law in the United States governing water pollution. The CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution, and ensuring that surface waters would meet standards necessary for human sports and recreation.

Clear Zone (CZ): An accident potential zone constituting the innermost portions of the runway approach.

Council on Environmental Quality (CEQ): The Council is within the Executive Office of the President and is composed of three members appointed by the President, subject to approval by the Senate. Members are to be conscious of and responsive to the scientific, economic, social, esthetic, and cultural needs of the nation; and to formulate and recommend national policies to promote the improvement of environmental quality.

Day-Night Average Sound Level (DNL): DNL is a noise metric combining the levels and durations of noise events and the number of events over an extended time period. It is a cumulative average computed over a 24-hour period to represent total noise exposure. DNL also accounts for more intrusive nighttime noise, adding a 10 dB penalty for sounds after 10:00 P.M. and before 7:00 A.M. DNL is the Federal Aviation Administration's (FAA) primary noise metric. FAA Order 1050.1E defines DNL as the yearly day/night average sound level.

Decibel (dB): A sound measurement unit.

De Minimis Threshold: The minimum threshold for which a conformity determination must be performed for various criteria pollutants in various areas.

Endangered Species: The Endangered Species Act of 1973 defined the term "endangered species" to mean any species (including any subspecies of fish or wildlife or plants, and any distinct population segment of any species or vertebrate fish or wildlife which interbreeds when mature) that is in danger of extinction throughout all or a significant portion of its range.

Environmental Justice: Pursuant to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, review must be made as to whether a federal program, policy, or action presents a disproportionately high and adverse human health or environmental effect on minority and/or low-income populations.

Equivalent Noise Level (Leq): Represents aircraft noise levels decibel-averaged over a specified time period and is useful for considering noise effects during a specific time period such as a school day (denoted $L_{eq(SD)}$ and measured from 8:00 A.M. to 4:00 P.M.).

Groundwater: Water held underground in the soil or in pores and crevices in rock.

Floodplain: An area of low-lying ground adjacent to a river, formed mainly of river sediments and subject to flooding.

Hazardous Material: Solids, liquids, or gases that can harm people, other living organisms, property, or the environment.

Hazardous Waste: Waste that poses substantial or potential threats to public health or the environment. In the United States, the treatment, storage and disposal of hazardous waste is regulated under the Resource Conservation and Recovery Act.

Joint Land Use Study (JLUS): A JLUS is a cooperative land use planning effort between military installations and surrounding communities that examines the positive and negative impacts that military installations have on surrounding communities, and vice versa.

Maximum Noise Level (L_{max}): The highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight).

Mean Sea Level (MSL): Altitude expressed in feet measured above average sea level.

Military Operations Area (MOA): Airspace below 18,000 feet above mean sea level established to separate military activities from Instrument Flight Rule traffic and to identify where these activities are conducted for the benefit of pilots using Visual Flight Rule.

Mobile Sources: Includes cars and light trucks, heavy trucks and buses, nonroad engines, equipment, and vehicles.

National Ambient Air Quality Standards (NAAQS): NAAQS are established by the U.S. Environmental Protection Agency for criteria pollutants that represent the maximum levels of background pollution considered safe, with an adequate margin of safety, to protect public health and safety.

National Environmental Policy Act (NEPA): The National Environmental Policy Act of 1969 directs federal agencies to take environmental factors into consideration in their decisions.

National Historic Preservation Act (NHPA): The National Historic Preservation Act of 1966, as amended, established a program for the preservation of historic properties throughout the United States.

National Register of Historic Places (NRHP): The NRHP is the Federal government's official list of districts, sites, buildings, structures, and objects deemed worthy of preservation.

NOISEMAP: NOISEMAP is a group of computer programs developed over a number of years by the U.S. Air Force for prediction of noise exposures in the vicinity of a military installation. NOISEMAP is the primary computer model used by the U.S. Department of Defense for evaluating military fixed-wing aircraft noise. It contains a suite of computer programs for prediction of noise exposure from aircraft flight, maintenance, and ground runup operations. NOISEMAP output includes noise contours, noise levels at preselected locations, and other supplemental metrics to assist users in analyzing impacts resulting from aircraft noise in the airfield environment.

Onset Rate-Adjusted Day-Night Average Sound Level (L_{dnmr}): The L_{dnmr} metric adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.

Operation: An operation consists of a single activity such as a landing or a takeoff by one aircraft. Each time a single aircraft flies into a different airspace unit, one operation is counted. During a single sortie, an aircraft could fly in several airspace units and conduct a number of operations; therefore, the number of operations exceeds the number of sorties.

Power Setting: The power or thrust output of an engine in terms of kilonewtons thrust for turbojet and turbofan engines or shaft power in terms of kilowatts for turboprop engines.

Primary Aerospace Vehicles Authorized (PAA): PAA consists of the aircraft authorized and assigned to perform a U.S. Air Force wing’s mission.

Region of Influence (ROI): The geographic scope of potential consequences in an area.

Scoping: A National Environmental Policy Act process of identifying the main issues of concern at an early stage in planning in order to discover any alternatives and aid in site selection.

Sortie: A sortie consists of a single military aircraft flight from the initial takeoff through the final landing and includes all activities that occur during that mission. For this EIS, the term sortie is used when referring to the quantity of aircraft operations from the airfield. A sortie can include more than one operation.

Sound Exposure Level (SEL): SEL accounts for both the maximum sound level and the length of time a sound lasts. It provides a measure of the total sound exposure for an entire event. Federal Aviation Administration Order 1050.1E defines SEL as a single event metric that takes into account both the noise level and duration of the event and references to a standard duration of one second.

State Historic Preservation Office (SHPO): State department responsible for assigning protected status for cultural and historic resources.

Threatened Species: A species likely to become endangered within the foreseeable future throughout all, or a significant portion, of its range.

Traditional/Cultural Resource: Traditional and cultural resources are any prehistoric or historic district, site or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes.

Wetland, Jurisdictional: A jurisdictional wetland is a wetland that meets all three U.S. Army Corps of Engineers’ criterion for jurisdictional status: appropriate hydrologic regime, hydric soils, and facultative to obligate wetland plant communities under normal growing conditions and is classified as a “Water of the US”

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