July

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Draft

Environmental Assessment

Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico

United States Air Force
Kirtland Air Force Base
Air Force Research Laboratory

AFRL-2024-3779

PRIVACY ADVISORY

This Draft Environmental Assessment (EA) is provided for public comment in accordance with the National Environmental Policy Act of 1969, as amended, (42 United States Code § 4321 et seq.), implemented by the Council on Environmental Quality Regulations (40 Code of Federal Regulations [CFR] Parts 1500–1508) and 32 CFR Part 989, *Environmental Impact Analysis Process*.

The Environmental Impact Analysis Process provides an opportunity for public input on USAF decision making and solicits comments on the USAF's analysis of environmental impacts. Public commenting allows USAF to make better-informed decisions. Letters or other written comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Private addresses may be compiled to develop a mailing list for those requesting copies of the EA. Only the names of the individuals making comments and specific comments will be disclosed in the EA. Personal information, home addresses, telephone numbers, and email addresses will not be published in the EA.

This EA has been verified to be compliant with the 75-page limit, not including appendices, required by 40 CFR § 1501.5(f). As defined in 40 CFR § 1508.1(v) a "page" means 500 words and does not include maps, diagrams, graphs, tables, and other means of graphically displaying quantitative or geospatial information.

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1

FINDING OF NO SIGNIFICANT IMPACT

for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico

Pursuant to provisions of the National Environmental Policy Act (NEPA), Title 42 United States Code (USC) §§ 4321 to 4347, implemented by Council on Environmental Quality (CEQ) Regulations, Title 40 Code of Federal Regulations Parts 1500–1508, and 32 CFR Part 989, *Environmental Impact Analysis Process* (EIAP), the United States Air Force (USAF) assessed the potential impacts on the natural and human environment associated with the USAF, United States Space Force (USSF), and Defense Threat Reduction Agency (DTRA) continuing to conduct current test activities and implementing future test activities, as well as construct, operate, maintain, and remove supporting infrastructure on the **C**onventional **H**igh **E**xplosive **S**imula**T**ed **NU**clear **T**est (CHESTNUT) Site and Joint Use Area (collectively hereafter referred to as "the Range") on Kirtland Air Force Base (AFB), New Mexico.

Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue conducting current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting research, development, test, and evaluation (RDT&E) activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/Directed Energy Directorate (RD) for testing and training with explosives, high energy lasers (HEL) and high-power electromagnetic (HPEM) systems, and drones; (2) AFRL/Space Vehicle Directorate (RV) for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of weapons of mass destruction (WMD) and improvised explosive devices; and (4) 377th Mission Support Group/Explosive Ordnance Disposal (MSG/EOD) for explosive handling and emergency operations.

The need for the Proposed Action is to allow USAF, USSF, and DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve current technology. Such tests detailed above are needed to determine the survivability and vulnerability of structures and targets for national security. In turn, these tests allow for the delivery of innovative and affordable weapons, materials, and methods to the warfighter in time to meet their mission demands. Because of ever-changing threat scenarios, the RDT&E and training conducted by these agencies is a critical element in the development of new capabilities for the nation's security, and it provides an important component of the United States' global leadership in safety, science, and technology.

Description of the Proposed Action and Alternatives

Proposed Action. The Proposed Action includes current and proposed future test activities conducted by the USAF, USSF, and DTRA at the Range. Under the Proposed Action, AFRL/RD would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as HEL and HPEM, would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. AFRL/RV proposes to begin conducting vaporization experiments on the Range. DTRA would continue to

analyze the impacts of its RDT&E activities to counter, deter, and defeat WMD and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377 MSG/EOD would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables (e.g., fiber optic cables, power lines, etc.) a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the Range (e.g., weed and brush removal, grading and leveling areas for explosive tests, weather proofing, and removing rodents/rodent waste from structures and bunkers).

Given the length of time that has elapsed since the original 1987 Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) for The Civil Engineering Research Facility Test Site, Kirtland AFB, New Mexico and the proposed future test activities, the 377 MSG NEPA Program Manager and 377 ABW Environmental Judge Advocate determined that an update to the EA is appropriate.

Alternatives. The EA considered all reasonable alternatives in accordance with CEQ regulation 40 CFR § 1502.14(a). Two alternatives were considered and eliminated from further consideration based on the selection standards outlined in **Section 2.2** of the EA.

No Action Alternative. CEQ regulation 40 CFR § 1502.14(a) requires the inclusion of a No Action Alternative in the NEPA analysis. Under the No Action Alternative, operations would continue as usual for the already authorized users of the Range, as consistent with mission and management plans. Planned efforts would not increase over current operating levels and would not deviate from DE research and development, explosives, and drone tests/training already approved. No new test and/or training activities would occur; this includes any expanded RDT&E operations and AFRL/RV or DTRA experiments that would pose new impacts on environmental resources. Additionally, no new support infrastructure would be constructed, operated, maintained, or removed on the Range.

The No Action Alternative would not allow USAF, USSF, and DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve technology. Therefore, the No Action Alternative would not meet the purpose of and need for the Proposed Action as described in **Sections 1.3** and **1.4** of the EA; however, the USAF EIAP (32 CFR § 989.8[d]) require consideration of the No Action Alternative. Therefore, the No Action Alternative was carried forward for detailed analysis in the EA.

Summary of Environmental Effects

The USAF has concluded that the Proposed Action would not affect the following resources: airspace management, land use, socioeconomics, and environmental justice. Based on the findings in the EA, less than significant adverse impacts would result on the following resources: noise, air quality, geological resources, water resources, biological resources, cultural resources, infrastructure, hazardous materials and wastes, and safety. The analysis in the EA for each of the environmental resource areas listed above identified negligible to moderate adverse impacts under the Proposed Action. Potential environmental impacts are not expected to be significant for any of the resources. Additionally, no significant adverse cumulative impacts would result from

the Proposed Action, when combined with present and reasonably foreseeable future actions. A summary of the environmental consequences is provided in **Table 2-3** of the EA.

Conclusion

Based on the description of the Proposed Action as set forth in the EA, all activities were found to comply with the criteria or standards of environmental quality and were coordinated with the appropriate federal, state, and local agencies. The attached EA and this FONSI were made available to the public for a 30-day review period on 15 July 2024. Agencies were coordinated with throughout the EA development process and their comments were incorporated into the analysis of potential environmental impacts performed in the EA as appropriate.

Finding of No Significant Impact

Based on my review of the facts and analysis contained in the attached EA, conducted under the provisions of NEPA, CEQ regulations, and 32 CFR Part 989, I conclude that the Proposed Action would not have a significant environmental impact, either by itself of cumulatively, with other known projects. Accordingly, an Environmental Impact Statement is not required. This analysis fulfills the requirements of NEPA, the President's CEQ regulations in 40 CFR Parts 1500–1508, and USAF EIAP regulations in 32 CFR Part 989. The signing of this FONSI completes the environmental impact analysis process.

MICHAEL J. POWER, Colonel, USAF
Commander

Date

Attachment: *Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico*

ACRONYMS AND ABBREVIATIONS

ABW	Air Base Wing
ACM	asbestos-containing material
AEHD-AQD	Albuquerque Environmental Health Department Air Quality Division
AFB	Air Force Base
AFFF	aqueous film forming foam
AFMAN	Air Force Manual
AFR	Albuquerque Fire Rescue
AFRL	Air Force Research Laboratory
AFSC	Air Force Systems Command
AFWL	Air Force Weapons Laboratory
APD	Albuquerque Police Department
APE	area of potential effect
bgs	below ground surface
BMP	best management practice
CEIEC	Civil Engineering Installation Environmental Compliance
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERF	Civil Engineering Research Facility
CFR	Code of Federal Regulations
CHESTNUT	Conventional High Explosive Simulated Nuclear Test
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
CWA	Clean Water Act
CZ	clear zone
DAF	Department of the Air Force
DAFI	Department of the Air Force Instruction
dB	decibel
dBA	A-weighted decibel
DE	directed energy
DoD	Department of Defense
DOE	Department of Energy
DTRA	Defense Threat Reduction Agency
EA	Environmental Assessment
EESOH-MIS	Enterprise Environmental, Safety, and Occupational Health Management Information System
EIAP	Environmental Impact Analysis Process
EO	Executive Order
EOD	Explosive Ordnance Disposal
ER	Environmental Restoration
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FERMI	Free Electron laser Radiation for Multidisciplinary Investigations
FONPA	Finding of No Practicable Alternative
FONSI	Finding of No Significant Impact
FTU	Formal Training Unit
g	grams
GHG	greenhouse gas

GRABS	Giant Reusable Air Blast Simulator
GT	Ground Terminal
GZ	Ground Zero
HE	high explosive
HEL	high energy laser
HPEM	high-power electromagnetic
HWMP	Hazardous Waste Management Plan
ICRMP	Integrated Cultural Resources Management Plan
IRP	Installation Restoration Program
kg	kilogram
lb	pound
LBP	lead-based paint
LEC	Laser Effect Compound
LiDAR	Light Detection and Ranging
L_{pk}	peak sound pressure level
MBTA	Migratory Bird Treaty Act
mgd	million gallons per day
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
MSG	Mission Support Group
N.E.W.	net explosive weight
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NFA	no further action
NHPA	National Historic Preservation Act
NMAC	New Mexico Administrative Code
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
NuDEL	nuclear distribution element-like
NuIDEA	Nuclear in District Applications
O_3	ozone
OSH	occupational safety and health
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PEA	Programmatic Environmental Assessment
PFAS	per-and polyfluoroalkyl substances
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RD	Directed Energy Directorate
RDT&E	research, development, test, and evaluation
REVIL	Re-Entry Vehicle Integration Laboratory
RMO	Range Management Office
RV	Space Vehicle Directorate

SATCOM	Satellite Communications
SDS	safety data sheet
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Officer
SOP	standard operating procedure
SOR	Starfire Optical Range
SOW	Special Operations Wing
SO_X	sulfur oxide
SPCC	Spill Prevention, Control, and Countermeasure
STARCOM	Strategic Training and Readiness Command
sUAS	small unmanned aircraft systems
SWEIS	Sitewide Environmental Impact Statement
SWMU	Solid Waste Management Unit
T&F	timing and firing
TES	Test and Evaluation Squadron
tpy	tons per year
$\mu g/m^3$	micrograms per cubic meter
UAS	unmanned aircraft systems
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
UXO	unexploded ordnance
VOC	volatile organic compounds
WMD	weapons of mass destruction
WOTUS	Water of the United States
WSMR	White Sands Missile Range

COVER SHEET

DRAFT
ENVIRONMENTAL ASSESSMENT ADDRESSING TEST ACTIVITIES AND INFRASTRUCTURE IMPROVEMENTS AT THE CONVENTIONAL HIGH EXPLOSIVE SIMULATED NUCLEAR TEST SITE AND JOINT USE AREA ON KIRTLAND AIR FORCE BASE, NEW MEXICO

Responsible Agencies: United States Air Force (USAF), Kirtland Air Force Base (AFB), Air Force Research Laboratory (AFRL).

Affected Location: Kirtland AFB, New Mexico.

Proposed Action: Test Activities and Infrastructure Improvements at the **C**onventional **H**igh **E**xplosive **S**imulated **Nu**clear **T**est (CHESTNUT) Site and Joint Use Area on Kirtland AFB.

Report Designation: Draft Environmental Assessment (EA).

Abstract: This EA was developed in compliance with the USAF's *Environmental Impact Analysis Process*. It supports a proposal by AFRL and USAF for the USAF, United States Space Force (USSF), and Defense Threat Reduction Agency (DTRA) to continue conducting current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range") on Kirtland AFB, New Mexico.

The Proposed Action includes current and proposed future test activities conducted by the USAF, USSF, and DTRA at the Range. Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems (sUAS), unmanned aircraft systems (UAS), and drones. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat sUAS, UAS, and drones. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its research, development, test, and evaluation activities to counter, deter, and defeat weapons of mass destruction and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the Range.

Given the length of time that has elapsed since the original 1987 *Environmental Assessment and Finding of No Significant Impact for The Civil Engineering Research Facility Test Site, Kirtland AFB, New Mexico* and the proposed future test activities, the 377 MSG/Civil Engineering Installation Environmental Compliance NEPA Program Manager and the 377th Air Base Wing Environmental Judge Advocate determined that an update to the EA is appropriate.

TABLE OF CONTENTS

1.0 PURPOSE AND NEED FOR ACTION 1-1

1.1 INTRODUCTION 1-1
1.2 BACKGROUND 1-4
1.2.1 AFRL Operations 1-4
1.2.1.1 AFRL/RD Operations 1-4
1.2.1.2 AFRL/RV Operations 1-5
1.2.2 DTRA Operations 1-5
1.2.3 377 MSG/EOD Operations 1-5
1.3 PURPOSE OF THE PROPOSED ACTION 1-5
1.4 NEED FOR THE PROPOSED ACTION 1-6
1.5 DECISION TO BE MADE 1-6
1.6 INTERGOVERNMENTAL COORDINATION / CONSULTATIONS 1-6
1.6.1 Interagency and Intergovernmental Coordination and Consultations 1-6
1.6.2 Government to Government Coordination and Consultations 1-7
1.7 PUBLIC AND AGENCY REVIEW OF DRAFT EA 1-7

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES 2-1

2.1 PROPOSED ACTION 2-1
2.2 SELECTION STANDARDS 2-1
2.3 DETAILED DESCRIPTION OF THE ALTERNATIVES 2-1
2.3.1 Proposed Action 2-1
2.3.1.1 Test and Training Activities 2-1
2.3.1.2 Infrastructure Projects 2-7
2.3.2 No Action Alternative 2-8
2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION 2-8
2.4.1 White Sands Missile Range 2-8
2.4.2 Cannon AFB and Melrose Range 2-8
2.5 COMPARATIVE SUMMARY OF IMPACTS 2-9

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 3-1

3.1 SCOPE OF THE ANALYSIS 3-1
3.1.1 Resources Analyzed 3-1
3.1.2 Resources Considered but Eliminated from Detailed Analysis 3-2
3.2 NOISE 3-3
3.2.1 Affected Environment 3-4
3.2.2 Environmental Consequences 3-4
3.2.2.1 Proposed Action 3-4
3.2.2.2 No Action Alternative 3-5
3.3 AIR QUALITY 3-6
3.3.1 Affected Environment 3-7
3.3.2 Environmental Consequences 3-8
3.3.2.1 Proposed Action 3-8
3.3.2.2 No Action Alternative 3-12
3.4 GEOLOGICAL RESOURCES 3-12
3.4.1 Affected Environment 3-13
3.4.2 Environmental Consequences 3-14

3.4.2.1 Proposed Action 3-14
3.4.2.2 No Action Alternative 3-15
3.5 WATER RESOURCES 3-15
3.5.1 Affected Environment 3-16
3.5.2 Environmental Consequences 3-17
3.5.2.1 Proposed Action 3-17
3.5.2.2 No Action Alternative 3-18
3.6 BIOLOGICAL RESOURCES 3-18
3.6.1 Affected Environment 3-18
3.6.1.1 Vegetation 3-19
3.6.1.2 Wildlife Species and Habitat 3-19
3.6.1.3 Special Status Species 3-20
3.6.1.4 Critical Habitat 3-22
3.6.2 Environmental Consequences 3-22
3.6.2.1 Proposed Action 3-22
3.6.2.2 No Action Alternative 3-23
3.7 CULTURAL RESOURCES 3-23
3.7.1 Affected Environment 3-24
3.7.2 Environmental Consequences 3-25
3.7.2.1 Proposed Action 3-25
3.7.2.2 No Action Alternative 3-25
3.8 INFRASTRUCTURE 3-26
3.8.1 Affected Environment 3-26
3.8.2 Environmental Consequences 3-27
3.8.2.1 Proposed Action 3-27
3.8.2.2 No Action Alternative 3-28
3.9 HAZARDOUS MATERIALS AND WASTES 3-28
3.9.1 Affected Environment 3-30
3.9.2 Environmental Consequences 3-31
3.9.2.1 Proposed Action 3-31
3.9.2.2 No Action Alternative 3-34
3.10 SAFETY 3-34
3.10.1 Affected Environment 3-34
3.10.2 Environmental Consequences 3-35
3.10.2.1 Proposed Action 3-35
3.10.2.2 No Action Alternative 3-37
3.11 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY 3-37
3.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES 3-37
4.0 REASONABLY FORESEEABLE ACTIONS AND CUMULATIVE EFFECTS 4-1
4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS 4-1
4.2 ASSESSMENT OF CUMULATIVE IMPACTS BY RESOURCE 4-7
4.2.1 Noise 4-7
4.2.2 Air Quality 4-7
4.2.3 Geological Resources 4-7
4.2.4 Water Resources 4-8
4.2.5 Biological Resources 4-8
4.2.6 Cultural Resources 4-8
4.2.7 Infrastructure 4-8
4.2.8 Hazardous Materials and Wastes 4-8

4.2.9 Safety 4-9
5.0 LIST OF PREPARERS AND REVIEWERS....5-1
6.0 REFERENCES....6-1

LIST OF FIGURES

Figure 1-1. Kirtland AFB Vicinity Map 1-2
Figure 1-2. CHESTNUT Site and Joint Use Area Overview 1-3
Figure 2-1. Location of GZ-1, GZ-2, and LEC Test Areas 2-4
Figure 3-1. Active MMRP Sites on or within .05-Mile of the Range 3-32

LIST OF TABLES

Table 2-1. Proposed Small-, Medium-, and Large-Scale Testing Activity....2-5
Table 2-2. Test Preparation Construction Equipment....2-7
Table 2-3. Summary of Potential Impacts....2-10
Table 3-1. Average Noise Levels for Common Construction Equipment....3-5
Table 3-2. Calendar Year 2023 Air Emissions Inventory for Kirtland AFB....3-8
Table 3-3. Estimated Annual Air Emissions from the Proposed Action 3-9
Table 3-4. Theoretical Social Cost of GHGs from the Proposed Action 3-11
Table 3-5. Theoretical Social Cost of GHGs from the Proposed Action and Relative Comparison....3-12
Table 3-6. Wildlife Species Observed at the Range in March 2021 3-19
Table 4-1. Present or Reasonably Foreseeable Future Actions 4-2

APPENDICES

A. Interagency and Intergovernmental Coordination for Environmental Planning and Public Involvement Materials
B. Class G Airspace Access Approval for AFRL/RD
C. Periodic Table of Elements
D. Air Quality Support Documentation
E. Final Biological Survey Report for the Chestnut Range and Joint Use Area, Kirtland Air Force Base
F. Avian Species Observed on Kirtland Air Force Base from 2022-2023
G. Kirtland Air Force Base Safety Standards

1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

Kirtland Air Force Base (AFB), located southeast of the city of Albuquerque, New Mexico (see **Figure 1-1**), is home to the 377th Air Base Wing (ABW) of the Air Force Global Strike Command. The installation is a center for research, development, and testing of nonconventional weapons, space and missile technology, and directed energy (DE) systems. The 377 ABW ensures readiness and training of airmen for worldwide duty and prepares personnel to deploy worldwide on a moment's notice. The installation encompasses 51,585 acres, of which 44,052 acres are under United States Air Force (USAF) control (see **Figure 1-1**). In 2009, a Memorandum of Understanding (MOU) for the coordination and use of the CHESTNUT Site, Joint Use Area, and DOE's Thunder Range was prepared to document a cooperative relationship between 377 ABW (as the property owner), DOE, the Defense Threat Reduction Agency (DTRA), and Air Force Research Laboratory (AFRL)/Directed Energy Directorate (RD). The MOU notes that the CHESTNUT Site and Joint Use Area are managed and scheduled by AFRL/RD, with coordination through 377 ABW Weapons Safety, and Thunder Range is managed and scheduled by DOE and its contractor, Sandia National Laboratories.

The **C**onventional **H**igh **E**xplosive **S**imula**T**ed **NU**clear **T**est (CHESTNUT) Site and Joint Use Area on Kirtland AFB (collectively hereafter referred to as "the Range") is an 800-acre range located on USAF-owned land in the southwest portion of the installation (see **Figure 1-2**) with 300-acres being an approved explosive range rated for up to 2,000-pounds (lbs) Net Explosive Weight (N.E.W.). The Range is bordered by Mesa del Sol to the west, the Pueblo of Isleta Reservation to the south, US Department of Energy (DOE) land to the north, and USAF property to the east. The area was established in 1987 through The Civil Engineering Research Facility (CERF) Test Site Environmental Assessment (EA), hereafter referred to as the 1987 CERF EA, and has been in continuous operation since. Potential users of the Range could include the AFRL/RD, AFRL/Space Vehicle Directorate (RV), DTRA, and 377th Mission Support Group (MSG)/ Explosive Ordnance Disposal (EOD), among others. Approximately 50 acres of the Joint Use Area north of CHESTNUT is an approved site for explosive tests. On CHESTNUT proper, AFRL/RD fires high energy lasers (HEL) and high-power electromagnetics (HPEM) toward the east, which is the Joint Use Area. The remaining Joint Use Area (approximately 500 acres) provides a buffer between the DOE Thunder Range and CHESTNUT Site (see **Figure 1-2**).

The Proposed Action includes current and proposed future test activities conducted by the USAF, United States Space Force (USSF), and DTRA on the Range. Under the Proposed Action, AFRL/RD would continue to integrate DE technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as HEL and HPEM, would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems(sUAS), unmanned aircraft systems (UAS), and drones. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat sUAS, UAS, and drones. AFRL/RV, of the USSF, proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its research, development, test, and evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377 MSG/EOD would continue to use the Range for suspicious package destruction.

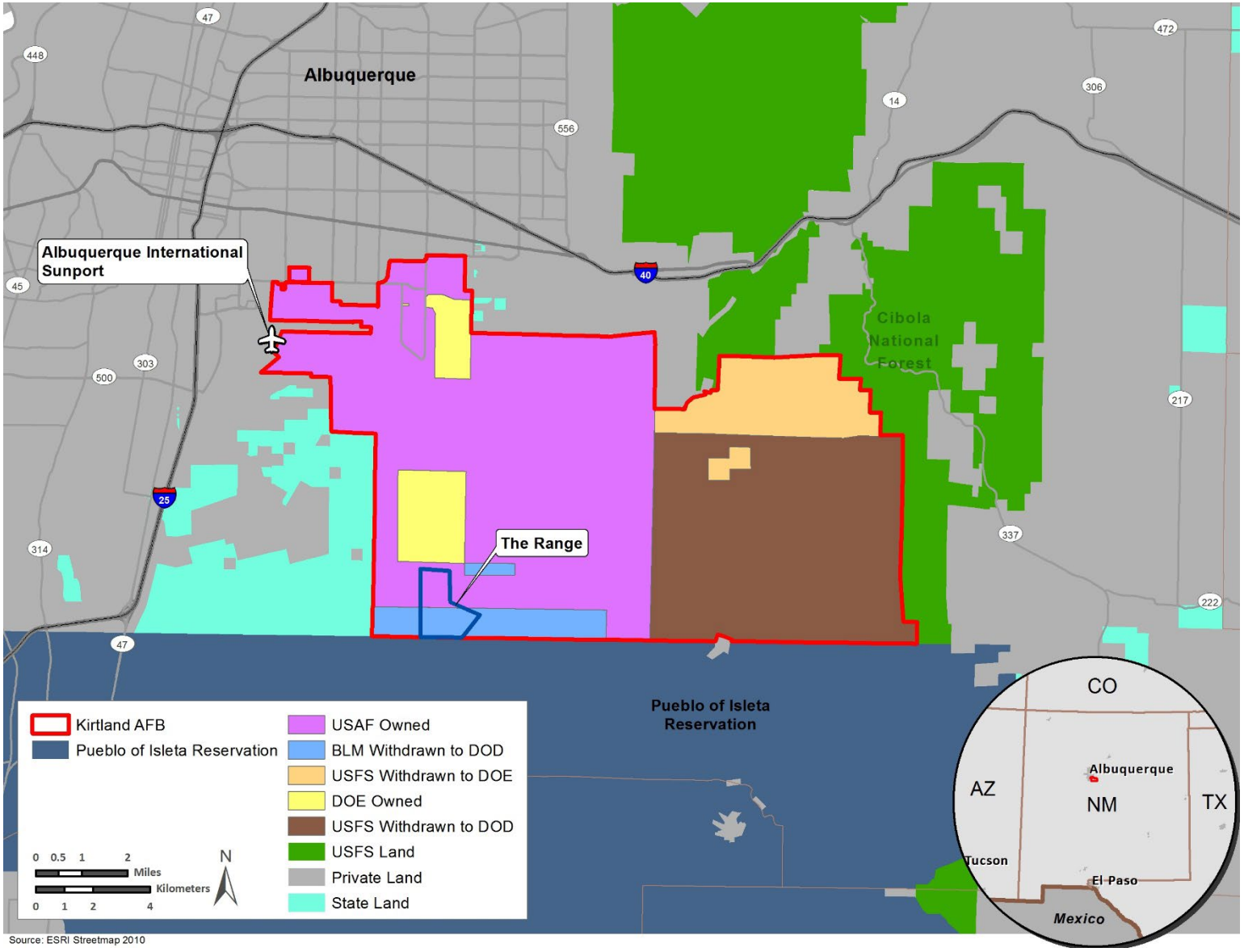

Figure 1-1. Kirtland AFB Vicinity Map

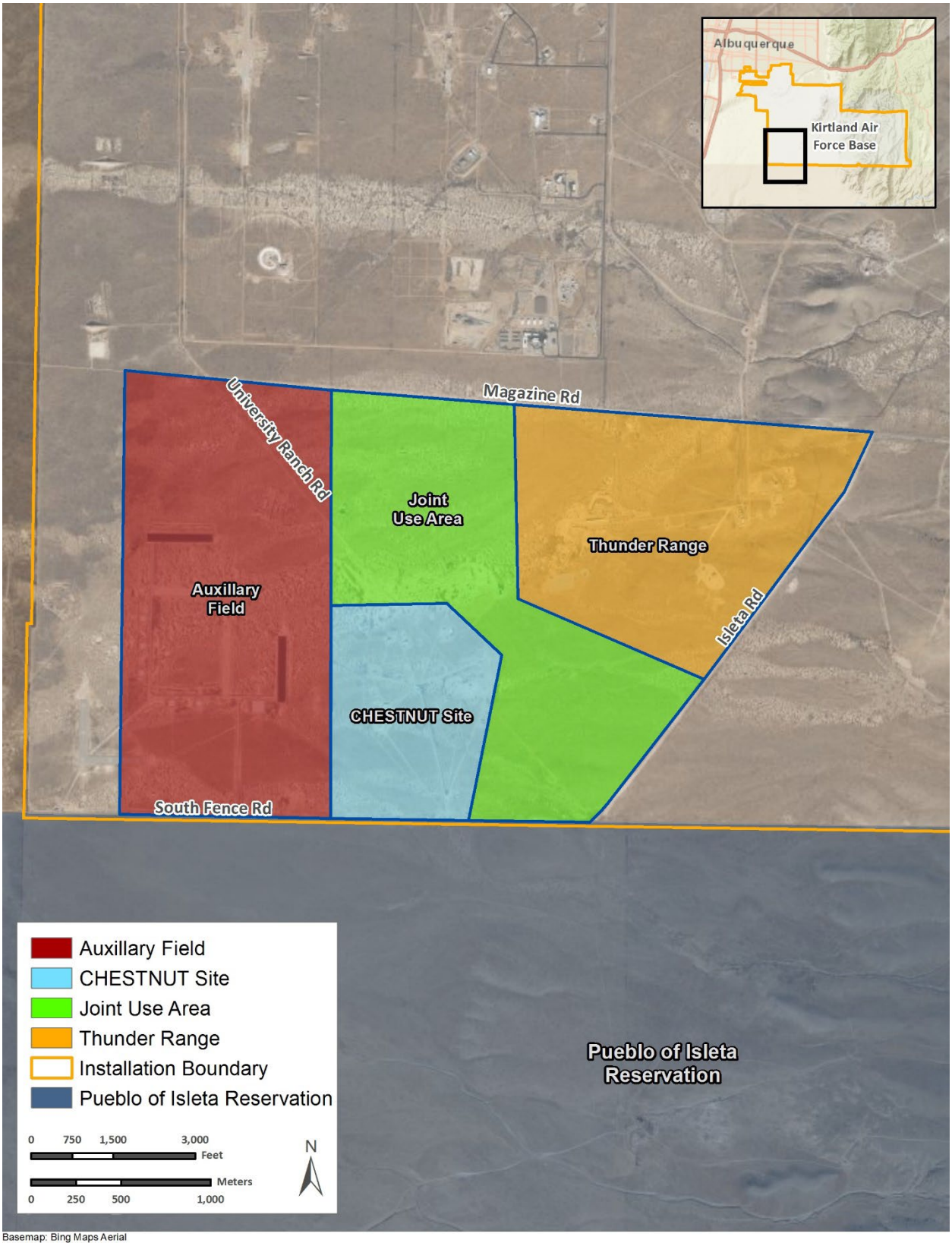

Figure 1-2. CHESTNUT Site and Joint Use Area Overview

In addition to the test activities, the Proposed Action also includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing (T&F) trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables (e.g., fiber optic cables, power lines, etc.) a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the Range (e.g., weed and brush removal, grading and leveling areas for explosive tests, weather proofing, and the cleanup of rodent waste in test bunkers). Given the length of time that has elapsed since the 1987 CERF EA and the proposed future test activities, the 377 MSG/Civil Engineering Installation Environmental Compliance (CEIEC) NEPA Program Manager and 377 ABW Environmental Judge Advocate determined that an update to the EA is appropriate.

This EA details the proposed activities under the Proposed Action. The EA is a planning and decision-making tool that will be used to guide the USAF in implementing the Proposed Action in a manner that complies with all applicable federal, state, and local environmental laws and regulations and is consistent with USAF standards for environmental stewardship. This EA supports a proposal by the USAF, Kirtland AFB, and AFRL to conduct a range of test activities on the Range as well as construct, operate, maintain, and remove supporting infrastructure.

1.2 BACKGROUND

The Department of Defense (DoD) Armed Services perform research and development to support the discovery of technologies to meet increasing threats and challenges encountered by the military under Title 10 of the United States Code (USC) § 4001. In 1949, the USAF established its own Special Weapons Center and test laboratory at Kirtland Field near Sandia, which eventually became the Air Force Weapons Laboratory (AFWL) in 1963 under the Air Force Systems Command (AFSC). AFWL conducted scientific research on weapons and their effects, as well as explored the military uses of nuclear power, weapons, and support equipment seeking to reduce the vulnerability of United States systems to enemy weapons. In the 1960s, AFWL's work moved toward laser research with the establishment of the Airborne Laser Laboratory program in the 1970s. DE's heritage has been strengthened over the years because of the shift from nuclear WMD to DE weapons which provide increased capabilities for surgical strikes.

In 1990, AFSC reorganized 13 laboratories across the country into four super laboratories and AFWL became Phillips Laboratory at Kirtland AFB, devoted to space and missiles research and development. Then in 1997, the laboratories were reorganized again and named the AFRL, as it is known today. Two directorates of AFRL remained at Kirtland AFB to continue research in space (RV) and directed energy (RD). All current training activities and facilities are situated on lands owned by USAF or on lands withdrawn from public use, by the Bureau of Land Management or the United States Forest Service, and given to USAF for military research, testing, and development activities.

1.2.1 AFRL Operations

1.2.1.1 AFRL/RD Operations

The AFRL/RD mission is to, "Lead the discovery, development and delivery of directed energy science and technology for National Security." The research originally conducted by AFWL evolved into weapons that are very precise, can focus energy, cause minimal damage to surrounding personnel, and can counter threats employed by adversaries. Today AFRL/RD

develops DE weapons to counter electronic systems, attack improvised explosive devices or other munitions, and disable other targets. As this technology develops, scientists and engineers expand the concepts to ensure they can work for the warfighter.

AFRL/RD specializes in HEL and HPEM technology development. These areas of research offer the warfighter innovative technologies that enable a variety non-traditional counter electronic and thermal effects that can be either lethal or non-lethal. HEL systems enable pinpoint accurate methods to degrade or destroy adversary systems. HPEM systems enable low collateral damage methods to disturb, deny, or damage electronics contained in adversary systems or buildings. Both technologies operate by emitting high bursts of photons, but the damage mechanisms vary depending on the photon energies emitted. This vision of modern DE warfare is enabled by recent revolutionary advances and additional anticipated advances.

1.2.1.2 AFRL/RV Operations

AFRL/RV served as the USAF's center of excellence for space technology research and development until it was reorganized under the USSF in 2020. The directorate develops and transitions space technologies to provide space-based capabilities. Primary mission activities include space-based intelligence, surveillance and reconnaissance; space domain awareness; space communications, position, navigation and timing; and defensive space control (protecting space assets from man-made and natural effects). AFRL/RV leverages commercial, civil, and other government resources to stay one step ahead in space and to ensure the United States' advantage.

1.2.2 DTRA Operations

DTRA is the DoD's official Combat Support Agency for countering WMD. Personnel at DTRA address the entire spectrum of chemical, biological, radiological, nuclear, and high yield explosive threats. DTRA's programs include basic science research and development, operational support to warfighters on the front line, and an in-house WMD think tank that aims to anticipate and mitigate future threats long before they have a chance to cause harm. DTRA works with the military services, other elements of the US Government, and countries across the world on counterproliferation, nonproliferation, and WMD reduction issues with one goal in mind – making the world safer.

1.2.3 377 MSG/EOD Operations

The 377 MSG/EOD began using the Joint Use Area for training when the Open Detonation Treatment Facility on Kirtland AFB was shut down in 2010. Today, 377 MSG/EOD uses the Range for monthly proficiency training and emergency operations, as necessary. 377 MSG/EOD and AFRL/RD explosive handlers require routine training events to ensure personnel stay qualified and current with safety and proficiency standards. 377 MSG/EOD must remain qualified to support any potential munition/explosive emergency that may occur on Kirtland AFB or in locations required by their mission. They must be able to rapidly respond to ensure potential hazards are neutralized with minimum disturbance to personnel, property, and the surrounding environment.

1.3 PURPOSE OF THE PROPOSED ACTION

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue conducting current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure for all DoD agencies conducting RDT&E activities

on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HEL and HPEM systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

1.4 NEED FOR THE PROPOSED ACTION

The need for the Proposed Action is to allow USAF, USSF, and DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve the technology discussed in **Sections 1.2.1** through **1.2.4**. Such tests detailed above are needed to determine the survivability and vulnerability of structures and targets for national security. In turn, these tests allow for the delivery of innovative and affordable weapons, materials, and methods to the warfighter in time to meet their mission demands. Because of ever-changing threat scenarios, the RDT&E and training conducted by these agencies is a critical element in the development of new capabilities for the nation's security, and it provides an important component of the United States' global leadership in safety, science, and technology.

1.5 DECISION TO BE MADE

This EA evaluates whether the Proposed Action would result in significant impacts on the environment. If significant impacts are identified, Kirtland AFB would undertake mitigation to reduce impacts to below the level of significance, undertake the preparation of an Environmental Impact Statement addressing the Proposed Action, or abandon the Proposed Action. If significant impacts are not identified, then the EA would be finalized and a Finding of No Significant Impact (FONSI) would be signed. The decision would be made by the approving official and could incorporate the Proposed Action, its alternatives, or any combination of the Proposed Action and alternatives. This Draft EA was prepared in accordance with the National Environmental Policy Act of 1969, as amended, (NEPA) (42 USC § 4321 et seq.), the regulations of the President's Council on Environmental Quality (CEQ) that implement NEPA procedures (40 Code of Federal Regulations [CFR] Parts 1500–1508), and the USAF Environmental Impact Analysis Process (EIAP) Regulations at 32 CFR Part 989.

1.6 INTERGOVERNMENTAL COORDINATION / CONSULTATIONS

1.6.1 Interagency and Intergovernmental Coordination and Consultations

Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, as amended by EO 12416, requires federal agencies to provide opportunities for consultation by elected officials of state and local governments that would be directly affected by a federal proposal. In compliance with EO 12372, as amended; NEPA; and NEPA implementing regulations, Kirtland AFB notified relevant stakeholders about the Proposed Action and alternatives (see **Appendix A** for all stakeholder coordination materials). The notification process provides these stakeholders the opportunity to cooperate with Kirtland AFB and provide comments on the Proposed Action and alternatives.

Per the requirements of Section 106 of the National Historic Preservation Act (NHPA) and implementing regulations (54 USC § 306108), Section 7 of the Endangered Species Act (ESA) and implementing regulations (50 CFR Part 402), findings of effect and a request for concurrence was transmitted to the State Historic Preservation Officer (SHPO) and the United States Fish and Wildlife Service (USFWS). A brief summary of comments received will be provided in the Final

EA and all correspondence with the SHPO and USFWS will be included in **Appendix A**. Additionally, correspondence regarding the findings, concurrence, and resolution of any adverse effect will be included in **Appendix A**.

1.6.2 Government to Government Coordination and Consultations

Consistent with NHPA implementing regulations, DoD Instruction 4710.02, *Interactions with Federally-Recognized Tribes*; Department of Air Force Instruction (DAFI) 90-2002, *Interactions with Federally-Recognized Tribes*; and Air Force Manual (AFMAN) 32-7003, *Environmental Conservation*, the USAF is also consulting with federally recognized tribes that are historically affiliated with the geographic region being considered for the Proposed Action regarding the potential to affect properties of cultural, historical, or religious significance to the tribes (see **Appendix A** for all tribal coordination materials). The tribal coordination process is distinct from NEPA consultation or the intergovernmental coordination process and requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of intergovernmental consultations.

Scoping letters were provided to Native American tribal entities who have a vested interest or affiliation with the land underlying Kirtland AFB, inviting them to consult on the proposed undertakings outlined within the EA.

1.7 PUBLIC AND AGENCY REVIEW OF DRAFT EA

A Notice of Availability (NOA) for the Draft EA was published in *The Albuquerque Journal* announcing the availability of the Draft EA on 15 July 2024. Letters were provided to relevant federal, state, and local agencies and Native American tribal governments informing them that the Draft EA is available for review. The publication of the NOA initiated a 30-day comment period. Copies of the Draft EA were made available for review at the San Pedro Public Library, 5600 Trumbull Avenue SE, Albuquerque, New Mexico. A copy of the Draft EA was also made available for review online at http://www.kirtland.af.mil under the Environment tab. At the closing of the public review period, applicable comments from the general public and interagency and intergovernmental coordination and consultation will be incorporated into the analysis of potential environmental impacts performed as part of the EA, where applicable, and included in **Appendix A** of the Final EA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The USAF proposes that the USAF, USSF, and DTRA would continue to conduct current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure on the Range on Kirtland AFB, New Mexico.

2.2 SELECTION STANDARDS

Selection standards were developed to assist the USAF in determining reasonable alternatives and the basis for eliminating any of them. The following selection standards were used to determine the feasibility of each alternative and to determine which of the alternatives would be the best fit to meet the needs of the project:

1. The alternative(s) must meet the purpose of and need for the Proposed Action (see **Sections 1.3** and **1.4**) The alternatives must allow the USAF, USSF, and DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve the technology discussed in **Sections 1.2.1** through **1.2.4**.
2. The alternative(s) must comply with all applicable USAF, federal, and state requirements.
3. The alternative(s) must avoid and/or mitigate direct and indirect, adverse impacts on safety, cultural or natural resources, or other environmental constraints, such as impacts on an environmental restoration site.
4. The alternative site(s) must accommodate a 2000-lb N.E.W. capability with enough land to ensure safe clear zones (CZs).
5. The alternative site(s) must accommodate DE devices and weapon system testing. This includes spectrum authorization for propagation of HPEM radio frequencies and airspace with terrain backstop within 3 miles.
6. The alternative site(s) must have airspace to accommodate drone flying, testing, and training[1].
7. The alternative site(s) must be available and provide access for USAF, USSF, and DTRA current and future users to perform RDT&E mission activities. The site needs to be a remote location that is available for up to 22 days per month.

2.3 DETAILED DESCRIPTION OF THE ALTERNATIVES

2.3.1 Proposed Action

2.3.1.1 Test and Training Activities

The Proposed Action includes current and proposed future test activities conducted by the USAF, USSF, and DTRA on the Range. Under the Proposed Action, these DoD agencies would continue

[1] In accordance with the Privacy Act of 1974 as amended by 5 USC § 552a, spying is prohibited. AFRL takes every effort to limit the collection of US Person Information (USPI) by operating within designated government-controlled property or ranges to the maximum extent possible. US persons or corporations are not targeted for USPI or any other associated metadata in any manner. Although some of the drones have cameras, none of them have memory cards and images are never saved. The cameras are only used for navigation purposes.

to use the Range to develop DE weapon systems and test new methods and explosive materials. This includes the evaluation of new concepts, tests of new HEL and HPEM system configurations, training of personnel to maintain explosive handling qualifications, and pilot proficiency training with drones[2]. These efforts and systems would be staged on the Range with the intent to expand knowledge to further develop and enhance system capabilities. The USAF, USSF, and DTRA current and future users would focus their efforts on:

- DE and material effects,
- System performance and reliability,
- Integration of radar and command and control systems with DE demonstrators,
- HEL and HPEM target interaction,
- New explosives and detonation techniques,
- The use of explosives to create shock and blast waves,
- Training with explosives and drone platforms to maintain proficiency, and
- Testing with drones or other targets of interest.

AFRL/RD currently manages the Range and shares it with other DoD agencies. The schedule for the Range is sporadic and depends on the mission needs of each organization. However, all test and training events are scheduled well in advance with the 377 ABW/Range Management Office (RMO). AFRL/RD and 377 ABW/RMO evaluate requests to use the Range from other interested DoD agencies to ensure the proposed activities fall within the scope of land use and meet all safety and environmental requirements. Explosive operations are authorized for up to 2,000-lbs N.E.W. at the northern portion of the Range and 55-lbs N.E.W. at the southern portion of the Range. Explosive quantities are increased as operations move from south to north to ensure safe distance and CZs meet or exceed minimum requirements in accordance with DoD Explosive Safety Regulation 6055.09 AFMAN 91-201, *Explosives Safety Standards.* The overall limitations and rules for explosive operations are defined and authorized by the DoD Explosive Safety Board Siting.

Less than 10 people would be on site daily during test preparation when instrumentation, equipment, and temporary structures are in place. The number of personnel on the Range during a test can be as many as 30, including up to 12 personal vehicles. All vehicles and personnel are required to stay on existing dirt roads as much as possible and at appropriate, safe distances during test events. When drones are defeated, personnel search the area and recover the assets. In 2022, the Range was used for test events a total of 108 days, with 3 of those days being dual use days in which two organizations conducted test events on different locations on the Range. In 2023, the Range was used a total of 102 days with only 6 of those days being dual use days. Additional schedules would be added for the AFRL/RV vaporization tests and any other future tests to be performed. Activities performed on the Range would continue to be deconflicted with surrounding operations by ensuring all events appear on the monthly 377 ABW/RMO Range Schedule.

[2] To prevent drones from getting close to the Pueblo of Isleta Reservation, boundaries and restrictions are programmed in the drone that are more restrictive than the actual airspace; however, some drones do not have this capability. Should an sUAS, UAS, or drone land on the Pueblo of Isleta Reservation, the reservation-provided point of contact would be contacted to arrange for recovery of the sUAS, UAS, or drone. USAF, USSF, and DTRA personnel would not enter the Pueblo of Isleta Reservation without permission.

The following sections provide example test and training activities for current and future USAF, USSF, and DTRA users. For the purposes of this analysis, the following activities are not agency specific but could potentially be performed by any DoD agency at the approved locations on the Range. Additionally, the following sections detail activities that could occur but also would allow for additional similar activities to occur in the future that are a result of new technology. Any new proposed activities would be required to undergo the Kirtland AFB environmental review process.

2.3.1.1.1 AFRL Activities

2.3.1.1.1.1 AFRL/RD Activities

AFRL/RD activities are focused on research and development of DE, HEL, and HPEM devices and weapons, that provide the warfighter with precision offensive and defensive engagement of target threats. DE weapons are fundamentally different from conventional kinetic weapons by offering the following advantages: (1) speed of light delivery, (2) graduated effects (deny, disrupt, degrade, damage, and/or destroy), (3) minimal collateral damage, and (4) low operational costs.

DE weapons perform tests with targets by staging equipment on the Range to orient and limit beam propagation to safer airspace regions. Targets of interest are drones, cased munitions (such as mortars, shells, domes, and missiles), electronics (such as computers), and other components associated with threats. DE weapons are directional and can be focused to specific areas, all efforts are made to minimize impacts to overhead assets and use surrounding terrain as a backstop when testing. Targets are placed on a concrete pad, with overhead dog-house structures, and constrained to prohibit launching off site. A small transformer provides electrical power at the Laser Effect Compound (LEC) for tests conducted in this area. However, when the transformer is not available or cannot provide enough power, AFRL/RD brings temporary portable generators to the Range. AFRL/RD routinely uses three test locations on the Range (Ground Zero [GZ]-1, GZ-2, and the LEC) (see **Figure 2-1**) to position DE devices. Drones can be launched and flown anywhere on the Range within the Federal Aviation Administration approved Certificate of Waiver or Authorization. Drones are limited to a height of 700 feet (see **Appendix B**).

AFRL/RD also routinely conducts open-air (outdoor) tests of HPEM systems on the Range. These tests involve transporting the HPEM system to an approved site on the Range and radiating electromagnetic energy toward a target or sensing device. While the HPEM systems are commonly placed near a location on the Range with 480-volt AC shore power, the systems can also be powered by a portable generator and therefore, be located anywhere on the Range for deconfliction with other tests. HPEM systems can be large or small, aboard a trailer, placed directly on the ground, or potentially in the air. Similarly, targets can be large or small, on the ground or in the air. HPEM tests are used to verify system performance in field conditions and can last several months depending on system performance and range schedule.

2.3.1.1.1.2 AFRL/RV Activities

AFRL/RV tests would be performed to optimize canister system designs for generating metallic vapor to study plasma effects in the ionosphere, a part of the space environment that has significant impacts on communications. Vaporization experiments would be conducted by looking at a range of materials to determine which combinations of materials would provide the best plasma. Diagnostics and models would be developed for further tests in space where the metal vapor could form a temporary plasma. Tests would consist of small (100 to 200 grams [g] of total material), medium (1 kilogram [kg] of total material), and large scale (7 kg of total material) tests.

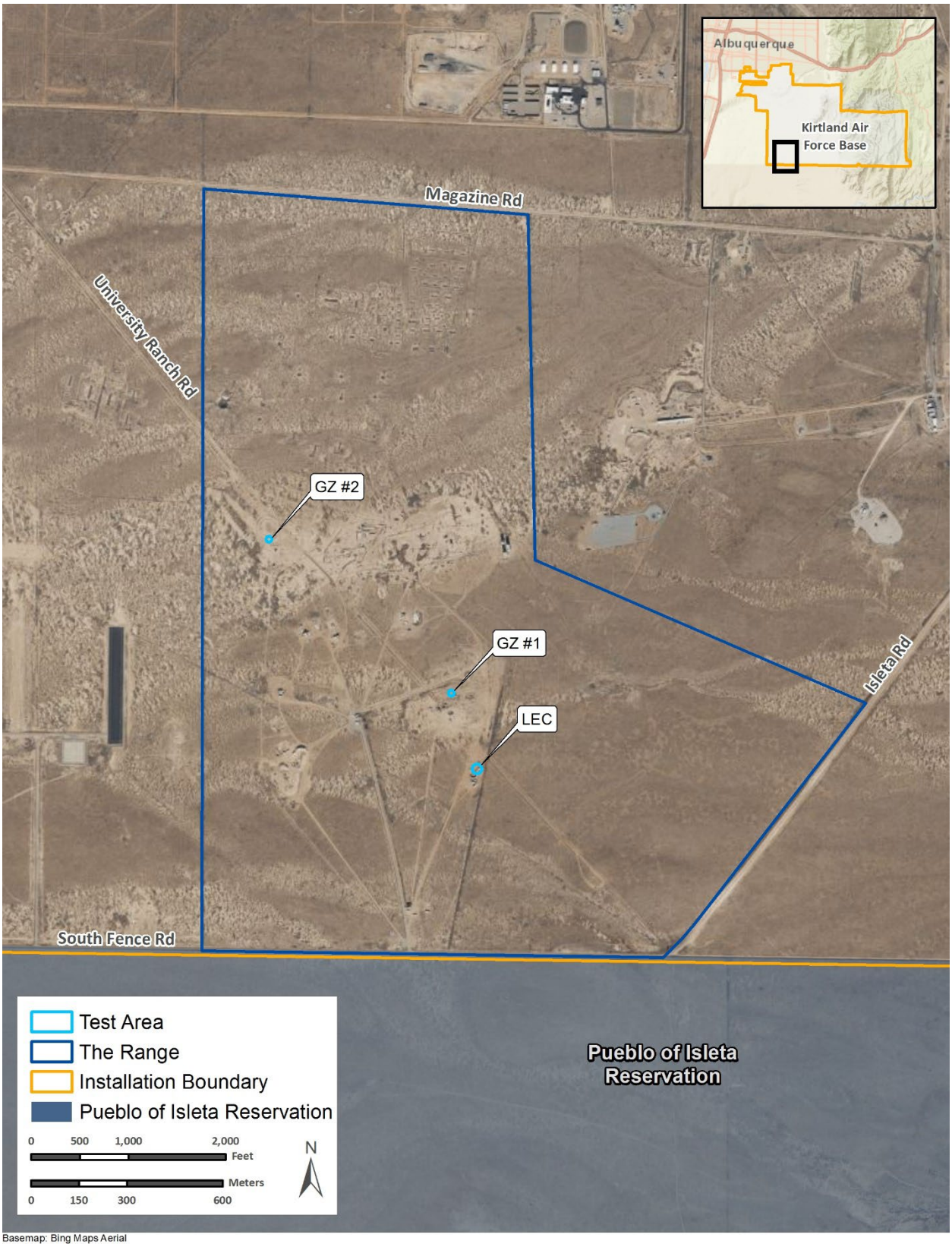

Figure 2-1. Location of GZ-1, GZ-2, and LEC Test Areas

Materials to be used include most of the first two columns of the periodic table (see **Appendix C**) - alkali metals (lithium, sodium, potassium, rubidium, and cesium), alkali earth metals (magnesium, calcium, strontium, and barium), third row transition metals (scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, and zinc), and lanthanide metals (lanthanum, cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, holmium, erbium, thulium, ytterbium, and lutetium). Heat reaction sources to be used would include titanium, boron, cesium nitrate, potassium nitrate, sodium nitrate, and tungsten (VI) oxide. AFRL/RV would be required to submit an Air Force Form 813 for evaluation if any new metal/metal molecule and/or heat reaction source is proposed for use beyond what is listed above.

The releases happen very quickly (lasting less than 1 second) and result in plumes of approximately 20, 50, and 80 feet into the air for the small-, medium-, and large-scale tests, respectively. The quantity of metals listed above that would be released during these tests are comparable to the quantity of metals released by common fireworks. A single firework shell as employed in common professional displays is of very similar size to the largest being proposed for this testing, 1 to10 kg. These fireworks also contain very similar chemical compositions, for example the most fireworks contain approximately 70 percent potassium nitrate (one of the chemicals on this list), as well as other metals such as barium and magnesium at about 10 percent. Typical firework shows involve hundreds to thousands of shells. The Macy's Fourth of July show has more than 50,000 shells employed. These shows release significantly more material in a single show than is being proposed for use at the Range over 1 or more years (greater than 10 times more). The location being considered for this testing is an existing concrete pad near GZ-2 (see **Figure 2-1**). The amount of testing proposed per year is shown in **Table 2-1**.

Table 2-1. Proposed Small-, Medium-, and Large-Scale Testing Activity

	Small-Scale	Medium-Scale	Large-Scale
Tests per year	50	12	1
Range time needed per test	1/2 day	1 day	2 days

2.3.1.1.2 DTRA Activities

Most of the DTRA tests conducted on the Range involve the design, analysis, and testing of temporary structures, new equipment, and explosives. The types of temporary structures involved may include personnel protective structures, missile silos, bunkers, aircraft hangars, antennas, and tunnels. Most test structures are scaled versions and DTRA removes all structures at the end of test requirements.

Scaled high explosive (HE) field testing is an effective, real- world method of evaluating the accuracy of scientific calculations and theories related to the blast and shock environment and impacts on hardened, protective structures and equipment. This testing provides a reference point for, and validation of, both pre- and post-test predictions. Taken together, several tests provide a database against which future calculations, designs, and assessments of similar structures, equipment, and geological settings are evaluated. The following paragraphs provide a brief description of various types tests DTRA conducts on the Range.

Scaled and Non-scaled Building Tests. These tests measure the impact of explosives on scaled buildings or full-size building sections. The data collected from these survivability tests support improvements to military and civilian facility designs. Buried and aboveground structures are evaluated using aboveground, ground-level, and buried explosives.

Development and Testing of New Explosives. These tests determine the detonation characteristics of proposed new HE types, charge configurations, or new detonation techniques. New explosive mixtures or detonators are tested for explosive power, safety, and reliability. This testing may be done in an open area, within a structure, or buried. Initial tests usually use less than 10 lbs. of explosive but may be increased during a test program. The maximum surface charge is equivalent to 2000-lbs N.E.W.

Explosives to Create Shock and Blast Waves. Shock and blast waves check the ability of equipment or sensors to withstand explosive blasts or to obtain basic blast and shock impact measurements (i.e., air blast, crater, ejecta, and/or ground motion from either surface or buried charges).

Instrumentation Development Tests. These tests use explosives to evaluate new instrumentation techniques for measuring blast and shock parameters (e.g., soil stress, particle motions, air blast peak, strains of structural models, and environmental impacts). Explosives are used to launch dust, water particles, or a non-active biological simulant into the air to create a cloud for new sensor testing.

Non-Explosive Tests. These tests are used to provide structural strength (before or after an explosive test) and to develop or test non-blast-related sensors. The sensors may collect air samples, measure various parts of the non-visual spectrum (e.g., infrared/ultraviolet), or measure other, non-blast-related characteristics. Most of the sensors are non-emitting, passive instruments; and some are hung from balloons to provide a vertical collection system.

Cloud Simulation Tests. These tests would use a disseminator to loft water, sands, and/or other possible nonhazardous materials to create “simulant clouds.” The other possible nonhazardous materials include oleic acid, cocoa powder, volcanic ash, urea, potassium chloride, dust, wheat/pizza flour, powdered sugar, Portland cement, or soybean meal. No explosives or hazardous materials are involved. The disseminator contains a heater, a blower, and dispersal injectors. DTRA may test equipment modifications during these efforts. Long-range sensors such as a Light Detection and Ranging (LiDAR) and long-wave infrared hyperspectral imaging systems would measure the cloud formation. sUAS, UAS, and drones may also be deployed during test events. The LiDAR might contain non-eye safe lasers; all remaining systems are eye safe.

2.3.1.1.3 377 MSG/EOD Activities

377 MSG/EOD would continue to use the Range primarily for training as evaluated in the 2016 *Programmatic EA (PEA) Addressing the Development, Use, and Maintenance of Military Training Areas at Kirtland AFB, New Mexico,* hereafter referred to as the 2016 Training PEA. GZ-2, just north of CHESTNUT in the Joint Use Area (see **Figure 2-1**), was originally established by AFRL/RD in 2001 for HE tests. Environmental impacts associated with these activities were evaluated in the 2016 Training PEA and no significant impacts were found to be associated. A FONSI was signed for the PEA in September 2016. EOD uses GZ-2 for monthly proficiency training and emergency operations as necessary. Activities performed at GZ-2 are limited to 2,000-lbs N.E.W. All munitions are transported to GZ-2 using approved vehicles, containers, and designated routes. Monthly proficiency training consists of up to four shots, which typically last up to 6 hours and involve as many as 15 personnel. Additionally, the gated area behind GZ-2 is periodically used by 377 MSG/EOD to practice using tools for their operations.

2.3.1.1.4 Test Site Preparation

All development activities would stay within the boundaries of the Range. The location of all tests and experiments would meet DoD explosive safety distance requirements and would consider all environmental resources prior to placement on the Range to ensure adverse impacts are avoided. Equipment used in site development activities are identified in **Table 2-2**. These vehicles would be parked within previously disturbed areas or the proposed training areas to avoid disturbing more ground than necessary. Access to the Range would remain the same and no new improved roadways would be developed. No permanent storage for fuel or lubricants would occur on the Range. All necessary fuels or additional equipment would be provided by the using agency as needed for test efforts.

Table 2-2. Test Preparation Construction Equipment

Construction Equipment Type	Expected Use (days per year)	Fuel
bulldozer	10	Diesel
forklift	20	Diesel
backhoe	20	Diesel
dump truck	10	Gas
concrete truck delivery	10	Diesel
front-end loaders	150	Diesel
crane	3	Diesel
pickup truck	365	Gas
5-kilowatt generator	100	Gas
60-kilowatt generator	100	Diesel

Potential temporary structures that could be constructed for test activities include towers (free standing or guywire supported); buildings (typically concrete, steel frame); mobile structures, trailers, conex(s) (freight containers, typically 8 feet by 8.5 feet tall and 20 feet long); earthen structures (such as berms, pits, or trenches); and barriers or other safety/security devices.

Operational Risk Management is conducted for each test event to minimize fire, dust, and safety hazards. Dry vegetation near the DE target or explosives is removed, and water is transported to the Range for individual test events to use for any potential fires. When occupied, Fire Station 4, located within a 2-minute drive from the southwest corner of Kirtland AFB, is available to respond to fires. Additionally, wind and weather conditions would be monitored to ensure noise, sound pressures, and vibrations generated by test activities would not affect other facilities or locations on or off Kirtland AFB, including the Pueblo of Isleta Reservation.

2.3.1.2 Infrastructure Projects

Under the Proposed Action, the USAF, USSF, and DTRA current and future users would also construct, operate, maintain, and remove supporting infrastructure as well as conduct routine range construction, site preparation, and maintenance. Examples of infrastructure projects that could be included in the Proposed Action consist of replacing outdated project T&F trailers, installing permanent pneumatic mast setups, replacing/installing up to 25,000 feet of underground cables (e.g., fiber optic cable, power lines, etc.) a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the range (e.g., weed and brush removal, grading and leveling areas for explosive tests, weather proofing, and cleanup of rodent waste in test bunkers).

2.3.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual for the already authorized users of the Range, as consistent with mission and management plans. Planned efforts would not increase over current operating levels and would not deviate from DE research and development, explosives, and drone tests/training already approved. No new test and/or training activities would occur; this includes any expanded RDT&E operations and AFRL/RV or DTRA experiments that would pose new impacts on environmental resources. Additionally, no new support infrastructure would be constructed, operated, maintained, or removed on the Range. The USAF EIAP (32 CFR § 989.8[d]) requires consideration of the No Action Alternative. Therefore, this alternative will be carried forward for detailed analysis in the EA. However, this No Action Alternative would not allow USAF, USSF, or DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve technology. Therefore, the No Action Alternative would not meet the purpose of or need for the Proposed Action as described in **Sections 1.3** and **1.4**.

2.4 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

The following alternatives were eliminated from further consideration based on the selection standards outlined in **Section 2.2** and other reasons as explained below.

2.4.1 White Sands Missile Range

White Sands Missile Range (WSMR) is located south of Albuquerque, New Mexico, approximately 129 miles from the northern boundary of the Range and approximately 242 miles from the southern boundary of the Range. WSMR is managed by the US Army and has an Environmental Impact Statement that covers range activities. WSMR is DoD's largest, fully instrumented, open-air (outdoor) range and provides the United States' Armed Forces, allies, partners, and defense technology innovators with the world's premiere RDT&E, experimentation, and training facilities to ensure our nation's defense readiness. All proposed actions in **Section 2.3.1** were considered at WSMR.

However, although WSMR could provide the land and airspace for the Proposed Action, the scheduling and availability of the range extremely limits the ability of the USAF, USSF, and DTRA current and future users to accomplish mission tasks (Selection Standard 7). This alternative would also require the construction and/or relocation of temporary structures to WSMR, resulting in environmental impacts greater than those associated with the Range (Selection Standard 3). Therefore, this potential alternative was considered but eliminated from further analysis.

2.4.2 Cannon AFB and Melrose Range

Cannon AFB is located 196 miles east of Albuquerque, New Mexico, encompassing 3,789 acres of land but most testing occurs on the Melrose Air Force Range (Melrose). The Melrose training area is located 25 miles west of Cannon AFB and is comprised of approximately 70,000 acres. Operations on Melrose also cover an area of 2,500 square miles of airspace. The primary focus for activities on Melrose is training, supporting daily air-to-ground and electronic combat training for approximately 3,400 F-16 wing sorties annually. Melrose is also used by the New Mexico Air National Guard, based at Kirtland AFB, and other United States and allied aircrew accounting for an additional 1,400 sorties annually. The Proposed Action was considered at Melrose.

However, the usage of Melrose would limit several proposed activities. Further, the configuration of the site severely limits how the range could be used and does not provide the ability to conduct both HEL and HPEM test activities in conjunction with targets and drones to the extent needed for the AFRL/RD RDT&E mission (Selection Standards 1 and 6). Additionally, Melrose would require the construction of temporary structures and additional access and availability, restricting the ability of DTRA to accomplish mission objectives (Selection Standards 1 and 5). This alternative does not meet the selection standard for scheduling or for accommodating HEL, HPEM, and DTRA explosive operations (Selection Standard 7). Therefore, this potential alternative was considered but eliminated from further analysis.

2.5 COMPARATIVE SUMMARY OF IMPACTS

Table 2-1 below presents a summary of the impacts anticipated under the Proposed Action and the No Action Alternative.

Table 2-3. Summary of Potential Impacts

Affected Resource	Proposed Action	No Action Alternative
Noise	Long-term, direct, intermittent and temporary, negligible to minor, adverse impacts on noise would occur. Heavy equipment would generate intermittent, temporary increases in ambient noise levels. Use of exhaust mufflers and other noise dampening equipment would reduce noise levels. Test activities involving explosives tests would generate distinct acoustical events that would briefly exceed ambient noise levels. Wind and weather conditions would be monitored to ensure noise, sound pressures, and vibrations generated by test activities would not affect other facilities or locations on or off the installation, to include the Pueblo of Isleta Reservation. Personnel that have the potential to be exposed to noise greater than 140 decibels would wear hearing protection to reduce sound levels to acceptable limits. All test structures and personnel would be sited outside structural damage and ground shock threshold areas during test events.	Existing conditions would remain unchanged.
Air Quality	Long-term, direct, intermittent, minor, adverse impacts on air quality would occur. Total net annual emissions from the Proposed Action are not expected to exceed the insignificance indicator. Fugitive dust emissions would vary based on the work phase, level of activity, and prevailing weather conditions. Dust suppression techniques would be used, and appropriate permits would be obtained. Long-term, intermittent, negligible impacts from greenhouse gases would occur.	Existing conditions would remain unchanged.
Geological Resources	Short-term, direct, minor, adverse impacts on topography and soils would be expected from the testing that requires underground detonation of explosives, including the potential temporary structures that could be constructed for test activities, mainly those that require berms, pits, or trenches.	Existing conditions would remain unchanged.
Water Resources	No impacts on groundwater, wetlands, or floodplains would be anticipated. Due to the minor sizes of the proposed detonations and the fact that they would take place significantly above the static water table, no contamination of potable groundwater would occur. Under- and above-ground explosives testing would not occur in an area with surface water, wetlands, or within a floodplain. Short-term, indirect, negligible, adverse impacts on surface waters would be anticipated.	Existing conditions would remain unchanged.

Affected Resource	Proposed Action	No Action Alternative
Biological Resources	Short- and long-term, direct, negligible to minor, adverse impacts on grassland vegetation would be expected. Direct effects on vegetation from removal and crushing and indirect effects from soil compaction and the potential for establishment of invasive species would occur. Short- and long-term, direct, minor, adverse impacts on wildlife species and habitat would be expected. Test and training activities would result in temporary, short-term, minor degradation of wildlife habitat, while construction of temporary support infrastructure would result in short- and long-term, minor degradation of habitat. Although there is no evidence of western burrowing owls on the Range, there is the potential for the Proposed Action to result in short-term, minor, adverse impacts to this federal species of concern. As noted above, ground-disturbing activities could indirectly impact the owls and their habitats, and project activities would result in temporary, minor degradation of habitat.	Existing conditions would remain unchanged.
Cultural Resources	No impacts on cultural resources are anticipated. There are no eligible archaeological sites or architectural resources within the area of potential effect. If any cultural resources are inadvertently encountered, work would be halted, the immediate area secured, the Cultural Resources Program Manager shall be notified, and procedures outlined in the Integrated Cultural Resources Management Plan would be followed.	Existing conditions would remain unchanged.
Infrastructure	Short-term, indirect, negligible, adverse impacts on the transportation system would be expected. The Proposed Action would be expected to result in intermittent, short-term, negligible, adverse impacts on area roadways because of a temporary increase in the number of vehicles accessing the installation. Short- and long-term, minor, adverse impacts on solid waste management at Kirtland AFB would be expected. Project activities would generate minimal amounts of solid waste, primarily recyclable and reusable building materials (e.g., concrete, metals).	Existing conditions would remain unchanged.
Hazardous Materials and Wastes	No impacts on or from environmental restoration program sites, toxic substances, and per- and polyfluoroalkyl substances are anticipated. Short-term, negligible, adverse impacts on hazardous material and waste management could occur during construction and removal of supporting infrastructure. No impacts on hazardous material and waste management would be expected from current or future test activities under the Proposed Action.	Existing conditions would remain unchanged.

Affected Resource	Proposed Action	No Action Alternative
Safety	Short- and long-term, negligible, adverse impacts on safety would be expected. Project activities associated with the Proposed Action would result in short-term, negligible, adverse impacts on the safety of contractors, military and civilian personnel, and the public. While unlikely, short- and long-term, negligible to moderate, adverse impacts could result from an accident at the Range resulting from test activities. However, Kirtland AFB has numerous safety protocols in place to prevent and minimize potential impacts.	Existing conditions would remain unchanged.

1

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 SCOPE OF THE ANALYSIS

3.1.1 Resources Analyzed

Resources in the project area that were analyzed include noise, air quality, geological resources, water resources, biological resources, cultural resources, infrastructure, hazardous materials and wastes, and safety. The following sections provide a characterization of the affected environment and an analysis of the potential direct and indirect impacts each alternative would have on the affected environment. Each alternative was evaluated for its potential to affect physical, biological, and socioeconomic resources. Cumulative and other impacts are discussed in **Section 4.0**. All potentially relevant resource areas were considered in this EA. The following discussion elaborates on the characteristics that might relate to impacts on resources:

- **Short-term or long-term.** These characteristics are determined on a case-by-case basis and do not refer to any rigid time period. In general, short-term impacts are those that would occur only with respect to a particular activity, for a finite period, or only during the time required for construction or installation activities. Long-term impacts are those that are more likely to be persistent and chronic.
- **Direct or indirect.** A direct impact is caused by and occurs contemporaneously at or near the location of the action. An indirect impact is caused by a proposed action and might occur later in time or be farther removed in distance but still be a reasonably foreseeable outcome of the action. For example, a direct impact of erosion on a stream might include sediment-laden waters near the action, whereas an indirect impact of the same erosion might lead to lack of spawning and result in lowered reproduction rates of indigenous fish downstream.
- **Negligible, minor, moderate, or major.** These relative terms are used to characterize the magnitude or intensity of an impact. Negligible impacts are generally those that might be perceptible but are at a lower level of detection. A minor impact is slight but detectable. A moderate impact is readily apparent. A major impact is one that is severely adverse or exceptionally beneficial.
- **Adverse or beneficial.** An adverse impact is one having unfavorable or undesirable outcomes on the man-made or natural environment. A beneficial impact is one having positive outcomes on the man-made or natural environment. A single act might result in adverse impacts on one environmental resource and beneficial impacts on another resource.
- **Significance.** In considering whether the effects of the Proposed Action are significant, agencies analyze the potentially affected environment (context) and degree of the effects of the action (intensity).
- **Context.** The context of an impact can be localized or more widespread (i.e., regional).
- **Intensity.** The intensity of an impact is determined through consideration of several factors, including whether an alternative might have an adverse impact on the unique characteristics of an area (e.g., historical resources or ecologically critical areas), public health or safety, or endangered or threatened species or designated critical habitat. Intensity of impacts are also considered in terms of their potential for violation of federal, state, or local environmental law; their controversial nature; the degree of uncertainty or

unknown impacts, or unique or unknown risks; if there are precedent-setting impacts; and their cumulative impacts (see **Section 4.0**).

In accordance with NEPA, CEQ regulations, and 32 CFR Part 989, the following evaluation of environmental impacts focuses on those resources and conditions potentially subject to impacts.

3.1.2 Resources Considered but Eliminated from Detailed Analysis

Based on the scope of the Proposed Alternative, environmental resources with few to no impacts were identified and removed from detailed analysis. The following describes those resource areas and why they were eliminated.

- **Airspace Management.** Under the Proposed Action, no changes to current airspace types, flight activities, or training would occur. The RV tests detailed in **Section 2.3.1.1.1.2** would only reach a maximum height of 80 feet. Meanwhile, helicopters fly at an altitude of 500 to 1,000 feet above ground level and the approach for the Isleta Drop Zone is no lower than 300 feet above ground level. Therefore, there would be no impact on airspace management. Similarly, the No Action Alternative would not change any current flight patterns for aircraft in the area. No short- or long-term impacts on airspace management would result from the Proposed Action; therefore, airspace management has been eliminated from detailed analysis in this EA.

  A comment was received from the Federal Aviation Administration on 16 February 2024, requesting that Kirtland AFB ensure the proposed testing complies with 14 CFR Part 77, *Objects that Affect the Navigable Airspace*, ensuring safe and efficient use of the navigable airspace. The proposed testing would only reach a maximum height of 80 feet, and 14 CFR Part 77 only applies to objects that surpass a height of 200 feet. Therefore, the proposed project would be in compliance with 14 CFR Part 77.

- **Land Use.** Under the Proposed Action, no changes to current land use designations would occur. According to the 2016 Installation Development Plan, the Range is located within the Southern Research & Development Area and implementation of the Proposed Action would not change this designation (KAFB 2016). No short- or long-term impacts on land use would result from the Proposed Action; therefore, land use has been eliminated from detailed analysis in this EA.

- **Socioeconomics.** Activities associated with the Proposed Action would result in temporary increases in payroll tax revenue from the hiring of local construction workers and the purchase of construction materials and goods in the local area, resulting in a beneficial impact. No adverse impacts on socioeconomics would be expected from the Proposed Action. Because the potential beneficial impacts are negligible and there would be no adverse impacts, socioeconomics has been eliminated from detailed analysis in this EA.

- **Environmental Justice.** EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations*, requires federal agencies to consider any potentially disproportionate human health or environmental risks their activities, policies, or programs may pose on minority or low-income populations. EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to identify and assess health risks and safety risks that may disproportionately affect children. EO 13985, *Advancing Racial Equity and Support for Underserved Communities Through the Federal Government*, requires federal agencies to pursue a comprehensive approach to advancing equity for all, in particular by fighting systemic racism. EO 14096,

Revitalizing Our Nation's Commitment to Environmental Justice for All, signed 21 April2023, states that restoring and protecting a healthy environment—wherever people live, play, work, learn, grow, and worship—is a matter of justice and a fundamental duty that all federal agencies must uphold on behalf of all people. It requires that federal agencies advance environmental justice for all by implementing and enforcing the Nation's environmental and civil rights laws, preventing pollution, addressing climate change and its effects, and working to clean up legacy pollution that is harming human health and the environment.

All activities associated with the Proposed Action would occur entirely on Kirtland AFB and noise resulting from project activities is not expected to impact residential areas or sensitive receptors. A traffic schedule for additional vehicles would be coordinated to ensure any potential impacts on congestion or noise around the installation from a potential increase in traffic would be negligible. There are no daycare centers or schools near the Range and standard site safety precautions would be implemented to ensure children would not be exposed to increased health or safety risks. Under the No Action Alternative, there would be no changes to baseline conditions. Therefore, Environmental Justice is not carried forward for detailed analysis in this EA because no human populations, low income, minority, or otherwise would be negatively impacted as a result of the Proposed Action.

3.2 NOISE

Noise is defined as undesirable sound that interferes with communication, is intense enough to damage hearing, or is otherwise intrusive. Human response to noise varies depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day. Sensitive noise receptors could include specific locations (e.g., churches, schools, hospitals) or an expansive area (e.g., nature preserves, conservation areas) in which occasional or persistent sensitivity to noise above ambient levels exist.

Sound intensity is quantified using a measure of sound pressure level called decibels (dB). The A-weighted decibel (dBA) is a measurement in which "A-weighting" is applied to the dB to deemphasize the higher and lower frequencies that the human ear does not perceive well in order to approximate a frequency response representing the human perception of sound. The range of audible sound for humans is considered to be 1 to 130 dBA and the threshold of audibility is generally within the range of 5 to 25 dBA (USEPA 1981a, USEPA 1981b). The threshold for perception of a change in sound is 5 dBA. A sound level that increases by 10 dBA is perceived as being twice as loud, while a sound level that decreases by 10 dBA is perceived as being half as loud (USEPA 1971). Supplemental noise metrics, such as peak sound pressure level (L_{pk}), which is the true peak of a sound pressure wave used to capture the true instantaneous sound pressure, can be used to measure impulsive sounds (i.e., explosions).

According to the United States Environmental Protection Agency (USEPA), continuous and long-term noise exposure to levels in excess of 65 dB is normally incompatible with noise-sensitive land uses such as residences, schools, churches, and hospitals (USEPA 1974). According to the United States Department of Housing and Urban Development, residential units and other noise-sensitive land uses are "clearly unacceptable" in areas where noise exposure exceeds 65 dBA, and "normally acceptable" in areas where noise exposure is 65 dBA or less (24 CFR Part 51).

Military and civilian personnel exposed to high noise levels are required to wear hearing protection, in accordance with DoD Instruction 6055.12, *Hearing Conservation Program* and Occupational Safety and Health Administration (OSHA) regulations (29 CFR § 1910.95). OSHA

workplace standards state constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed to is 115 dBA, and exposure to this level must not exceed 15 minutes within an 8-hour period. These standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

3.2.1 Affected Environment

The Range is in rural New Mexico where ambient noise levels are estimated at 40 dBA in the daytime and 34 dBA at night (ANSI 2013). The overall ambient noise environment at Kirtland AFB is affected mainly by USAF and civilian aircraft operations, automotive vehicles, live-fire weapons, and testing activities. In the heavily developed northwestern portion of the installation, aircraft operations at the Albuquerque International Sunport are the primary source of noise, with industrial activities and military training as secondary noise sources. The ambient sound environment of the southern portion of the installation, including at the Range is quieter because development is less concentrated. Intermittent noises from military training, military vehicles, live-fire weapons, and explosives testing are the primary sources of noise in the southern portion of the installation. Explosive testing produces the highest noise levels, which can reach up to between 160 and 190 dB L_{pk} at the site of testing (NSWC 1981, KAFB 1987). Noise levels decrease with increasing distance from the noise source.

The nearest noise sensitive receptor to the Range is the Pueblo of Isleta Reservation, which is just south of the Range. However, the nearest inhabited area of the territory is more than 6 miles (31,680 feet) southwest from the southern boundary of the Range. Noise from existing operations on the Range at this distance is less than 65 dBA, which is compatible with noise-sensitive land uses.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action

Long-term, intermittent and temporary, negligible to minor, adverse impacts on noise would occur from the Proposed Action. Noise from site preparation and infrastructure projects would result from use of heavy construction equipment, which would generate intermittent, temporary increases in ambient noise levels while such activities are occurring. Noise levels associated with construction equipment that is likely to be used at the Range are listed in **Table 3-1**. Individual pieces of equipment would produce noise levels between 60 and 94 dBA at a distance of 50 feet. When several pieces of equipment are used simultaneously, the addition of a piece of equipment with identical noise levels to another piece of equipment would increase the overall noise environment by 3 dB (USEPA 1974). Therefore, additive noise associated with multiple pieces of construction equipment operating simultaneously would increase the overall noise environment by a few dB over the noisiest equipment. The use of exhaust mufflers and other noise dampening equipment could reduce the noise level by up to 10 dBA (USEPA 1974).

Table 3-1. Average Noise Levels for Common Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)	Predicted Noise Level at 250 feet (dBA)	Predicted Noise Level at 500 feet (dBA)	Predicted Noise Level at 1,000 feet (dBA)
Truck	83 to 94	69 to 80	63 to 74	57 to 68
Backhoe	72 to 93	58 to 79	52 to 73	46 to 67
Concrete Mixer	74 to 88	60 to 74	54 to 68	48 to 62
Dozer/Tractor	60 to 89	46 to 75	40 to 69	34 to 63
Front Loader	70 to 90	56 to 76	50 to 70	44 to 64
Crane	63 to 88	49 to 74	43 to 68	37 to 62

Sources: USEPA 1974, TRS Audio 2024, FHWA 2007

The Proposed Action includes the continuation of testing activities that have occurred since the 1987 CERF EA was completed. Noise from current testing events on the Range would continue under the Proposed Action. Additionally, testing activities involving DE technology, HEL and HPEM systems, drones, and non-explosive tests generate minimal levels of noise that likely would not exceed the ambient noise levels of rural New Mexico. Testing activities involving explosives would generate distinct acoustical events that would briefly exceed ambient noise levels; however, noise from these events would attenuate to levels less than 65 dBA at nearby noise sensitive receptors, such as the Pueblo of Isleta Reservation community which is more than 6 miles southwest of the Range. As noted in **Section 2.3.1.1.4**, wind and weather conditions would be monitored to ensure noise, sound pressures, and vibrations generated by test activities would not affect other facilities or locations on or off Kirtland AFB, to include the Pueblo of Isleta Reservation. Depending on the size of the explosive detonated during the test and whether the explosive is detonated at surface level or underground, noise greater than 130 dB could reach personnel operating at areas near the Range, such as at the Auxiliary Field and Thunder Range. At this level, personnel may experience a startle effect. Tinnitus, or a ringing in the ear, can be caused by loud noise exposure in excess of 163 dB. On-site safety officers and test controllers would identify the distance to be clear of all personnel to avoid exposure to noise levels in excess of 163 dB prior to a testing event (KAFB 1987). In accordance with OSHA regulations, the area where instantaneous noise exposure could exceed 140 dBA would be clear of personnel. Personnel that have the potential to be exposed to noise greater than 140 dBA would be required to wear hearing protection equipment that would reduce sound levels to acceptable limits.

To avoid impacts on animal species, personnel would sweep the area to ensure no vulnerable species are present in the immediate vicinity. However, species are likely to be deterred from the area during test site preparation and when personnel are present.

The threshold for structural damage caused by sound pressure is 170 dB. Structures within 600 feet of a 2,000 pound N.E.W. surface-level detonation would have the potential to sustain damage from a test, assuming testing would occur under relatively normal, calm atmospheric conditions (KAFB 1987). Pressure waves that travel through the ground surface, called ground shock, may also damage existing resources. To avoid impacts on structures and reduce ground motion effects on personnel, all test structures and personnel would be sited outside structural damage and ground shock threshold areas during a test event.

3.2.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing ambient noise environment described in **Section 3.4.1** would remain unchanged.

3.3 AIR QUALITY

Air quality is defined by the concentration of various pollutants in the atmosphere at a given location. Under the Clean Air Act, the six pollutants defining air quality, called "criteria pollutants," are carbon monoxide (CO), sulfur dioxide, nitrogen dioxide, ozone (O_3), suspended particulate matter (measured less than or equal to 10 microns in diameter [PM_{10}] and less than or equal to 2.5 microns in diameter [$PM_{2.5}$]), and lead. Volatile organic compound (VOC) and nitrogen oxide (NO_X) emissions are precursors of O_3 and are used to represent O_3 generation.

Under the Clean Air Act (42 USC § 7401 *et seq*.), the USEPA has established National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) for criteria pollutants. Areas that are and have historically been in compliance with the NAAQS or have not been evaluated for NAAQS compliance are designated as attainment areas. Areas that violate an air quality standard are designated as nonattainment. Areas that have transitioned from nonattainment to attainment are designated as maintenance and are required to adhere to a State Implementation Plan to ensure continued attainment.

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas. A general conformity determination is required when the total direct and indirect emissions of nonattainment and maintenance pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a general conformity determination are called *de minimis* levels and are specified at 40 CFR § 93.153. *De minimis* levels (in tons per year [tpy]) vary by pollutant and also depend on the severity of the nonattainment status for the air quality management area in question. The General Conformity Rule does not apply to federal actions occurring in attainment or unclassified areas.

The New Mexico Environment Department (NMED) Air Quality Bureau oversees programs for permitting the construction and operation of new or modified stationary source air emissions in New Mexico. The NMED Air Quality Bureau has delegated authority over air quality in Bernalillo County to the Albuquerque Environmental Health Department Air Quality Division (AEHD-AQD). AEHD-AQD has also promulgated fugitive dust control permits and open burn program requirements in the New Mexico Administrative Code (NMAC).

Global climate change refers to long-term fluctuations in temperature, precipitation, wind, sea level, and other elements of Earth's climate system. Of particular interest, greenhouse gases (GHGs) are gas emissions that trap heat in the atmosphere. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, tropospheric O_3, and several fluorinated and chlorinated gaseous compounds. Most GHGs occur naturally in the atmosphere but increases in concentrations result from human activities such as burning fossil fuels. Scientific evidence indicates a trend of increasing global temperature over the past century because of an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*, which reinstated the *Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews* issued on 5 August 2016 and the CEQ *National Environmental Policy Act Interim Guidance on Consideration of Greenhouse Gas Emissions and Climate Change* issued on 9 January 2023, recommend that federal agencies consider GHG emissions and the effects of climate change in NEPA reviews. EO 13990 required federal agencies to capture the full costs of GHG emissions as accurately as possible to facilitate sound decision-making, recognize the breadth of climate impacts, and support the international leadership of the United

States on climate issues. The CEQ *National Environmental Policy Act Interim Guidance on Consideration of Greenhouse Gas Emissions and Climate Change*, issued 9 January 2023, recommends determining the social cost of GHG emissions from a proposed action, where feasible, as a means of comparing the GHG impacts of the alternatives. Accordingly, estimated CO_2 equivalent (CO_2e) emissions and social cost of GHGs associated with the Proposed Action is provided in this EA for informative purposes. The "social cost of GHGs" is an estimate of the monetized damages associated with incremental increases in GHG emissions, such as reduced agricultural productivity, human health effects, property damage from increased flood risk, and the value of ecosystem services.

EO 14008, *Tackling the Climate Crisis at Home and Abroad*, implements objectives to reduce GHG emissions and bolster resilience to the impacts of climate change, and requiring federal agencies to develop and implement climate action plans. The *Department of the Air Force Climate Action Plan* recognizes the department's role in contributing to climate change and aims to address the challenges and risks posed by climate change through the implementation of climate priorities (DAF SAF/IE 2022). The USAF also follows the *Department of Defense Climate Adaptation Plan* and considers the *Department of Defense Climate Risk Analysis* for climate change planning. The *Long-term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050* sets target benchmarks to achieve net-zero GHG emissions by no later than 2050 (DOS and EOP 2021).

3.3.1 Affected Environment

Kirtland AFB is in Bernalillo County, New Mexico, which is within the Albuquerque-Mid Rio Grande Intrastate Air Quality Control Region 152 (40 CFR § 81.83). Bernalillo County was redesignated from nonattainment to attainment for the 1971 CO NAAQS in 1996 and was classified as a maintenance area for CO. As a result, a CO Limited Maintenance Plan for Bernalillo County was incorporated in the New Mexico State Implementation Plan. Bernalillo County was subject to a CO Limited Maintenance Plan for two consecutive 10-year periods. The first limited maintenance plan was approved by USEPA on 13 June 1996, and the second was approved on 14 April 2005 (Vol. 70, No. 71 Federal Register, 19702, 14 April 2005). As of 13 June 2016, the end of the 20-year limited maintenance period has been reached and the General Conformity Rule is no longer applicable to emissions of CO in the limited maintenance area. Bernalillo County is designated as attainment or unclassified for all other criteria pollutants (USEPA 2023a). As a result, the General Conformity Rule is not applicable to federal actions occurring in the county.

On 6 March 2024, the USEPA published the final rule for *Reconsideration of the National Ambient Air Quality Standards for Particulate Matter*, which lowered the primary annual $PM_{2.5}$ NAAQS from 12 micrograms per cubic meter ($\mu g/m^3$) to 9 $\mu g/m^3$ (Vol. 89, No. 45 *Federal Register*, 16366, 6 March 2024). Attainment designations are based on an area's "design value," which represents monitored air concentrations of criteria pollutants averaged over 3 years. The 2020–2022 design value for Bernalillo County is 9.6 $\mu g/m^3$. The 2-year designation process includes an initial designation recommendation made by the state and a final designation decision made by USEPA. The state's recommendation and USEPA's decision may be based on data for different years, depending on what data becomes available during the designation process. USEPA's final designation decisions will likely rely on air monitoring data from 2022 to 2024 (USEPA 2024a). The annual mean value for $PM_{2.5}$ in Bernalillo County was 8.08 $\mu g/m^3$ in 2022, the latest year for which data are available (USEPA 2023b). At the time of this analysis, Bernalillo County has not been officially designated as nonattainment for the 2024 annual $PM_{2.5}$ NAAQS and was therefore considered in attainment for the $PM_{2.5}$ NAAQS. If Bernalillo County is designated as nonattainment following a final decision by USEPA, the *de minimis* level thresholds that would trigger a

conformity determination would be 100 tpy for $PM_{2.5}$ and 100 tpy for SO_X, NO_X, VOC, and ammonia (because they are precursors of $PM_{2.5}$) (40 CFR § 93.153).

Kirtland AFB must comply with 20.11.42 NMAC Title V Operating Permit #527-RN1, which covers most permitted stationary emissions sources on the installation. The installation is considered a synthetic minor source of hazardous air pollutants under Title I, Section 112 of the Clean Air Act. The 2023 Air Emissions Inventory for Kirtland AFB is summarized in **Table 3-2**. There are no permitted stationary emissions sources within the Range.

Table 3-2. Calendar Year 2023 Air Emissions Inventory for Kirtland AFB

Actual Emissions	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_X (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	Lead (tpy)
	4.95812	35.80884	2.37998	0.42298	0.88338	0.88363	0.00017

Source: KAFB 2024a
Notes: SO_X = sulfur oxide

Air emissions are produced from the current test activities conducted at the Range including from explosives testing, vehicle and equipment operation, vehicle movements along dirt and gravel roads, test bed preparation activities, drilling and trenching operations, and other earth moving activities. Estimates for air emissions from existing range activities have not been calculated; however, it was estimated in the 1987 CERF EA that existing activities produce insignificant quantities of dust when compared to natural dust phenomena and minor amounts of other gaseous emissions (KAFB 1987).

AEHD-AQD issues Fugitive Dust Control Program permits for ground disturbance and explosives activities at the Range under 20.11.20 NMAC. Kirtland AFB also obtains Open Burn Program permits from AEHD-AQD under 20.11.21 NMAC for explosives testing, as required.

Climate Change and GHGs. Ongoing global climate change in the southwestern United States, including Bernalillo County, has contributed to increased drought severity, increased frequency of devastating wildfires, and more intense heat and arid weather conditions. These regional climate changes could lead to damaged infrastructure, decreased availability of water supplies in the future, and greater risk of agriculture failure (White et al. 2023, USEPA 2016). Higher air temperatures can cause adverse health effects such as heat stroke and dehydration, especially in vulnerable populations, which can affect cardiovascular and nervous systems. Warmer air also can increase the formation of ground-level O_3, which can lead to a variety of health effects, including aggravation of lung diseases and increased risk of death from heart or lung disease (USEPA 2016). Climate change effects linked to Kirtland AFB include increased temperature and drought potential, which could increase dust generation, damage infrastructure, and decrease mission capabilities.

In 2023, New Mexico produced approximately 43.2 million tons of CO_2e and Bernalillo County produced approximately 5.6 million tons of CO_2e (USEPA 2023c). CO_2e emissions from stationary sources on Kirtland AFB do not exceed the USEPA GHG Reporting program's reporting threshold of 25,000 tpy; therefore, Kirtland AFB is not required to report annual CO_2e emissions to USEPA.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

This air quality analysis estimates the effects on air quality and climate change that would result from the Proposed Action. Bernalillo County is in attainment/unclassified for all criteria pollutants;

therefore, the General Conformity Rule is not applicable to the Proposed Action. Per the USAF Air Quality EIAP Guide, insignificance indicators are applied to actions occurring in attainment/unclassified areas to provide an indication of potential impacts on air quality. The insignificance indicator used by USAF is the 250 tpy Prevention of Significant Deterioration (PSD) threshold, as defined by USEPA, and is applied to the emissions of all attainment/unclassified criteria pollutants besides lead. The insignificance indicator for lead is 25 tpy. The insignificance indicators do not denote a significant impact; however, they do provide a threshold to identify actions that have insignificant impacts to air quality. Any action with net emissions below the insignificance indicators for all criteria pollutants is considered so insignificant that the action will not cause or contribute to an exceedance of one or more NAAQS (AFCEC 2020).

Annual test site preparation activities, infrastructure projects, and testing activities under the Proposed Action would result in long-term, intermittent, minor, adverse impacts on air quality. Emissions of criteria pollutants would occur from operation of heavy equipment; heavy duty diesel vehicles hauling material, testing components, and other equipment to and from the Range; workers and testing personnel commuting daily to and from the testing site(s) during site preparation and the test event; and ground disturbance from site preparation, infrastructure projects, and explosives testing. Air emissions produced by such activities would vary depending on the requirements of the specific test event and would occur intermittently over the course of the year.

The USAF Air Conformity Applicability Model was used to estimate the annual emissions from test site preparation activities and infrastructure projects. Many testing activities, such as the use of DE technology, HEL and HPEM systems, and drones, and conducting non-explosive tests do not produce air emissions; however, generator operation during these testing activities would produce air emissions and were included in the model. Emissions from explosives testing were calculated separately from the model. **Table 3-3** provides the estimated annual emissions that would result from the Proposed Action. Annual emissions from AFRL/RV vaporization experiments would be roughly equivalent to five or six firework shells from a typical Fourth of July fireworks show. Estimated emissions from AFRL/RV vaporization experiments, along with other explosives testing, are included in **Table 3-3**.

Table 3-3. Estimated Annual Air Emissions from the Proposed Action

	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_x (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)	Lead (tpy)	CO_2e (tpy)
Test Site Preparation	1.058	0.265	1.447	0.080	2.625	0.107	<0.001	359.2
Infrastructure Projects	5.861	1.070	8.301	0.021	13.607	0.218	<0.001	2,005.4
Explosives Testing	1.959	0.550	24.584	0.628	31.631	31.631	No Data	316.7
Generator Use During Testing	6.648	2.149	4.378	0.614	0.661	0.661	<0.001	821.2
Total	**16.583**	**4.299**	**40.156**	**1.423**	**51.148**	**32.724**	**<0.001**	**3,861.7**
PSD Insignificance Indicator	250	250	250	250	250	250	25	NA
Exceeds PSD Insignificance Indicator?	No	No	No	No	No	No	No	NA

Notes: NA = not applicable

The total net annual emissions from the Proposed Action are not expected to exceed the insignificance indicator of 250 tpy (25 tpy or lead). Additionally, as noted in the 1987 CERF EA, most of the gaseous products produced react with the atmosphere resulting in greatly reduced concentrations within the first 10 to 30 seconds following detonation. The products of these reactions are water, CO_2, and nitrogen compounds. The remaining gaseous products diffuse into the atmosphere (KAFB 1987). The 2015 Giant Reusable Air Blast Simulator (GRABS) Site EA, which was prepared by DTRA for explosive test events using up to 900 N.E.W. at the GRABS Site, notes that during test events, minor quantities of air emissions are and would be generated. However, these emissions occur in a remote, unpopulated area and rapidly disperse into the ambient air (KAFB 2015). Therefore, adverse impacts on air quality would not be significant. Detailed emissions calculations are included in **Appendix D**. If Bernalillo County were to be designated by USEPA as nonattainment for the 2024 annual $PM_{2.5}$ NAAQS in the future, emissions from the Proposed Action would not exceed the applicable *de minimis* level thresholds of 100 tpy for $PM_{2.5}$, SO_X, NO_X, VOC, and ammonia[3].

Particulate matter, such as fugitive dust, would be generated from ground disturbing activities, combustion of fuels in equipment, vehicles traveling on unpaved roads, and testing activities. Fugitive dust emissions would vary from day to day based on the work phase, level of activity, and prevailing weather conditions. DTRA cloud simulation tests would introduce additional particulate matter to the atmosphere beyond what was included in **Table 3-3**. During test site preparation, infrastructure projects, and explosive and cloud simulation test events, particulate matter emissions would be temporary and would disperse rapidly through the atmosphere. Emissions of particulate matter would generally be confined within an area of disturbance and would dissipate with increasing distance from the disturbance area. Much of the particulate matter kicked up by track or tire movements would deposit quickly on the ground surface, and particulate matter that becomes airborne during explosives testing would fall back down to the ground in the immediate vicinity of the test area. However, during periods of high surface winds, particulates could transport further from the test areas. To ensure land outside the installation is not affected, activities could be restricted when winds are oriented to the south.

To reduce particulate matter emissions, dust suppression techniques would be used during earth moving activities. These techniques could include application of water, soil stabilizers, or vegetation; use of wind break enclosures; use of covers on soil stockpiles and dump truck loads; use of silt fences; and suspension of earth-movement activities during high-wind conditions. In addition, work vehicles would be well-maintained and use diesel particulate filters to reduce emissions of criteria pollutants. These best management practices (BMPs) and environmental control measures could reduce particulate matter emissions from the Range by approximately 50 percent depending on the number of BMPs and environmental control measures required and the potential for particulate air emissions (USEPA 1985).

Users of the Range would obtain the appropriate permits from AEHD-AQD prior to site preparation or conducting testing activities. These could include Fugitive Dust Permits for ground disturbing activities greater than 0.75 acre (20.11.20 NMAC), construction permits for new generators (20.11.41 NMAC), and Open Burn/Open Detonation permits (20.11.21 NMAC). All ground disturbance activities would be required to comply with the general provisions from 20.11.20.12 NMAC, which require that reasonably available control measures be implemented to prevent the release of fugitive dust.

[3] Ammonia is not considered a criteria pollutant but is a precursor of the criteria pollutant, $PM_{2.5}$. Emissions of ammonia are not shown in **Table 3-3**. Annual emissions of ammonia from the Proposed Action would be 0.007 tpy. Detailed emissions calculations are shown in **Appendix D**.

Climate Change and GHGs. Consistent with EO 14008 and the 2016 Final Guidance, this EA examines GHGs as a category of air emissions. The USEPA's PSD permitting change threshold of 75,000 tpy (68,039 metric tpy) of CO_2e was used as a significance indicator for GHG impacts. Any action with net GHG emissions below the indicator is considered too insignificant on a global scale to warrant any further analysis. Per CEQ guidance, the climate change analysis includes social cost of GHG estimates and qualitatively assesses the Proposed Action's impacts on potential future climate scenarios and whether elements of the Proposed Action would be affected by climate change. This analysis does not attempt to measure the actual incremental impacts of GHG emissions from the Proposed Action, as there is lack of consensus on how to measure such impacts. Global and regional climate models have substantial variation in output and do not have the ability to measure the actual incremental impacts of a project on the environment.

As shown in **Table 3-3**, the Proposed Action would produce approximately 3,861.7 tons of CO_2e annually, which is the approximate GHG footprint of 834 passenger vehicles driven for 1 year or 457 homes' energy use for 1 year (USEPA 2024). Annual CO_2e emissions from the Proposed Action would represent less than 0.07 percent of the annual CO_2e emissions in Bernalillo County and less than 0.009 percent of the annual CO_2 emissions in New Mexico. As such, GHG emissions from the Proposed Action would not meaningfully contribute to the potential effects of global climate change and would not considerably increase the total CO_2e emissions produced by Bernalillo County or the state. **Table 3-4** summarizes the annual GHG emissions and associated social cost from the Proposed Action during a 10-year period (2024 through 2033).

Table 3-4. Theoretical Social Cost of GHGs from the Proposed Action [1]

Year	CO_2e (tpy)	CO_2e (metric tpy) [2]	Social Cost (in 2020 dollars) [3]
2024	3,861.7	3,503.3	$192,739.32
2025	3,861.7	3,503.3	$196,238.22
2026	3,861.7	3,503.3	$199,754.97
2027	3,861.7	3,503.3	$206,752.38
2028	3,861.7	3,503.3	$210,269.32
2029	3,861.7	3,503.3	$213,768.02
2030	3,861.7	3,503.3	$217,284.96
2031	3,861.7	3,503.3	$220,783.67
2032	3,861.7	3,503.3	$224,300.61
2033	3,861.7	3,503.3	$227,817.36
Total Social Cost of GHGs Over a 10-Year Period			$2,109,708.82

Notes:
[1] Social cost calculated for a 10-year period in which the Proposed Action would occur. Social cost for subsequent years would be higher than what is shown for the 10-year period, as social cost of GHGs increases over time.
[2] One US ton is equal to 0.907184 metric tons.
[3] Social costs were calculated using a 3 percent average discount rate in 2020 dollars.

GHG emissions would occur only during test site preparation, infrastructure projects, and testing activities, which would occur intermittently throughout the year. Annual GHG emissions would not exceed the 75,000 tpy PSD threshold for CO_2e. Therefore, net GHG emissions are considered insignificant on a global scale and would not result in significant impacts on global climate change. The estimated social cost of GHGs from the first year of testing activities (2024) would be approximately $192,739. To provide real-world context of the GHG and climate change impacts on a national, state, and regional scale, **Table 3-5** provide a relative comparison of the social cost of GHGs from 1 year of testing activities under the Proposed Action and United States, state, and

county emissions for the same time period. Detailed social cost of GHGs calculations are included in **Appendix D**.

Table 3-5. Theoretical Social Cost of GHGs from the Proposed Action and Relative Comparison

Reference Scale	CO_2e (tons) [1]	Social Cost (in 2020 dollars) [2]	Comparison to Reference Scale
United States	5,036,507,694 [3]	$253,470,418,777.01	100%
New Mexico	43,206,442 [3]	$2,173,826,877.78	0.86%
Bernalillo County	5,646,632 [3]	$284,368,064.81	0.11%
Proposed Action	3,861.7 [4]	$192,739.32 [5]	0.000076%

Sources: USEPA 2023c, IWG-SCGHG 2021
Notes:
[1] To calculate the total CO_2e, all GHGs are multiplied by their global warming potential and the results are added together. The global warming potentials used to calculate CO_2e are as follows: $CO_2 = 1$; $CH_4 = 25$; $N_2O = 298$.
[2] Social costs were calculated using a 3 percent average discount rate in 2020 dollars.
[3] CO_2e emissions for Bernalillo County, New Mexico, and United States in 2024 were assumed to be consistent with 2020 reported emissions.
[4] Represents a sum of CO_2e emissions for first year of testing activities (i.e., 2024).
[5] The 2024 social cost shown represents the social cost from the first year of testing activities under the Proposed Action. Social cost for subsequent years would be higher than what is shown, as social cost of GHGs increases over time.

Ongoing changes to climate patterns in the southwestern United States are described in **Section 3.3.1**. These climate changes are unlikely to affect USAF's ability to implement the Proposed Action. At the time of this analysis, no future climate scenario or potential climate stressor would have appreciable effects on any element of the Proposed Action. In accordance with the *Department of the Air Force Climate Action Plan*, design of new and upgraded infrastructure would incorporate features to improve resilience against the potential future effects of climate change such as increased temperatures and drought severity.

3.3.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing air quality conditions described in **Section 3.3.1** would remain unchanged.

3.4 GEOLOGICAL RESOURCES

Geological resources are comprised of Earth's surface and subsurface materials. Within a given physiographic province, these resources are typically described in terms of geology, topography and physiography, soils and soil quality, farmland productivity, and where applicable, geologic hazards.

Geology is a synthesis of many sciences that study the Earth's composition and provides information on structural observations of surface and subsurface features. Field analyses gather information on the configuration and characterization of such features and can be used to understand the processes that enacted themselves on the landscape during a generalized time. Different field techniques are used to gather information necessary to the area of study, such as boreholes or geophysical methods to understand subsurface bedrock and groundwater interactions, or soil methods that can determine the structural integrity of a landscape.

Soils are the unconsolidated materials overlying bedrock or other geologic parent material, and they were formed by chemical and physical weathering forces that modified rock and sediments by breaking them down into smaller and smaller debris. Over time, this debris is subject to different soil-forming processes, and soils then develop horizons, which are zones of material characterized by differing compositions of organic, clay, silt, and sand particles. All soils are usually described in terms of their complex type, slope, and physical characteristics. Their differences, however, are described in terms of their elasticity, strength, shrink-swell potential, drainage, and erosion potentials, all of which affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with different types of land uses, such as construction activities.

When soils become so unconsolidated that they lose their structural integrity, whether it be to rainfall events, lack of vegetation, or temporal patterns of weathering, mass wasting events can occur. These events are classified as geological hazards and occur when mass amounts of soil and debris move downslope in one bulk mass due to gravity. All types of hazards, which can additionally include earthquakes and sinkholes, among others, can endanger human and animal lives and threaten property.

3.4.1 Affected Environment

Regional Geology. The Range is within the Basin and Range physiographic region of New Mexico and lies along the eastern margin of the Albuquerque basin, one of the largest and deepest geological structures within the area of the Rio Grande Rift. The basin contains a series of major fault trends and displacements, some of which can be found within the installation. There is one distinct geologic unit underlying the Range, which is constituted by piedmont alluvial deposits, dating back to the Holocene to lower Pleistocene geologic epochs. However, there are other geologic units underlying other areas throughout the installation footprint, and the entire installation lies along a normal geologic fault that runs northeast to southwest. This fault is a segment of the Rio Grande Rift where bedrock is deeply buried under Santa Fe Group alluvium, which filled in the Albuquerque basin after mountain blocks uplifted and slowly weathered over time (KAFB 2018, KAFB 2022a). This type of fault is the most common type of fault found around the globe and is produced when rock mass above an inclined fracture plane moves downward and slides along the rock on the other side of the fracture (USGS 2024, CAL Academy 2024).

Topography. The installation is flat topographically, and elevation is approximately 5,400 feet above mean sea level (Google Earth 2023). Apart from the regional hilly areas surrounding the installation, the range of topography is very flat.

Soils. Two soil types are present within the Range. The Wink fine sandy loam and the Tome very fine sandy loam are both derived from igneous and sedimentary rock as alluvial material. Because of their composition, neither of these soils are classified as prime farmland. Both soils also have a depth greater than 80 inches below ground surface (bgs) to restrictive subsoils (USDA 2023). The lithology of the Range is constituted by alluvial fans and terraces, indicating that the historic material of these areas was transported by a river, either in the riverbed itself or on its floodplain and riverbanks, and was shaped into triangle-shaped deposits of gravel, sand, and even some silt. Additionally, terraces were a result of downcutting, which created step-like landforms, and although these terraces are common within the Tome very fine sandy loam soil type, natural terraces may or may not be found within the installation.

Geologic Hazards. Rockfalls, sinkholes, and minor earthquakes are common in some areas of New Mexico, and since Kirtland AFB lies along a normal fault, experiences of earthquakes may

have the potential to be more common. More commonly known as the Tijeras fault zone, the Tijeras-Cañoncito fault system consists of several northeast-oriented, sub-vertical faults that form the eastern edge of the Albuquerque Basin. The Tijeras fault zone is part of this regionally extensive group of faults. The southern end of the Tijeras fault zone converges with the southern Sandia and Hubbell Spring fault zones beneath Kirtland AFB near Tijeras Arroyo. Frequent, low magnitude and intensity earthquakes are common occurrences for the Albuquerque region, including Kirtland AFB (USGS 2002).

Accordingly, the United States Geological Survey rates the seismic hazard of this area as "moderate" based on a measurement of expected building damage in an earthquake scenario. Similarly, the International Conference of Building Officials Uniform Building Code classifies the region as having a moderate potential for damage to structures from seismic activity (USGS 2008).

3.4.2 Environmental Consequences

Protection of unique geological features, minimization of soil erosion, and siting of facilities in relation to potential geologic hazards are considered when evaluating potential effects of a proposed action on geological resources. Generally, adverse effects can be avoided or minimized if proper techniques, erosion-control measures, and structural engineering design are incorporated into project development.

Effects on geology and soils would be major and adverse if they would alter the lithology (i.e., the character of a rock formation), stratigraphy (i.e., the layering of sedimentary rocks), and geological structures that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability; or change the soil composition, structure, or function within the environment.

3.4.2.1 Proposed Action

Regional Geology. Short-term, negligible, adverse impacts on regional geology would be expected. Certain activities, largely those that would require underground explosive testing, would not be a large enough size to impact regional geology, even with those explosives potentially being able to move amounts of earthen material. No activities would alter lithology, stratigraphy, or the geological structures underlying the Range.

Topography. Short-term, minor, adverse impacts on topography would be expected from the testing that requires underground detonation of explosives, including the potential temporary structures that could be constructed for test activities, mainly those that require berms, pits, or trenches. Additional impacts would be expected from the implementation of a variety of infrastructure projects, including earthmoving and disturbing activities, such as those to replace or install up to 25,000 feet of underground cables or installing and removing structures, concrete pads, and dirt berms, which could result in long-term, minor, adverse impacts on topography within the Range. Some of the potential projects that could result in adverse impacts to the topography of the area do not meet traditional BMP recommendations. However, erosion control measures and additional BMPs would be implemented for non-explosive activities.

Soils. Short-term, minor, adverse impacts on soils would result from the underground detonation of explosive devices. Some of the tests proposed for the Range, including Instrumentation Development Tests, rely on certain soil factors to change for the study to be useful. For example, these tests use explosives to evaluate new instrumentation techniques for measuring blast and shock parameters, including soil stress. In other tests that use shock and blast waves to check

the ability of equipment or sensors to withstand explosive blasts or to obtain basic blast and shock impact measurements, surface or buried charges are used, which would result in soil movement from the explosion(s) and surface stability could be impacted. The same could also be said for the scaled and non-scaled building tests and the development and testing of new explosives. Many of the tests proposed for the Range would result in short-term, minor, adverse impacts on soils.

Due to the nature of the tests and developments that would be taking place at the Range, potential BMPs and additional erosion control measures are limited since they are often tailored to more traditional construction activities and not explosive devices.

Geologic Hazards. No impact to geologic hazards would be expected as a result of the Proposed Action, and no geologic hazards could be catalyzed as a result of the Proposed Action.

3.4.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing geological resources described in **Section 3.4.1** would remain unchanged.

3.5 WATER RESOURCES

Water resources are natural and man-made sources of water that are available for use by, and for the benefit of, humans and the environment. Water resources relevant to the Range on Kirtland AFB include groundwater, surface water, floodplains, and wetlands (USFWS 2024, KAFB 1995).

Groundwater. Groundwater is water that exists in the saturated zone beneath the Earth's surface that collects and flows through aquifers and is used for drinking, irrigation, and industrial purposes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, and recharge rates.

Surface Water and Wetlands. Surface water includes natural, modified, and man-made water confinement and conveyance features above groundwater that may or may not have a defined channel and discernable water flow. Stormwater is an important component of surface water systems because of its potential to introduce sediments and other contaminants that could degrade surface waters, such as lakes, rivers, or streams. The Energy Independence and Security Act Section 438 (42 USC § 17094) establishes into law stormwater design requirements for federal development projects that disturb a footprint of greater than 5,000 square feet. 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.

The Clean Water Act (CWA) establishes federal limits for regulating point and non-point discharges of pollutants into Waters of the United States (WOTUS) and quality standards for surface waters. WOTUS has a broad meaning under the CWA and incorporates deep water aquatic habitats and special aquatic habitats (including wetlands and playas). EO 11990, *Protection of Wetlands*, requires federal agencies to determine whether a proposed action would occur within a wetland and to avoid new construction in wetlands wherever there is a practicable alternative. It is USAF policy to avoid construction within areas containing wetlands where there is a practicable alternative per AFMAN 32-7003, *Environmental Conservation*, and EO 11990.

The United Stated Army Corps of Engineers (USACE) (33 CFR § 328.3) and the USEPA (40 CFR § 120.2) define wetlands as "areas that are inundated or saturated by surface or groundwater 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 and waters that meet the definition of WOTUS (33 CFR § 328.3; 40 CFR §120.2) are considered jurisdictional and subject to the requirements of the CWA. AFMAN 32-7003, para. 3.18.1 requires site level jurisdictional delineations of WOTUS for proposed development activities that may affect wetlands, streams, and water bodies, utilizing the criteria approved by the USEPA USACE. The USFWS maintains the National Wetland Inventory for public use, which provides maps of current status, extent, characteristics, and functions of wetland, riparian, and deepwater habitats.

Floodplains. Floodplains are any land area that are susceptible to being inundated by floodwaters from any source (FEMA 2011). Flood potential is evaluated by the Federal Emergency Management Agency (FEMA), which defines the 100-year floodplain as an area within which there is a one percent chance of inundation by a flood event in a given year, or a flood event in the area once every 100 years. EO 11988, *Floodplain Management*, requires federal agencies to determine whether a proposed action would occur within a floodplain and to avoid floodplains to the extent possible wherever there is a practicable alternative. EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, requires agencies to prepare for and protect federally funded buildings and projects from flood risks. More specifically, it requires agencies to determine specific federal building or project dimensions (i.e., how high, wide, and expansive a building or project should be) in order to manage and mitigate any current or potential flood risks. Additionally, Directive-type Memorandum 22-003, *Flood Hazard Area Management for Department of Defense Installations*, directs the DoD to avoid development within a flood hazard area to the maximum extent practicable. It is USAF policy to avoid construction within the 100-year floodplain, where there is a practicable alternative, per AFMAN 32-7003 and EO 11988.

3.5.1 Affected Environment

Groundwater. Kirtland AFB is within the limits of the Rio Grande Underground Water Basin. The average depth to groundwater beneath Kirtland AFB is 450 to 550 feet bgs. The Rio Grande Basin's source of groundwater is the Santa Fe Aquifer, which has an estimated 2.3 billion acre-feet of recoverable water. The regional aquifer, Albuquerque Basin Regional Aquifer, is used for the installation's water supply. Kirtland AFB has a water right that allows it to divert approximately 6,400 acre-feet of water, or approximately 2 billion gallons, per year from the aquifer. In 2020, Kirtland AFB pumped 2,421 acre-feet (789 million gallons) of water from the regional aquifer (KAFB 2021a). Depth to groundwater in the western portion of the installation ranges from 350 to 500 feet bgs.

Surface Water and Wetlands. Kirtland AFB is within the Rio Grande watershed. The Rio Grande is the major surface hydrologic feature in central New Mexico, flowing north to south through Albuquerque, approximately 5 miles west of the installation. Surface water on the installation typically occurs in the form of stormwater sheet flow that drains into small gullies during heavy rainfall events (KAFB 2018). Surface water generally flows across the installation in a westerly direction toward the Rio Grande. The two main surface water drainage channels on Kirtland AFB are the Tijeras Arroyo and the smaller Arroyo del Coyote, which joins the Tijeras Arroyo approximately 1 mile west of the Tijeras Arroyo Golf Course. Both are tributaries to the Rio Grande. The Tijeras Arroyo, which remains dry most of the year, is the primary surface channel that drains surface water from Kirtland AFB to the Rio Grande. Nearly 95 percent of the precipitation that flows through the Tijeras Arroyo evaporates before it reaches the Rio Grande.

The remaining 5 percent is equally divided between groundwater recharge and runoff (KAFB 2018, USAF 1991).

During heavy precipitation, stormwater on the installation is collected via a series of storm drains, flood canals, and small arroyos that eventually drain to Tijeras Arroyo or Arroyo del Coyote. In the developed area of the installation, stormwater drains into small culverts towards Gibson Boulevard along the installation boundary. Stormwater in the portion of the installation where the Range is located discharges through surface runoff to three large culverts that drain toward the Tijeras Arroyo on the south (KAFB 2018). The northern boundary of the Range is approximately 2.5 miles southwest of the Arroyo del Coyote and 4.1 miles south of the Tijeras Arroyo.

There are 10 wetlands supplied by at least 15 naturally occurring springs on Kirtland AFB; however, no Jurisdictional Determinations have been made concerning these water features. There are no natural lakes or rivers on Kirtland AFB; however, six man-made ponds have been created on the Tijeras Arroyo Golf Course. No wetlands are located within or adjacent to the Range (KAFB 2018).

Floodplains. The 100-year floodplain on the installation is associated with the Arroyo del Coyote and Tijeras Arroyo. Arroyo del Coyote and Tijeras Arroyo floods occur infrequently and are characterized by high peak flows, small volumes, and short durations (KAFB 2018). The Range is not located within or adjacent to a floodplain.

3.5.2 Environmental Consequences

3.5.2.1 Proposed Action

Groundwater. No impacts on groundwater, to include Hubbell Spring which is approximately 1 mile south of the Range and used as a water source for commercial cattle operations on the Pueblo of Isleta Reservation, would be anticipated. As noted in the 1987 CERF EA and the 2015 GRABS Site EA, due to the minor sizes of the proposed detonations and the fact that the detonations would take place significantly above the static water table, no contamination of potable groundwater would occur. In some instances, materials such as detonators and explosives are not entirely expelled and combusted during blasting. However, as noted in the 1987 CERF EA and the 2015 GRABS Site EA, extensive literature searches and contacts with personnel from the Bureau of Mines, Waterways Experiment State, USGS, and other DoD organizations involved in HE detonations indicate that significant contamination of soil or groundwater by detonation byproducts has never been observed (KAFB 1987, KAFB 2015).

Under- and above-ground explosives testing would not occur in an area with surface water, wetlands, or within a floodplain. Depth to groundwater underneath the Range is approximately 350 to 500 feet bgs, which no explosive test would reach (maximum depth of explosive impact would be 30 feet). Potential construction activities related with temporary structures that could be constructed for test activities could disturb soils and lead to increased sediment transportation during rainfall events that could eventually enter groundwater through recharge points. This is also true for materials used for explosives testing. Implementation of BMPs and planning during construction would minimize the potential for impacts by controlling the movement of surface water runoff and ensuring no direct access to groundwater recharge points. BMPs could include using temporary barriers such as fiber logs or silt fences, which would be placed based on site-specific evaluations on an as-needed basis.

The use of vehicles and equipment could increase the potential for petroleum or hazardous material spills, typically due to leaks or accidents at the work site. Any such leaks or spills could

be transported to groundwater either by surface water runoff or by soil leaching. Proper housekeeping, maintenance of equipment, and containment of fuels and other potentially hazardous materials would be implemented to minimize the potential for a release of fluids. With the implementation of BMPs and minimal groundwater recharge in the area, implementation of the Proposed Action would not be expected to result in an impact on groundwater.

Surface Water and Wetlands. Short-term, negligible, adverse impacts on surface waters would be anticipated. Project activities could result in the transportation of additional sediment and other materials into stormwater, which has the potential to carry sediment and other substances into the surface streams and springs across the installation. Surface water bodies on Kirtland AFB have connections to waters outside the installation; however, stormwater protection BMPs and spill prevention and management plans would serve to reduce any lasting detrimental effects on the quality of surface waters. Additionally, the Proposed Action would not be expected to have any impacts on water bodies beyond the installation's boundaries. No impacts on wetlands would result from the Proposed Action as there are no wetlands within or adjacent to the Range.

Floodplains. No impacts on floodplains would result from the Proposed Action as there are no floodplains within or adjacent to the Range. Additionally, no impacts on FEMA floodplains would be expected as no FEMA floodplains have been officially designated on Kirtland AFB (FEMA 2024).

3.5.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing water resources conditions described in **Section 3.5.1** would remain unchanged.

3.6 BIOLOGICAL RESOURCES

Biological resources include native or naturalized plants and animals and the habitats in which they occur, and native or introduced species found in landscaped or disturbed areas. Protected species are defined as those listed as threatened, endangered, or proposed or candidate for listing by the USFWS or New Mexico Department of Game and Fish (NMDGF). Federal species of concern are not protected by the ESA; however, these species could become listed, and therefore are given consideration when addressing biological resource impacts of an action. Avian species are subject to the MBTA.

Sensitive habitats include those areas designated by the USFWS as critical habitat protected by the ESA and sensitive ecological areas as designated by state or federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (e.g., migration routes, breeding areas, crucial summer/winter habitats).

3.6.1 Affected Environment

Kirtland AFB lies at the intersection of four major North American biotic provinces, including the Great Plains, Great Basin, Rocky Mountains, and Chihuahuan Desert. Vegetation and wildlife found within the installation are influenced by each of these provinces, with the Great Basin being the most dominant influence. Elevations range from approximately 5,000 feet in the west to almost 8,000 feet in the Manzanita Mountains, providing a variety of ecosystems. Elevation within the Range is approximately 5,300 feet above mean sea level. The climate at Kirtland AFB is classified

within the Dry Mid Latitude Steppe Köppen climate group (KAFB 2023a). Generally, this climate is characterized by average annual temperatures under 64 degrees Fahrenheit, where evaporation typically exceeds precipitation potential. Locally it is characterized by low precipitation, wide temperature extremes, frequent drying winds, and short, but heavy, rains.

Recent biological surveys were conducted in March 2021 and March 2023. Although the March 2023 surveys are more recent, the March 2021 survey is included in this EA because it was conducted during the COVID-19 pandemic, when human activity at the installation was lower than usual. Due to this low activity level, it is anticipated that greater than average numbers and types of wildlife would have been present on the Range. Therefore, both surveys are included in this analysis.

3.6.1.1 Vegetation

The Range, being utilized for explosives testing and training for many years, is heavily disturbed and composed primarily of a network of two-track roads as well as several training and test structures located on bare ground with little to no vegetation. Vegetation in the remainder of the Range is fairly homogenous and consists of disturbed short grassland intermixed with a sparse shrub layer, comprised predominantly of Russian thistle (*Salsola tragus*). Common grass species include fluff-grass (*Dasyochloa pulchella*), blue grama (*Bouteloua gracilis*), red three-awn (*Aristida purpurea*), ring muhly (*Muhlenbergia torreyi*), bush muhly (*Muhlenbergia porteri*), burrograss (*Sclerogpogon brevifolia*), and dropseed (*Sporobolus spp.*). Shrubs observed during the March 2021 survey included sand sagebrush (*Artemisia filifolia*), broom snakeweed (*Gutierrezia sarothrae*), plains prickly pear (*Opuntia polyacantha*), and Great Plains yucca (*Yucca glauca*) (KAFB 2021b). These vegetation communities are common in the region and occur throughout much of the eastern half of Kirtland AFB. A full list of all plants observed during the surveys is included in **Appendix E**.

3.6.1.2 Wildlife Species and Habitat

Wildlife communities at Kirtland AFB are typical of those in woodland and grassland habitats in the central New Mexico region. During the March 2021 survey, three mammal and nine bird species were observed (KAFB 2021b). Kangaroo rat (*Dipodomys spp.*) burrows were observed in several areas. No active bird nests or burrows were found; however, the survey occurred prior to the onset of the general bird nesting season. One inactive nest, likely belonging to a common raven (*Corvus corax*), was observed. **Table 3-6** below lists the wildlife species observed within the limits of the Range. Avian surveys were also conducted from 1 January 2022 to 22 August 2023, 143 species were observed. A full list of these species is included in **Appendix F**.

Table 3-6. Wildlife Species Observed at the Range in March 2021

Common Name	Scientific Name
Birds	
American kestrel	*Falco sparverius*
Common raven	*Corvus corax*
Great-horned owl	*Bubo virginianus*
Horned lark	*Eremophila alpestris*
Northern harrier	*Circus cyaneus*
Sage thrasher	*Oreoscoptes montanus*
Say's phoebe	*Sayornis saya*
Sayornis saya	*Sayornis saya*
Western burrowing owl	*Athene cunicularia hypugaea*
Western meadowlark	*Sturnella neglecta*

Common Name	Scientific Name
Mammals	
Black-tailed jackrabbit	*Lepus californianus*
Desert cottontail	*Sylvilagus audubonii*
Kangaroo rat	*Dipodomys spp.*

Source: KAFB 2021b

3.6.1.3 Special Status Species

Nine special status species are known to occur at Kirtland AFB (see **Table 3-7**). The following section describes the habitat requirements of these species and the potential for these species to occur within the Range.

Table 3-7. Special Status Species with the Potential to Occur within the Range

Common Name	Scientific Name	Special Status	Potential to Occur in Project Area (Y/N)
Birds			
Golden eagle	*Aquila chrysaetos*	BGEPA (USFWS)	N
Gray vireo	*Vireo vicinior*	T (NMDGF)	N
Loggerhead shrike	*Lanius ludovicianus*	SGCN (NMDGF)	Y
Mountain plover	*Charadrius montanus*	SGCN (NMDGF)	Y
Peregrine falcon	*Falco peregrinus*	T (NMDGF)	N
Western burrowing owl	*Athene cunicularia hypugaea*	SC (USFWS)	Y
Mammals			
Gunnison's prairie dog	*Cynomys gunisonii*	SGCN (NMDGF)	Y
Plants			
Santa Fe milkvetch	*Astagalus feensis*	S (NMDGF)	Y
Reptiles			
Desert massasauga	*Sistrurus catenatus edwardsii*	SGCN (NMDGF)	Y

Notes: T = Threatened, C = Candidate, SC = Species of Concern, SGCN = Species of Greatest Conservation Need
S = Sensitive, BGPA = Bald and Golden Eagle Protection Act

The two state-listed species with the potential to occur at Kirtland AFB, the gray vireo (*Vireo vicinior*) and peregrine falcon (*Falco peregrinus*), are unlikely to occur within the Range, except as possible flyovers. The gray vireo is known to inhabit juniper woodland communities and the peregrine falcon is known to inhabit cliffs in canyons and occasionally hangars on Kirtland AFB near the Albuquerque International Sunport (KAFB 2021b). These habitats do not occur within the Range. However, gray vireo territories were observed on other areas of Kirtland AFB during the March 2023 surveys. Estimates have been consistent or increasing since 2016, with an average of 70 territories found each year 2016–2022, and 140 found in March 2023 (KAFB 2023b).

The golden eagle is protected under the Bald and Golden Eagle Protection Act and nests along cliffs on the eastern boundary of Kirtland AFB (KAFB 2021b). This habitat is not present within the Range, and the presence of golden eagles is unlikely to occur, except as a possible flyover.

Suitable habitat was observed during the March 2021 survey for six special status species, including the loggerhead shrike (*Lanius ludovicianus*), western burrowing owl (*Athene cunicularia hypugaea*), Gunnison's prairie dog (*Cynomys gunisonii*), desert massasauga (*Sistrurus catenatus edwardsii*), mountain plover (*Charadrius montanus*), and Santa Fe milkvetch (*Astagalus feensis*).

The loggerhead shrike, a New Mexico Species of Greatest Conservation Need (SGCN), has been observed on the installation in grassland, piñon-juniper, and riparian habitats. Loggerhead shrike inventory and monitoring have been conducted at Kirtland AFB since 2007 (KAFB 2021b). Marginal habitat for this species occurs within the Range. Potential nesting habitat for the loggerhead shrike within the Range is limited to a few Siberian elms. During the March 2023 survey, 22 loggerhead shrike breeding territories were observed on Kirtland AFB (KAFB 2023b).

The western burrowing owl, a USFWS Species of Concern, occurs on Kirtland AFB from March to October before migrating south, although some may remain in the area during mild winters (KAFB 2021b). Western burrowing owls on Kirtland AFB are found within developed areas where grasses are less dense and afford a greater line of sight for protection from predators and prey detection. This species is very closely associated with prairie dog colonies on Kirtland AFB, utilizing abandoned prairie dog burrows for nesting. Western burrowing owl inventories and monitoring of the population at Kirtland AFB have been conducted every year since 1994 (KAFB 2021b). One individual western burrowing owl was observed in the southeast quadrant of the Range in March 2021. This individual did not appear to be part of an existing pair and may have been scouting the area for burrows. The March 2023 survey found 23 breeding pairs on the installation, compared to 13 breeding pairs in 2022 (KAFB 2023b). The Range was surveyed again in March 2024 for the presence of burrowing owls, and no individuals were observed (KAFB 2024b). While the Range contains suitable habitat for western burrowing owls, similar habitat occurs throughout much of the eastern half of Kirtland AFB.

Gunnison's prairie dog, a New Mexico SGCN, occur in colonies or towns primarily within the grasslands in the northern half of Kirtland AFB and in the cantonment area (KAFB 2021b). Gunnison's prairie dog habitat was mapped at Kirtland AFB in 2016, based on observations of Gunnison's prairie dogs (KAFB 2021b). One of the habitats mapped includes the northern boundary of the Range; however, this area was investigated in March 2021, and no signs of Gunnison's prairie dog were observed. The Range was surveyed again in March 2024 for the presence of prairie dogs, and no individuals were observed (KAFB 2024b). While the Range does contain suitable habitat for this species, similar habitat occurs throughout much of the eastern half of Kirtland AFB.

The desert massasauga, a New Mexico SGCN, is most commonly associated with low elevation grassland habitats at Kirtland AFB (KAFB 2021b). Kirtland AFB conducted massasauga surveys from 2009–2016 and additional investigations are ongoing. While no individuals were observed in March 2021, it is likely that desert massasaugas weren't active and hadn't left hibernacula yet. Marginal habitat for this species was observed; however, grassland habitat within the Range is heavily disturbed and higher quality habitat occurs in other areas of Kirtland AFB. Twenty-five desert massasaugas were observed on Kirtland AFB during the March 2023 survey. The highest density of desert massasaugas was at drift fences on the west end of Magazine Road (KAFB 2023b).

The mountain plover, a New Mexico SGCN, occurs in grasslands and is typically found within prairie dog towns. Plovers usually arrive on their New Mexico breeding grounds in mid-March and depart by August (KAFB 2021b). While no individuals were observed in March 2021, it is likely that mountain plovers had not migrated into the region yet. Suitable nesting habitat for this species is limited on the installation; therefore, it is unlikely that the mountain plover utilizes Kirtland AFB during the nesting season. However, the southern grasslands of Kirtland AFB, including the Range, could be used as brood-rearing habitat or during migration (KAFB 2021b).

Santa Fe milkvetch occurs on benches and gravelly hillsides in piñon-juniper woodland or plains-mesa grassland and is known from grassland communities along the lower slopes of hills on the

eastern boundary of Thunder Range (KAFB 2021b). Due to the proximity to Thunder Range, Santa Fe milkvetch could potentially occur within the Range. Santa Fe milkvetch flowers April through June. While no individuals were observed in March 2021, it is possible that this species had not yet emerged.

3.6.1.4 Critical Habitat

Critical habitats are those areas of land, air, or water that are essential for maintaining or restoring threatened or endangered plant or animal populations. Neither the NMDGF nor USFWS has designated or identified any critical habitat on Kirtland AFB or on the Range. Although not considered critical habitat, surveys and literature indicate that important habitats on the installation include wetlands, which are rare in this region; prairie dog towns, which provide nesting habitat for the western burrowing owl; and areas between 5,900 and 6,600 feet containing open juniper woodlands, which are used as nesting habitat by the gray vireo (KAFB 2023a).

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

Vegetation. Short- and long-term, negligible to minor, adverse impacts on grassland vegetation would occur. Direct effects on vegetation from removal and crushing and indirect effects from soil compaction and the potential for establishment of invasive species would occur. Crushing and soil compaction would occur when vehicles and equipment access, park, and maneuver around the Range during project activities. Additionally, ground disturbance and transport of equipment could increase the potential for the establishment of invasive plant species. Adverse impacts on vegetation would be minimized with the use of appropriate BMPs, such as cleaning equipment prior to entering the project area. In accordance with EO 13112, *Invasive Species*, active measures would be implemented to help prevent and control dissemination of invasive plant species during ground-disturbing activities. Additionally, revegetation and stabilization would be required per the USEPA, helping to reduce the potential for long-term, adverse impacts on vegetation.

Wildlife Species and Habitat. Short- and long-term, minor, adverse impacts on wildlife species and habitat would occur. Test and training activities would result in temporary, short-term, minor degradation of wildlife habitat, while construction of temporary support infrastructure would result in short- and long-term, minor degradation of habitat. Adherence to BMPs would minimize unnecessary disturbances to habitat. If vegetation establishment occurs, a Stormwater Pollution Prevention Plan would be required and reseeding would be conducted.

Temporary displacement of mobile wildlife from noise, lighting, and other disturbances would occur from project activities. Project activities that require heavy equipment could cause more-mobile mammals, reptiles, and birds, including breeding migratory birds, to temporarily relocate to nearby similar habitat. This disturbance is expected to be minor, and it is assumed that displaced wildlife would return soon after activities conclude. Conversely, newly constructed infrastructure could provide new habitat for certain avian species. However, as infrastructure would be used for testing activities (resulting in a highly active area) and would be temporary in nature, it is unlikely that this would occur. Therefore, impacts would be expected to be minor.

Individuals of smaller, less-mobile species could be inadvertently killed or injured during ground-disturbing activities or transportation of equipment and personnel. Burrowing animals, such as burrowing owls, rodents, and reptiles, could be impacted.

Special Status Species. Although there is no evidence of western burrowing owls on the Range, there is the potential for the Proposed Action to result in short-term, minor, adverse impacts to this federal species of concern. As noted above, ground-disturbing activities could indirectly impact the owls and their habitats, and project activities would result in a temporary, minor degradation of habitat. To help mitigate these impacts, Kirtland AFB has developed a burrowing owl management plan with BMPs, including maintaining a 50-meter buffer around occupied burrows, conducting surveys prior to any major test activities, having a monitor onsite during such activities to observe the owls' response and ensure their safety, and adding traffic signage for speeding (Cruz-McDonnell and Cruz-Carretero 2007). Owls should be relocated only as a last resort and is the responsibility of the US Department of Agriculture Animal and Plant Health Inspection Service. Surveys take place when funding is available; no documented observations of burrowing owl or prairie dog colonies have extended into the Range. However, to ensure no impact, an updated species list from USFWS is required to be obtained within 90 days of starting any construction (Chaon et al. 2020, USFWS 2023). The Proposed Action would have no effect on threatened or endangered species.

3.6.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing biological conditions described in **Section 3.6.1** would remain unchanged.

3.7 CULTURAL RESOURCES

Cultural resources are any prehistoric or historic remains or indicators of past human activities, including artifacts, sites, structures, landscapes, and objects of importance to a culture or community for scientific or traditionally important reasons. Archaeological resources comprise areas where human activity has measurably altered the earth or deposits of physical remains are found (e.g., projectile points and bottles), but standing structures do not remain. Architectural resources include standing buildings, bridges, dams, other structures, and designed landscapes of historic or aesthetic significance. Resources of traditional, religious, and cultural importance can include archaeological resources, sacred sites, structures, neighborhoods, prominent topographic features, habitat, plants, animals, or minerals considered essential for the preservation of traditional culture.

The National Register of Historic Places (NRHP) defines historic properties as buildings, structures, sites, districts, or objects listed in or eligible for listing in the NRHP. Historic properties are generally 50 years of age or older, are historically significant, and retain sufficient integrity to convey their historic significance. Such resources might provide insight into the cultural practices of previous civilizations, or they might retain cultural and religious significance to modern groups. Resources less than 50 years of age may be eligible for NRHP listing if they meet NRHP criteria and are exceptionally significant. Cultural resources listed as National Historic Landmarks are historic properties of exceptional national significance.

Cultural resources management includes compliance with applicable historic preservation laws and regulations. Federal laws that pertain to cultural resources management include the NHPA (1966), the Archeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act (1990). Under Section 110 of the NHPA, federal agencies are required to locate, inventory, and nominate to the NRHP, all resources eligible for inclusion in the NRHP under their jurisdiction. The Integrated Cultural Resources Management

Plan (ICRMP) for Kirtland AFB is the guidance document for cultural resources for planning and proposed activities at Kirtland AFB (KAFB 2023b).

Under Section 106 of the NHPA, federal agencies must consider the effect of their undertakings on historic properties and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment. Under this process, the federal agency evaluates the NRHP eligibility of resources within the proposed undertaking's area of potential effect (APE) and assesses the possible effects of the proposed undertaking on historic properties in consultation with the SHPO and other consulting or interested parties, including the public.

The APE is defined as the geographic area or areas within which an undertaking (project) may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The APE for the Proposed Action is defined as the boundaries of the Range.

3.7.1 Affected Environment

Kirtland AFB has conducted an installation-wide survey of archaeological and cultural resources. A total of 740 archaeological sites were recorded within the boundaries of the installation, and 251 have been determined to be eligible for the NRHP. These sites contain artifacts such as pottery, ground stone, stone tools, and historic artifacts. In addition to artifacts many of the archaeological sites on Kirtland AFB contain features which include hearths, prehistoric structures, storage pits, historic structures, mines, weapons testing structures, and military training structures. In addition to archaeological sites, a total of 2,189 facilities have been evaluated for NRHP eligibility, and 271 were found to be eligible (KAFB 2023b).

Kirtland AFB's ICRMP addresses the cultural resources on the installation. The ICRMP provides guidelines and standard operating procedures to non-technical managers and planners in order to comply with the installation's legal responsibilities for the preservation of significant archaeological and historic resources (KAFB 2023b).

The APE for the Proposed Action has been defined as the boundaries of the Range. A review of the Kirtland AFB cultural resources database as well as the New Mexico Cultural Resources Inventory database was conducted to identify all historic properties within the APE.

Archaeological and Traditional Cultural Properties. The APE was covered by a cultural resources survey in 1981 by the Center for Anthropological Studies (Franklin et al. 1981). In 1994, Butler Service Group, Inc. completed a cultural resources survey that included the northern half of the Joint Use Area (Hoagland et al. 1995) and in 2001, AMEC Earth and Environmental, Inc. (Sullivan et al. 2002) completed an archaeological inventory of 16,090 acres on the installation that included approximately 90 percent of the APE. The combined surveys identified one archaeological site within the Joint Use Area: LA134597. LA134597 was recorded as an undefined rock alignment of unknown age or cultural affiliation. The site was determined not eligible for the NRHP with concurrence from the agency and the SHPO on 10 May 2015.

Two additional archaeological sites have been identified in proximity to the APE: LA134598 and 134600. LA134598 is a small Archaic period lithic scatter located approximately 370 meters outside of the APE. The site was determined eligible for listing on the NRHP on 25 June 2015.

LA134600 is a possible stone cairn of unknown age or cultural affiliation located approximately 67 meters outside of the APE. LA134600 was determined not eligible for the NRHP with concurrence from the agency and the SHPO on 10 May 2015.

Traditional cultural properties and sacred sites are a special class of cultural resources that require specialized expertise in their identification and assessment. Thirty-four federally recognized tribes—both in- and out-of-state—have been identified as having an interest in protecting cultural resources located on the installation. Consultations to comply with Section 106 of the NHPA are currently underway. At present, there are no known Native American burial grounds or sacred areas located on Kirtland AFB (KAFB 2023b). Kirtland AFB will continue to consult with the tribes regarding their concerns about properties of traditional cultural and religious importance that may be present.

Architectural Properties. No architectural resources, including buildings, structures, or objects, have been identified in the vicinity of the APE.

3.7.2 Environmental Consequences

Adverse impacts or effects to historic properties might include physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; neglecting the resource to the extent that it deteriorates or is destroyed; or the sale, transfer, or lease of the historic property out of agency ownership (or control) without adequate enforceable restrictions or conditions to ensure preservation of the property's historic significance (36 CFR § 800.5).

3.7.2.1 Proposed Action

No impacts on cultural resources are anticipated from the Proposed Action. There are no NRHP-eligible archaeological sites or architectural resources located within the APE. Test areas GZ-1, GZ-2, and LEC are not in the vicinity of any known cultural resources. At present there are no known Traditional Cultural Places, Native American burial grounds or sacred areas located on Kirtland AFB (KAFB 2023b). Kirtland AFB will continue to consult with federally recognized tribes pursuant to NHPA Section 110(a)(2) and 36 CFR § 800.2 to identify, evaluate, and treat historic properties that have religious or cultural importance to those groups.

The areas of the APE have not been surveyed in over 20 years. However, the Kirtland AFB ICRMP identifies the APE as an area with a low density of archaeological sites and states the 2001 survey by AMEC Earth and Environmental, Inc. was completed to modern standards (Sullivan et al. 2002). Additional surveys may be necessary as determined by the Kirtland AFB Cultural Resources Program Manager to account for the current understanding of archaeology in the region and environmental changes that may alter or uncover new archaeological sites.

If any cultural resources, including archaeological features and artifacts or human remains, are inadvertently encountered, work in the area shall be halted, the immediate vicinity of the resource shall be secured, and the Kirtland AFB Cultural Resources Program Manager shall be notified. Procedures outlined in the installation's ICRMP shall be followed. Work would not continue until the Cultural Resources Program Manager evaluates the site and determines appropriate steps to move forward. Evaluation may include engagement with local Native American Tribes and Pueblos if necessary.

3.7.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be

constructed, operated, maintained, or removed. The existing cultural resources conditions discussed in **Section 3.8.1** would remain unchanged.

3.8 INFRASTRUCTURE

Infrastructure consists of the manmade systems and physical structures that enable a population in a specified area to function. Infrastructure components at Kirtland AFB include transportation, munitions storage, utilities, and solid waste management. Transportation includes major and minor roadways that feed into the installation and the security gates, roadways, parking areas, and pedestrian networks on the installation. Utilities include electrical supply, liquid fuel supply, natural gas supply, water supply, sanitary sewer and wastewater systems, stormwater drainage, communications systems, and solid waste management.

3.8.1 Affected Environment

Transportation. Numerous modes of transportation are available at Kirtland AFB, including air, mass transit, and federal and state highway access. The Albuquerque International Sunport, located along the western boundary of the installation, provides commercial and public aviation and military support, particularly for USAF and Air Force Reserve units. The Albuquerque Transit Department, ABQ RIDE, provides and operates public bus services throughout the city. Several bus routes regularly service Kirtland AFB (ABQ RIDE 2018). There are currently seven gated entrances from the city of Albuquerque to Kirtland AFB including a Contractor's Gate used for truck inspections. There are approximately 430 miles of paved roads and 230 miles of unpaved roads on Kirtland AFB.

Electrical System. Kirtland AFB purchases electrical power from the Western Area Power Administration. Electric lines are placed above and below ground, feeding the 20 substations on the installation. The installation's average yearly consumption is approximately 407,010 kilowatt hours (KAFB 2016).

Natural Gas and Propane. Natural gas is supplied by Coral Energy and delivered in New Mexico Gas Company pipelines supplying the industrial complex, family housing, and heating plants on the installation. There are approximately 496,000 linear feet of natural gas mains (KAFB 2016). Rural portions of the installation do not receive natural gas service and rely on propane, which is delivered to and stored in local propane storage tanks.

Liquid Fuel. Liquid fuels are supplied to Kirtland AFB by contractors. The primary liquid fuels supplied include JP-8 (jet propellant [fuel] – type 8), diesel, and unleaded gasoline. Fuels are purchased in bulk, delivered to the installation by tanker truck, and stored in various-sized storage tanks across the installation. Liquid fuels at Kirtland AFB are primarily used to power military aircraft and ground-based vehicles (KAFB 2016).

Water Supply System. Water is supplied to Kirtland AFB by six groundwater wells and two distribution systems that have a collective water-pumping maximum capacity of 8.1 million gallons per day (mgd). The installation pumps an average of 5.5 mgd of treated, potable water through 160 miles of distribution mains (KAFB 2016). There are also approximately 50 miles of non-potable water pipeline serving the Tijeras Golf Course and providing water for fire protection. In 2017, Kirtland AFB pumped a total of 744 million gallons (2,283 acre-feet) of water from these wells. The installation can also purchase water from the Albuquerque-Bernalillo County Water Utility Authority to meet demand during peak periods; however, the amount of water purchased from the city has been negligible since 1998.

Sanitary Sewer/Wastewater System. Approximately 491,000 linear feet of sanitary system mains transports wastewater to the Albuquerque Bernalillo County Water Utility Authority treatment facility. The permissible discharge rate for Kirtland AFB is fixed at 70,805,000 gallons per month. The installation discharges an average of approximately 1.4 mgd, or approximately 42 million gallons per month (KAFB 2016). Some facilities in remote areas and other portions of the installation are not serviced by the sanitary sewer system; these facilities use isolated, onsite septic systems to dispose of wastewater.

Communications System. The communication network on Kirtland AFB was constructed as two separate systems that were later connected to provide redundancy. The main information transfer node is located on the west side of the installation. The Communication Main Switch Facility is located on the east side of the installation.

Solid Waste Management. Kirtland AFB operates a construction and demolition (C&D) waste-only landfill on the installation. This landfill accepts only nonhazardous C&D waste from permitted contractors working on the installation and has a net waste capacity of 7.2 million cubic yards. As of 31 December 2023, the remaining capacity of this landfill was 1.67 million cubic yards. In 2022 and 2023, an average of 125,680 tons of C&D waste per year was deposited in this landfill (KAFB 2024c).

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

Transportation. Short-term, negligible to moderate, adverse impacts on the transportation system could occur. The Proposed Action would be expected to result in intermittent, short-term, negligible, adverse impacts on area roadways because of a temporary increase in the number of vehicles accessing the installation. However, early coordination with Kirtland AFB organizations would ensure necessary safety precautions are taken and would allow ample advance notice to affected commuters and personnel. If any intermittent road closures are required, closures and potential installation-wide traffic changes would be communicated to installation staff via electronic signs, bulletins, and memos. Additionally, project-related traffic would be timed to not occur during peak travel periods. Typical project-related traffic would include delivery trucks, haul trucks, and passenger vehicles. The influx of project-related traffic may result in short-term, negligible, adverse impacts on parking. Project activities will be timed to not occur during peak parking hours to help mitigate the potential adverse impacts on parking.

Additionally, there is the potential of an incident resulting from the transportation of explosives used for testing activities. Potential impacts could be moderate and adverse; however, with the implementation of standard safety BMPs, these impacts are unlikely to occur. Analysis regarding the safety of transporting explosives is discussed in **Section 3.10.2**.

Electrical System. Long-term, negligible to minor, beneficial impacts on the electrical system would occur. The Proposed Action would include the installation of up to 25,000 feet of underground fiber optic cable and power lines.

Natural Gas System. No impacts on the natural gas system would occur. The Proposed Action is not anticipated to result in any changes to the installation's natural gas system.

Liquid Fuel. No impacts on the liquid fuel system would occur. The Proposed Action is not anticipated to result in any changes to the installation's petroleum, oils, and lubricants or liquid fuel systems, and equipment and vehicles would not utilize the installation's fuel supply.

Water Supply System. No impacts on the water supply system would occur. The Proposed Action is not anticipated to result in any changes to the installation's water supply system.

Sanitary Sewer/Wastewater System. No impacts on the sanitary sewer/wastewater system would occur. The Proposed Action is not anticipated to result in any changes to the installation's sanitary sewer/wastewater system.

Communications System. No impacts on the communications system would occur. The Proposed Action is not anticipated to result in any changes to the installation's communication systems.

Solid Waste Management. Short- and long-term, minor, adverse impacts on solid waste management would occur. Project activities would generate minimal amounts of solid waste, primarily recyclable and reusable building materials (e.g., concrete, metals). Waste disposal would be conducted in accordance with all federal, state, and local laws and regulations. To reduce the amount of waste disposed of at the landfill, materials that could be recycled or reused would be diverted from landfills to the greatest extent possible. The weights of all materials diverted for recycling or reuse would be reported to the Kirtland AFB Quality Recycling Program to be credited toward the DoD-mandated construction and demolition diversion rate of 60 percent. Additionally, the weight/volume of all waste disposed, recycled, or salvaged off the installation would be documented and provided to the 377 MSG/CEIEC Integrated Solid Waste Program Manager. Nonhazardous explosive testing debris and construction waste that is not recyclable or reusable would be disposed of at the installation's C&D landfill resulting in a long-term, negligible, adverse effect on solid waste management. Whenever possible, clean construction debris (e.g., concrete, asphalt) would be reused for fill and road work, rather than disposed of in a landfill. The Proposed Action would increase the overall amount of solid waste generated at Kirtland AFB but would not significantly alter the existing waste and recycling streams maintained by the installation.

3.8.2.2 No Action Alternative

Under the No Acton Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing infrastructure and transportation conditions discussed in **Section 3.8.1** would remain unchanged.

3.9 HAZARDOUS MATERIALS AND WASTES

Hazardous Materials, Petroleum Products, and Hazardous Wastes. Hazardous materials, as defined by 49 CFR § 171.8, are hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR § 172.101), and materials that meet the defining criteria for hazard classes and divisions in 49 CFR Part 173. Petroleum products include crude oil or any derivative thereof, such as gasoline, diesel, or propane. They are considered hazardous materials because they present health hazards to users in the event of incidental releases or extended exposure to their vapors. Hazardous wastes are defined by the Resource Conservation and Recovery Act (RCRA) at 42 USC § 6903(5), as amended by the Hazardous and Solid Waste Amendments, as "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating, reversible illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." Certain types of common hazardous wastes are subject to special management provisions intended to ease the

management burden and facilitate the recycling of such materials. These are called universal wastes and the standards for managing them are established in 40 CFR Part 273. Wastes covered under the universal waste standards include batteries, pesticides, mercury-containing equipment, lamps, and aerosol cans.

Toxic Substances. Toxic substances are substances that might pose a risk to human health and are addressed separately from hazardous materials and hazardous wastes. Toxic substances include asbestos-containing materials (ACMs), lead-based paint (LBP), and polychlorinated biphenyls (PCBs), all of which are typically found in buildings and utilities infrastructure.

Asbestos is regulated by the USEPA under the Clean Air Act; Toxic Substances Control Act; and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The USEPA has established that any material containing more than 1 percent asbestos by weight is considered an ACM. The USEPA has implemented several bans on various ACMs between 1973 and 1990, so ACMs are most likely found in older buildings (i.e., constructed before 1990). LBP was commonly used prior to its ban in 1978; therefore, buildings constructed prior to 1978 may contain LBP. PCBs are man-made chemicals that persist in the environment and were widely used in building materials (e.g., caulk) and electrical products prior to 1979. Structures constructed prior to 1979 potentially include PCB-containing building materials.

Per-and Polyfluoroalkyl Substances. The DoD has identified certain per-and polyfluoroalkyl substances (PFAS) as emerging contaminants of concern that have affected USAF installations. PFAS are a class of synthetic compounds that possess a chemical structure that gives them unique properties, including thermal stability and the ability to repel both water and oil. This class of chemicals was developed in the 1940s and includes the chemicals perfluorooctane sulfonate, perfluorooctanoic acid, perfluorobutanesulfonic acid, perfluorononanoic acid, and perfluorohexane sulfonate. Aqueous film forming foam (AFFF)-containing PFAS was developed in the early 1960s and used at airports, municipal fire stations, petroleum facilities, and in other industries in the United States to extinguish hydrocarbon-based fires effectively. The USAF began using AFFF-containing PFAS as a firefighting agent to extinguish petroleum fires in the 1970s. Firefighters at military installations regularly used AFFF in emergencies or were trained with AFFF in an unconfined manner. As awareness of PFAS-related health risks has increased, USAF has limited the use of PFAS at its installations and continues to investigate and mitigate PFAS-related environmental impacts under CERCLA.

Environmental Restoration Program. CERCLA governs response or cleanup actions to address releases of hazardous substances, pollutants, and contaminants into the environment. Congress formally established the Defense Environmental Restoration Program in 1986 to provide for the cleanup of DoD property at active installations, Base Realignment and Closure installations, and formerly used defense sites throughout the United States and its territories. The two major restoration programs under the Defense Environmental Restoration Program are the Installation Restoration Program (IRP) and Military Munitions Response Program (MMRP). The IRP addresses contaminated sites, while the MMRP addresses nonoperational military ranges and other sites suspected or known to contain unexploded ordnance (UXO), discarded military munitions, or munitions constituents. Each site is investigated, and appropriate remedial actions are taken, under the supervision of applicable federal and state regulatory programs. When it is determined that there is no remaining unacceptable risk to human health and the environment, a no further action (NFA) decision is documented.

The DOE Environmental Restoration Project, now Environmental Restoration Operations, was created in 1992 under the Office of Environmental Management to identify, assess, and remediate sites potentially contaminated by past spill, release, or disposal activities in accordance with

RCRA. The initial identification of Environmental Restoration (ER) sites was completed in 1987 and the Environmental Restoration Project was launched to implement assessment and remediation activities for sites that had been contaminated or potentially contaminated from past operations (SNL 2023).

3.9.1 Affected Environment

Hazardous Materials and Petroleum Products. Contractors proposing to use hazardous materials on the installation must notify the 377 MSG/Civil Engineering Installation Environmental Compliance (CEIEC) Hazardous Material Program by submitting a completed Hazardous Material Worksheet and a list of all materials along with their associated Safety Data Sheet (SDS) prior to use. Hazardous materials used by units stationed at Kirtland AFB are obtained through authorized shop codes in the Enterprise Environmental, Safety, and Occupational Health Management Information System (EESOH-MIS). AFMAN 32-7002, *Environmental Compliance and Pollution Prevention*, provides the requirements and defines the roles of applicable organizations within the USAF as they pertain to operating within an Environmental Management System framework. AFMAN 32-7002 provides installation environmental reporting requirements, to include environmental incidents and spill reporting, and provides the guidance to integrate DoD environmental inspection requirements with the USAF inspection process. The Kirtland AFB Spill Prevention, Control, and Countermeasure (SPCC) Plan provides operating procedures to prevent the occurrence of spills, control measures to prevent spills from entering surface waters, and countermeasures to contain and cleanup the effects of an oil spill that could impact surface waters (KAFB 2023c).

Hazardous materials and petroleum products are not stored on the Range; however, they are used during test activities. Use of these materials is conducted in accordance with Kirtland AFB environmental procedures; AFRL and DTRA Standard Operating Procedures (SOPs); and all federal, state, and local regulations.

Hazardous and Petroleum Wastes. The 377 MSG/CEIEC Hazardous Waste Program is responsible for implementing the hazardous waste management program at Kirtland AFB through waste characterization; establishing collection sites; receiving and processing hazardous waste for turn-in; reporting, tracking logs, and manifesting; regulatory interface; recordkeeping; and hosting and conducting inspections (KAFB 2022b). The installation's Hazardous Waste Management Plan (HWMP) establishes the procedures to comply with applicable federal, state, and local standards for solid waste and hazardous waste management. Kirtland AFB is a large-quantity generator of hazardous waste (USEPA ID #NM9570024423).

Hazardous and petroleum wastes are generated during test activities on the Range. However, hazardous and petroleum wastes are not stored on the Range and are disposed of in compliance with the installation's HWMP and all federal, state, and local regulations.

Toxic Substances. There are several structures within the Range that may contain ACMs, LBP, or PCBs; however, none of these structures are proposed to be renovated or demolished under the Proposed Action. Additionally, all transformers on the installation are self-contained and certified PCB free (KAFB 2023c). Therefore, there is no potential for toxic substances to be disturbed by the Proposed Action and toxic substances are not discussed further in this EA.

Per-and Polyfluoroalkyl Substances. Through investigations pursuant to CERCLA, the USAF has identified four potential AFFF release areas on Kirtland AFB for the potential presence of PFAS in the soil and/or groundwater (AFCEC 2023). The closest potential AFFF release area is AFFF Area 2, which is approximately 3 miles northeast of the Range. Therefore, PFAS is not discussed further in this EA.

Environmental Restoration Program. Kirtland AFB has 51 active IRP sites (also referred to as Solid Waste Management Units [SWMUs]) that include known or suspected soil and groundwater contamination associated with landfills, oil/water separators, drainage areas, septic systems, fire training areas, and spill areas. Kirtland AFB has nine active MMRP sites, comprising 5,274 acres (see **Figure 3-1**). These sites are former impact and training areas that are primarily located along the outer perimeter and center of the installation. The sizes, types of munitions debris, and potential for UXO varies by location (AFCEC 2024). Additionally, DOE actively manages six open ER sites on Kirtland AFB property, which include three groundwater areas of concern and three SWMUs at active test facilities (SNL 2023).

There are no active IRP or DOE ER on or within 0.5-mile of the Range. A portion of MMRP Site AL120e falls within the southeastern boundary of the Range and MMRP Site AL120b is approximately 1 mile west of the western boundary of the Range. There are no groundwater monitoring wells within or immediately adjacent to the Range.

AL120b, McCormick UXO Munitions Response Site (MRS), consists of approximately 1 acre in the southwestern portion of the installation. AL120b MRS was part of the AL120 Proximity Fuze Range Munitions Response Area and was one of three MRSs recommended for further response action. Surface clearance was conducted over the entire MRS and no munitions and explosives of concern or material potentially presenting an explosive hazard were found. AL120b was recommended for NFA status in April 2022 and is awaiting USEPA concurrence (AFCEC 2022).

AL120e, Proximity Fuze Range MRS, consists of approximately 2,060 acres in the southwestern portion of the installation. A 2013 NFA report recommended dividing AL120e into two MRSs, AL120e (approximately 988 acres) and AL120f (approximately 1,072 acres), and recommended NFA status for AL120e. However, based on investigation results and accessibility to the site, the sites were not divided, and the entire site has been moved into Remedial Investigation and will be moving forward under CERCLA. Surface clearance was conducted over the entire MRS and no munitions and explosives of concern or munitions debris were found within the proposed AL120e MRS. The northwestern boundary of the proposed AL120f MRS is approximately 0.4 mile east of the northeastern boundary of the Range (AFCEC 2013, AFCEC 2024).

3.9.2 Environmental Consequences

Evaluation of hazardous materials, petroleum products, and hazardous wastes focuses on the storage, transportation, handling, and use of hazardous materials and petroleum products, as well as the generation, storage, transportation, handling, and disposal of hazardous wastes. In addition to being a threat to humans, the improper release or storage of hazardous materials, hazardous wastes, and petroleum products can threaten the health and well-being of wildlife species, habitats, soil systems, and water resources.

3.9.2.1 Proposed Action

Hazardous Materials and Petroleum Products. Short-term, negligible, adverse impacts on hazardous materials management could occur during construction and removal of supporting infrastructure. Construction contractors would ensure the handling and storage of any hazardous material and petroleum product is carried out in compliance with applicable laws and regulations.

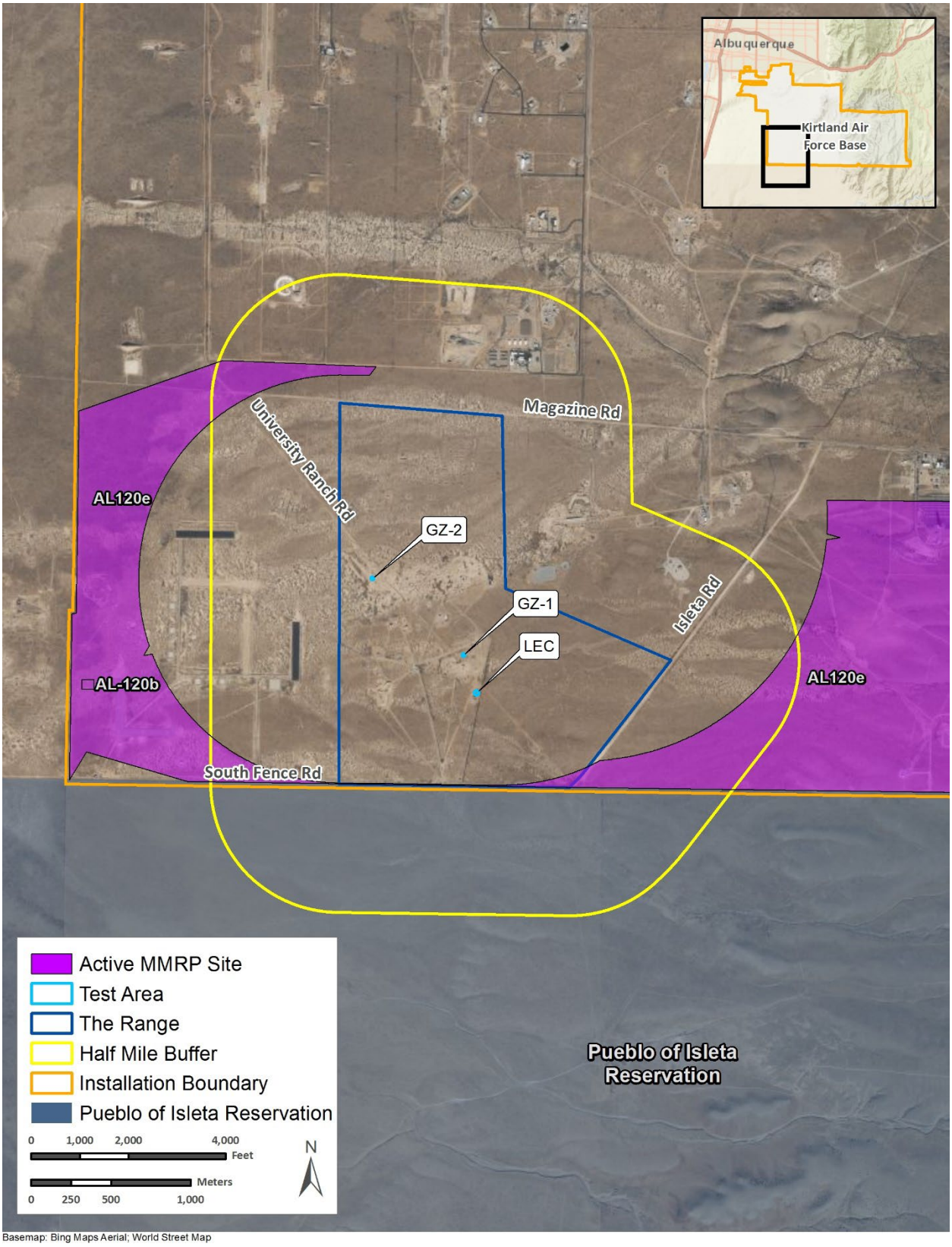

Figure 3-1. Active MMRP Sites on or within .05-Mile of the Range

Prior to bringing hazardous materials onto the installation, contractors would obtain authorization from and provide applicable SDSs to 377 MSG/CEIEC. At the conclusion of construction activities, all hazardous materials used by contractors would be reported to 377 MSG/CEIEC. Units stationed at Kirtland AFB would obtain hazardous materials through authorized shop codes in EESOH-MIS. Construction and heavy equipment would use small quantities of hazardous materials and petroleum products such as solvents, hydraulic fluid, oil, antifreeze, and other hazardous materials. Hazardous materials could be used for minor equipment servicing and repair activities. Should any hazardous materials or petroleum products be released into the environment, adherence to applicable management plans such as the installation's SPCC Plan would occur. The severity of a potential impact from an accidental release would vary based on the extent of a release and the substances involved. Implementation of BMPs and environmental protection measures would reduce the potential for an accidental release of these materials. All equipment would be maintained in accordance with manufacturer's specifications and drip mats would be placed under parked equipment as needed.

No hazardous materials or petroleum products are stored within the Range. Test personnel would comply with existing Kirtland AFB environmental procedures, AFRL and DTRA SOPs, and applicable federal and state laws governing the use, storage, and transportation of solid or hazardous materials. No impacts on the hazardous materials program would be expected from current or future explosive tests or vaporization experiments under the Proposed Action. As noted in the 1987 CERF EA and 2015 GRABS Site EA, detonation products released during explosive tests are naturally occurring substances, and potential products resulting from reactions with the atmosphere are natural and nonhazardous (KAFB 1987, KAFB 2015). Additionally, as noted in **Section 1.2.1.1.1.2**, vaporization experiments would be conducted on an existing concrete pad near GZ-2 and the quantity of metals released would be comparable to those released by common fireworks; therefore, no impacts would be expected.

Hazardous and Petroleum Wastes. Short-term, negligible, adverse impacts on hazardous and petroleum waste generation would be expected during construction and removal of supporting infrastructure. It is anticipated that the quantity of hazardous and petroleum wastes generated would be negligible. All wastes generated during construction of supporting infrastructure would be characterized and documented by contractors and site personnel in accordance with 40 CFR § 262.11. Any wastes characterized as universal or hazardous would be disposed of in accordance with the installation's HWMP; AFRL and DTRA SOPs; and federal, state, and local laws and regulations.

Long-term, negligible, adverse impacts on the hazardous waste program could result from new test activities under the Proposed Action. New or updated activities could introduce or alter a waste stream or require establishment of an Initial Accumulation Point for hazardous waste. USAF, USSF, and DTRA personnel would coordinate with their Unit Environmental Coordinators and Kirtland AFB Hazardous Waste Program personnel to ensure wastes generated are properly managed. In accordance with AFRL and DTRA SOPs, following each test event, all debris would be collected and disposed of in accordance with applicable federal, state, and local laws and regulations.

Environmental Restoration Program. No impacts on or from IRP, MMRP, or DOE ER sites are anticipated. There would be no impacts on or from IRP and DOE ER sites because no such active sites are within 0.5-mile of the Range. Only one MMRP site, AL120e, is on or within 0.5-mile of the Range. Based on the findings of the 2013 NFA report, no evidence of munitions and explosives of concern or munitions debris were observed in the portion of AL120e on or within

the 0.5-mile radius of the Range; therefore, no impacts on or from MMRP site AL120e would occur.

3.9.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing hazardous materials and wastes conditions discussed in **Section 3.10.1** would remain unchanged.

3.10 SAFETY

A safe environment is one in which there is no, or an optimally reduced, potential for death, serious bodily injury or illness, or property damage. Human health and safety address workers' and public health and safety during and following project activities.

Site safety requires adherence to regulatory requirements imposed for the benefit of employees and the public. Site safety includes implementation of engineering and administrative practices that aim to reduce risks of illness, injury, death, and property damage. The health and safety of onsite military and civilian workers are safeguarded by numerous DoD and military branch-specific requirements designed to comply with standards issued by the federal OSHA, USEPA, and state occupational safety and health (OSH) agencies. These standards specify health and safety requirements, the amount and type of training required for workers, the use of personal protective equipment (PPE), administrative controls, engineering controls, and permissible exposure limits for workplace stressors.

Health and safety hazards can often be identified and reduced or eliminated before an activity begins. Necessary elements for an accident-prone situation or environment include the presence of the hazard itself, together with the exposed (and possibly susceptible) population or public. The degree of exposure depends primarily on the proximity of the hazard to the population. Hazards include transportation, maintenance, and repair activities, and the creation of a noisy environment. The proper operation, maintenance, and repair of vehicles and equipment carry important safety implications. Noisy environments can also mask verbal or mechanical warning signals such as sirens, bells, or horns.

3.10.1 Affected Environment

Contractor Safety. All contractors performing project activities are responsible for following federal and state safety regulations and are required to conduct activities in a manner that does not increase risk to workers or the public.

New Mexico is one of several states that administer their own OSH program according to the provision of the federal OSH Act of 1970, which permits a state to administer its own OSH program if it meets all federal requirements regarding the program's structure and operations. The New Mexico Occupational Health and Safety Bureau program has the responsibility of enforcing occupational health and safety regulations within the state. Its jurisdiction includes all private and public entities such as city, county, and state government employees. Federal employees are excluded as they are covered by federal OSHA regulations.

OSH programs address the health and safety of people at work. OSH regulations cover potential exposure to a wide range of chemical, physical, and biological hazards, and ergonomic stressors. The regulations are designed to control these hazards by eliminating exposure to the hazards via

administrative or engineering controls, substitution, or use of PPE. Occupational health and safety is the responsibility of each employer, as applicable. Employer responsibilities are to review potentially hazardous workplace conditions; monitor exposure to workplace chemical (e.g., asbestos, lead, hazardous substances), physical (e.g., noise propagation, falls), and biological (e.g., infectious waste, wildlife, poisonous plants) agents, and ergonomic stressors; recommend and evaluate controls (e.g., prevention, administrative, engineering, PPE) to ensure exposure to personnel is eliminated or adequately controlled; and ensure a medical surveillance program is in place to perform occupational health physicals for those workers subject to the use of respiratory protection or engaged in hazardous waste, asbestos, lead, or other work requiring medical monitoring.

Military and Civilian Personnel Safety. Each branch of the military has its own policies and regulations that act to protect its workers, despite their work location. DAFI 91-202, *The Department of the Air Force (DAF) Mishap Prevention Program,* "establishes mishap prevention program requirements, assigns responsibilities for program elements, and contains program management information." In order to meet the goals of minimizing loss of USAF resources and protecting military and civilian personnel, mishap prevention programs should address groups at increased risk for mishaps, injury of illness; a process for tracking incidents; funding for safety programs; metrics for measuring performance; safety goals; and methods to identify safety BMPs.

Public Safety. Kirtland AFB has its own emergency services department. The emergency services department provides the installation with fire suppression, crash response, rescue, emergency medical response, hazardous substance protection, and emergency response planning and community health and safety education. The Veterans Affairs Medical Center and the 377th Medical Group are the primary military medical facilities for Kirtland AFB. Several other hospitals and clinics, which are devoted to the public, are located off-installation in the city of Albuquerque. These facilities include Lovelace Medical Center, University of New Mexico Hospital, and Presbyterian Hospital.

Albuquerque Fire Rescue (AFR) provides fire suppression, emergency medical and dispatch services, fire prevention, arson investigation, special operations response, community paramedicine, and public education to the nearby city of Albuquerque (AFR 2024). AFR is comprised of numerous uniformed personnel, including 760 full-time firefighters, 471 basic emergency medical technicians and 212 paramedics within AFR staffing levels, 23 fire engine companies, 7 fire ladder companies, 5 wildland task force stations, 2 hazardous materials task force stations, 1 fire investigation/arson division, and 1 technical rescue task force station (AFR 2024). The city of Albuquerque also has approximately 877 sworn police officers and 43 service aides available within seven geographical area commands to provide law enforcement services (APD 2023). The Southeast Area Command (Phil Chacon Memorial Substation) borders the northwest corner of Kirtland AFB. A mutual service agreement is in place for fire and emergency services between the city of Albuquerque and Kirtland AFB.

3.10.2 Environmental Consequences

3.10.2.1 Proposed Action

Short- and long-term, negligible, adverse impacts would occur. Project activities would result in short-term, adverse impacts on the safety of contractors, military and civilian personnel, and the public. While unlikely, short- and long-term, negligible to moderate, adverse impacts could result from an accident at the Range resulting from test activities. However, Kirtland AFB, AFRL, and DTRA have numerous SOPs and safety protocols in place to prevent and minimize potential impacts.

Contractor Safety. Short-term, negligible, adverse impacts on the health and safety of contractor personnel would occur. Project activities would slightly increase the health and safety risk to personnel within the project area. Contractors would be required to develop a comprehensive health and safety plan detailing all potential hazards and site-specific guidance to ensure potential safety risks are minimized. The plan would include, at a minimum, emergency response and evacuation procedures; operating manuals; PPE recommendations; procedures for handling, storing, and disposing of hazardous materials and wastes; information on the effects and symptoms of potential exposures; and guidance with respect to hazard identification. Contractor personnel would be responsible for compliance with applicable federal, state, and local safety regulations and would be educated though daily safety briefings to review upcoming work activities and associated hazards. Therefore, the Proposed Action would not be expected to result in a significant impact on contractor safety.

Military and Civilian Personnel Safety. Short-term, negligible, adverse impacts on the health and safety of military and civilian personnel that work near the Range, and the potential for short- and long-term, negligible to moderate, adverse impacts in the unlikely event of an accident at the Range. Project activities would comply with all applicable safety requirements, SOPs, and installation-specific protocols and procedures, including appropriately marking potentially hazardous areas and posting warning signs and barriers to limit access to approved personnel only. Kirtland AFB follows all safety standards listed in DAFI 91-202 (see **Appendix G**), in addition to the following:

- Post a Notice to Airmen the day prior to testing events
- Post two road guards to restrict access to the Range (road guards also watch for low flying aircraft)
- Monitor an FAA radar feed to monitor aircraft approaching the test area
- Verify the location of all test participants before starting a countdown sequence
- Ensure the area is clear of aircraft by consulting the FAA monitor and road guards
- Provide countdown via radio to begin testing
- Announce when test is complete.

Explosives are not permanently stored at the Range and would be transported to the Range in advance of each testing event only in the quantities necessary to support the event. Adherence to SOPs, use of appropriate PPE, and compliance with DoD and OSHA standards (29 CFR § 1910.109) would reduce the potential for injuries, accidents, or other impacts on safety.

Public Safety. No short- or long-term impacts on the health and safety of the public would occur. Because the proposed activities would occur within the boundaries of Kirtland AFB, an active military installation that is not open to the public, the Proposed Action would not pose a safety risk to the public or off-installation areas. Further, the Range would be appropriately delineated and posted with access limited to site personnel. Additionally, the activities discussed in **Section 2.3.1** would comply with all applicable safety requirements, SOPs, and installation-specific protocols and procedures, including appropriately marking potentially hazardous areas and posting warning signs and barriers to limit access to approved personnel only. Therefore, the Proposed Action is not expected to result in a significant impact on public safety.

3.10.2.2 No Action Alternative

Under the No Action Alternative, no changes to already authorized operating levels, testing types, or testing frequencies on the Range would occur, and no new support infrastructure would be constructed, operated, maintained, or removed. The existing safety conditions discussed in **Section 3.10.1** would remain unchanged.

3.11 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

The relationship between short-term uses and enhancement of long-term productivity from implementation of the Proposed Action is evaluated from the standpoint of short-term effects and long-term effects. Short-term effects would be those associated with test activities and construction of temporary structures. The long-term effects would be those associated with prolonged test activities overtime.

The Proposed Action represents an enhancement of long-term productivity and enhanced capability for mission success at Kirtland AFB. The negative effects of short-term impacts from the Proposed Action would be minor compared to the long-term positive impacts by enabling the mission at Kirtland AFB to continue to grow and evolve as warfare grows more technologically advanced and specialized.

3.12 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of non-renewable resources and the impacts that the use of these resources would have on future generations. Irreversible impacts primarily result from the use or destruction of a specific resource that cannot be replaced within a reasonable timeframe (e.g., energy and minerals). The irreversible and irretrievable commitments of resources that would result from implementation of the Proposed Action involve the consumption of material resources used for construction, energy resources, biological resources, and human labor resources. The use of these resources is considered to be permanent.

Material Resources. Material resources used for the Proposed Action would potentially include construction materials, concrete and asphalt, and various construction materials and supplies. Materials that would be consumed are not in short supply, would not limit other unrelated construction activities, and would not be considered significant.

Energy Resources. Energy resources, including petroleum-based products (e.g., gasoline and diesel), used for the Proposed Action would be irretrievably lost. During project activities, gasoline and diesel would be used for the operation of vehicles and equipment. However, consumption of these energy resources would not place a significant demand on their availability in the region. Therefore, less than significant impacts would be expected.

Human Resources. The use of human resources for project activities is considered an irretrievable loss only in that it would preclude such personnel from engaging in other work activities. However, the use of human resources for the Proposed Action represents employment opportunities and is considered beneficial.

Biological Resources. The Proposed Action would result in a permanent, negligible to minor loss of vegetation and wildlife habitat. However, the loss would not be considered significant; therefore, a less than significant impact on the irretrievable loss of vegetation and wildlife habitat is expected.

4.0 REASONABLY FORESEEABLE ACTIONS AND CUMULATIVE EFFECTS

CEQ regulations (40 CFR § 1508.1(g)(3)) define cumulative effects or impacts as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time." Informed decision-making is served by consideration of cumulative impacts resulting from projects that are proposed, under construction, recently completed, or anticipated to be implemented in the reasonably foreseeable future.

This cumulative impacts analysis summarizes expected environmental impacts from the combined impacts of past, current, and reasonably foreseeable future actions in accordance with CEQ regulations implementing NEPA and CEQ guidance on cumulative effects. The geographic scope of the analysis varies by resource area. For example, the geographic scope of cumulative impacts on resources such as soils and vegetation are narrow and focused on the location of the resource. The geographic scope of air quality and wildlife and sensitive species is much broader and considers more county-or region-wide activities. Projects that were considered for this analysis were identified by Kirtland AFB, news releases and published media reports, and publicly available information and reports from federal, state, and local agencies. Projects that do not occur in proximity (i.e., within several miles) of the proposed project site would not contribute to a cumulative impact and are generally not evaluated further.

4.1 PAST, PRESENT, AND REASONABLY FORESEEABLE ACTIONS

Past actions are those within the cumulative impacts analysis areas that have occurred prior to the development of this EA. The impacts of these past actions are generally described in **Section 3.0**. Present actions include current or funded construction projects, operations near the proposed site, and current resource management programs and land use activities within the cumulative impacts analysis areas. Reasonably foreseeable future actions consist of activities that have been approved and can be evaluated with respect to their effects. The following activities listed in **Table 4-1** below are present or reasonably foreseeable future actions.

Table 4-1. Present or Reasonably Foreseeable Future Actions

Name of Action	Location	Project Description	Timeframe
AFRL HPEM Laboratory	North side of Building 323 and renovations to Buildings 322 and 323	AFRL is proposing to construct a modern, flexible HPEM laboratory space for development of advanced High-Power Microwave and High Energy Density Physics research. Construction includes a 48,000-square foot addition and renovation of 19,970 square feet of existing laboratory space. The efforts would be undertaken to modernize, expand, and consolidate AFRL HPEM operations. This project would also include demolition of 15 facilities and divestment of 2 facilities in order to offset the space created by the new construction.	0–5 years
Consolidation of AFRL/RV Integrated Experiments and Evaluation Division mission	Construction surrounding Building 595 and across Aberdeen Street	Construct Space Test and Evaluation Center, a Systems and Digital Engineering Lab, an Artificial Intelligence Satellite Lab, a larger parking lot, and a Meteorology Facility. This project would also include the demolition of Buildings 276, 277, 592, and 593.	10–15 years
Construction of Re-Entry Vehicle Integration Laboratory (REVIL), Free Electron laser Radiation for Multidisciplinary Investigations (FERMI), and Raw Materials Lab	Southgate Road	AFRL is proposing to construct two modern and flexible laboratories: REVIL (5,200 square feet) and FERMI (6,000 square feet). The facilities would be used to design, construct, and operate non-destructive test capabilities for development of next-generation nuclear technologies. The efforts would be undertaken to expand AFRL Nuclear Deterrence Operations.	REVIL & FERMI – 0–5 years Raw Materials Lab – 15–20 years
Construction of Nuclear in District Applications (NuIDEA) and nuclear distribution element-like (NuDEL)	Between Buildings 570 and 580	The NuDEL and NuIDEA projects will involve designing two buildings that support the AFRL/RV Atomic Long-range Systems Branch in expanding Modeling and Simulation and International Test and Evaluation capabilities. NuDEL is a proposed FLEX4 construction project to provide an approximately 8,000-square foot facility with secure laboratories and office space. NuIDEA is a proposed military construction project to provide an approximately 15,000-square foot facility that expands NuDEL to include additional secure laboratories, office space, and parking to expand the mission's capacities further. The existing bioenvironmental chapel building would be demolished.	5–10 years

Name of Action	Location	Project Description	Timeframe
AFRL/RDL – Laser Effects & Simulation Lab MILCON	400 Area	Replace Buildings 400 and 418 with a new 45,000–50,000-square foot laboratory facility.	10–15 years
AFRL/RD Electro-Optical Division Starfire Optical Range (SOR) – Satellite Assessment Laboratory for Space Situational Awareness	Addition or alternative to Building 66048	Construct a new 7,918-square foot two-story addition to Building 66048. Includes relocation of the existing generator.	0–5 years
AFRL/RD Electro-Optical Division SOR – STARQUEST	East of Building 66019	Construct a new 6,400-square foot laboratory addition to Building 66019 and refurbish 1,000 square feet of the existing facility to house unique research and development test beds capable of addressing critical technology areas in space domain awareness, quantum networking, and DE. Project includes the demolition of Building 66029, a test shed, and a storage shed.	0–5 years
Zia Park Area Development	Former Zia Park Housing Area	Development of a former housing area, called Zia Park, which encompasses approximately 300 acres of land central to the primary cantonment area of the installation. Construction would include administrative buildings, infrastructure improvements, medical facilities, community services, residential lodging, outdoor recreation space, and demolition of several facilities that would be redundant with new construction (e.g., gyms, child development center, dormitory).	Construction projects would be completed in various phases, either short-term (1–7 years), mid-term (8–16 years), or long-term (17+ years).
Enhanced Land Use Development	From Carlisle Gate to Truman Gate	Development of a 90-acre site for mixed-use development that would include office, retail/commercial, multifamily housing, hotel, and restaurant space. This development area is on the northwestern edge of Kirtland AFB, south of Gibson Boulevard, and west of Truman Gate/Visitors Center.	1–5 years
Security Forces Complex	Assumed to be in the vicinity of Randolph Avenue and San Mateo Boulevard	The USAF proposes to construct, operate, and maintain a 43,500-square foot security forces complex to provide adequate space and modern facilities to house all 377th Security Forces Group administrative and support functions in a consolidated location. The functions that would be transferred to the new security forces complex include an operations center with command and control facility, administration and office space, training rooms, auditorium or assembly room, guard mount, hardened armory for weapons and ammunition storage,	1–5 years

Name of Action	Location	Project Description	Timeframe
		confinement facilities, law enforcement, logistics warehouse, general storage, vehicle garage with maintenance area, and associated communications functions. One existing building (879 square feet) within the footprint of the complex would be demolished. This project would result in an increase of 41,621 square feet of building space on the installation.	
Renewable Energy Projects	Unknown	The USAF proposes to develop renewable energy projects at Kirtland AFB. The proposed project would include the installation of various renewable energy technologies installation-wide, up to a 20-megawatt solar photovoltaic array and rooftop/carport solar voltaic systems.	TBD
Upgrade, Develop, and Maintain the Storm Drainage System	Along the flightline and the existing arroyos	The USAF proposes to develop, upgrade, and maintain storm drainage systems and conduct arroyo erosion repair and damage avoiding measures across the installation. Storm drainage system activities could include constructing stormwater system upgrades and components including cleaning, regrading, ditching, trenching, trench lining, backfilling, bedding, reinforced concrete pipe, culverts, vegetation, riprap, drop inlets, and retention and outlet structures. Arroyo repair activities could include excavating, filling, and lining arroyo banks and constructing and repairing box culverts, bank protection, and grade control structures to assist in stabilizing the arroyo bed toward a stable slope.	11+ years
New Mexico Army National Guard 515th Regiment	Former Zia Park Housing Area & Tijeras Arroyo Golf Course	The New Mexico Army National Guard proposes to relocate its 515th Regiment from the Oñate Training Complex in Santa Fe to Kirtland AFB. Construction includes a 366,000-square foot main campus in the former Zia Park housing area and a 40-acre maneuver and driver's training course with motor pool and classroom near the Tijeras Arroyo Golf Course. The main campus would include an educational facility, billeting, dining facilities, and associated parking.	TBD
AC-130J Formal Training Unit (FTU) Relocation	58th Special Operations Wing (SOW) Campus	The USAF is proposing to relocate the Air Force Special Operation Command AC-130J FTU from Hurlburt Field, Florida, to Kirtland AFB, New Mexico, and	Fiscal Year 2025–Fiscal Year 2029

Name of Action	Location	Project Description	Timeframe
		organizationally realign the unit under the 58 SOW (Air Education and Training Command). The Proposed Action also includes personnel needed to operate and maintain the Air Force Special Operations Command AC-130J aircraft and construction of new and/or modification of existing facilities on the installation to support the relocation.	
DoD Satellite Communications (SATCOM) Ground Terminal (GT) Facility	Pennsylvania Street/Wyoming Boulevard	The Proposed Action is to develop and operate a SATCOM GT facility on approximately 15 acres of previously disturbed land in the northwestern portion of Kirtland AFB, on the west side of Pennsylvania Street adjacent to the southern end of Wyoming Boulevard. The GT facility would consist of three 44.3-foot (13 meters) diameter dish antennas, enclosed within approximately 72-foot (22 meters) high radome enclosures, an associated equipment shelter, two emergency generators, perimeter fencing, a sensor equipment tower, and utilities. It would be used to communicate with satellites. The facility would include multiple concrete pads to accommodate all the structures. An additional pad would be constructed for a temporary, small, transportable antenna and emergency generator.	0–5 years
USSF Strategic Training and Readiness Command (STARCOM) Delta 11 Beddown	Buildings 20362, 20363, 20364	The USSF proposes to locate three Space Delta units (Delta 10, Delta 11, and Delta 12) of the STARCOM at DAF installations in the United States. DAF has selected Kirtland AFB as the preferred alternative for locating Delta 11 Headquarters (Delta 11 HQ), 11th Delta Operations Squadron, 57th Space Aggressor Squadron, the 98th Space Range Squadron, and 1st Test and Evaluation Squadron (TES) personnel authorizations of the Delta 12. Inclusion of the 1 TES personnel of Delta 12 considers mission and operational efficiency along with reducing current support of families' constraints at Schriever Space Force Base (where Deltas 11 and 12 are currently activated). Space Delta 11 (Delta 11) is the Space Range and Aggressors unit of STARCOM. Delta 11 and its associated units are planned to relocate to the final basing location by	0–5 years

Name of Action	Location	Project Description	Timeframe
		4th quarter of Fiscal Year 2023 for performing mission/tasks and have all authorizations at the permanent location by the 1st quarter of Fiscal Year 2026. Delta 11 operates the National Space Test and Training Complex and provides adversary training support through Space Aggressor Squadrons. It supports USSF testing and evaluation, training, and exercises. Specifically, at Kirtland AFB, this includes renovation and reuse of Buildings 20362 (28,500 square feet), 20363 (29,300 square feet), and 20364 (29,500 square feet).	
DOE National Nuclear Security Administration (NNSA) Sandia Field Office Sitewide Environmental Impact Statement (SWEIS)	Basewide	DOE NNSA Sandia Field Office is updating their 1999 SWEIS. Proposed actions and alternatives to be considered in the SWEIS include (1) no action, (2) modernized operations, (3) expanded operations. The expanded operations alternative is DOE's preferred alternative. This alternative will include (1) construction and operation of new facilities and (2) upgrades to existing facilities that result in changing the nature and capabilities of these facilities. This alternative would expand capabilities at SNL/NM beyond those that currently exist.	0–15 years

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4.2 ASSESSMENT OF CUMULATIVE IMPACTS BY RESOURCE

A cumulative impacts analysis must be conducted within the context of the resource areas. The magnitude and context of the impact on a resource area depends on whether the cumulative effects exceed the capacity of a resource to sustain itself and remain productive. The following discusses potential cumulative impacts that could occur as a result of implementing the Proposed Action and other past, present, and reasonably foreseeable actions. No significant cumulative impacts were identified in the cumulative impacts analysis.

4.2.1 Noise

The Proposed Action, when combined with other past, present, and reasonably foreseeable actions, would result in intermittent, temporary, additive noise levels; however, most reasonably foreseeable future actions would occur in the heavily developed northwestern portion of the installation, more than 5 miles north of the Range. If conducted concurrently, noise from the Proposed Action and from construction of the past, present, and reasonably foreseeable future actions may produce additive noise levels a few dBA greater than what would be produced by the Proposed Action alone. The temporary increases in noise would be limited to areas in the vicinity of the projects. New facilities would be sited among existing facilities of similar use and function; therefore, the nature and levels of noise from new facility operations would be comparable to existing noise levels, consistent with noise levels typical for Kirtland AFB. In addition, noise from potential additive noise would attenuate to levels less than 65 dB at the Pueblo of Isleta Reservation community, the closest noise sensitive receptor to the Proposed Action. Therefore, the Proposed Action, when combined with present and reasonably foreseeable actions, would not result in significant cumulative impacts on noise.

4.2.2 Air Quality

Testing activities under the Proposed Action would result in low levels of air emissions below the PSD insignificance thresholds. The Proposed Action, when combined with past, present, and reasonably foreseeable future actions within Bernalillo County, which include all reasonably foreseeable actions listed in **Table 4-1**, may contribute additional air emissions in the county, resulting in short-term, minor, adverse, cumulative impacts. However, such emissions would be temporary in nature and would cease upon completion of construction for the reasonably foreseeable future actions. BMPs discussed in **Section 3.3**, including dust suppression and use diesel particulate filters would minimize emissions of criteria pollutants and GHGs. Long-term, operational, cumulative impacts would occur if the reasonably foreseeable future actions would introduce permanent stationary sources of air emissions, such as boilers and electricity generators, which would increase the installation's annual emissions beyond what was estimated from the Proposed Action alone. The magnitude of long-term, cumulative impacts would be dependent on the aggregate increase in operational air emissions but would likely be less than significant.

4.2.3 Geological Resources

The Proposed Action, when combined with other past, present, and reasonably foreseeable actions occurring in the surrounding area, may result in minor cumulative impacts on geologic resources, namely soil. Other projects would include construction of buildings and expanding infrastructure to facilitate those new buildings, thus increasing soil disturbances within the installation. However, BMPs would be implemented which would minimize potential impacts.

4.2.4 Water Resources

The Proposed Action, when combined with other past, present, and reasonably foreseeable actions occurring in the surrounding area, may result in negligible to minor cumulative impacts on water resources. Other projects would include construction of buildings and increase impervious surface area, thus increasing potentially contaminated runoff volume into surface water bodies. However, BMPs would be implemented to minimize potential impacts.

4.2.5 Biological Resources

The Proposed Action, when combined with other past, present, and reasonably foreseeable actions on the installation and within the city of Albuquerque, would result in impacts on vegetation crushing and soil compaction during ground-disturbing activities, which could result in establishment of invasive species. Adverse impacts on vegetation would be minimized through the use of appropriate BMPs, such as cleaning equipment prior to entering the project area and measures would be implemented to help prevent and control dissemination of invasive plant species during ground-disturbing activities.

Activities that require heavy equipment could cause mobile mammals, reptiles, and birds, including breeding migratory birds, to temporarily relocate to nearby similar habitat. This disturbance is expected to be minor, and it is assumed that displaced wildlife would return to these areas soon after activities conclude or else would move to adjacent areas of similar habitat. Adverse impacts on wildlife would be minimized through the use of BMPs, such as conducting surveys prior to any construction and scheduling project activities to occur outside of the nesting season of 1 March to 30 September in order to reduce impacts on migratory birds. Although growth and development can be expected to continue outside of Kirtland AFB and within the surrounding natural areas, significant adverse impacts would not be expected with the implementation of BMPs. Therefore, the Proposed Action would not result in a significant cumulative impact on biological resources.

4.2.6 Cultural Resources

No significant adverse cumulative impacts would result from the Proposed Action when combined with other present or reasonably foreseeable future actions at Kirtland AFB. Compliance with all requirements and management measures identified in the Kirtland AFB ICRMP would ensure that inadvertent discoveries of cultural resources during the Proposed Action and the reasonably foreseeable future actions listed in **Table 4-1** are properly addressed and would minimize impacts.

4.2.7 Infrastructure

The Proposed Action, when combined with past, present, and reasonably foreseeable future actions on the installation and within the surrounding areas, would result in negligible to minor impacts on both transportation and solid waste management at Kirtland AFB. Impacts on transportation would be due to the potential intermittent and temporary increases in traffic at the installation and impacts on solid waste management would be due to the generation of additional solid waste, both resulting from increased activity on the installation. These impacts would not be expected to be significant.

4.2.8 Hazardous Materials and Wastes

The Proposed Action, as well as past, present, and reasonably foreseeable future actions at Kirtland AFB, would incorporate appropriate BMPs and environmental protection measures to limit and control hazardous materials and wastes and other contaminants into their design and

operations plans. Additionally, for new activities on the installation, the need to use and store specific types of hazardous materials and generate hazardous wastes, as well as the potential need to establish an Initial Accumulation Point, would be determined prior to start-up. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable actions, would not result in a significant cumulative impact on hazardous materials and waste management.

4.2.9 Safety

No adverse cumulative impacts on health and safety would be expected from the Proposed Action, when combined with other past, present, and reasonably foreseeable actions on the installation or in the surrounding area, unless a situation where safety protocol is not observed occurs. In that unlikely instance, negligible to moderate impacts could result from an accident. Adherence to SOPs and established procedures, to include the use of PPE; fencing project areas and posting signs; and compliance with OSH, DoD, and OSHA standards would reduce or eliminate health and safety impacts on contractors, military and civilian personnel, and the public. These procedures are typical for test and construction activities on the installation and in the surrounding areas. Therefore, the Proposed Action, when combined with other past, present, and reasonably foreseeable actions, would not result in a significant cumulative impact on health and safety.

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APPENDIX A

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION FOR ENVIRONMENTAL PLANNING AND PUBLIC INVOLVEMENT MATERIALS

1

Appendix A

Interagency and Intergovernmental Coordination for Environmental Planning and Public Involvement Materials

Federal, State, and Local Agencies – Distribution List

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Southwest Region Regional Office
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Ms. Sabrina Flores, District Manager
Bureau of Land Management
Albuquerque District Office
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Albuquerque NM 87109-4676

Ms. Rebecca Collins
Regional Environmental Officer
Office of Environmental Policy and
Compliance, US Department of the Interior
1001 Indian School Road NW, Suite 348
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Mr. Rob Lowe, Regional Administrator
Federal Aviation Administration
Southwest Region
10101 Hillwood Parkway
Fort Worth TX 76177

Mr. Nikolas Goodman
District Conservationist
Natural Resources Conservation Service
Albuquerque Service Center
100 Sun Avenue NE, Suite 160
Albuquerque NM 87109

Ms. Danielle Galloway, Chief
Environmental Resources Section
US Army Corps of Engineers - Albuquerque
District
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Region 6
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US Forest Service, Southwestern Region
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Board of Directors
Mid-Region Council of Governments
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Representative
United States House of Representatives
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Washington DC 20515

The Honorable Teresa Leger Fernandez
Representative
United States House of Representatives
1432 Longworth House Office Building
Washington DC 20515

Ms. Stephanie Garcia Richard
Commissioner of Public Lands
New Mexico State Land Office
310 Old Santa Fe Trail
Santa Fe NM 87501

Ms. Sarah Cottrell Propst,
Cabinet Secretary
New Mexico Energy, Minerals and Natural Resources Department
Wendell Chino Building
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Santa Fe NM 87505

Commissioners
Bernalillo County Board of Commissioners
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Albuquerque NM 87102

Councilmember
Albuquerque City Councilmembers
PO Box 1293
Albuquerque NM 87103

Federal, State, and Local Agencies – Example Scoping Letter

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

12 February 2024

Colonel Michael J. Power, USAF
Commander
377th Air Base Wing
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Kirtland AFB NM 87117

Mr. Matt Wunder
Chief of Ecological & Environmental Planning
New Mexico Department of Game and Fish
One Wildlife Way
Santa Fe NM 87507

Dear Mr. Wunder

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) NEPA regulations, the Air Force Research Laboratory (AFRL) is preparing an Environmental Assessment (EA) to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed NUclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico.

The Proposed Action includes current and proposed future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range"). Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its Research, Development, Test, and Evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables per year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities per year, and conducting general clean-up activities on the Range.

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting RDT&E activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HPEM and HEL systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

The environmental analysis for the Proposed Action is being conducted by the USAF in accordance with the Council on Environmental Quality guidelines pursuant to the NEPA of 1969. In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we solicit your comments concerning the proposal and any potential environmental consequences of the action. If you have additional information regarding impacts of the Proposed Action on the natural environment or other environmental aspects of which we are unaware, we would appreciate receiving such information for inclusion and consideration during the NEPA compliance process.

A copy of the Final Description of the Proposed Action and Alternatives for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico is available at https://www.kirtland.af.mil/Home/Environment/. A hardcopy can also be provided upon request. We look forward to and welcome your participation in this process. Please respond within 30 days of receipt of this letter to ensure your concerns are adequately addressed in the EA.

Please send your written responses to Ms. Martha Garcia, Unit Environmental Coordinator AFRL/RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB, New Mexico 87117, or martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.01.03 14:47:57 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

1

Federal, State, and Local Agencies – Scoping Letter Responses

From: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI
To: Hannah Patel; BARE, MICHELLE; Long, Kristen M CIV USARMY CESPA (USA); OHTA, PRISCILLA W CIV USSF AFMC AFRL/RVOIF; MENDOZA, MARIA A CIV USSF AFMC AFRL/RVOI
Subject: [External] - Response from Sen. Heinrich"s Office FW: CHESTNUT Project
Date: Tuesday, February 27, 2024 1:50:51 PM
Attachments: image008.png
image009.png
image010.png
image011.png
image001.png
Letter from the Department of the Air Force[1].pdf
image006.png

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

From: SISNEROS, BRIANNE L CIV USAF AFGSC 377 MSG/CEIEC <brianne.sisneros@us.af.mil>
Sent: Tuesday, February 27, 2024 8:54 AM
To: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI <martha.garcia.3@spaceforce.mil>
Subject: FW: CHESTNUT Project

Good morning, Martha,
Please see forwarded correspondence below from Senator Heinrich's office.

Best,
Bre

Brianne L. Sisneros
NEPA Program Manager
brianne.sisneros@us.af.mil
505.846.6446

From: CLARK, MELISSA B CIV USAF AFGSC 377 MSG/CEI <melissa.clark.8@us.af.mil>
Sent: Tuesday, February 27, 2024 8:23 AM
To: SISNEROS, BRIANNE L CIV USAF AFGSC 377 MSG/CEIEC <brianne.sisneros@us.af.mil>
Subject: FW: CHESTNUT Project

FYI

Sent with BlackBerry Work
(www.blackberry.com)

Subject: [Non-DoD Source] CHESTNUT Project

Hi Eva,

Good morning!

I received the attached letter regarding the upgrade and maintenance of the Conventional High Explosive SimulaTed Nuclear Test Site and Joint Use Area.

Is it possible for us to schedule a site visit to the location so I can get a walk-through on the project?

Just let me know when you can.

Thank you,

Jason

Jason Jarvis
Field Representative | Office of U.S. Senator Martin Heinrich of New Mexico
400 Gold Avenue SW, Suite 1080, Albuquerque, N.M. 87102
E: Jason_Jarvis@Heinrich.Senate.Gov
T: (505) 346-6601
C: (505) 629-7069
Heinrich.Senate.Gov

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From: SCHNEIDER, GARY J CIV USAF AFGSC 377 MSG/CE <gary.schneider.2@us.af.mil>
Date: Tuesday, Feb 27, 2024 at 8:15 AM
To: CLARK, MELISSA B CIV USAF AFGSC 377 MSG/CEI <melissa.clark.8@us.af.mil>
Subject: FW: CHESTNUT Project

FYSA

From: OKUMURA, JASON K Col USAF AFGSC 377 MSG/CC <jason.okumura@us.af.mil>
Sent: Monday, February 26, 2024 8:37 PM
To: SCHNEIDER, GARY J CIV USAF AFGSC 377 MSG/CE <gary.schneider.2@us.af.mil>
Cc: VAN SLYKE, CHARLES CIV USAF AFGSC 377 MSG/CE2 <charles.van_slyke@us.af.mil>; FIFE, JAMES M CIV USAF AFGSC 377 MSG/CD <james.fife@us.af.mil>; KEDGE, MARIA C 1st Lt USAF AFGSC 377 MSG/CCE <maria.kedge@us.af.mil>
Subject: FW: CHESTNUT Project

Gary,

FYSA.

V/R,
Jason

From: BLAYLOCK, EVA D CIV USAF AFGSC 377 ABW/PA <eva.blaylock@us.af.mil>
Sent: Monday, February 26, 2024 11:56 AM
To: Jarvis, Jason (Heinrich) <Jason_Jarvis@heinrich.senate.gov>
Cc: BANKS, ONEIKA L CIV USAF AFGSC 377 ABW/PA <oneika.banks.1@us.af.mil>; ZUCH, OTHANA R CIV USAF AFMC AFRL/AFRL/QZX <othana.zuch@us.af.mil>; SMITH, ROBERT B CIV USAF AFGSC 377 ABW/PA <robert.smith.388@us.af.mil>; WAKEFIELD, SCOTT L CIV USAF AFGSC 377 ABW/PA <scott.wakefield.4@us.af.mil>; PERKINS, JESSIE L CIV USSF AFMC AFRL/QZX <jessie.perkins.2@spaceforce.mil>
Subject: RE: CHESTNUT Project

Good morning, Jason!
I am copying a few friends so we are all on the same page. (AFRL PA included - if I am missing others, please let them in the loop.)
As always, please let me know when and how you want to visit KAFB to learn more about this effort.

V/R,
Eva

From: Jarvis, Jason (Heinrich) <Jason_Jarvis@heinrich.senate.gov>
Sent: Monday, February 26, 2024 10:23 AM
To: BLAYLOCK, EVA D CIV USAF AFGSC 377 ABW/PA <eva.blaylock@us.af.mil>
Cc: BANKS, ONEIKA L CIV USAF AFGSC 377 ABW/PA <oneika.banks.1@us.af.mil>

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MICHELLE LUJAN GRISHAM
GOVERNOR

JAMES C. KENNEY
CABINET SECRETARY

April 1, 2024

United States Department of the Air Force
Colonel Michael J. Power, Commander
377th Air Base Wing
2000 Wyoming Blvd SE, Building 20604
Kirtland AFB, NM 87117

Submitted electronically to: Ms. Martha Garcia, martha.garcia.3@spaceforce.mil

RE: Environmental Assessment for projects related to Conventional High Explosive SimulaTed Nuclear Test (CHESTNUT) Site and Joint Use Areas on Kirtland Air Force Base in New Mexico

Dear Commander Power,

The New Mexico Environment Department (NMED) appreciates the opportunity to submit comments on the subject Environmental Assessment (EA), especially because some details are not clear. In this letter, NMED provides input to ensure the proposed construction, operation, maintenance, and removal of supporting infrastructure at facilities located on the Kirtland Air Force Base is done in accordance with applicable federal and NMED regulations and standards.

The request contains no actions that will impact storage tank systems currently regulated under 20.5 NMAC and does not propose the installation of new storage tank systems. If an abandoned storage tank system or petroleum impacted soil and/or water is discovered during construction, the Petroleum Storage Tank Bureau must be notified (20.5.118 NMAC, etc.) during business hours via the "Leak of the Week" at: https://www.env.nm.gov/petroleum_storage_tank/ or at 505-476-4397. During non-business hours, please call 505-827-9329.

Any asbestos waste generated during this project must be properly handled. Asbestos waste is considered a special waste under NMED's Solid Waste Rules, which require unique handling, transportation, and disposal requirements to assure protection of the environment and the public health, welfare and safety. The Solid Waste Rules, 20.9.8.12 NMAC, which deal with asbestos waste must be followed for the safety of the community and the environment. In addition, any solid waste generated during the project, should be disposed of properly at an approved transfer station or landfill. As it states in the Solid Waste Rules, 20.9.2.8.D NMAC, anyone who generates, stores, processes, transports or disposes of solid waste shall do so in a manner that does not create a public nuisance.

NMED notes that the EA specifies periodic cleanup activities but does not discuss sampling of cleanup wastes for a hazardous waste determination or provide any additional details regarding the handling of wastes generated at CHESTNUT. Waste materials that could have been potentially impacted by range activities must be characterized per 40 CFR 262.11 to determine if sufficient toxic metals/other chemicals or contamination by listed hazardous wastes would cause such cleanup wastes to be handled as hazardous waste. Materials meeting those criteria must be handled in accordance with applicable regulatory standards. Specifically, in the

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section regarding use by AFRL/RV, potential materials involved in testing included barium and chromium, which at sufficient concentrations would make graded environmental media and material otherwise contaminated with these elements a hazardous waste.

Once the CHESTNUT site is no longer in use, a Solid Waste Management Unit (SWMU) Assessment Report should be completed in accordance with the Hazardous Waste Permit Part 6.1.8 in order for NMED to evaluate whether the site should be added to the list of SWMUs.

Thank you for providing the opportunity to review the Environmental Assessment of the proposed action and alternatives.

Sincerely,

Jonas Armstrong

Digitally signed by Jonas Armstrong
Date: 2024.04.02 07:36:19 -06'00'

Jonas Armstrong, Director
Office of Strategic Initiatives

Cc: James C. Kenney, Cabinet Secretary, NMED
Courtney Kerster, Senior Advisor, Office of Governor Michelle Lujan Grisham
Dr. Sydney Lienemann, Deputy Cabinet Secretary of Administration, NMED
Zachary Ogaz, General Counsel, NMED
Rick Shean, Director, Resource Protection Division, NMED

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U.S. Department
of Transportation
Federal Aviation Administration

Southwest Region
10101 Hillwood Parkway
Fort Worth, TX 76177

February 16, 2024

Colonel Michael J. Power, USAF
Commander
377th Air Base Wing
2000 Wyoming Boulevard SE, Building 20604
Kirtland AFB NM 87117

Dear Colonel Power,

This is in response to your February 12, 2024, correspondence concerning the future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area. You requested information regarding impacts of the Proposed Action on the natural environment or other environmental aspects of which you are unaware.

As set forth in Title 14 of the Code of Federal Regulations Part 77, Objects that Affect the Navigable Airspace, the prime concern of the Federal Aviation Administration is the effect of certain proposed construction on the safe and efficient use of the navigable airspace.

To accomplish this mission, aeronautical studies are conducted based on information provided by sponsors on FAA Form 7460-1, Notice of Proposed Construction or Alteration. If your organization is planning to sponsor any construction or alterations that may affect navigable airspace, you must file FAA Form 7460-1 electronically via:
https://oeaaa.faa.gov/oeaaa/external/portal.jsp.

For additional information and assistance, please feel free to contact the Obstruction Evaluation Group via email, OEGroup@faa.gov, at 10101 Hillwood Parkway, Fort Worth, Texas, 76177, or (817) 222-5954.

Sincerely,

ROBERT R LOWE
Digitally signed by ROBERT R LOWE
Date: 2024.02.26 11:23:39 -06'00'

Rob Lowe
Regional Administrator,
Southwest Region

CC: Obstruction Evaluation Group, AJV-A520

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Joint Land Use Study Memorandum of Understanding – Scoping Letter Distribution List

Mr. Jim Bordegaray, Director
Commercial Resources Division
New Mexico State Land Office
PO Box 1148
Santa Fe NM 87504

Ms. Catherine VerEecke
Development Manager/Department Director
Bernalillo County Planning Section
111 Union Square SE, Suite 100
Albuquerque NM 87102

Joint Land Use Study Memorandum of Understanding – Example Scoping Letter

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

12 February 2024

Colonel Michael J. Power, USAF
Commander
377th Air Base Wing
2000 Wyoming Boulevard SE, Building 20604
Kirtland AFB NM 87117

Mr. Jim Bordegaray, Director
Commercial Resources Division
New Mexico State Land Office
PO Box 1148
Santa Fe NM 87504

Dear Mr. Bordegaray

As set forth in the Kirtland Air Force Base (AFB) – New Mexico State Land Office Joint Land Use Study Memorandum of Understanding, and as required by the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) NEPA regulations, the Air Force Research Laboratory (AFRL) is preparing an Environmental Assessment (EA) to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed NUclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico.

The Proposed Action includes current and proposed future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range"). Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its Research, Development, Test, and Evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables per year, installing and removing up to 20 test structures/concrete pads/dirt berms per year, and conducting general clean-up activities on the Range.

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue current testing activities and implement future testing activities, as well as to construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting RDT&E activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HPEM and HEL systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

In accordance with Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, as amended by EO 12416, *Intergovernmental Review of Federal Programs*, I am requesting your participation in the NEPA document review and comment process. A copy of the Final Description of the Proposed Action and Alternatives for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico is available at https://www.kirtland.af.mil/Home/Environment/. A hardcopy can also be provided upon request. We look forward to and welcome your participation in this process. Please respond within 30 days of receipt of this letter to ensure your concerns are adequately addressed in the EA.

Please send your written responses to Ms. Martha Garcia, Unit Environmental Coordinator AFRL/RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB, New Mexico 87117, or martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.01.03 16:49:00 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

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U.S. Fish and Wildlife Service - Distribution List

Ms. Amy Leuders, Regional Director
US Fish and Wildlife Service, Southwest Regional Office
500 Gold Ave. SW
Albuquerque NM 87102

U.S. Fish and Wildlife Service – Scoping Letter

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

12 February 2024

Colonel Michael J. Power
Commander
377th Air Base Wing
2000 Wyoming Boulevard SE Bldg 20604
Kirtland Air Force Base NM 87117

Ms. Amy Leuders
Regional Director
U.S. Fish and Wildlife Service, Southwest Regional Office
500 Gold Avenue SW
Albuquerque NM 87102

Dear Ms. Leuders

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) NEPA regulations, the Air Force Research Laboratory (AFRL) is preparing an Environmental Assessment (EA) to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico.

The Proposed Action includes current and proposed future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range"). Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its Research, Development, Test, and Evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables per year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities per year, and conducting general clean-up activities on the Range.

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue current testing activities and implement future test activities, as well as to construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting RDT&E activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HPEM and HEL systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

Pursuant to Section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 United States Code 1531, et seq.), Kirtland AFB conducted an effect determination for the Proposed Action. All interrelated and interdependent actions were analyzed during that review. The United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) Official Species and Habitat List was received on 8 July 2023 under Consultation Code 2023-0105806. The USFWS IPaC tool listed a total of six federally listed threatened or endangered species with the potential to occur within the project area, including the New Mexico Meadow Jumping Mouse (Zapus hudsonius luteus), Mexican Spotted Owl (Strix occidentalis lucida), Southwestern Willow Flycatcher (Empidonax traillii extimus), Yellow-billed Cuckoo (Coccyzus americanus), Rio Grande Silvery Minnow (Hybognathus amarus), and Monarch Butterfly (Danaus plexippus). However, due to the active nature of the proposed project areas, it is unlikely that suitable habitat exists within these areas. To ensure no impact, an updated species list from USFWS is required to be obtained within 90 days of starting construction activities.

If you have additional information regarding impacts of the Proposed Action on the natural environment or other environmental aspects of which we are unaware, we would appreciate receiving such information for inclusion and consideration during the NEPA compliance process. A copy of the Final Description of the Proposed Action and Alternatives for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico is available at https://www.kirtland.af.mil/Home/Environment/. A hardcopy can also be provided upon request. We look forward to and welcome your participation in this process. Please respond within 30 days of receipt of this letter to ensure your concerns are adequately addressed in the EA.

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Please contact my office at (505) 846-7377 if you would like to discuss the proposed project or proceed with the Section 7(a)(2) consultation. Please send your written response to Ms. Martha Garcia, Unit Environmental Coordinator AFRL/RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB, New Mexico 87117, or martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.01.03 16:52:09 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

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1 **U.S. Fish and Wildlife Service – Scoping Letter Response**

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque, New Mexico 87113
Telephone 505-346-2525 Fax 505-346-2542
www.fws.gov/southwest/es/newmexico/

March 13, 2024

Cons# 2023-0105806

Martha Garcia
Unit Environmental Coordinator
AFRL/RV & RD
Building 464, Room 405
3550 Aberdeen Avenue SE
Kirtland AFB, New Mexico 87117

Dear Ms. Garcia:

The U.S. Fish and Wildlife Service (Service) received your letter dated February 12, 2024, requesting our comments for the preparation of a draft Environmental Assessment (EA) for the proposed Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site (CHESTNUT) and Joint Use Area on Kirtland Air Force Base (AFB), New Mexico. The CHESTNUT and Joint Use Areas combine to form an 800-acre range that includes 300 acres of an approved explosive range, plus approximately 500 acres that serve as a buffer between this site and other ranges at Kirtland AFB. The proposed project would include research and development of directed energy devices including high energy lasers and high power electromagnetics using targets such as drones, cased munitions, and electronics; experiments to study plasma effects in the ionosphere using generation of metallic vapor; and supporting infrastructure that would include the construction and maintenance of up to 25,000 feet of underground cables and 20 pads, berms, and other structures on the range.

We have reviewed the information within the project's Description of Proposed Action and Alternatives (DOPAA), and information contained within our files. Your letter indicated that the project's submission to the Service's Information for Planning and Consultation tool returned a total of six federally threatened, endangered, proposed or candidate species with the potential to occur within the project area, including the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*), Mexican spotted owl (*Strix occidentalis lucida*), southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus*), Rio Grande silvery minnow (*Hybognathus amarus*), and monarch butterfly (*Danaus plexippus*). You concluded that it is unlikely that suitable habitat for any listed species exists within these areas. We interpret this statement as a "no effect" determination pursuant to Section 7(a)(2) of the Endangered Species Act of 1973, as amended (16 United States Code 1531, et seq.), but also

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note that the DOPAA contains a statement that a "request for concurrence" per the ESA and its implementing regulations will be transmitted to the Service. Although the ESA does not require Federal agencies to consult with the Service if the action agency determines their action will have "no effect" on threatened or endangered species or designated critical habitat (50 CFR 402.12), we request confirmation that you have made a "no effect" determination, and appreciate your notification of these determinations.

In addition to an understanding of the potential for occurrence of ESA listed species indicated above, the Kirtland AFB natural resources program has conducted long-term monitoring of a variety of Service-identified Birds of Conservation Concern and state Species of Greatest Conservation Need. These data are valuable in helping to understand the status of wildlife, habitat, and other natural resources at Kirtland AFB, and we recommend that the project's EA incorporate current survey and monitoring results from these efforts within the Affected Environment and Environmental Consequences section of the EA to be developed. To better understand the degree of potential effects to migratory birds and other resources, we also recommend that the EA's project description of directed energy testing provide additional detail on the distance and elevation (similar to what was included for the vaporization experiments) of targets such as drones that are utilized in these tests. Finally, we recommend that the EA provide additional detail on the geographic scope of rodent removals, to clarify whether these would occur strictly at developed structures, or expand into the less disturbed areas where species such as Gunnison's prairie dogs (*Cynomys gunnisoni*) and their burrows that support burrowing owls (*Athene cunicularia*) could occur, if those species may be present on the CHESTNUT or Joint Use Area ranges.

Thank you for the opportunity the review the DOPAA for this project, and for your concern for threatened and endangered species and New Mexico's wildlife resources. If you have questions or could benefit from technical assistance from the Service at any time during planning or implementation of this project, please contact Chuck Hayes of my staff at the letterhead address, or by electronic mail at charles_hayes@fws.gov.

Sincerely,

JODIE MAMUSCIA
Digitally signed by JODIE MAMUSCIA
Date: 2024.03.13 08:45:53 -06'00'

(For) Shawn Sartorius
Field Supervisor

1

State Historical Preservation Office – Distribution List

Dr. Jeff Pappas, PhD
State Historic Preservation Officer and Director
New Mexico Historic Preservation Division
Department of Cultural Affairs
Bataan Memorial Building
407 Galisteo Street Suite 236
Santa Fe NM 8750

State Historical Preservation Office – Scoping Letter

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

12 February 2024

Colonel Michael J. Power
Commander
377th Air Base Wing
2000 Wyoming Boulevard SE Bldg 20604
Kirtland Air Force Base NM 87117

Dr. Jeff Pappas, PhD
State Historic Preservation Officer and Director
New Mexico Historic Preservation Division, Department of Cultural Affairs
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe NM 87501

Dear Dr. Pappas

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) NEPA regulations, the Air Force Research Laboratory (AFRL) is preparing an Environmental Assessment (EA) to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico (see attachment, figure 1).

The Proposed Action includes current and proposed future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range"). Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its Research, Development, Test, and Evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site

preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables per year, installing and removing up to 20 test structures/concrete pads/dirt berms per year, and conducting general clean-up activities on the Range. The Range encompasses approximately 800 acres (see attachment, figure 2).

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue current testing activities and implement future test activities, as well as to construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting RDT&E activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HPEM and HEL systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

USAF has determined that the Area of Potential Effects (APE) for this Undertaking encompasses approximately 800 acres where ground-disturbing and testing activities would occur and a 1-mile buffer where indirect effects to cultural resources could occur (see attachment, figure 3). Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 (36 Code of Federal Regulations Part 800), as amended, the USAF would like to initiate consultation concerning the Proposed Action to allow you the opportunity to identify any comments, concerns, and suggestions you might have.

A copy of the Final Description of the Proposed Action and Alternatives for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico is available at https://www.kirtland.af.mil/Home/Environment/. As we move forward through this process, we welcome your participation and input.

As noted above, the USAF would like to initiate consultation pursuant to Section 106 of the NHPA concerning this Undertaking and is seeking concurrence on the APE, as defined. Please send/your written responses to Ms. Martha Garcia, Unit Environmental Coordinator AFRL/RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB, New Mexico 87117, or martha.garcia.3@spaceforce.mil. Please contact Mr. David Reynolds, Cultural Resources Program Manager, at david.reynolds.37@us.af.mil if you have any technical questions.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.01.03 16:50:11 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Attachment:
Figures

1

Figure 1. Overview Map

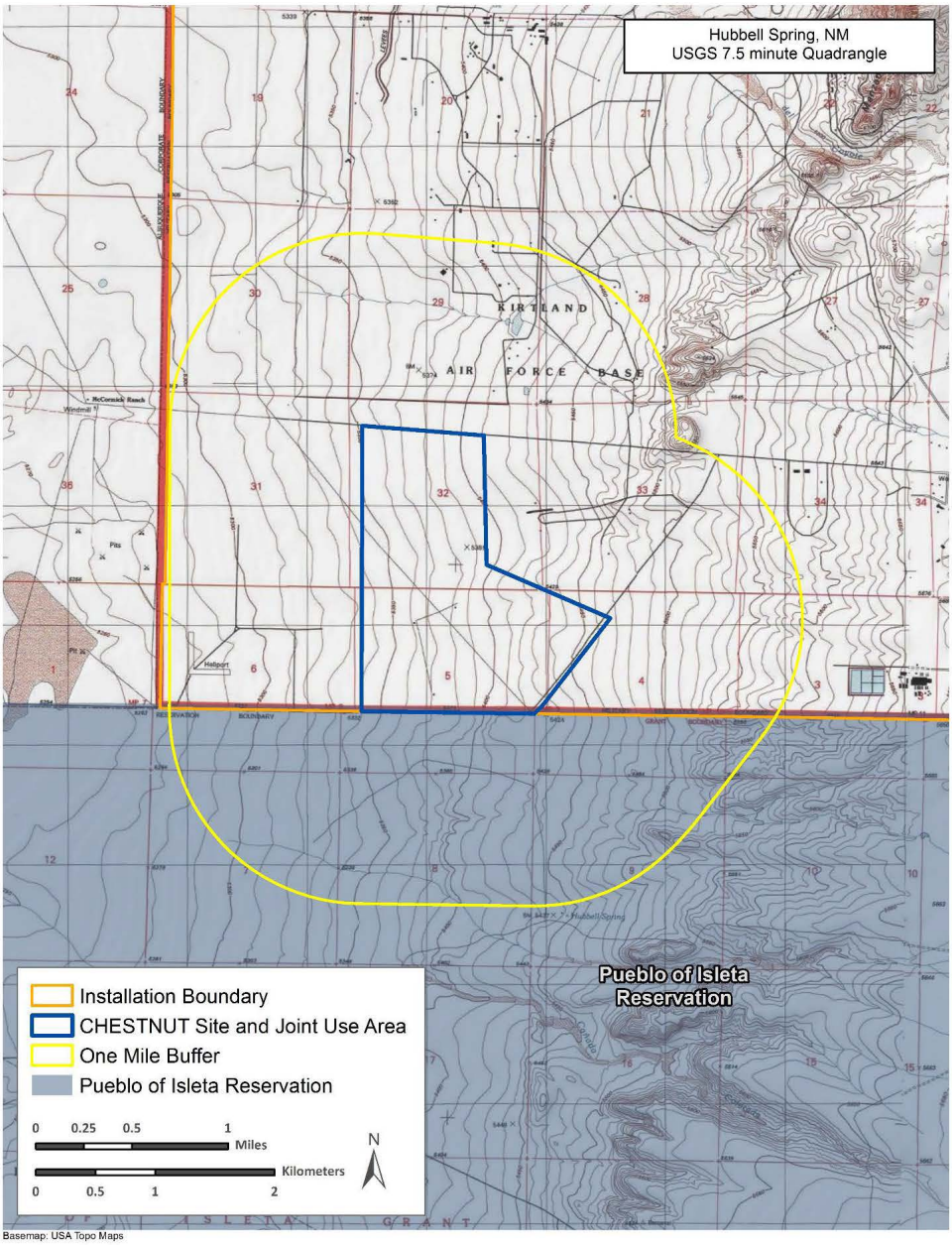


Figure 2. USGS 7.5' Quad with 1-Mile Buffer

1

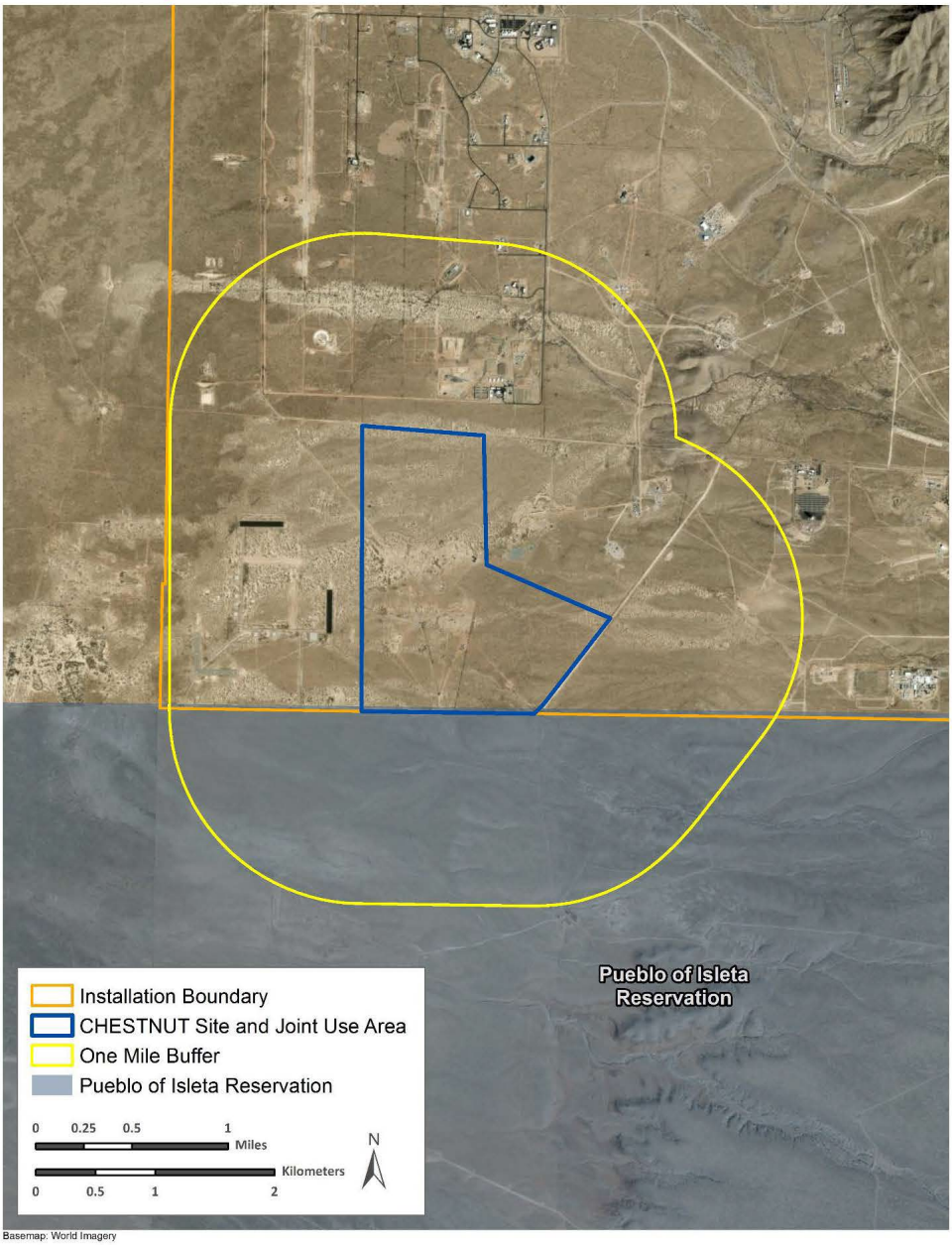


Figure 3. Aerial Map with 1-Mile Buffer

Native American Tribes – Distribution List

Governor Randall Vicente
Pueblo of Acoma
PO Box 309
Acoma Pueblo NM 87034

Governor Joel Aquero
Pueblo of Cochiti
PO Box 70
Cochiti Pueblo NM 87072

Chairman Timothy L. Nuvangyaoma
The Hopi Tribe
PO Box 123
Kykotsmovi AZ 86039

Governor Max Zuni
Pueblo of Isleta
PO Box 1270
Isleta NM 87022

Governor Peter Madalena
Pueblo of Jemez
PO Box 100
Jemez Pueblo NM 87024

President Sonja Newton
Jicarilla Apache Nation
PO Box 507
Dulce NM 87528

Governor Wilfred Herrera
Pueblo of Laguna
PO Box 194
Laguna NM 87026

President Eddy Martinez
Mescalero Apache Tribe
PO Box 227
Mescalero NM 88340

Governor Nathaniel Porter
Pueblo of Nambe
15A NP102 West
Santa Fe NM 87506

President Buu Nygren
Navajo Nation
PO Box 7440
Window Rock AZ 86515

Governor Larry Phillips, Jr.
Ohkay Owingeh
PO Box 1099
San Juan Pueblo NM 87566

Governor Craig Quanchello
Pueblo of Picuris
PO Box 127
Peñasco NM 87553

Governor Jenelle Roybal
Pueblo of Pojoaque
78 Cities of Gold Road
Santa Fe NM 87506

Governor Felix Chaves
Pueblo of Sandia
481 Sandia Loop
Bernalillo NM 87004

Governor Anthony Ortiz
Pueblo of San Felipe
PO Box 4339
San Felipe Pueblo NM 87001

Governor Christopher Moquino
Pueblo of San Ildefonso
02 Tunyo Po
Santa Fe NM 87506

Governor Myron Armijo
Pueblo of Santa Ana
2 Dove Road
Santa Ana Pueblo NM 87004

Governor J. Michael Chavarria
Pueblo of Santa Clara
PO Box 580
Española NM 87532

Governor Frank P. Nieto
Pueblo of Santo Domingo
PO Box 99
Santo Domingo Pueblo NM 87052

Governor Fred L. Romero
Pueblo of Taos
PO Box 1846
Taos NM 87571

Governor Milton Herrera
Pueblo of Tesuque
Route 42 Box 360-T
Santa Fe NM 87506

Chairman Kasey Velasquez
White Mountain Apache Tribe
PO Box 700
Whiteriver AZ 85941

Governor E. Michael Silvas
Ysleta del Sur Pueblo
P119 S. Old Pueblo Road
Ysleta del Sur TX 79917

Governor Ben Shije
Pueblo of Zia
135 Capitol Square Drive
Zia Pueblo NM 87053

Governor Arden Kucate
Pueblo of Zuni
PO Box 339
Zuni NM 87327

Chairman Manuel Heart
Ute Mountain Ute Tribe
PO Box JJ
Towaoc CO 81334

Chairwoman Lori Gooday-Ware
Fort Sill Apache Tribe of Oklahoma
Rt 2, Box 121
Apache OK 73006

Chairman Durell Cooper
Apache Tribe of Oklahoma
PO Box 1330
Anadarko OK 73005

Chairman Lawrence SpottedBird
Kiowa Tribe of Oklahoma
PO Box 369
Carnegie OK 73015

Chairman Mark Woommavovah
Comanche Nation of Oklahoma
PO Box 908
Lawton OK 73502

President Walter Echo-Hawk
Pawnee Nation of Oklahoma
PO Box 470
Pawnee OK 74058

Chairman Terry Rambler
San Carlos Apache Tribe
PO Box 0
San Carlos AZ 85550

Chairman Melvin J. Baker
Southern Ute Indian Tribe
PO Box 737
Ignacio CO 81137

Chairman Mark Mitchell
All Pueblo Council of Governors
2401 12th Street NW
Albuquerque NM 87103

Mr. Joshua Madalena, Executive Director
Five Sandoval Indian Pueblos
4321-B Fulcrum Way NE
Rio Rancho NM 87144

Mr. Gilbert Vigil, Executive Director
Eight Northern Indian Pueblos Council
327 Eagle Drive
Ohkay Owingeh NM 87566

Honorable Crystalyne Curley
Speaker of the Navajo Nation
25th Navajo Nation Council
PO Box 3390
Window Rock AZ 86515

Native American Tribes – Example Scoping Letter

DEPARTMENT OF THE AIR FORCE
377TH AIR BASE WING (AFGSC)

12 February 2024

Colonel Michael J. Power, USAF
Commander
377th Air Base Wing
2000 Wyoming Boulevard SE, Building 20604
Kirtland AFB NM 87117

Governor Randall Vicente
Pueblo of Acoma
PO Box 309
Acoma Pueblo NM 87034

Dear Governor Vicente

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) NEPA regulations, the Air Force Research Laboratory (AFRL) is preparing an Environmental Assessment (EA) to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed NUclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico (see attachment, figure 1).

The Proposed Action includes current and proposed future test activities conducted by the USAF, US Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the CHESTNUT Site and Joint Use Area (collectively hereafter referred to as "the Range"). Under the Proposed Action, AFRL/Directed Energy Directorate (RD) would continue to integrate directed energy (DE) technology into warfighter vehicles and evaluate DE weapon systems effectiveness on the Range. DE devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM engagements on various targets to include explosives, munitions, electronics, small unmanned aircraft systems, and unmanned aerial vehicles. AFRL/RD would also continue to evaluate radar systems to be used in the detection and tracking of potential threat small unmanned aerial systems. The AFRL Space Vehicle Directorate proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its Research, Development, Test, and Evaluation (RDT&E) activities to counter, deter, and defeat weapons of mass destruction (WMD) and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables per year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities per year, and conducting general clean-up activities on the Range.

The purpose of the Proposed Action is for the USAF, USSF, and DTRA users to continue current testing activities and implement future test activities, as well as to construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting RDT&E activities on the Range on Kirtland AFB. The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) AFRL/RD for testing and training with explosives, HPEM and HEL systems, and drones; (2) AFRL/RV for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into the deterrence of WMD and improvised explosive devices; and (4) 377 MSG/EOD for explosive handling and emergency operations.

USAF has determined that the Area of Potential Effects (APE) for this Undertaking encompasses approximately 800 acres where ground-disturbing and testing activities would occur and a 1-mile buffer where indirect effects to cultural resources could occur (see attachment, figures 2 and 3). Pursuant to Section 106 of the National Historic Preservation Act (36 Code of Federal Regulations Part 800), the USAF would like to initiate government-to-government consultation to allow you and your designee the opportunity to identify any comments, concerns, and suggestions relevant to the NEPA compliance process concerning the Proposed Action. A copy of the Final Description of the Proposed Action and Alternatives for the Environmental Assessment Addressing Test Activities and Infrastructure Improvements at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area on Kirtland Air Force Base, New Mexico is available at https://www.kirtland.af.mil/Home/Environment/. As we move forward through this process, we welcome your participation and input.

As noted above, the USAF would like to initiate government-to-government consultation pursuant to Section 106 of the NHPA concerning this Undertaking and is seeking concurrence on the APE, as defined. Please contact my office at (505) 846-7377 if you would like to meet to discuss the proposed project or proceed with the Section 106 consultation. Please contact Mr. David Reynolds, Cultural Resources Program Manager, at david.reynolds.37@us.af.mil if you have any technical questions.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.01.03 16:51:19 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Attachment:
Figures

1

2

Figure 1. Overview Map

1

2

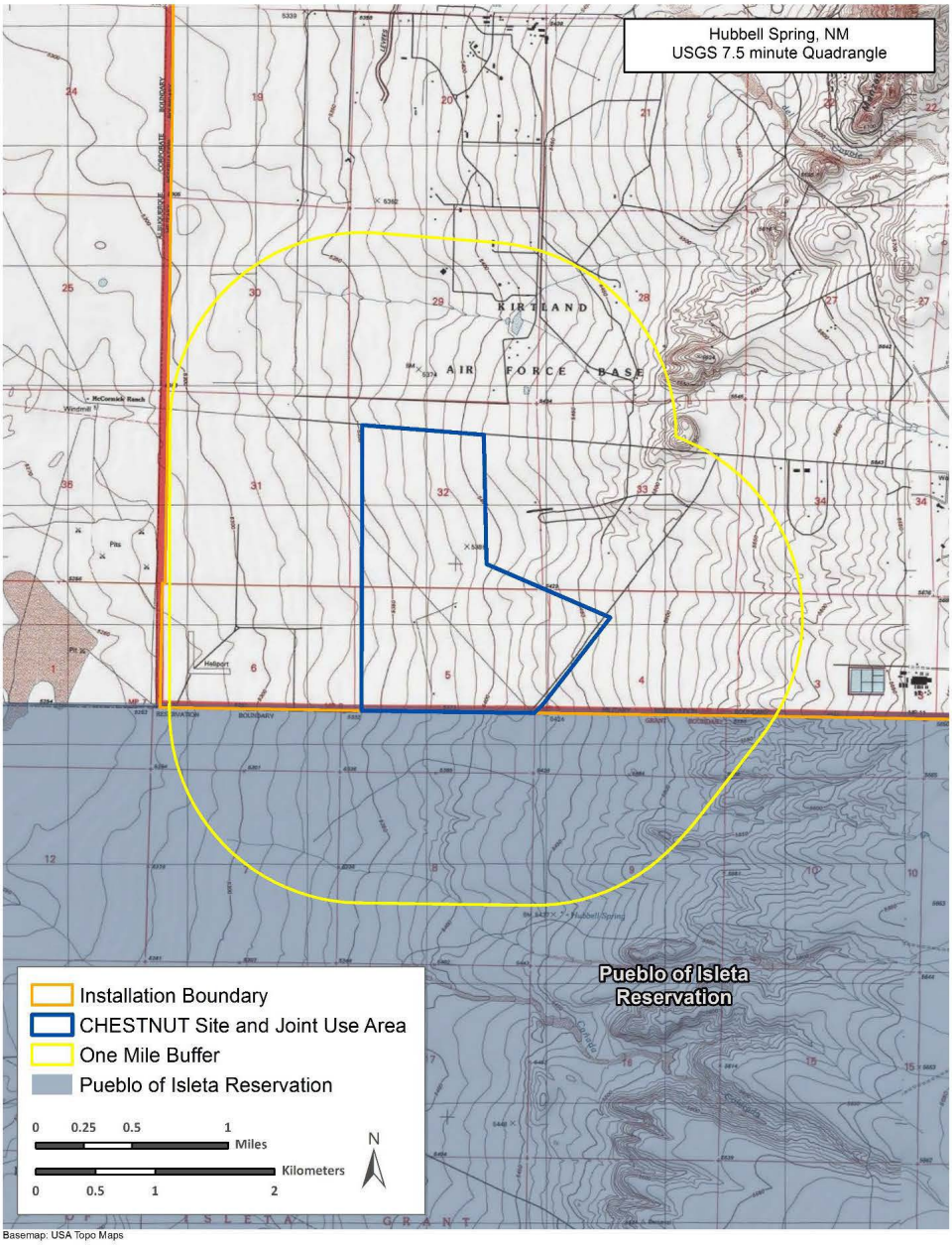


Figure 2. USGS 7.5' Quad with 1-Mile Buffer

1

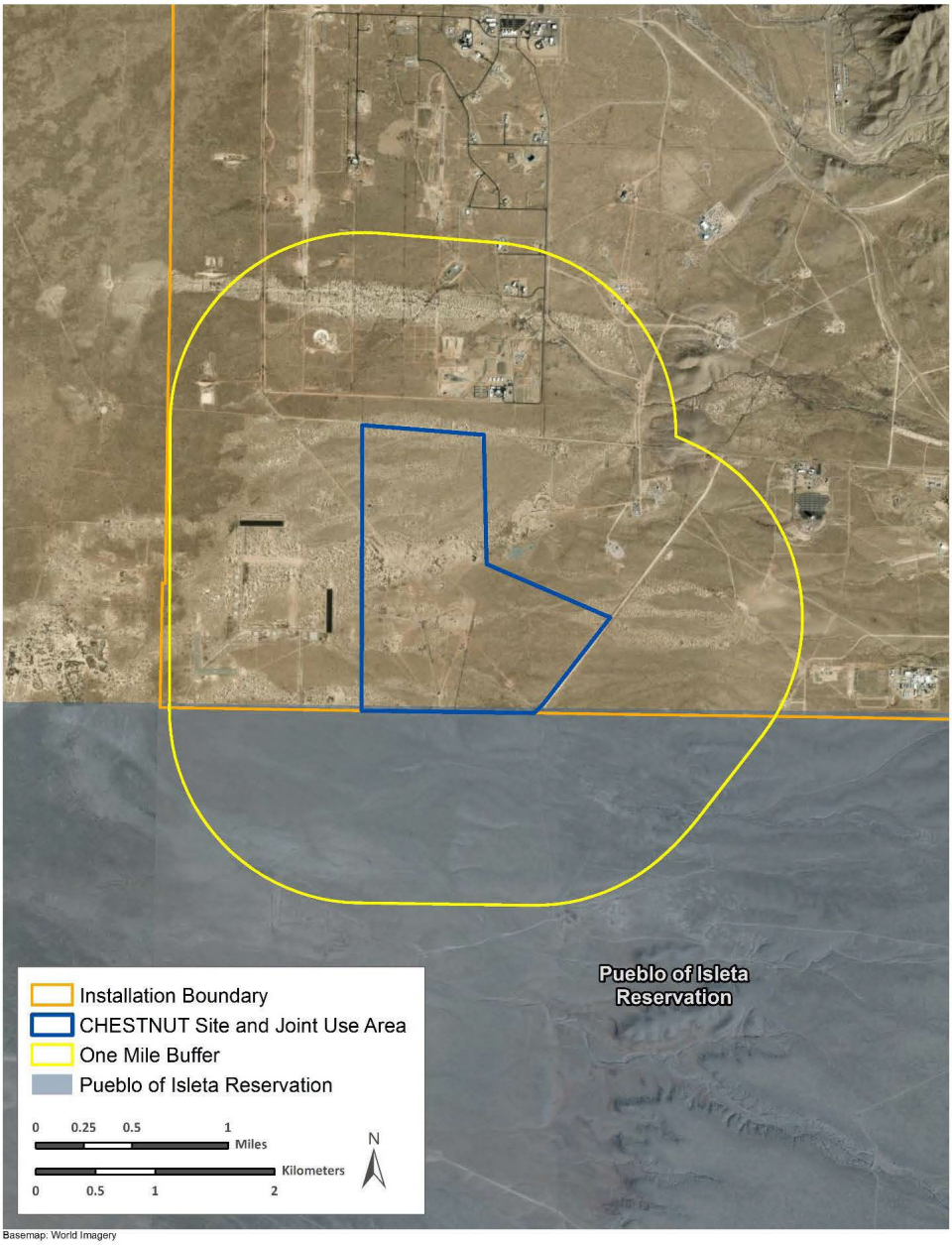


Figure 3. Aerial Map with 1-Mile Buffer

Native American Tribes –Scoping Letter Responses

From:	GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI
To:	Hannah Patel; BARE, MICHELLE; Sarah Thompson
Cc:	Long, Kristen M CIV USARMY CESPA (USA); Nicolas Frederick
Subject:	[External] - FW: Conventional High Explosive Simulated Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico
Date:	Friday, March 22, 2024 3:53:40 PM
Attachments:	image001.png

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Ladies, Ysleta del Sur Pueblo response is below. Martha

From: REYNOLDS, DAVID H CIV USAF AFGSC 377 MSG/CEIEC <david.reynolds.37@us.af.mil>
Sent: Friday, March 22, 2024 1:41 PM
To: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI <martha.garcia.3@spaceforce.mil>; SISNEROS, BRIANNE L CIV USAF AFGSC 377 MSG/CEIEC <brianne.sisneros@us.af.mil>
Subject: FW: Conventional High Explosive Simulated Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico

From: Omar Villanueva <ovillanueva@ydsp-nsn.gov>
Sent: Wednesday, March 13, 2024 2:57 PM
To: REYNOLDS, DAVID H CIV USAF AFGSC 377 MSG/CEIEC <david.reynolds.37@us.af.mil>
Subject: [Non-DoD Source] Conventional High Explosive Simulated Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico

> You don't often get email from ovillanueva@ydsp-nsn.gov. Learn why this is important

Dear David Reynolds,

This email is in response to the correspondence received in our office in which the USAF would like to initiate government-to-government consultation to address the potential environmental impacts associated with the continuation of current test activities and implementation of future test activities, as well as construction, operation, maintenance, and removal of supporting infrastructure at the Conventional High Explosive SimulaTed Nuclear Test (CHESTNUT) Site and Joint Use Area on Kirtland Air Force Base (AFB) in New Mexico.

While the Ysleta del Sur Pueblo does not wish to consult at the moment, we do have a concern. How would this affect the Pueblo of Isleta lands? What are some of the anticipated cultural resources impacts? These are some of our concerns.

We thank you for allowing Ysleta del Sur Pueblo the opportunity to comment on this proposed project.

Sincerely,

Omar Villanueva
Tribal Council Assistant
Ysleta del Sur Pueblo
(915) 342-2557
ovillanueva@ydsp-nsn.gov

1

APPENDIX B

CLASS G AIRSPACE ACCESS APPROVAL FOR AFRL/RD

1

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE RESEARCH LABORATORY
WRIGHT-PATTERSON AIR FORCE BASE

7 June 2022

MEMORANDUM FOR AFRL/RD

FROM: AFRL/DOO
1864 4TH ST, BLDG 18, RM 008
Wright-Patterson Air Force Base, OH 45433

SUBJECT: Class G Airspace Access Approval

1. The Memorandum of Understanding (MOU) between the Department of Defense (DoD) and the Federal Aviation Administration (FAA) concerning the operation of DoD Unmanned Aircraft Systems in the National Airspace System streamlines the COA process for DoD operations. As a result, this memo provides the authorization to operate AFRL/RD Unmanned Aircraft Systems (UAS) within the confines listed below. The attached Airspace Access Approval 2021-CSA-9715-USAF13-DoD is valid from 7 June 2022 to 6 June 2024 unless rescinded by the FAA or AFRL.

2. Procedures outlined within Airspace Access Approval 2021-CSA-9715-USAF13-DoD (attachment), and any local operating procedures, serves as the operational guidance for Group 1 operations in the vicinity of Kirtland AFB, Chestnut and HERT F areas.

3. In the event of an accident/incident, follow the accident/incident reporting procedures in the Unexpected Events Worksheet.

4. Unit is responsible to conduct UAS operations IAW Deputy SECDEF Policy Memorandum dated 18 August 2018, "Guidance for the Domestic Use of Unmanned Aircraft Systems in U.S. National Airspace".

5. Unit is responsible to ensure that appropriate frequency authorization is obtained for the operational airspace identified in the attached Airspace Access Approval.

6. Unit is responsible to ensure that a current approved cyber exemption is obtained for all SUAS utilized.

7. Only SUAS that have an approved airworthiness will be utilized.

8. Please provide monthly usage reports for scheduled test and/or training operations to afrl.do.workflow@us.af.mil. Flight reporting not required during planned downtimes. **Attn: Flight Reporting** NLT 5th day of each month for the month prior.

9. If you have any questions please contact AFRL/DOO, AFRL.DOO.Workflow@us.af.mil. As of Apr 2022, Maj Eric Vander Wyst, Comm 937-904-6591, Email: eric.vander_wyst.1@us.af.mil, is located within AFRL/DOO.

ERIC M. VANDER WYST, Maj, USAF
Chief, Operations Support Division

Attachment: Airspace Access Approval Number: 2021-CSA-9715-USAF13-DoD

Attachment – Airspace Access Approval 2021-CSA-9715-USAF13-DoD

Issued To: AFRL/RD

Activity: Operation of the Group 1 Unmanned Aircraft System (UAS) in Class G Airspace, as outlined in the Operations Area, at or below 700 feet Above Ground Altitude (AGL).

Purpose: To prescribe UAS operating requirements in the National Airspace System (NAS) for the purpose of test and/or training flights.

Dates of Use: This Airspace Access Approval is valid from 29 April 2022 to 28 April 2024. Should a renewal become necessary, the operators will advise AFRL/DOO, in writing, no later than 45 business days prior to the requested renewal date.

General:

1. All personnel connected with the SUAS operation must read and comply with the contents of this approval and its provisions.

2. A copy of this Airspace Access Approval must be immediately available to all operational personnel at each operating location whenever UAS operations are being conducted.

3. This approval may be canceled when it is no longer required, there is an abuse of its provisions, or when unforeseen safety factors develop. Failure to comply with the approval is cause for cancellation.

4. This Airspace Access Approval does not, in itself, waive any Title 14 Code of Federal Regulations, nor any state law or local ordinance. Should the proposed operation conflict with any state law or local ordinance, or require permission of local authorities or property owners, it is the responsibility of AFRL/RD to resolve the matter. This Airspace Access Approval does not authorize flight within regulatory Special Use Airspace without approval from the using agency.

5. A NOTAM must be issued through the local base operations or NOTAM issuing authority, or by contacting the Lockheed Martin Flight Service Station NOTAM Office at 1-877-4-US-NTMS (1-877-487-6867) not more than 72 hours in advance, but not less than 48 hours prior to the operation. Be prepared to provide the following information:
   a. Location, altitude, or operating area.
   b. Time and nature of the activity.

6. Visual observers must be used at all times to ensure see-and-avoid requirements are met and must have and maintain instantaneous communication with the pilot. The pilot is responsible to ensure visual observers are able to see the air vehicle and the surrounding airspace throughout the entire flight, and provide the pilot with the UAS's flight path, and proximity to all aviation activities and other hazards (e.g., terrain, weather, structures) sufficiently to exercise effective control of the UAS.

7. The UAS must be shown to be airworthy to conduct flight operations in the NAS. The UAS must be operated in strict compliance with all provisions and conditions contained in the Airworthiness Safety Release (ASR), Initial Flight Clearance (IFC), Military Flight Release (MFR) or Airworthiness Release (AWR) including all documents and provisions referenced. It is the responsibility of the unit to ensure all supporting documents, i.e. frequency spectrum approval, pilot training, medical clearances, etc., are current and valid for the operations being performed.

8. Multiple UASs may be controlled from a single control station only if an approved 'Multi-Vehicle Operations' Threat Hazard Assessment (THA) has been reviewed and approved by the Safety Review Board (SRB).

9. The pilot is responsible for halting or canceling activity in the approved operating area if, at any time, the safety of persons or property on the ground or in the air is in jeopardy.

10. Do not conduct operations over populated areas, heavily trafficked roads, or an open-air assembly of people, unless authorized in the Airworthiness documentation.

11. If equipped, the UAS must operate with;
    a. An operational mode 3/A transponder with altitude encoding, or mode S transponder (preferred) set to an ATC assigned squawk.
    b. Position/navigation and anti-collision lights on at all times during flight unless stipulated in the test plan.

Specific:

1. Range/Host Nation/ Individual Crew Coordination:

   Prior to operations, coordination will be made between the flight operations team and the Albuquerque International Sunport (KABQ) TRACON (Terminal Radar Approach Control). Proper coordination includes publishing a NOTAM at least 48 hours prior to operation, a same-day notice to the control tower/TRACON and a day-of communications check and approval to operate. The crew will have adequate rest before arriving on test days.

2. PIC to Observers and ATC Communication Requirements:

   The PIC and Observers must stay within a reasonable distance to communicate vocally. If an incident requiring ATC coordination occurs, the team will contact the Albuquerque Tower (KABQ) at 505-856-4935/4900/4903/4904.

3. Emergency/Contingency Procedures:

In the event of an accident/mishap, all operations will cease immediately and the AFRL Unexpected Event Worksheet will be used. The initial response is:

• Ensure everyone is safe and contact emergency services, if needed.
• Minimize fire damage to wreckage, if applicable.
• Do not disturb the accident scene – preserve all wreckage and surrounding areas in their original state.
• Move or change things at the scene only in the interest of safety. Photograph the site before and after anything is disturbed. Take lots of pictures so an investigator can easily retrace the situation before it was changed.
• Gather pertinent personal information from everyone at the scene (name, duty, title, office symbol, contact information).
• Gather witness statements as soon as possible to ensure clarity and freshness of memory. Write down exactly what was personally witnessed.
• Follow the contact procedures on the front of the AFRL Unexpected Events Worksheet. For a Class A, B, or C mishap, notification to identified contacts must be reported as soon as possible but no later than 8 hours after occurrence in order to prepare the OPREP. For Class E events occurring after normal home office duty hours, report incident to AFRL Flight Safety within 8 hours and all other contacts on the next business day.

For Class A, B, or C mishaps, notify the Tech Directorate's Executive Officer or Tech Director to initiate OPREP-3 reporting procedures IAW AFI10-206 AFMCSUP 1.

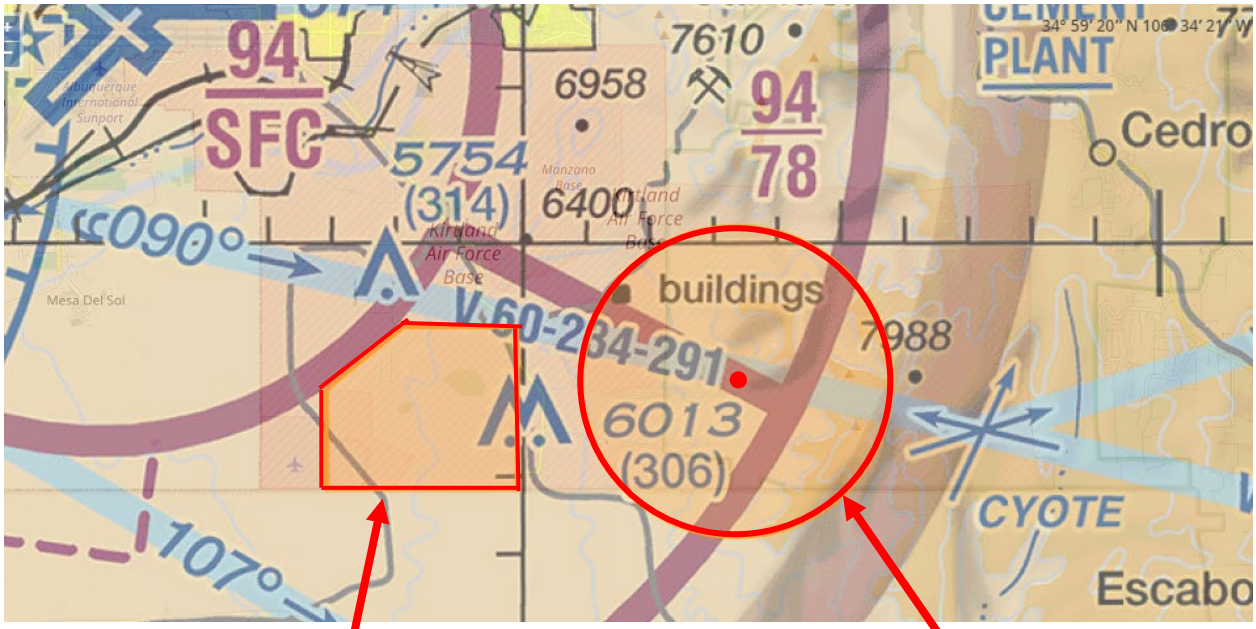
• Wait for guidance from range safety, a trained safety investigator, or HQ safety personnel before removing, cleaning, or disturbing a crash site.

Attachment – Airspace Access Approval 2021-CSA-9715-USAF13-DoD

In addition to the entities on the Unexpected Events Worksheet, the following facilities will be contacted:

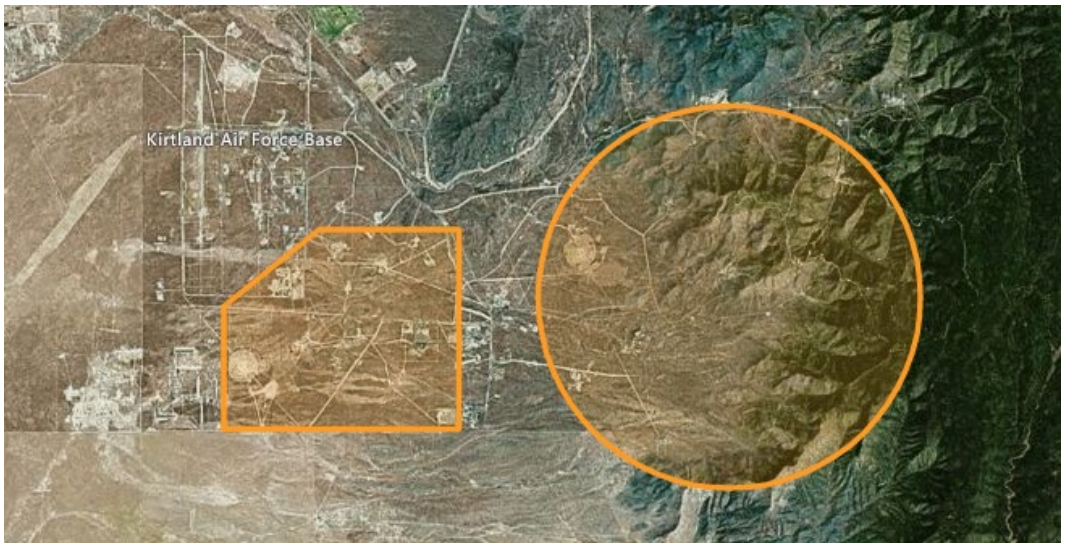
(1) Kirtland Command Post. Phone 846-3776/7.
(2) VA Hospital Emergency Room. Phone 265-1711 x-2929.
(3) Kirtland Fire Department. Phone 911 (cell) 853-9111.
(4) Kirtland Weapons Safety Office. Phone 846-4229.
(5) AFRL Det 8/SE (AFRL Safety). Phone 846-1676/227

4. Operating Area:



Latitude	Longitude
34°58'8"N	106°33'5"W
34°56'51"N	106°33'5"W
34°56'51"N	106°30'5"W
34°58'56"N	106°30'5"W
34°58'56"N	106°31'52"W

HERT F
Center Lat/Long: 34 58.13° N / 106 26.38° W
Radius: 2nm
Height: 0’ AGL – 700’ AGL


Kirtland Air Force Base

Data Reporting: NOTE: Negative (zero flights) reports are required.

1. The unit must submit the following information to (afrl.do.workflow@us.af.mil) on a monthly basis:
   a. The number of flights conducted under this Airspace Access Approval (A flight during which any portion is conducted in the NAS must be counted only once, regardless of how many times it may enter and leave Special Use airspace between takeoff and landing).
   b. Aircraft operational hours per flight.
   c. Equipment malfunctions (hardware/software) affecting either the air vehicle or ground control station.
   d. Deviations from ATC instructions and/or Letters of Agreement/Procedures.
   e. Operational/coordination issues.
   f. The number and duration of lost link events (control, vehicle performance and health monitoring, or communications) per aircraft per flight.

Unexpected Event/Accident/Mishap Reporting: Immediately after an incident or accident, and before additional flight under this Airspace Access Approval, the unit must provide initial notification to the proper authorities IAW the program's Unexpected Events worksheet. Initial reporting should include the unit involved (who), initial facts of the incident/accident/mishap (what), the location of the air vehicle at the time of the incident/accident/mishap (where), and the day/time of the incident/accident/mishap (when).

Reportable events often include but are not limited the following:

1. All accidents/mishaps involving UAS operations where any of the following occurs:
   a. Fatal injury, where the operation of a UAS results in a death occurring within 30 days of the accident/mishap.
   b. Serious injury, where the operation of a UAS results in a hospitalization of more than 48 hours, the fracture of any bone (except for simple fractures of fingers, toes, or nose), severe hemorrhage or tissue damage, internal injuries, or second or third-degree burns.
   c. Total loss.
   d. Substantial damage to the system where there is damage to the airframe, power plant, or onboard systems that must be repaired prior to further flight.
   e. Damage to property, other than the UAS.

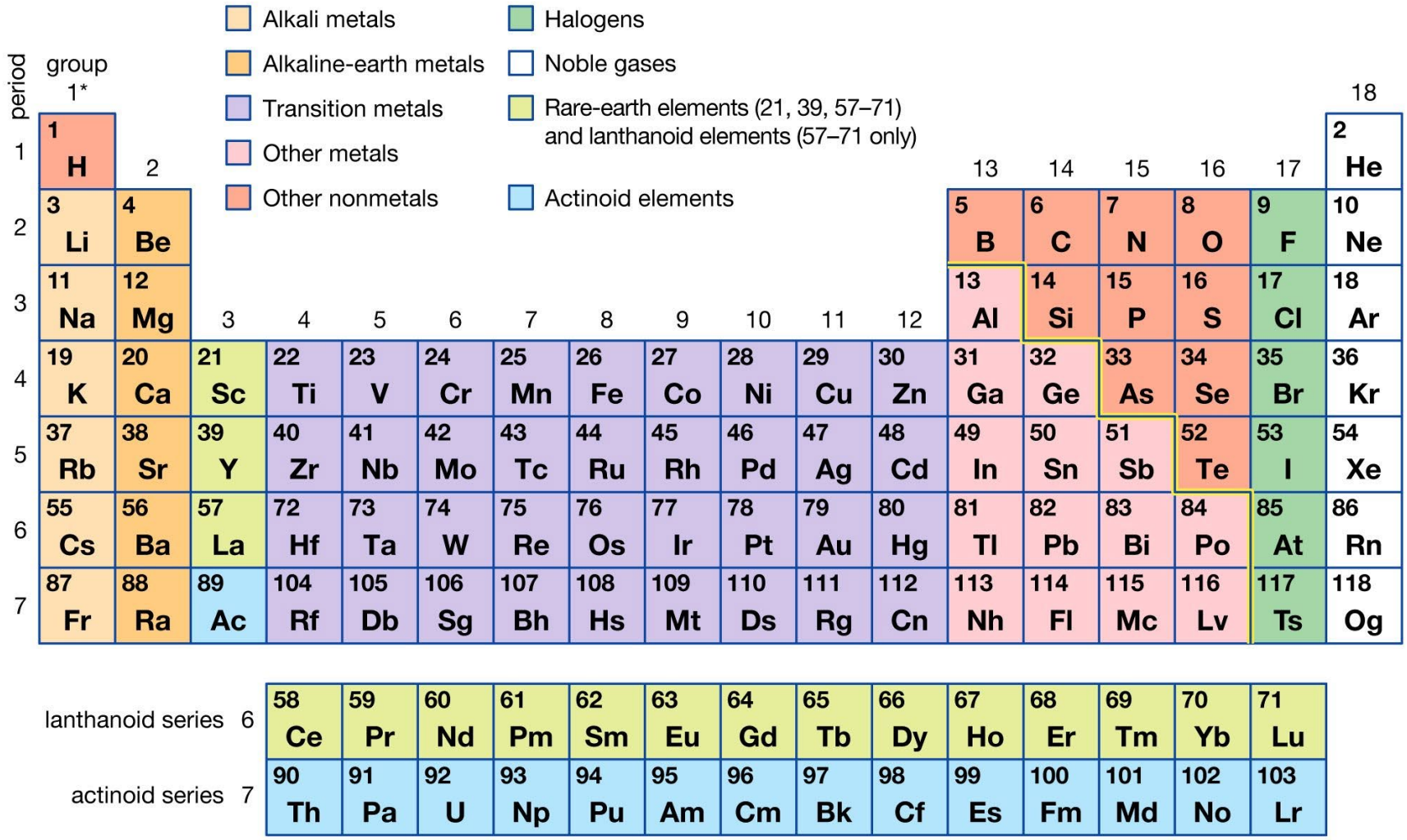
2. Any incident/mishap that results in an unsafe/abnormal operation including but not limited to:
   a. A malfunction or failure of the on-board flight control system (including navigation).
   b. A malfunction or failure of the ground control station flight control hardware or software (other than loss of control link).
   c. A power plant failure or malfunction.
   d. An in-flight fire on the air vehicle or Ground Control Station.
   e. An aircraft collision.
   f. Any in-flight failure of the air vehicle's electrical system requiring use of alternate or emergency power to complete the flight.
   g. A deviation from any provision contained in this Airspace Access Approval.
   h. A deviation from an ATC clearance and/or Letter(s) of Agreement/Procedures.
   i. A lost control link event resulting in:
      (1) Fly-away, or
      (2) Execution of a pre-planned/unplanned lost link procedure.

APPENDIX C

PERIODIC TABLE OF ELEMENTS

1

Periodic table of the elements



*Numbering system adopted by the International Union of Pure and Applied Chemistry (IUPAC).

1

APPENDIX D

AIR QUALITY SUPPORT DOCUMENTATION

1

Appendix D

Air Quality Analysis Supporting Documentation

This appendix discusses emission factor development and calculations including assumptions employed in the analyses presented in **Section 3.4** of the Environmental Assessment.

D.1. Site Preparation and Infrastructure Projects Emissions Calculations

The Air Conformity Applicability Model (ACAM) version 5.0.18a was used to perform an analysis to assess the potential air quality impacts associated with the Proposed Action in accordance with Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process* (EIAP, 32 Code of Federal Regulations [CFR] Part 989) and the General Conformity Rule (40 CFR Part 93, Subpart B). Due to the limited capability of the model, ACAM was used only for test site preparation activities and infrastructure projects. Emissions for munitions/explosive use were calculated separately. A surrogate year of 2024 was used as the starting year for all activities.

The emission factors used in ACAM are imbedded within ACAM and come from the following DAF documents: (1) *Air Emissions Guide for Air Force Stationary Sources, Methods for Estimating Emissions of Air Pollutants for Stationary Sources at U.S. Air Force Installations*, Air Force Civil Engineer Center (June 2023), and (2) *Air Emissions Guide for Air Force Mobile Sources, Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations*, Air Force Civil Engineering Center (June 2023). The ACAM reports are below.

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention*; the Environmental Impact Analysis Process (EIAP) (32 CFR Part 989); and the General Conformity Rule (GCR) (40 CFR Part 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:

Base: KIRTLAND AFB
State: New Mexico
County(s): Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Test Activities and Infrastructure Improvements at the CHESTNUT Site and Joint Use Area

c. Project Number(s) (if applicable):

d. Projected Action Start Date: 1 / 2024

e. Action Description:

The Proposed Action includes current and proposed future test activities conducted by the United States Air Force (USAF), United States Space Force (USSF), and Defense Threat Reduction Agency (DTRA) at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area (collectively referred to as "the Range") on Kirtland Air Force Base (AFB), New Mexico. Under the Proposed Action, the Air Force Research Laboratory Directed Energy Directorate (AFRL/RD) would continue to integrate directed energy technology into warfighter vehicles and evaluate directed energy weapon systems effectiveness on the Range. Directed energy devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM on various targets to include explosives, munitions, electronics, small unmanned aircraft systems (sUAS), unmanned aircraft systems (UAS), and drones. AFRL/RD also would continue to evaluate radar systems to be used in the detection and tracking of potential threat sUAS, UAS, and drones. The Air Force Research Laboratory Space Vehicle Directorate (AFRL/RV) proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its research, development, test, and evaluation activities to counter, deter, and defeat weapons of mass destruction and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377th Mission Support Group/Explosive Ordnance Disposal would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the Range.

The analysis assumes the annual test activities and activities involving construction, operation, maintenance, and removal of infrastructure would continue indefinitely. A surrogate year of 2024 was used as the starting year for all activities.

Many testing activities, such as the use of DE technology, HEL and HPEM systems, and drones, and conducting non-explosive tests do not produce air emissions. Emissions from these activities were not calculated; however, generator operation during these testing activities would produce air emissions and were included in the model. Due to the limited capability of ACAM, ACAM was used only for test

site preparation activities, infrastructure projects, and generator use for testing activities. Emissions for munitions/explosive use were calculated separately.

f. Point of Contact:

Name: Carolyn Hein
Title: Contractor
Organization: HDR
Email:
Phone Number:

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 tons per year (tpy) Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5 percent of any NAAQS) and the GCR *de minimis* values (25 tpy for lead and 100 tpy for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5 percent of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the *Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments*.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

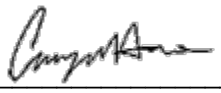
2024

Pollutant	Action Emissions (tpy)	INSIGNIFICANCE INDICATOR	
		Indicator (tpy)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	3.484	250	
NO_x	13.566	250	
CO	14.126	250	
SO_x	0.715	250	
PM_{10}	16.892	250	
$PM_{2.5}$	0.986	250	
Pb	0.000	25	No
NH_3	0.007	250	
CO_2e	3185.8		

2025 - (Steady State)

Pollutant	Action Emissions (tpy)	INSIGNIFICANCE INDICATOR	
		Indicator (tpy)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	250	
NO_x	0.000	250	
CO	0.000	250	
SO_x	0.000	250	
PM_{10}	0.000	250	
$PM_{2.5}$	0.000	250	
Pb	0.000	25	No
NH_3	0.000	250	
CO_2e	0.0		

None of the estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.



Carolyn Hein, Contractor

4/10/2024
DATE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- Action Location
Base: KIRTLAND AFB
State: New Mexico
County(s): Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Test Activities and Infrastructure Improvements at the CHESTNUT Site and Joint Use Area

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2024

- Action Purpose and Need:

The purpose of the Proposed Action is for the United States Air Force (USAF), United States Space Force (USSF), and Defense Threat Reduction Agency (DTRA) users to continue conducting current test activities and implement future test activities, as well as construct, operate, maintain, and remove supporting infrastructure for all Department of Defense (DoD) agencies conducting Research, Development, Test, and Evaluation (RDT&E) activities on the Range on Kirtland Air Force Base (AFB). The Range would continue to be shared by multiple DoD agencies, including but not limited to (1) Air Force Research Laboratory Directed Energy Directorate (AFRL/RD) for testing and training with explosives; (2) Air Force Research Laboratory Space Vehicle Directorate (AFRL/RV) for optimizing canister system designs to generate metallic vapor for the study of plasma effects in the ionosphere; (3) DTRA for research into deterrence of weapons of mass destruction and improvised explosive devices; and (4) 377th Mission Support Group (MSG)/Explosive Ordnance Disposal (EOD) for explosive handling and emergency operations.

The need for the Proposed Action is to allow USAF, USSF, and DTRA current and future users the ability to test concepts in need of an open-air (outdoor) environment to improve the technology. Such tests are needed to determine the survivability and vulnerability of structures and targets for national security. In turn, these tests allow for the delivery of innovative and affordable weapons, materials, and methods to the warfighter in time to meet their mission demands. Because of ever-changing threat scenarios, the RDT&E and training conducted by these agencies is a critical element in the development of new capabilities for the nation's security, and it provides an important component of the United States' global leadership in safety, science, and technology.

- Action Description:

The Proposed Action includes current and proposed future test activities conducted by the USAF, USSF, and DTRA at the Conventional High Explosive Simulated Nuclear Test Site and Joint Use Area (collectively referred to as "the Range") on Kirtland AFB, New Mexico. Under the Proposed Action, AFRL/RD would continue to integrate directed energy technology into warfighter vehicles and evaluate directed energy weapon systems effectiveness on the Range. Directed energy devices, such as high energy laser (HEL) and high-power electromagnetics (HPEM), would be set up on the Range to evaluate the effects resulting from HEL and HPEM on various targets to include explosives, munitions, electronics, sUAS, UAS, and drones. AFRL/RD also would continue to evaluate radar systems to be used in the detection and tracking of potential threat sUAS, UAS, and drones. AFRL/RV proposes to begin conducting vaporization experiments on the Range. DTRA would continue to analyze the impacts of its RDT&E activities to counter, deter, and defeat weapons of mass destruction and improvised explosive device testing conducted on the Range. Additionally, DTRA proposes to begin conducting cloud simulation tests on the Range. The 377 MSG/EOD would continue to use the Range for suspicious package destruction.

In addition to the test activities, the Proposed Action includes the construction, operation, maintenance, and removal of supporting infrastructure as well as routine range construction, site preparation, and maintenance. Examples of supporting infrastructure projects that could be included in the Proposed

Action consist of replacing outdated project timing and firing trailers, installing permanent pneumatic mast setups, replacing or installing up to 25,000 feet of underground cables a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for test activities a year, and conducting general clean-up activities on the Range.

The analysis assumes the annual test activities and activities involving construction, operation, maintenance, and removal of infrastructure would continue indefinitely. A surrogate year of 2024 was used as the starting year for all activities.

Many testing activities, such as the use of directed energy, high energy laser systems, high power electromagnetics systems, and drones, and conducting non-explosive tests do not produce air emissions. Emissions from these activities were not calculated. Due to the limited capability of the ACAM, ACAM was used only for test site preparation activities and infrastructure projects. Emissions for munitions/explosive use were calculated separately.

- Point of Contact

Name: Carolyn Hein
Title: Contractor
Organization: HDR
Email:
Phone Number:

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Test Site Preparation Activities
3.	Emergency Generator	Test Site Preparation Activities - 5 kW Generator Use
4.	Emergency Generator	Test Site Preparation Activities - 60 kW Generator Use
5.	Construction / Demolition	Infrastructure Projects
6.	Emergency Generator	Testing Activities - Generator Use (5-kW gasoline generators)
7.	Emergency Generator	Testing Activities - Generator Use (90-kW natural gas generator)
8.	Emergency Generator	Testing Activities - Generator Use (60-kW natural gas generators)
9.	Emergency Generator	Testing Activities - Generator Use (60-kW diesel generators)
10.	Emergency Generator	Testing Activities - Generator Use (9-kW natural gas generator)

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Construction / Demolition

2.1 General Information & Timeline Assumptions

- Activity Location

County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Test Site Preparation Activities

- Activity Description:

Potential temporary structures that could be constructed for test activities include towers (free standing or guywire supported); buildings (typically concrete, steel frame); mobile structures, trailers, conex(s) (freight containers, typically 8 feet by 8.5 feet tall and 20 feet long); earthen structures (such as berms, pits, or trenches); and barriers or other safety/security devices.

It was assumed temporary structures would be constructed on previously disturbed areas that would not require grading. It was assumed a total of 5,000 square feet of berms (using 2,500 cubic yards of fill), 5,000 linear feet of pits/trenches (with an average 3-foot trench width), and 5,000 square feet of

temporary structures would be constructed per year. It was assumed all structures would be demolished within the same year.

The following equipment and operating hours were used to calculate emissions from exhaust.

Construction Equipment Type	Expected Use (days per year)	Expected Use (hours per day)	Expected Use (average hours per day over 1 year [365 working days])
bulldozer	10	8	0.22
forklift	20	8	0.44
backhoe	20	8	0.44
dump truck	10	8	0.22
concrete truck delivery	10	8	0.22
front-end loaders	150	8	3.29
crane	3	8	0.07
pickup truck	365	8	8.00
5-kilowatt generator	100	8	2.19
60-kilowatt generator	100	8	2.19

- Activity Start Date
Start Month: 1
Start Month: 2024

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.140166
SO_x	0.003035
NO_x	0.658116
CO	1.180634
PM_{10}	2.542019

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.024524
Pb	0.000000
NH_3	0.002228
CO_2e	313.5

2.1 Demolition Phase

2.1.1 Demolition Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

2.1.2 Demolition Phase Assumptions

- General Demolition Information
Area of Building to be demolished (square feet): 5,000
Height of Building to be demolished (feet): 10

- Default Settings Used: No

- Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Rubber Tired Dozers Composite	1	0.22

- Vehicle Exhaust

Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.1.3 Demolition Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Rubber Tired Dozers Composite								
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	CH_4	CO_2e
Emission Factors	0.1747	0.0024	1.1695	0.6834	0.0454	0.0454	0.0157	239.47

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

2.1.4 Demolition Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (0.00042 * BA * BH) / 2000$

$PM10_{FD}$: Fugitive Dust PM_{10} Emissions (TONs)
0.00042: Emission Factor (points/cubic feet)
BA: Area of Building to be demolished (square feet)
BH: Height of Building to be demolished (feet)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

VMT_{VE} = BA * BH * (1 / 27) * 0.25 * (1 / HC) * HT

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building being demolish (square feet)
BH: Height of Building being demolish (feet)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 cubic yard / 27 cubic feet)
0.25: Volume reduction factor (material reduced by 75% to account for air space)
HC: Average Hauling Truck Capacity (cubic yards)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC cubic yards)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

VMT_{WT} = WD * WT * 1.25 * NE

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.2 Trenching/Excavating Phase

2.2.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date

Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration

Number of Month: 12
Number of Days: 0

2.2.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information

Area of Site to be Trenched/Excavated (square feet): 15,000
Amount of Material to be Hauled On-Site (cubic yards): 2,500
Amount of Material to be Hauled Off-Site (cubic yards): 2,500

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Dumpers/Tenders Composite	1	0.22
Tractors/Loaders/Backhoes Composite	1	0.44

- Vehicle Exhaust
Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (miles): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

2.2.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.604	000.007	000.679	005.119	000.013	000.012		000.033	00365.157
LDGT	000.784	000.010	001.171	008.128	000.015	000.013		000.034	00488.008
HDGV	001.315	000.015	003.118	025.189	000.035	000.031		000.045	00760.452
LDDV	000.249	000.003	000.329	003.517	000.007	000.006		000.008	00371.991
LDDT	000.550	000.005	000.880	007.137	000.008	000.008		000.008	00579.910
HDDV	000.934	000.014	009.704	002.987	000.373	000.344		000.031	01586.560
MC	002.847	000.008	000.870	014.993	000.028	000.025		000.051	00396.071

2.2.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM_{10} Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 pounds / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (cubic yards)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (cubic yards)
HC: Average Hauling Truck Capacity (cubic yards)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC cubic yards)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

2.3 Building Construction Phase

2.3.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

2.3.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 5,000
Height of Building (feet): 10
Number of Units: N/A
- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	0.07
Off-Highway Trucks Composite	1	0.22
Other Construction Equipment Composite	1	8
Rough Terrain Forklifts Composite	1	0.44
Rubber Tired Loaders Composite	1	3.29

- Vehicle Exhaust

Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (miles): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips

Average Vendor Round Trip Commute (mile): 40

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

2.3.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Cranes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0715	0.0013	0.4600	0.3758	0.0161	0.0161	0.0064	128.78
Off-Highway Trucks Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.1188	0.0026	0.5286	0.5400	0.0163	0.0163	0.0107	260.33
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0461	0.0012	0.2243	0.3477	0.0079	0.0079	0.0041	122.61
Rough Terrain Forklifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0415	0.0008	0.2498	0.4433	0.0106	0.0106	0.0037	70.374
Rubber Tired Loaders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0587	0.0012	0.3130	0.4323	0.0137	0.0137	0.0053	108.74

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

2.3.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (square feet)
BH: Height of Building (feet)
(0.42 / 1000): Conversion Factor cubic feet to trips (0.42 trip / 1,000 cubic feet)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vendor Trips Emissions per Phase
VMT_{VT} = BA * BH * (0.38 / 1000) * HT

VMT_{VT}: Vendor Trips Vehicle Miles Travel (miles)
BA: Area of Building (square feet)
BH: Height of Building (feet)
(0.38 / 1000): Conversion Factor cubic feet to trips (0.38 trip / 1,000 cubic feet)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vendor Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

3. Emergency Generator

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Test Site Preparation Activities - 5 kW Generator Use

- Activity Description:
It is estimated a gasoline-powered 5-kW generator, and a diesel-powered 60-kW generator would be used for 100 days each during site preparation activities. It was assumed 8 hours of operations per day of use.

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.035376
SO_x	0.001584
NO_x	0.029480
CO	0.018653
PM_{10}	0.001932

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.001932
Pb	0.000000
NH_3	0.000000
CO_2e	2.9

3.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Gasoline
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 6.7
Average Operating Hours Per Year (hours): 800

3.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pounds/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.0132	0.000591	0.011	0.00696	0.000721	0.000721			1.08

3.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year
AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/horsepower-hour)

4. Emergency Generator

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Test Site Preparation Activities - 60 kW Generator Use

- Activity Description:
It is estimated a gasoline-powered 5-kW generator, and a diesel-powered 60-kW generator would be used for 100 days each during site preparation activities. It was assumed 8 hours of operations per day of use.

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.089838
SO_x	0.075670
NO_x	0.370300
CO	0.247296
PM_{10}	0.080822

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.080822
Pb	0.000000
NH_3	0.000000
CO_2e	42.8

4.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 80.5
Average Operating Hours Per Year (hours): 800

4.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pounds/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

4.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year
AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/horsepower-hour)

5. Construction / Demolition

5.1 General Information & Timeline Assumptions

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Infrastructure Projects

- Activity Description:
Users would construct, operate, maintain, and remove supporting infrastructure as well as conduct routine range construction, site preparation, and maintenance. Examples of infrastructure projects that could be included in the Proposed Action consist of replacing outdated project T&F trailers, installing permanent pneumatic mast setups, replacing/installing up to 25,000 feet of underground cables (e.g., fiber optic cables, power lines, etc.) a year, installing and removing up to 20 test structures/concrete pads/dirt berms to be used for text activities a year, and conducting general clean-up activities on the range (e.g., weed and brush removal, grading and leveling areas for explosive tests, weather proofing, and the cleanup of rodent waste in test bunkers).

It was assumed a total of demolition of 5,000 square feet of T&F trailers would be replaced, 4,000 square feet of test structures/concrete pads/dirt berms would be installed or removed, 5,000 square feet would be graded/leveled, and 25,000 linear feet would be trenched per year (with an average 3-foot trench width).

- Activity Start Date
Start Month: 1
Start Month: 2024

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	1.069562
SO_x	0.020521
NO_x	5.860816
CO	8.301331
PM_{10}	13.606750

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.217543
Pb	0.000000
NH_3	0.004665
CO_2e	2005.4

5.1 Demolition Phase

5.1.1 Demolition Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

5.1.2 Demolition Phase Assumptions

- General Demolition Information
Area of Building to be demolished (square feet): 9,000
Height of Building to be demolished (feet): 10

- Default Settings Used: No

- Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Concrete/Industrial Saws Composite	1	8
Rubber Tired Dozers Composite	1	1
Tractors/Loaders/Backhoes Composite	2	6

- Vehicle Exhaust
Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (miles): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

5.1.3 Demolition Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Concrete/Industrial Saws Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0357	0.0006	0.2608	0.3715	0.0109	0.0109	0.0032	58.544
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.1747	0.0024	1.1695	0.6834	0.0454	0.0454	0.0157	239.47
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0348	0.0007	0.1980	0.3589	0.0068	0.0068	0.0031	66.875

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**Pb**	**NH_3**	**CO_2e**
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

5.1.4 Demolition Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (0.00042 * BA * BH) / 2000$

$PM10_{FD}$: Fugitive Dust PM_{10} Emissions (TONs)
0.00042: Emission Factor (pounds/cubic feet)
BA: Area of Building to be demolished (square feet)
BH: Height of Building to be demolished (feet)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (1 / 27) * 0.25 * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building being demolish (square feet)
BH: Height of Building being demolish (feet)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 cubic yard / 27 cubic feet)
0.25: Volume reduction factor (material reduced by 75% to account for air space)
HC: Average Hauling Truck Capacity (cubic yards)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC cubic yards)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

5.2 Site Grading Phase

5.2.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

5.2.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (square feet): 5,000
Amount of Material to be Hauled On-Site (cubic yards): 1,000
Amount of Material to be Hauled Off-Site (cubic yards): 1,000

- Site Grading Default Settings
Default Settings Used: No
Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	1	6
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	6
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust

Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips

Average Worker Round Trip Commute (mile): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

5.2.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0714	0.0014	0.3708	0.5706	0.0167	0.0167	0.0064	132.90
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0461	0.0012	0.2243	0.3477	0.0079	0.0079	0.0041	122.61
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.1747	0.0024	1.1695	0.6834	0.0454	0.0454	0.0157	239.47
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0348	0.0007	0.1980	0.3589	0.0068	0.0068	0.0031	66.875

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

5.2.4 Site Grading Phase Formula(s)

- Fugitive Dust Emissions per Phase

$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM_{10} Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 pounds / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)

H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (cubic yards)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (cubic yards)
HC: Average Hauling Truck Capacity (cubic yards)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC cubic yards)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

5.3 Trenching/Excavating Phase

5.3.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

5.3.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (square feet): 75,000
Amount of Material to be Hauled On-Site (cubic yards): 0

Amount of Material to be Hauled Off-Site (cubic yards): 15,000

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Excavators Composite	2	8
Other General Industrial Equipment Composite	1	8
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (miles): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

5.3.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Graders Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0714	0.0014	0.3708	0.5706	0.0167	0.0167	0.0064	132.90
Other Construction Equipment Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0461	0.0012	0.2243	0.3477	0.0079	0.0079	0.0041	122.61
Rubber Tired Dozers Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.1747	0.0024	1.1695	0.6834	0.0454	0.0454	0.0157	239.47
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0348	0.0007	0.1980	0.3589	0.0068	0.0068	0.0031	66.875

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

5.3.4 Trenching / Excavating Phase Formula(s)

- Fugitive Dust Emissions per Phase
$PM10_{FD} = (20 * ACRE * WD) / 2000$

$PM10_{FD}$: Fugitive Dust PM_{10} Emissions (TONs)
20: Conversion Factor Acre Day to pounds (20 pounds / 1 Acre Day)
ACRE: Total acres (acres)
WD: Number of Total Work Days (days)
2000: Conversion Factor pounds to tons

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = (HA_{OnSite} + HA_{OffSite}) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
HA_{OnSite}: Amount of Material to be Hauled On-Site (cubic yards)
$HA_{OffSite}$: Amount of Material to be Hauled Off-Site (cubic yards)
HC: Average Hauling Truck Capacity (cubic yards)
(1 / HC): Conversion Factor cubic yards to trips (1 trip / HC cubic yards)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Vehicle Exhaust On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase
$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)
1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

5.4 Building Construction Phase

5.4.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2024

- Phase Duration
Number of Month: 12
Number of Days: 0

5.4.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 4,000
Height of Building (feet): 10
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 7

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cranes Composite	1	4
Forklifts Composite	2	6
Tractors/Loaders/Backhoes Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (miles): 20

- Vehicle Exhaust Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

- Worker Trips
Average Worker Round Trip Commute (miles): 20

- Worker Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	50.00	50.00	0	0	0	0	0

- Vendor Trips
Average Vendor Round Trip Commute (miles): 40

- Vendor Trips Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	0	0	0	0	0	100.00	0

5.4.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Emission Factors (pounds/hour)

Cranes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0715	0.0013	0.4600	0.3758	0.0161	0.0161	0.0064	128.78
Forklifts Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0246	0.0006	0.0973	0.2146	0.0029	0.0029	0.0022	54.451
Tractors/Loaders/Backhoes Composite								
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**CH_4**	**CO_2e**
Emission Factors	0.0348	0.0007	0.1980	0.3589	0.0068	0.0068	0.0031	66.875

- Vehicle Exhaust & Worker Trips Emission Factors (grams/mile)

	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**	**Pb**	**NH_3**	**CO_2e**
LDGV	000.225	000.002	000.129	003.365	000.005	000.004		000.024	00304.482
LDGT	000.223	000.003	000.223	003.754	000.006	000.005		000.026	00393.433
HDGV	000.830	000.006	000.943	013.718	000.025	000.022		000.051	00889.720
LDDV	000.073	000.001	000.089	003.143	000.002	000.002		000.008	00311.620
LDDT	000.074	000.001	000.132	002.161	000.003	000.003		000.009	00354.627
HDDV	000.113	000.004	002.600	001.531	000.048	000.044		000.032	01287.120
MC	002.651	000.003	000.757	013.180	000.024	000.021		000.055	00389.752

5.4.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * EF_{POL}) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
EF_{POL}: Emission Factor for Pollutant (pounds/hour)
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase

$VMT_{VE} = BA * BH * (0.42 / 1000) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
BA: Area of Building (square feet)
BH: Height of Building (feet)
(0.42 / 1000): Conversion Factor cubic feet to trips (0.42 trip / 1,000 cubic feet)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VE} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Worker Trips Emissions per Phase

$VMT_{WT} = WD * WT * 1.25 * NE$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
WD: Number of Total Work Days (days)
WT: Average Worker Round Trip Commute (miles)

1.25: Conversion Factor Number of Construction Equipment to Number of Works
NE: Number of Construction Equipment

$V_{POL} = (VMT_{WT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

- Vendor Trips Emissions per Phase
$VMT_{VT} = BA * BH * (0.38 / 1000) * HT$

VMT_{VT}: Vendor Trips Vehicle Miles Travel (miles)
BA: Area of Building (square feet)
BH: Height of Building (feet)
(0.38 / 1000): Conversion Factor cubic feet to trips (0.38 trip / 1,000 cubic feet)
HT: Average Hauling Truck Round Trip Commute (miles/trip)

$V_{POL} = (VMT_{VT} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{VT}: Vendor Trips Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Worker Trips On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

6. Emergency Generator

6.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Testing Activities - Generator Use (5-kW gasoline generators)

- Activity Description:
Generators are used to support testing activities and to power DE devices. Most commonly, 5-kW generators are used; however, larger generators, including 90-kW, 60-kW, and 9-kW generators may be used. When generators are in use, it is usually for an average of 8 to 10 hours at a time for approximately 5 to 10 days a month. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators, one 90-kW natural gas-fired generator, two 60-kW natural gas-fired generators, two 60-kW diesel-fired generators, and one 9 kW natural gas-fired generator would be used for 10 hours a day 20 days a month (2,400 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12

End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	1.061280
SO_x	0.047516
NO_x	0.884400
CO	0.559584
PM_{10}	0.057968

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.057968
Pb	0.000000
NH_3	0.000000
CO_2e	86.8

6.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Gasoline
Number of Emergency Generators: 10

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 6.7
Average Operating Hours Per Year (hours): 2,400

6.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pound/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.0132	0.000591	0.011	0.00696	0.000721	0.000721			1.08

6.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year
$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pound/horsepower-hourr)

7. Emergency Generator

7.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Testing Activities - Generator Use (90-kW natural gas generator)

- Activity Description:

Generators are used to support testing activities and to power DE devices. Most commonly, 5-kW generators are used; however, larger generators, including 90-kW, 60-kW, and 9-kW generators may be used. When generators are in use, it is usually for an average of 8 to 10 hours at a time for approximately 5 to 10 days a month. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators, one 90-kW natural gas-fired generator, two 60-kW natural gas-fired generators, two 60-kW diesel-fired generators, and one 9 kW natural gas-fired generator would be used for 10 hours a day 20 days a month (2,400 hours per year).

- Activity Start Date

Start Month: 1
Start Year: 2024

- Activity End Date

Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.177984
SO_x	0.000960
NO_x	1.277952
CO	0.840384
PM_{10}	0.000192

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.000192
Pb	0.000000
NH_3	0.000000
CO_2e	176.7

7.2 Emergency Generator Assumptions

- Emergency Generator

Type of Fuel used in Emergency Generator: Natural Gas - 4 Stroke Lean Burn
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption

Emergency Generator's Horsepower: 160
Average Operating Hours Per Year (hours): 2,400

7.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pound/horsepower-hour)

VOC	SO_x	NO_x	CO	PM^{10}	$PM^{2.5}$	Pb	NH_3	CO_2e
0.000927	0.000005	0.006656	0.004377	0.000001	0.000001			0.920156

7.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pound/horsepower-hour)

8. Emergency Generator

8.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Testing Activities - Generator Use (60-kW natural gas generators)

- Activity Description:
Generators are used to support testing activities and to power DE devices. Most commonly, 5-kW generators are used; however, larger generators, including 90-kW, 60-kW, and 9-kW generators may be used. When generators are in use, it is usually for an average of 8 to 10 hours at a time for approximately 5 to 10 days a month. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators, one 90-kW natural gas-fired generator, two 60-kW natural gas-fired generators, two 60-kW diesel-fired generators, and one 9 kW natural gas-fired generator would be used for 10 hours a day 20 days a month (2,400 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.222480
SO_x	0.001200
NO_x	1.597440
CO	1.050480
PM_{10}	0.000240

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.000240
Pb	0.000000
NH_3	0.000000
CO_2e	220.8

8.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Natural Gas - 4 Stroke Lean Burn
Number of Emergency Generators: 2

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 100
Average Operating Hours Per Year (hours): 2,400

8.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pound/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.000927	0.000005	0.006656	0.004377	0.000001	0.000001			0.920156

8.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pound/horsepower-hour)

9. Emergency Generator

9.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Testing Activities - Generator Use (60-kW diesel generators)

- Activity Description:
Generators are used to support testing activities and to power DE devices. Most commonly, 5-kW generators are used; however, larger generators, including 90-kW, 60-kW, and 9-kW generators may be used. When generators are in use, it is usually for an average of 8 to 10 hours at a time for approximately 5 to 10 days a month. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators, one 90-kW natural gas-fired generator, two 60-kW natural gas-fired generators, two 60-kW diesel-fired generators, and one 9 kW natural gas-fired generator would be used for 10 hours a day 20 days a month (2,400 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.669600
SO_x	0.564000
NO_x	2.760000
CO	1.843200
PM_{10}	0.602400

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.602400
Pb	0.000000
NH_3	0.000000
CO_2e	319.2

9.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 2

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 100
Average Operating Hours Per Year (hours): 2,400

9.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pound/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

9.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year
$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pound/horsepower-hour)

10. Emergency Generator

10.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Bernalillo
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Testing Activities - Generator Use (9-kW natural gas generator)

- Activity Description:
Generators are used to support testing activities and to power DE devices. Most commonly, 5-kW generators are used; however, larger generators, including 90-kW, 60-kW, and 9-kW generators may be used. When generators are in use, it is usually for an average of 8 to 10 hours at a time for approximately 5 to 10 days a month. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators, one 90-kW natural gas-fired generator, two 60-kW natural gas-fired generators, two 60-kW diesel-fired generators, and one 9 kW natural gas-fired generator would be used for 10 hours a day 20 days a month (2,400 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2024

- Activity End Date
Indefinite: No
End Month: 12
End Year: 2024

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.017798
SO_x	0.000096
NO_x	0.127795
CO	0.084038
PM_{10}	0.000019

Pollutant	Total Emissions (TONs)
$PM_{2.5}$	0.000019
Pb	0.000000
NH_3	0.000000
CO_2e	17.7

10.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Natural Gas - 4 Stroke Lean Burn
Number of Emergency Generators: 1

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 16
Average Operating Hours Per Year (hours): 2,400

10.3 Emergency Generator Emission Factor(s)

- Emergency Generators Emission Factor (pound/horsepower-hour)

VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
0.000927	0.000005	0.006656	0.004377	0.000001	0.000001			0.920156

10.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (pound/horsepower-hour)

D.2. Explosives Testing Emissions

Air emissions from explosives testing are based on net explosive weight (N.E.W.). Inert munitions have a N.E.W. of zero; therefore, only live munitions would produce air emissions. Emission factors for explosives were obtained from USEPA's AP-42 compilations of emissions factors, previous NEPA analyses, and from other sources. As described in Section 2.3.1.1.1.2, explosives used for AFRL/RV activities would be comparable to common fireworks; therefore, emissions factors for black powder, which is widely used to manufacture fireworks, was considered to be the explosive material for such activities. Trinitrotoluene (TNT) was used as a surrogate for the explosive material used in other types of explosives testing (i.e., DTRA activities). However, testing may use other explosive materials such as Composition B Explosive (a combination of RDX and TNT), Tritonal, or IMX-101, which may have different emissions factors. 377 MSG/EOD disposal activities include open burning of energetic materials in a burn pan, which has unique emissions factors listed separately. Emissions factors are provided in **Table C-1**.

Emissions from explosives testing were calculated using the equation below. **Table C-2** provides the detailed results of the calculated annual air emissions.

Pollutant Emissions = EF * Quantity/2,000

Pollutant Emissions = emissions for the associated pollutant (tpy)
EF = emissions factor for the associated pollutant (pounds per pound N.E.W. explosive)
Qty = quantity (pounds N.E.W. per year)
2,000 = conversion factor from pounds to tons (1 ton = 2,000 pounds)

Table C-1. Munitions Emissions Factors

Explosive	Pounds of Emissions / Pound N.E.W. of Explosive						
	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$	CO_2
Black Powder	0.0021[1]	0.016	0.085	0.00026	0.25	0.25	8.5
TNT	0.00715[1]	0.0093	0.398	0.00014	0.093	0.093	1.5
EOD	0.0071	0.035	0.27	0.013	0.6	0.6	5.60

Key: CO – carbon monoxide; CO_2 – carbon dioxide; EOD – Explosive Ordnance Disposal; N.E.W. – net explosive weight; NO_x – nitrogen oxides; PM_{10} - less than or equal to 10 microns in diameter; $PM_{2.5}$ – less than or equal to 2.5 microns in diameter; SO_x – sulfur oxides; TNT – trinitrotoluene; VOC – volatile organic compound
Notes: [1] VOC emissions measured as methane
Sources: USEPA 1980, KAFB 2015, KAFB 2016, USEPA 1998

Table D-2. Estimated Explosives Testing Emissions from the Proposed Action

Explosives Testing	Explosive	NEW (lb/item)	Quantity per Year	Emissions (tpy)						
				VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$	CO_2
AFRL/RV Vaporization Experiments	Small-Scale (Category 3 Roman Candle)	1.1	50	0.000058025	0.00044	0.002338	0.00000715	0.006875	0.006875	0.23375
	Medium-Scale (16-inch Fireworks Shell)	70	12	0.0008862	0.00672	0.0357	0.0001092	0.105	0.105	3.57
	Large-Scale (24-inch Fireworks Shell)	105	1	0.000110775	0.00084	0.004463	0.00001365	0.013125	0.013125	0.44625
DTRA Activities	Small-Scale	10	20[1]	0.0007151	0.00093	0.0398	0.000014	0.0093	0.0093	0.15
	Medium-Scale	900	20[1]	0.064359	0.0837	3.582	0.00126	0.837	0.837	13.5
	Large Scale	2,000	20[1]	0.14302	0.186	7.96	0.0028	1.86	1.86	30
377 MSG/EOD Activities	Explosive Ordnance Disposal	2,000	48	0.3408	1.68	12.96	0.624	28.8	28.8	268.8
Total				**0.5499491**	**1.95863**	**24.5843**	**0.628204**	**31.6313**	**31.6313**	**316.7**

Key: 377 MSG/EOD – 377th Mission Support Group/Explosive Ordnance Disposal; AFRL/RV – Air Force Research Laboratory Space Vehicle Directorate; CO – carbon monoxide; CO_2 – carbon dioxide; DTRA – Defense Threat Reduction Agency; N.E.W. – net explosive weight; NO_x – nitrogen oxides; PM_{10} - less than or equal to 10 microns in diameter; $PM_{2.5}$ – less than or equal to 2.5 microns in diameter; SO_x – sulfur oxides; tpy – tons per year; VOC – volatile organic compound
Notes: [1] Value represents an assumption

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APPENDIX E

FINAL BIOLOGICAL SURVEY REPORT FOR THE CHESTNUT RANGE AND JOINT USE AREA, KIRTLAND AIR FORCE BASE

1

Final

Biological Survey Report

Chestnut Range and Joint Use Area, Kirtland Air Force Base

Albuquerque, Bernalillo County, New Mexico

May 2021

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Table of Contents

1.0 Introduction 1
1.1 Biological Survey Area Location 1
2.0 Environmental Setting 3
2.1.1 Geology 3
2.1.2 Soil Conditions 3
2.1.3 Vegetation 3
2.1.4 Wildlife 4
2.1.5 Special Status Species 4
3.0 Methods 9
4.0 Survey Results 11
4.1 Vegetation 11
4.2 Wildlife 11
4.3 Special Status Species 12
5.0 Conclusions 15
6.0 References 17

Figures

Figure 1-1. Project Area Location 2
Figure 2-1. Mapped Vegetation Types in the Project Area 5

Tables

Table 2-1. Federal and State Listed Species with the Potential to Occur within the Project Area 6
Table 4-1. Wildlife Detected within the Project Area 11
Table 4-2. Special Status Species Potential to Occur in Project Area 12

Appendices

Appendix A: Photo Map and Site Photographs
Appendix B: Plant Species List

Abbreviations and Acronyms

AFB	Air Force Base
AFRL	Air Force Research Laboratory
BGEPA	Bald and Golden Eagle Protection Act
BISON-M	Biota Information System of New Mexico
BSR	Biological Survey Report
EOD	Explosive Ordnance Disposal
IPaC	Information Planning and Conservation system
NMDGF	New Mexico Department of Game and Fish
SGCN	Species of Greatest Conservation Need
sUAS	small Unmanned Aerial Systems
USFWS	US Fish and Wildlife Service

1.0 Introduction

On behalf of Gryphon Schafer and the Air Force Research Laboratory (AFRL), HDR, Inc. (HDR) has prepared this Biological Survey Report (BSR) in support of the proposed Chestnut Range/Joint Use Area Project (Project) at Kirtland Air Force Base (AFB) in Bernalillo County, New Mexico. AFRL is proposing a continuation and expansion of test and training activities within the approximately 800-acre Chestnut Range and Joint Use Area (Project Area).

HDR conducted a biological field survey of habitats present in the Project Area on March 15–17, 2021. This BSR addresses the results of the survey and the biological resources, including special habitat types, federal-listed, and state-listed species, that occur or could occur within the Project Area.

1.1 Biological Survey Area Location

The Chestnut Range, an approximately 260-acre site located in the southwest corner of Kirtland AFB, is operated by AFRL, and is used jointly by AFRL and the Defense Threat Reduction Agency (DTRA). The Joint Use Area is an approximately 540-acre site utilized by the US Air Force 377th Explosive Ordnance Disposal (EOD), AFRL, and its contractors. The Joint Use Area lies directly adjacent to the Chestnut Range to the north and east. The Project Area is bordered to the north by Magazine Road and to the south by South Fence Road and a wide expanse of open rangeland owned by the Pueblo of Isleta. Thunder Range Testing Area and Isleta Road border the Project Area to the east, and the Auxiliary Helicopter Training Field forms the western boundary. The general Project location is shown in **Figure 1-1**. The area between Chestnut Range and the Joint Use Area on the northern boundary of Chestnut Range is used for high explosive detonations by AFRL, DTRA, and EOD. The Joint Use Area east of Chestnut Range has been used by AFRL and DTRA for small Unmanned Aerial Systems (sUAS) training. AFRL also uses the area for High Energy Laser and High-Power Microwave sUAS engagements. No explosives or detonations are projected in the area east of Chestnut Range.

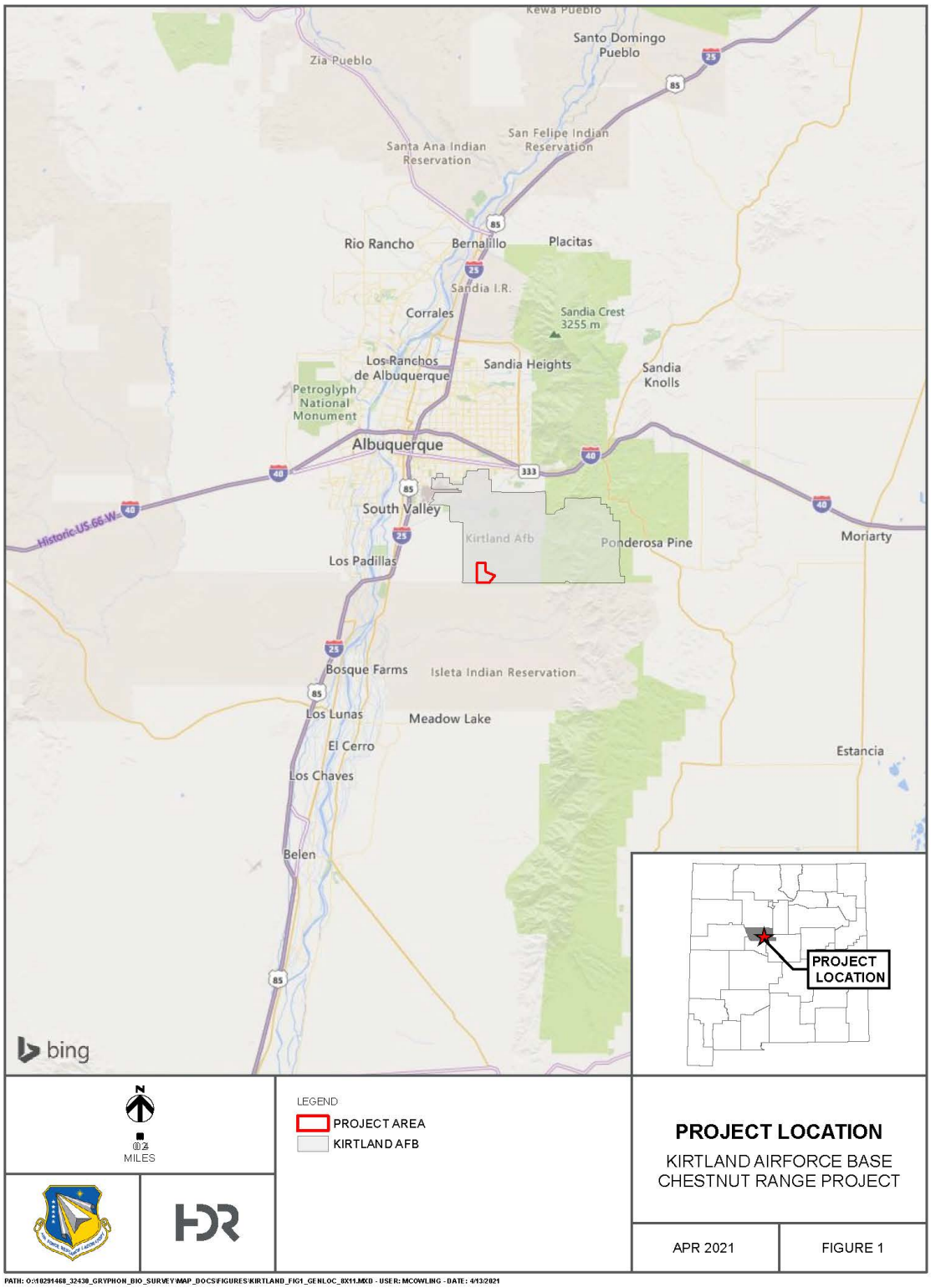

Figure 1-1. Project Area Location

2.0 Environmental Setting

The Project Area, having received about 0.64 inches of precipitation in 2021 (NWS 2021), was relatively dry at the onset of the surveys. Most of the vegetation (i.e., cool-season grasses and early forbs) present at the time of the survey was desiccated or just beginning to green up. Temperatures and conditions during the survey were typical for the area, ranging from 39–65° Fahrenheit and fluctuating from sunny and calm, to cloudy and gusty. Approximately 0.04 inches of snow fell during the night of March 16 (NWS 2021).

2.1.1 Geology

Kirtland AFB is in the eastern portion of the Albuquerque Basin, which is approximately 90 miles long and 40 miles wide. The Albuquerque Basin is bound by the Nacimiento Mountains and the Jemez Uplift to the north, the Socorro Basin to the south, the Sandia Mountains and the Manzano Uplift to the east, and the Lucero Uplift and Puerco Plateau to the west (Kelley 1977). The western portion of Kirtland AFB, including the Project Area, is located on gently sloping alluvial fan deposits of the Albuquerque Basin. The Project Area is relatively flat, with elevations ranging from 5,335 to 5,470 feet above mean sea level.

2.1.2 Soil Conditions

The dominant soils of the Albuquerque Basin are well drained and loamy, with small amounts of gravelly and stony soils along the mountains and arroyos (USDA 1977). Soils within the Project Area are predominantly composed of Wink series fine sandy loam and Latene series sandy loam, both of which are deep, well-drained soils on nearly level to moderately sloping uplands. The Wink series soils have moderately rapid permeability and a low risk for water erosion. The Latene series soils are characterized by medium runoff and a moderate potential for wind and water erosion (USDA 1977).

2.1.3 Vegetation

Kirtland AFB lies at the intersection of four major North American biotic provinces: the Great Plains, Great Basin, Rocky Mountains, and Chihuahuan Desert (Griffith et al. 2006). The Project Area can generally be classified as Grassland Vegetation Community (Dick-Peddie 1993), which can be further subdivided into two Plains-Mesa grassland series types, Grama-Dropseed (*Bouteloua eriopoda-Sporobolus contractus*) and Grama-Galleta (*Bouteloua eriopoda-Pleuraphis jamesii*). This community is found between elevations of 5,200 and 5,700 feet at Kirtland AFB. Primary grass species found in this community include black grama (*Bouteloua eriopoda*), blue grama (*B. gracilis*), six-weeks grama (*B. barbata*), ring muhly (*Muhlenbergia torreyi*), bush muhly (*M. porteri*) Indian ricegrass (*Achnatherum hymenoides*), spike dropseed (*Sporobolus contractus*), mesa dropseed (*S. flexuosus*), red three-awn (*Aristida purpurea* var. *longiseta*), and purple three-awn (*A. purpurea* var. *purpurea*). Shrub species that occur in the grassland community include sand sagebrush (*Artemisia filifolia*), plains prickly pear (*Opuntia polyacantha*), great plains yucca (*Yucca glauca),* winter fat (*Krascheninnikovia lanata*), and broom snakeweed (*Gutierrezia sarothrae*) (KAFB 2018).

A vegetation map of Kirtland AFB (2018) indicates the Project Area is composed of three vegetation communities: dwarf shrub (< or = 0.5 m) grassland, which accounts for approximately

368 acres of the Project Area, short (< or = 0.25 m) grassland, which accounts for approximately 358 acres of the Project Area, and large shrub (> or = 0.5 m) grassland comprises approximately 74 acres of the Project Area (see **Figure 2-1**). These vegetation communities are common in the region and occur throughout much of the eastern half of Kirtland AFB (KAFB 2021).

2.1.4 Wildlife

Wildlife communities on Kirtland AFB are typical of those found in central New Mexico. The composition of these communities is dependent on the quality and quantity of available habitat that matches the needs of each wildlife species (Findley 1987; KAFB 2018).

Mammals commonly found on the installation include desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), Gunnison's prairie dog (*Cynomys gunnisoni*), Ord's kangaroo rat (*Dipodomys ordii*), banner-tailed kangaroo rat (*D. spectabilis*), deer mouse (*Peromyscus maniculatus*), badger (*Taxidea taxus*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*). Reptiles and amphibians commonly encountered on Kirtland AFB include New Mexico whiptail (*Cnemidophorus neomexicanus*), lesser earless lizard (*Holbrookia maculata*), prairie rattlesnake (*Crotalus viridus*), and western diamondback rattlesnake (*C. atrox*). Birds that are commonly observed include the horned lark (*Eremophila alpestris*), northern mockingbird (*Mimus polyglottos*), greater roadrunner (*Geococcyx californianus*), mourning dove (*Zenaida macroura*), house finch (*Carpodacus mexicanus*), and red-tailed hawk (*Buteo jamaicensis)* (KAFB 2018).

2.1.5 Special Status Species

Prior to field surveys, HDR staff conducted a desktop review using the US Fish and Wildlife Service (USFWS) Information Planning and Conservation system (IPaC) and the New Mexico Department of Game and Fish's (NMDGF) Biota Information System of New Mexico (BISON-M) list of state sensitive species to determine which federal- and state-listed species and migratory birds have the potential to occur in Bernalillo County (see **Table 2-1**).

According to the 2021 USFWS IPaC Report, five federally threatened and endangered species could occur on Kirtland AFB or in the surrounding region (USFWS 2021). None of the five federally listed species, including the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), the southwestern willow flycatcher (*Empidonax traillii extimus*), the Mexican spotted owl (*Strix occidentalis lucida),* the New Mexico meadow jumping mouse (*Zapus hudsonius luteus*), and the Rio Grande silvery minnow (*Hybognathus amarus*), have been documented on the installation (KAFB 2018). All five of these species have final designated critical habitat; however, there are no critical habitats on or near Kirtland AFB.

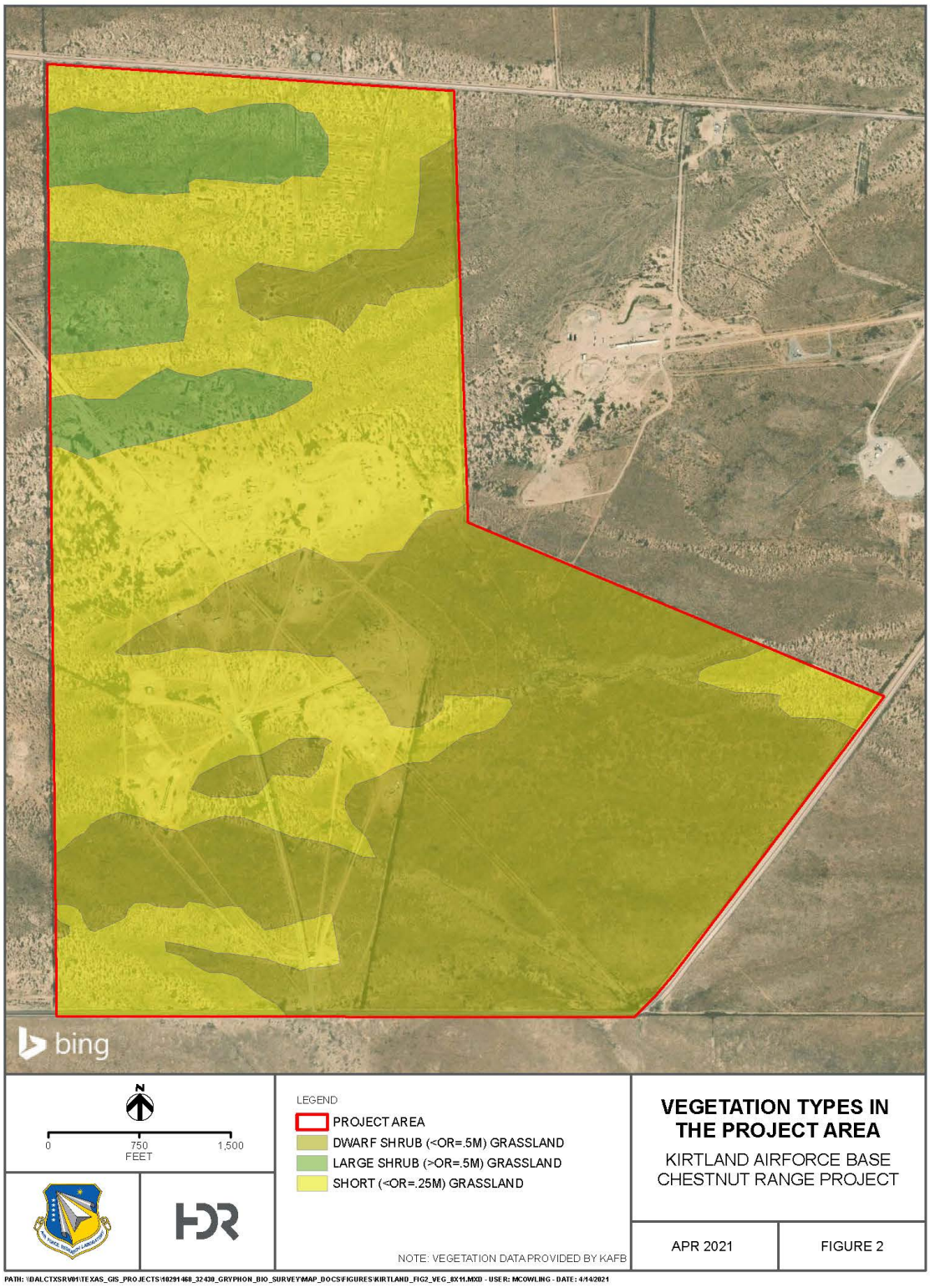

Figure 2-1. Mapped Vegetation Types in the Project Area

Table 2-1. Federal and State Listed Species with the Potential to Occur within the Project Area

Common Name	Scientific Name	NMDGF	USFWS	Potential to Occur at KAFB (Y/N)
Birds				
Least tern	*Aterna antillarum*	E		N
Golden eagle	*Aquila chrysaetos*		BGEPA	Y
Western burrowing owl	*Athene cunicularia hypugaea*		SC	Y
White-eared hummingbird	*Basilinna leucotis*	T		N
Common black hawk	*Buteogallus anthracinus*	T		N
Baird's sparrow	*Centronyx bairdii*	T		N
Mountain plover	*Charadrius montanus*	SGCN		Y
Yellow-billed cuckoo	*Coccyzus americanus occidentalis*		T	N
Broad-billed hummingbird	*Cynanthus latirostris*	T		N
Bald eagle	*Haliaeetus leucocephalus*	T		N
Southwestern willow flycatcher	*Empidonax traillii extimus*	E	E	N
Peregrine falcon	*Falco peregrinus*	T		Y
Loggerhead shrike	*Lanius ludovicianus*	SGCN		Y
Brown pelican	*Pelecanus occidentalis*	E		N
Neotropic cormorant	*Phalacrocorax brasilianus*	T		N
Mexican spotted owl	*Strix occidentalis lucida*		T	N
Bell's vireo	*Vireo bellii*	T		N
Gray vireo	*Vireo vicinior*			Y
Fish				
Rio Grande silvery minnow	*Hybognathus amarus*	E	E	N
Invertebrates				
Monarch butterfly	*Danaus plexippus*		C	N
Mammals				
Gunnison's prairie dog	*Cynomys gunisonii*	SGCN		Y
Spotted bat	*Euderma maculatum*	T		N
Meadow jumping mouse	*Zapus hudsonius luteus*	E	E	N
Plants				
Santa Fe milkvetch	*Astragaulus feensis*	S		Y
Reptiles				
Desert massasauga	*Sistrurus catenatus edwardsii*	SGCN		Y

Notes:
BGPA = Bald and Golden Eagle Protection Act
C = Candidate
E = Endangered
S = Sensitive
SC = Species of Concern
SGCN = Species of Greatest Conservation Need
T = Threatened

Based on the data provided in the BISON-M report, there are 19 species listed by NMDGF as state threatened or endangered (BISON-M 2021). Of the state-listed species known to occur in Bernalillo County, two species, the gray vireo (*Vireo vicinior*) and peregrine falcon (*Falco peregrinus*), have the potential to occur on Kirtland AFB (KAFB 2018).

In addition, six special status species (e.g., either SGCN or species protected under the BGEPA) are known to occur at Kirtland AFB: golden eagle (*Aquila chrysaetos)*; western burrowing owl (*Athene cunicularia hypugaea*); mountain plover (*Charadrius montanus*); Gunnison's prairie dog (*Cynomys gunisonii*); loggerhead shrike (*Lanius ludovicianus*); and desert massasauga (*Sistrurus catenatus edwardsii*).

One rare plant species, Santa Fe milkvetch (*Astragalus feensis*), is known to occur in Bernalillo County and on Kirtland AFB (KAFB 2018, Sullivan and Knight 1994).

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3.0 Methods

A biological survey was conducted by HDR biologists on March 15–17, 2021. Surveys for special status species habitats were conducted by walking pedestrian transects throughout the Project Area. In addition, the biologists documented the following:

- Habitat types;
- Site photographs (see **Appendix A**);
- Wildlife and plant species seen or detected.

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4.0 Survey Results

4.1 Vegetation

The Project Area, being utilized for explosives testing and training for many years, is heavily disturbed. The majority of the southwestern quadrant is composed of a network of two-track roads as well as several training or test structures located on bare ground with little to no vegetation. The vegetation in the remainder of the Project Area is fairly homogenous and consists of disturbed short grassland intermixed with a sparse shrub layer, predominantly Russian thistle (*Salsola tragus*). Common grass species included fluff-grass (*Dasyochloa pulchella*), blue grama, red three-awn, ring muhly, bush muhly, burrograss (*Sclerogpogon brevifolia)*, and dropseed (*Sporobolus* spp.). Shrubs observed included sand sagebrush, broom snakeweed, plains prickly pear, and Great Plains yucca. These vegetation communities are common in the region and occur throughout much of the eastern half of Kirtland AFB. A list of all plants observed during the surveys is in **Appendix B**.

4.2 Wildlife

During the survey, HDR biologists observed three mammal and nine bird species. Kangaroo rat burrows were observed in several areas. No active bird nests or burrows were found; however, given the Project location, the survey occurred prior to the onset of the general bird nesting season. One inactive nest, likely belonging to a common raven, was observed during the survey.

Table 4-1 lists the wildlife species observed within the limits of the Project Area during the 2021 survey.

Table 4-1. Wildlife Detected within the Project Area

Common Name	Scientific Name
Birds	
Western burrowing owl*	*Athene cunicularia hypugaea*
Great-horned owl	*Bubo virginianus*
Northern harrier	*Circus cyaneus*
Common raven	*Corvus corax*
Horned lark	*Eremophila alpestris*
American kestrel	*Falco sparverius*
Sage thrasher	*Oreoscoptes montanus*
Say's phoebe	*Sayornis saya*
Western meadowlark	*Sturnella neglecta*
Mammals	
Kangaroo rat	*Dipodomys* sp.
Black-tailed jackrabbit	*Lepus californianus*
Desert cottontail	*Sylvilagus audubonii*
*USFWS Species of Concern	

4.3 Special Status Species

As discussed in **Section 2.1.5**, nine special status species are known to occur at Kirtland AFB. The following section describes the habitat requirements of these species and the potential for these species to occur in the Project Area (see **Table 4-2**).

Table 4-2. Special Status Species Potential to Occur in Project Area

Common Name	Scientific Name	Special Status	Potential to Occur in Project Area (Y/N)
Birds			
Golden eagle	*Aquila chrysaetos*	BGEPA (USFWS)	N
Western burrowing owl	*Athene cunicularia hypugaea*	SC (USFWS)	Y
Mountain plover	*Charadrius montanus*	SGCN (NMDGF)	Y
Peregrine falcon	*Falco peregrinus*	T (NMDGF)	N
Loggerhead shrike	*Lanius ludovicianus*	SGCN (NMDGF)	Y
Gray vireo	*Vireo vicinior*	T (NMDGF)	N
Mammals			
Gunnison's prairie dog	*Cynomys gunisonii*	SGCN (NMDGF)	Y
Plants			
Santa Fe milkvetch	*Astagalus feensis*	S (NMDGF)	Y
Reptiles			
Desert massasauga	*Sistrurus catenatus edwardsii*	SGCN (NMDGF)	Y

Notes:
T = Threatened
C = Candidate
SC = Species of Concern
SGCN = Species of Greatest Conservation Need
S = Sensitive
BGPA = Bald and Golden Eagle Protection Act

The two state-listed species with the potential to occur at Kirtland AFB, the gray vireo and peregrine falcon, are unlikely to occur in the Project Area, except as possible flyovers. The gray vireo is known from juniper woodland communities, and peregrine falcons are known from cliffs in canyons and occasionally in hangars near the airport on Kirtland AFB (KAFB 2018). These habitats do not occur in the Project Area.

The golden eagle is protected under the BGEPA and nests along cliffs on the eastern boundary of Kirtland AFB (KAFB 2018). These habitats are not present in the Project Area, and the golden eagle is unlikely to occur, except as a possible flyover.

Suitable habitat was observed for six special status species: loggerhead shrike, western burrowing owl, Gunnison's prairie dog, desert massasauga, mountain plover, and Santa Fe milkvetch.

The loggerhead shrike, a New Mexico SGCN, has been observed on the installation throughout the year in grassland, piñon-juniper, and riparian habitats. Loggerhead shrike inventory and monitoring have been conducted at Kirtland AFB since 2007 (KAFB 2018). Marginal habitat for

this species occurs in the Project Area. Potential nesting habitat for the loggerhead shrike in the Project Area is limited to a few Siberian elms.

The western burrowing owl, a USFWS Species of Concern, occurs on Kirtland AFB from March to October before migrating south, although some may remain in the area during mild winters (KAFB 2018). Western burrowing owls on Kirtland AFB are found within developed areas where grasses are less dense and afford a greater line of sight for protection from predators and prey detection. This species is very closely associated with prairie dog colonies on Kirtland AFB, utilizing abandoned prairie dog burrows for nesting. Western burrowing owl inventories and monitoring of the population at KAFB have been conducted every year since 1994 (KAFB 2018). One individual western burrowing owl was observed in the southeast quadrant of the Project Area on March 17. This individual did not appear to be part of an existing pair and may have been scouting the area for burrows. While the Project Area contains suitable habitat for western burrowing owls, similar habitat occurs throughout much of the eastern half of Kirtland AFB.

Gunnison's prairie dog, a New Mexico SGCN, occur in colonies or towns primarily within the grasslands in the northern half of Kirtland AFB and in the cantonment area (KAFB 2018). Gunnison's prairie dog habitat was mapped at Kirtland AFB in 2016, based on observations of Gunnison's prairie dogs (KAFB 2021). One of the habitats mapped includes the northern boundary of the Project Area; however, this area was investigated, and no signs of Gunnison's prairie dog were observed. While the Project Area contains suitable habitat for this species, similar habitat occurs throughout much of the eastern half of Kirtland AFB.

The desert massasauga, a New Mexico SGCN, is most commonly associated with low elevation grassland habitats at Kirtland AFB (KAFB 2018). Kirtland AFB conducted massasauga surveys from 2009–2016 and additional investigations are ongoing. While no individuals were observed during the survey, it is likely that desert massasaugas weren't active and hadn't left hibernacula yet. Marginal habitat for this species was observed during the survey; however, grassland habitat within the Project Area is heavily disturbed and higher quality habitat occurs in other areas of Kirtland AFB.

The mountain plover, a New Mexico SGCN, occurs in grasslands and is typically found within prairie dog towns. Plovers usually arrive on their New Mexico breeding grounds in mid-March and depart by August (Hawks Aloft 2017). While no individuals were observed during the survey, it is likely that mountain plovers had not migrated into the region yet. Suitable nesting habitat for this species is limited on the installation; therefore, it is unlikely that the mountain plover utilizes Kirtland AFB during the nesting season. However, the southern grasslands of Kirtland AFB, including the Project Area, could be used as brood-rearing habitat or during migration (KAFB 2018).

Santa Fe milkvetch occurs on benches and gravelly hillsides in piñon-juniper woodland or plains-mesa grassland (New Mexico Rare Plant Council 1999) and is known from grassland communities along the lower slopes of hills on the eastern boundary of Thunder Range (Sullivan and Knight 1994). Due to the proximity to Thunder Range, Santa Fe milkvetch could potentially occur within the Project Area. Santa Fe milkvetch flowers April through June. While no individuals were observed during the survey, it is possible that this species had not yet emerged.

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5.0 Conclusions

Marginal to suitable habitat exists within the Project Area for six special status species: the loggerhead shrike, western burrowing owl, Gunnison's prairie dog, desert massasauga, mountain plover, and Santa Fe milkvetch. However, the habitat within the Project Area is not unique for Kirtland AFB or the region and the Project Area is heavily disturbed.

The Albuquerque Basin spans multiple counties to the north and south of Albuquerque and grassland habitats, such as those observed in the Project Area, are common throughout the region. The short (< or = 0.25 m) grassland community in the Project Area accounts for approximately 23 percent of vegetation at Kirtland AFB. The dwarf shrub (< or = 0.5 m) grassland in the Project Area accounts for approximately 4 percent of this vegetation type at Kirtland AFB. The large shrub (> or = 0.5 m) grassland in the Project Area accounts for approximately 3 percent of this vegetation type at Kirtland AFB.

In addition to the relative abundance of the mapped vegetation types, the Project Area has experienced heavy disturbance that has degraded the quality of the available habitat. Most of the disturbance occurs in Chestnut Range; however, large craters and associated spoil piles occur throughout the Joint Use Area. This disturbance regime has impacted the vegetation community, leading to an abundance of Russian thistle, and has compacted soils in portions of the Project Area.

Therefore, while the potential exists for these six special status species to occur, they are unlikely to persist in the Project Area.

Following training exercises, routine maintenance of the range is conducted, which includes filling holes and divots generated from the use of explosives and cleanup and removal of all debris (KAFB 2016). HDR biologists observed a few locations where maintenance (i.e., filling of holes created by impacts) had not yet occurred, creating conditions favorable for the establishment of burrowing animals (see **Appendix A** – Photograph 6). In addition, the western burrowing owl observed during surveys was in the vicinity of a burrow underneath a small pile of concrete debris (see **Appendix A** – Photograph 17).

Range maintenance activities should occur more frequently to reduce the likelihood of special status species to occur in the Project Area. Prior to construction or training exercises, the Kirtland AFB Natural Resource Program Manager should be consulted to determine if recent inventories and monitoring have identified nesting western burrowing owls in the Project Area and if surveys for western burrowing owls should be conducted prior to ground disturbing activities.

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6.0 References

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USFWS 2021	USFWS. 2021. Threatened, endangered, candidate, and proposed species. IPaC-Information, Planning, and Conservation System. Available online: <https://ecos.fws.gov/ipac/>. Consultation Code: 02ENNM00-2021-SLI-0708 Event Code: 02ENNM00-2021-E-01608, Received March 30, 2021.

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Appendix A: Photo Map and Site Photographs

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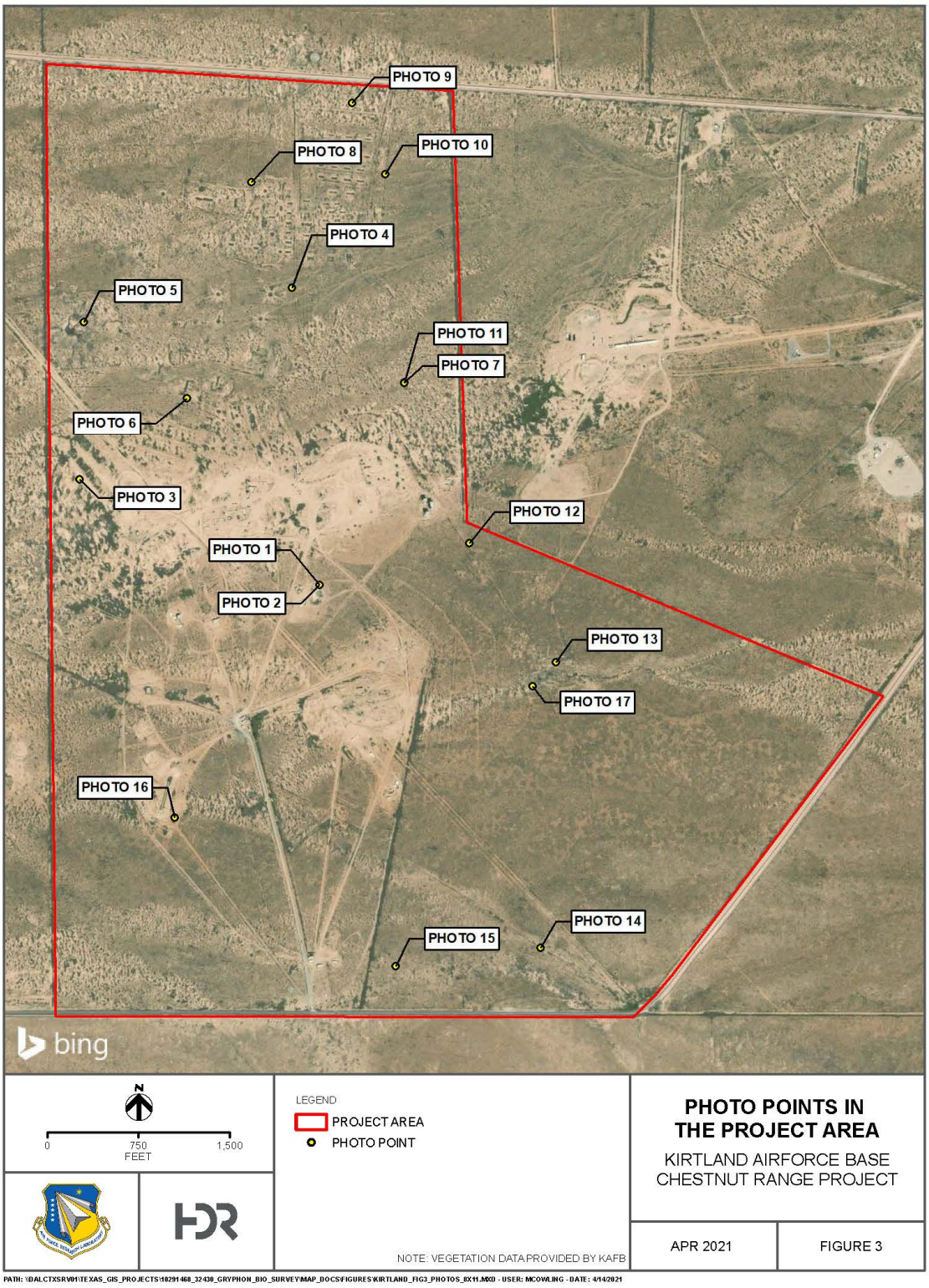

Figure A-1. Photo Point Locations

Photograph 1- Looking north from a heavily disturbed site in the central portion of the Project Area.

Photograph 2- Looking south from a heavily disturbed site in the central portion of the Project Area.

Photograph 3- Looking north at a disturbed site along the western boundary.

Photograph 4- Looking east from a disturbed area in the north-central portion of the Project Area.

Photograph 5- One of several impact sites filled with Russian thistle.

Photograph 6- An example of a burrow complex adjacent to an unmaintained impact site.

Photograph 7- Disturbed grassland looking north.

Photograph 8- Looking south.

Photograph 9- Looking north at area mapped as prairie dog town.

Photograph 10- Facing west.

Photograph 11- Looking east.

Photograph 12- Facing east.

Photograph 13- Facing west.

Photograph 14- Looking east.

Photograph 15- Looking north.

Photograph 16- Looking north.

Photograph 17- Western burrowing owl location.

Appendix B:
Plant Species List

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Plant Species Observed within the Survey Area

Common Name	Scientific Name
Desert holly	*Acourtia nana*
Sand sagebrush	*Artemisia filifolia*
Fourwing saltbush	*Atriplex canescens*
Black grama	*Bouteloua eriopoda*
Blue grama	*Bouteloua gracilis*
Yellowspine thistle	*Cirsium ochrocentrum*
Buffalo gourd	*Cucurbita foetidissima*
Fluff grass	*Dasyochloa pulchella*
Mormon tea	*Ephedra trifurca*
Spinystar	*Coryphantha viviparia*
Club cholla	*Cylindropuntia clavata*
Tree cholla	*Cylindropuntia imbricata*
Tansy mustard	*Descurainia sophia*
Broom snakeweed	*Gutierrezia sarothrae*
Needle and thread	*Hesperostipa comata*
Pale wolfberry	*Lycium pallidum*
Bush muhly	*Muhlenbergia porteri*
Ring muhly	*Muhlenbergia torreyi*
Plains prickly pear	*Opuntia polycantha*
Scorpion weed	*Phacelia integrifolia*
Wooly plantain	*Plantago patagonica*
Galleta	*Pleuraphis jamesii*
Russian thistle	*Salsola tragus*
Burrograss	*Scleropogon brevifolia*
Sand dropseed	*Sporobolus cryptandrus*
Mesa dropseed	*Sporobolus flexuosus*
Silverleaf nightshade	*Solanum eleagnifolium*
Siberian elm	*Ulms pumila*
Great Plains yucca	*Yucca glauca*
Prairie zinnia	*Zinnia grandiflora*

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APPENDIX F

AVIAN SPECIES OBSERVED ON KIRTLAND AIR FORCE BASE FROM 2022-2023

1

APPENDIX B— AVIAN SPECIES LIST

Table 1. A list of all avian species observed on Kirtland Air Force Base from January 1, 2022 – August 22, 2023 (*n* = 143).

American Coot
American Crow
American Kestrel
American Robin
American Pipit
American Widgeon
Ash-throated Flycatcher
American Tree Sparrow
Barn Owl
Barn Swallow
Black-chinned Hummingbird
Black-chinned Sparrow
Bewick's Wren
Blue-gray Gnatcatcher
Brown-headed Cowbird
Black-headed Grosbeak
Blue Grosbeak
Brewer's Sparrow
Broad-tailed Hummingbird
Black Phoebe
Black-throated Sparrow
Black-throated Gray Warbler
Blue-winged Teal
Brewer's Sparrow
Broad-tailed Hummingbird
Bufflehead
Bullock's Oriole
Burrowing Owl
Bushtit
Cackling Goose
Cactus Wren
Cassin's Finch
Cassin's Kingbird
Canada Goose
Canyon Towhee
Canyon Wren
Clay-colored Sparrow
Cliff Swallow
Curve-billed Thrasher
Chihuahuan Raven
Chipping Sparrow
Cinnamon Teal
Common Grackle
Common Merganser
Common Nighthawk
Common Poorwill
Common Raven
Common Yellowthroat
Cordilleran Flycatcher
Cooper's Hawk
Crissal Thrasher
Dark-eyed Junco
Downy Woodpecker
Dusky Flycatcher
Eastern Bluebird
Eastern Meadowlark
Eurasian Collard Dove
European Starling
Ferruginous Hawk
Fox Sparrow
Gadwall
Greater Yellowlegs
Great-tailed Grackle
Great-horned Owl
Green-winged Teal
Golden Eagle
Gray Flycatcher
Gray Vireo
Greater Roadrunner
Hairy Woodpecker
House Finch
Hooded Merganser
Horned Grebe
Horned Lark
House Sparrow
Juniper Titmouse
Killdeer
Lark Bunting
Lark Sparrow
Lazuli Bunting
Ladder-backed Woodpecker
Lesser Goldfinch
Loggerhead Shrike
Long-eared Owl
Lesser Scaup
Lucy's Warbler
Mallard
Marsh Wren
Merlin
MacGillivray's Warbler
Mountain Bluebird
Mourning Dove
Northern Flicker
Northern Harrier
Northern Mockingbird
Northern Shrike
Northern Rough-winged Swallow
Northern Shoveler
Orange Crowned Warbler
Osprey
Peregrine Falcon
Pinyon Jay
Pied-billed Grebe
Pine Siskin
Prairie Falcon
Plumbeous Vireo
Red Crossbill
Red-winged Blackbird
Ring-necked Duck
Rufous-crowned Sparrow
Ring-necked Duck
Rock Pigeon
Rock Wren
Ruddy Duck
Red-tailed Hawk
Sandhill Crane
Sagebrush Sparrow
Say's Phoebe
Sage Thrasher
Savannah Sparrow
Scaled Quail
Scott's Oriole
Song Sparrow
Sharp-shinned Hawk
Spotted Towhee
Snow Goose
Swainson's Hawk
Townsend's Solitaire
Turkey Vulture
Vesper Sparrow
Violet-green Swallow
Virginia Warbler
Warbling Vireo
Western Bluebird
Western Kingbird
Western Meadowlark
Western Tanager
Western Wood Peewee
Woodhouse's Scrub Jay
White-crowned Sparrow
White-breasted Nuthatch
White-winged Dove
Wilson's Warbler
Yellow Warbler
Yellow-rumped Warbler
Zone-tailed Hawk

APPENDIX G

KIRTLAND AIR FORCE BASE SAFETY STANDARDS

BY ORDER OF THE COMMANDER
AIR FORCE RESEARCH LABORATORY
(AFRL)

DEPARTMENT OF THE AIR FORCE
INSTRUCTION 91-202

AIR FORCE MATERIEL COMMAND
SUPPLEMENT

AIR FORCE RESEARCH LABORATORY
Supplement

11 OCTOBER 2023

Safety

THE US AIR FORCE MISHAP
PREVENTION PROGRAM

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(AFRL) This publication supplements Air Force Instruction (AFI) 91-202_AFMCSUP, *The US Air Force Mishap Prevention Program.* This publication applies to all AFRL units; it does not apply to US Air Force Reserve or Air National Guard units. This supplement clarifies or expands mishap prevention program requirements, assigns responsibilities for program elements, and contains program management information for AFRL. This supplement applies to all AFRL personnel. This publication may be supplemented at any level, but all supplements must be routed to the office of primary responsibility (OPR) of this publication for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the OPR using DAF Form 847, *Recommendation for Change of Publication*; route DAF Form 847 through the appropriate functional chain of command. References to the authority to waive requirements in this publication resides with the AFRL Deputy Commander. Submit requests for waivers through the chain of command to the Publication OPR for non-tiered compliance items. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Instruction (AFI) 33-322, *Records Management and Information*

Governance Program, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS).

SUMMARY OF CHANGES

(AFRL) This document only has minor revisions and correction but should be completely reviewed. This revision primarily aligns this supplement with parent document revisions. **Chapter 10**, Space Safety, adds incorrectly removed requirement of AFRL Det 3 acting as the Center level space safety representatives and Systems Safety Managers for the Center. **Chapter 16**, Test Safety Review Process, has changes regarding lessons learned entries, AFRL/SE's appraisal on AFRL led and shadow SRBs, and removes the SharePoint requirement for tracking of SRB Chair Training. Other minor changes regard punctuation and inconsistencies throughout the supplement.

1.1.4. (Added-AFRL) All Detachments, or Technical Directorate (TD) and 711 Human Performance Wing (HPW) are to validate accomplishments in meeting any of the Safety Management System (SMS) expectation tier levels achieved below which will also be approved by their leadership on an annual basis in conjunction with Annual Program Management Review (APMR) results:

1.1.4.1. (Added-AFRL) COPPER. The most recent APMR reflects the organization mishap prevention program conformance and effectiveness under the systematic processes of the SMS was not effective.

1.1.4.2. (Added – AFRL) BRONZE. The most recent APMR reflects the organization mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was met but needs significant improvement(s).

1.1.4.3. (Added-AFRL) SILVER. The most recent APMR reflects the organization mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was met but needs minor improvement.

1.1.4.4. (Added-AFRL) GOLD. The most recent APMR reflects the organization mishap prevention program conformance and effectiveness under the systemic processes of the AFSMS was met and effective.

1.4. (Added-AFRL) AFRL Det/SE offices will ensure their functional areas meet current guidelines based on the receiver's needs and supplier's ability to meet those needs. AFRL Det/SE will provide updated Host Tenant Agreements (HTA) to AFRL/SE whenever safety requirements in the HTA are changed or updated.

1.6. (Added-AFRL) Roles and Responsibilities. Some of the position and organization terms used in this document are not the terms used within AFRL. The equivalent AFRL office or position can be found in **Table 1.1**. See **Chapter 3** for more information about wing, group, and squadron classifications for the purpose of safety assessments.

Table 1.1. AFRL Equivalent Offices and Positions.

Term in Document	AFRL Equivalent
Detachment Safety Office or AFRL Det/SE	All Detachment Safety Offices. This includes Det 3/SE, Det 4/SE, Det 6/SE, Det 7/SE, 15 SPSS/SE, and the Wright Site Safety Office (AFRL/RQY). Note: The Wright Site Safety Office is the Detachment Safety Office for RG, RS, and STO. Unsupported offices shall take immediate action to garner support through an MOA or HTA or from AFRL Det/SE office.
Test Safety Office	Detachment Safety Office

1.6.13.7.1. (Added-AFRL) All AFRL safety professionals are required to use an Air Force Safety Automated System (AFSAS) account (with training tab) to create and document Air Force Continuing Education Unit (CEU) and mandated/recommended AFMC Safety training requirements. This standardized system of record is the only method acceptable to document, determine/resource, plan/program/budget, and manage/track/validate efforts to meet both Air Force and MAJCOM safety career field training compliance.

1.6.13.11. (Added-AFRL) All AFRL TD and 711 HPW, Chiefs of Safety (COS) or assigned safety staff (if no COS) will ensure all their unit personnel who have potential access to privileged safety information will receive annual training on the proper handling procedures and document the training annually. This training shall be uploaded to the HQ AFRL/SE SharePoint. AFRL TD and 711 HPW COS will also provide an annual listing of the training to AFRL/SE at least once per year.

1.6.13.11. 1 (Added-AFRL) AFRL HQ SE staff will periodically check privileged training certificates for currency. If current training is not uploaded on the AFRL HQ SE SharePoint site, SE staff will disable/remove AFSAS accounts accordingly.

1.6.14.11.3.1. (Added-AFRL) This will be accomplished by ensuring safety representation at facility utilization board meetings in order to ensure AFRL equities are addressed.

1.6.14.11.6.4.1. (Added-AFRL) AFRL System Safety managers will review designs and plans for projects and construction and will accompany both trained Occupational Safety reviewers and host installation CE personnel at any preplanning conferences, design reviews, preconstruction conferences and facility acceptance inspections involving AFRL equities. Note this is only required if the construction exceeds federal or state building codes.

1.6.14.11.6.4.2. (Added-AFRL) DDESB approves design and drawings for facilities that are explosive sited.

1.6.16.3.1. (Added-AFRL) The PM has the overall responsibility for program system safety, included as a part of the safety release. The System Safety Managers are assigned to the supporting AFRL/Det SE office.

1.6.24.8. (Added-AFRL) 711 HPW will appoint an administrator under the HQ AFMC AFSAS hierarchy to specifically approve, track, and manage any account request, investigation, or report related to and for the Occupational Illness Module.

1.6.27.14. (Added-AFRL) All TDs and 711 HPW with supporting safety professionals are to have an annual documented APMR, as outlined in AFI 91-202, 13.2. A copy of all completed, accepted, and signed APMRs will be up channeled by AFRL Det/SE Office to AFRL/SE for consolidation no later than (NLT) 1 November of each calendar year.

1.6.49.1. (Added-AFRL) The AFRL Program Manager has the overall responsibility to leverage their local AFRL Det/SE office and System Safety Managers in order to meet requirements of **Chapter 11**, **Chapter 13**, and **Chapter 16**. The PM has the overall responsibility for program system safety leveraging the System Safety Managers in the detachment safety offices.

1.6.62.4. (Added-AFRL) If required to be used, Chief of Safety and appropriate subordinate safety discipline personnel will manage their own AFMC Wing (equivalent) Tenant Safety Office inspection/assessment processes to include subordinate organizational account appointments within the AFSAS Inspection Module.

2.1. (Added-AFRL) Safety Staff. The AFRL/SE and AFRL Det/SE offices will have personnel authorizations to cover the Chief of Safety (COS) and core disciplines as applicable to each organization's mission, e.g., Occupational Safety (SEG), Flight Safety (SEF), Weapons Safety (SEW), System Safety (SES), and Space Safety (SEK). Due to AFRL's unique roles and responsibilities, CoS and the core disciplines are filled by civilian personnel for the Safety staff as denoted in this supplement **paragraph 3.4.8** and subsequent paragraphs.

3.4.8. (Added-AFRL) AFRL Safety program assessments will be completed in the following manner:

3.4.8.1. (Added-AFRL) AFRL Det/SE offices will assess the Safety program of each division and stand-alone branch of any TD once within every two year period.

3.4.8.2. (Added-AFRL) Air Force Office of Scientific Research (AFOSR) is the only occupational safety-related direct report to AFRL that does not have a safety staff and will be assessed by the Center Occupational Manager at least once every 24 months.

3.4.8.3. (Added-AFRL) Safety assessments and inspections will be conducted by the responsible detachment or matrixed safety staff as follows:

3.4.8.3.1. (Added-AFRL) Wing Level: 711 HPW and all other AFRL TDs as follows:

3.4.8.3.1.1. (Added-AFRL) 711 HPW: AFRL/RQY Safety staff

3.4.8.3.1.2. (Added-AFRL) AFRL/RY: AFRL/RQY Safety staff

3.4.8.3.1.3. (Added-AFRL) AFRL/RQ: AFRL/RQY Safety staff

3.4.8.3.1.4. (Added-AFRL) AFRL/RX: AFRL/RQY Safety staff

3.4.8.3.1.5. (Added-AFRL) AFRL/RI: Det 4 Safety staff

3.4.8.3.1.6. (Added-AFRL) AFRL/RW: Det 6 Safety staff

3.4.8.3.1.7. (Added-AFRL) AFRL/RQR: Det 7 Safety Staff

3.4.8.3.1.8. (Added-AFRL) AFRL/RD and AFRL/RV: Det 3 Safety staff

3.4.8.3.1.9. (Added-AFRL) AFOSR: AFRL HQ will conduct assessments while Air Force District of Washington (AFDW) will conduct annual inspections

3.4.8.3.1.10. (Added-AFRL*) AFRL/RS: AFRL/RQY Safety staff

3.4.8.3.1.11. (Added-AFRL*) AFRL/RG: AFRL/RQY Safety staff

3.4.8.3.1.12. (Added-AFRL*) STO: AFRL/RQY Safety staff

3.4.8.3.2. (Added-AFRL) Squadron Level: AFRL Divisions subordinate to TDs (including their branches), AOARD, EOARD, SOARD, and 711 HPW/RHD will be inspected every 12 months by host installation Safety offices (US Army Garrison Japan, 501 CSW/RAF Croughton, and 502 ABW Ft Sam) and assessed at least once every two year period as subordinates to AFOSR or 711 HPW.

3.4.8.3.3. (Added-AFRL) Group level inspections will be conducted as follows:

3.4.8.3.3.1. (Added-AFRL) AFRL/RDSM: Assessments and inspections will be conducted by the 15 SPSS Safety staff.

4.3. (Added-AFRL) AFRL TD and 711 HPW leadership . Will ensure an AF Form 457, USAF Hazard Report (HR), or equivalent product is readily available to all personnel. Tenant personnel will send hazard reports involving activities for which the host is responsible to the host base safety office for processing. AFRL Det/SE offices should coordinate (MOA, MOU, or local OI etc.) with host for any notifications for AF Form 457 that affect their operations or units. If not a responsibility of the host, the TD COS will determine appropriate AFRL safety, fire, or health discipline to investigate the HR.

9.11.2.1. (Added-AFRL) TD WSMs will maintain proof of training and training outline or follow installation requirements.

10.2.1.1.2. (Added-AFRL) AFRL Det 3/SE office will have one system safety personnel authorization dedicated to Space Safety. This System Safety Manager (SSM) will act as the AFRL Space Safety Manager (SpSM) and serve as AFRL's focal point and primary advisor to the AFRL/CC on all space safety issues. AFRL/SE will maintain oversight of the space safety program.

10.2.1.1.2. 1 (Added-AFRL) The Det/SE offices will coordinate with the AFRL Det 3/SE SpSM if their TD conducts research on any space programs.

11.1. (Added-AFRL) AFRL test and research programs will follow **Chapter 16**, Test Safety. As part of transition planning and execution, AFRL programs or AFRL-developed capabilities that transition to operational use must comply with this chapter. AFRL System Safety Managers will support the transition from test to operational use by providing users with the hazards documented in the test plan (both General Minimizing Procedures (GMPs) and Test Hazard Analyses (THAs)), mishap information IAW safety privilege restrictions, and by requiring, at a minimum, a Preliminary Hazard List (PHL) as described in MIL-STD-882E.

12.1. (Added-AFRL) AFRL System Safety Managers . Will provide guidance to program managers regarding test safety contract requirements. This will be done via the AFRL Form 4. The AFRL Form 4 is required for all AFRL work units unless exempted by **paragraph 16.5.1.3**. AFRL Form 4 must be completed before contract award.

13.1.3.1.2.2. (Added-AFRL) AFRL Safety Policy (AFRL VA 91-1) is to be communicated to all AFRL workers/employees through its posting to a prominent TD/Wing work location (i.e., at minimum will be at a location where other required notices (AF Form 457's, CA-10 etc.) are already posted.

16.1.1. (Added-AFRL) In this instruction, the term "activities" will include every activity that uses AFRL owned resources (e.g., personnel, equipment, or facilities). See AFRLI 61-103 paragraph 1.2 for definition of when the AFRL test review process will be utilized. Note that other instructions may be more restrictive and may also require safety reviews even if AFRL resources are not used for test. See AFRLI 61-103 Vol 1, *AFRL Flight Test and Evaluation*, for more information about safety review requirements for flight testing. See SEEK EAGLE OFPs and TOs for more information about flights including stores. See AFI 91-205, *Nonnuclear Munitions Safety Board*, for tests of munitions and munitions-related systems. See AFI 91-401, *Directed Energy System Safety*, for more information about testing of directed energy systems. See AFI 91-208, *Hazards of Electromagnetic Radiation to Ordinance (HERO) Certification and Management*, for

more information about tests electrically initiated devices. See DoDI 3100.11, *Management of Laser Illumination of Objects in Space*, for information about laser clearing house approval for tests with lasers. See AFRLI 61-106, *Planning and Management of AFRL Space Experiments*, for more information about safety review requirements for space programs. PAO designation, military-specific application, or data deliverables may also drive a safety review.

16.1.1.1. (Added-AFRL) All activities in AFRL will be categorized into one of two categories: laboratory research or field research.

16.1.1.1.1. (Added-AFRL) Laboratory research is research in which all testing or research occurs within a laboratory in a controlled setting. This includes (but is not limited to) chemistry laboratories, laser tests, clean rooms, and flying unmanned aerial vehicles (UAVs) in approved enclosed structures. These are generally ongoing activities. Laboratory research requires a signed AFRL Form 5 to permit operations within the laboratory. Hazards will be identified on AFRL Form 5. Laboratory research may or may not require a formal Safety Review Board (SRB), depending on the test's scope, complexity, similarity to other (including previous) laboratory research, and anticipated risk level. If an SRB is held for laboratory research, the SRB Chair will sign the AFRL Test Approval Worksheet (TAW). The TAW will be referenced on the laboratory's AFRL Form 5. Some laboratory research may be complex enough that hazards cannot be properly described on a Form 5. In this case, hazards may be documented on AFRL Form 12 instead, then referenced on AFRL Form 5.

16.1.1.1.2. (Added-AFRL) Field research is any research that does not fall into the laboratory research category. This includes (but is not limited to) any research that involves flying in the National Airspace (NAS), explosives testing, rocket engines, performing research on ranges, etc. The SRB Chair, the Test Execution Authority (TEA), and other required parties must sign the AFRL Test Approval Worksheet before research is permitted to begin. Test unique hazards will be identified on AFRL Form 12.

16.1.2.1. (Added-AFRL) Government-led safety reviews can be a formal SRB or a non-board review, as outlined in this chapter. Non-board reviews will be referred to as informal SRBs.

16.2.2.1. (Added-AFRL) Depending on the scope, complexity, similarity to previous tests, and anticipated risk level, the Technical Review Board (TRB) Chair and the SRB Chair can decide to hold a combined TRB/SRB. Combined reviews for flight tests must also meet the requirements described in AFRLI 61-103 Vol 1.

16.2.3.1. (Added-AFRL) Tests planned and reviewed by other government safety organizations that possess a mature, well-defined review process may be accepted at the discretion of the AFRL TEA, the Detachment Chief of Safety, and the Center Test Authority (CTA). (Note: The TEA would normally be identified after the SRB recommends the risk level. Therefore, in cases such as this, the anticipated AFRL TEA should be consulted for the decision to accept the alternate safety review.) This review does not assume or transfer mishap accountability or Convening Authority (CA) to the Department of Defense (DoD). Acceptance requires the participation of one person assigned to AFRL safety in the review process to ensure adequate SRB rigor and hazard management for AFRL assets.

16.2.3.1.1. (Added-AFRL) If the Lead Developmental Test Organization (LDTO) decides not to conduct the safety review, then AFRL must conduct one.

16.2.3.1.2. (Added-AFRL) The following items are the comprehensive safety requirements when AFRL participates in another organization's SRB (i.e., a "shadow SRB"):

16.2.3.1.2.1. (Added-AFRL) The AFRL Test Approval Worksheet must be signed by a person assigned to AFRL Safety who participated in the SRB. This person is the AFRL shadow SRB chair and will sign the TAW as the SRB Chair. The TEA must also sign the worksheet to document risk acceptance.

16.2.3.1.2.2. (Added-AFRL) AFRL shadow SRB Chair will provide a summary of the SRB in lieu of SRB minutes to document SRB competency, to include references to hazard and mishap discussions. A template can be found on the AFRL SRB SharePoint. This can be provided in the comment section on the TAW.

16.2.3.1.2.3. (Added-AFRL) THAs do not need to be documented on AFRL Form 12, but they must include the criteria listed in **paragraph 16.5.4.2.2.1**. If those criteria are not included, AFRL must supplement the hazard analysis to include the necessary information.

16.3.3. (Added-AFRL) AFRL TD Directors/711 HPW Commander will:

16.3.3.4. (Added-AFRL) On behalf of the AFRL/CC, AFRL COS will inform HQ AFMC/SE of high risk tests. AFRL/DO will notify AFMC A3/6 of high risk tests.

16.3.3.5. (Added-AFRL) Coordinate on high risk activities within their organization that involve AFRL personnel or facilities for which they are responsible.

16.3.4.4.1. (Added-AFRL) Test Directors will coordinate with the SRB chair to provide independent technical and operations experts for SRB membership. Due to the requirement for board member independence, it may be necessary to utilize staff from other commands to include TD, Center, and MAJCOM level cross orgs. Test Directors are responsible for independent board membership coordination to the SRB Chair's satisfaction no later than 5 duty days prior to the SRB.

16.3.5. (Added-AFRL) The Detachment Safety Office will:

16.3.5.2.1. (Added-AFRL) Local procedures will determine the renewal period for AFRL Form 5 Laboratory Permits.

16.3.5.2.2. (Added-AFRL) Coordinate local procedures with AFRL/SE and their detachment chain of command.

16.3.5.2.2.1. (Added-AFRL) Because Wright Site does not have a Detachment chain of command, their local procedures will be coordinated through AFRL/SE.

16.3.5.4.1. (Added-AFRL) The AFRL Det/SE COS will act as the SRB Chair. The Det/SE COS can delegate this responsibility to any qualified personnel assigned to AFRL Safety. If the Det/SE COS elects to delegate this responsibility to personnel outside AFRL safety, it will require AFRL COS approval.

16.3.5.9. (Added-AFRL) Notify AFRL/SE of mishaps per timelines in AFI 91-204, regardless of mishap class. Note that this is in addition to OPREP-3/CCIR requirements, not in place of.

16.3.5.10. (Added-AFRL) Provide assistance to scientists, engineers, and PMs completing AFRL Form 4 and complete assigned sections of AFRL Form 4.

16.3.5.11. (Added-AFRL) Submit lessons learned to AFRL/SE by the end of each calendar year. These will be available on AFRL Lessons Learned from Science & Technology Advanced Research (ALLSTAR). This database is found on the AFRL/SE SharePoint. AFRL/SE can provide the most up to date website address. A lesson learned is any element of knowledge that might assist a future AFRL PM, researcher, or other AFRL Det/SE Office in successful project completion. This could be a strength or something that "went wrong" such as an unexpected event (Do not include privileged safety information). The goal is to learn methods of conducting activities more efficiently, effectively, and safely.

16.3.5.12. (Added-AFRL) Ensure, as appropriate, contracts include requirements for the contractor to support the AFRL test safety review process and mishap investigations.

16.3.6. (Added-AFRL) The Program Manager will:

16.3.6.1. (Added-AFRL) Submit AFRL Form 4 to AFRL Det/SE prior to the start of an activity to ensure safety requirements are identified and efficiently integrated into execution. For contracted efforts, this must be done before contract award. Contact the AFRL Det/SE SSM for assistance to complete AFRL Form 4. AFRL Form 4 shall be submitted using the Work Unit (WU) App.

16.3.6.2. (Added-AFRL) Ensure test plans are submitted to the SRB Chair IAW the timeline outlined in **paragraph 16.6.2.3**.

16.3.6.3. (Added-AFRL) Ensure the SRB Chair has the most current version of the test plan.

16.3.6.4. (Added-AFRL) Ensure an independent airworthiness assessment has been initiated prior to the SRB for flight activities. The airworthiness assessment informs the safety risk assessment. NOTE: The Independent Assessment documentation (e.g., Military Flight Release (MFR), Civil Aircraft Operations (CAO) Letter, etc.) is not required to be signed prior to the SRB.

16.3.6.5. (Added-AFRL) Coordinate with SRB Chair prior to resumption of testing following a HQ AFRL-directed stand down. This may include notifying the SRB Chair the stand down has been lifted or having the SRB Chair sign an amended AFRL Test Approval Worksheet if necessary. SRB Chair will determine if delta SRB is required.

16.3.6.6. (Added-AFRL) Notify the AFRL Det/SE SSM when changes are made to a laboratory. The Det/SE SSM will make the appropriate changes to the AFRL Form 5.

16.3.6.7. (Added-AFRL) Coordinate with the SRB Chair when changes are made to a test plan.

16.3.6.8. (Added-AFRL) Notify the AFRL Det/SE Office upon completion of testing and ensure any lessons learned are documented on ALLSTARS (see **paragraph 16.3.5.11** for more information).

16.3.6.9. (Added-AFRL) Ensure all involved personnel clearly understand their mishap response, investigation, and reporting roles and responsibilities prior to the start of an activity IAW **paragraph 16.9** for all types of test activities and AFRLI 61-103 Vol 1 paragraph 6.17 for flight activities.

16.3.7. (Added-AFRL) The AFRL COS will:

16.3.7.1. (Added-AFRL) Approve SRB Chairs if the Chair is not assigned to AFRL Safety.

16.3.7.2. (Added-AFRL) Coordinate on high risk AFRL review packages prior to presentation to the AFRL Commander.

16.3.7.3. (Added-AFRL) Develop and maintain the AFRL safety review policy contained in this instruction providing overarching guidance, processes, and training.

16.3.7.4. (Added-AFRL) Inform HQ AFMC Safety of high risk activities prior to execution.

16.3.7.5. (Added-AFRL) Inform HQ AFMC/A3/6 of high risk non-flight activities prior to execution.

16.3.8. (Added-AFRL) AFRL Detachment COS will:

16.3.8.1. (Added-AFRL) Recommend to the TEA whether to accept an SRB equivalent review conducted by another government safety office.

16.3.8.2. (Added-AFRL) Coordinate with AFRL/SE on approval of high-risk activities.

16.3.8.3. (Added-AFRL) Maintain a list of approved SRB Chairs within their Detachment.

16.3.8.4. (Added-AFRL) Assign an SRB Chair to each test. If the SRB Chair is not assigned to AFRL Safety, selection of the chair requires AFRL COS approval.

16.3.8.5. (Added-AFRL) Ensure AFRL/SE is apprised of AFRL Det/SE-led or -shadowed SRBs.

16.3.9. (Added-AFRL) AFRL/DO will:

16.3.9.1. (Added-AFRL) Ensure this process is integrated or referenced in other test publications, as applicable.

16.3.9.2. (Added-AFRL) Notify AFMC A3/6 of high risk flight tests.

16.3.10. (Added-AFRL) The SRB Chair will:

16.3.10.1. (Added-AFRL) Determine SRB scope and membership requirements IAW paragraph 16.6..

16.3.10.2. (Added-AFRL) Determine the scope of safety review that changes to the test plan should receive if the changes exceed the scope of the approved test plan. Changes will be documented on AFRL Test Approval Worksheet for field research or on an updated AFRL Form 5 for laboratory research. It is at the discretion of the SRB Chair whether changes will require holding an additional SRB.

16.3.10.3. (Added-AFRL) Ensure the SRB timeline is followed IAW paragraph 16.6.2.3..

16.3.10.4. (Added-AFRL) Gather and forward comments and corrections from the SRB Board Members to the test team for reclama or implementation as appropriate.

16.3.10.5. (Added-AFRL) Ensure the test team is aware of SRB requirements and timelines.

16.3.10.6. (Added-AFRL) Coordinate with the TEA, CTA and AFRL/EN as appropriate on returning to testing following a stand-down of operations. This may include holding an additional SRB and will require signing AFRL Test Approval Worksheet.

16.3.10.7. (Added-AFRL) Receive the appropriate training. Training needs to be accomplished prior to chairing any SRBs. Training must be re-accomplished if the individual has not participated in an SRB within the past 12 months. Training requirements are outlined in **Attachment 6** and may be supplemented by the Det/SE Office. SRB training slides can be found on the HQ AFRL/SE SRB Resource SharePoint.

16.3.10.8. (Added-AFRL) Ensure SRB minutes are produced for each SRB IAW **paragraph 16.6.5.2.**.

16.3.10.9. (Added-AFRL) Notify AFRL COS of high risk tests before they occur.

16.3.10.10. (Added-AFRL) Invite AFRL COS to high risk TEA briefings.

16.4.1. (Added-AFRL) The overall test review process is governed by AFRLI 61-103.

16.4.2. (Added-AFRL) The test safety review will be conducted by AFRL Det/SE. Det/SE offices are defined in **Table 1.1**.

16.4.3. (Added-AFRL) Test Completion Termination (Feedback) will be considered complete when any relevant lessons learned have been submitted to ALLSTAR. The ALLSTAR system can be found on the AFRL/SE SharePoint. AFRL/SE can provide the most up to date website address.

16.5.1. (Added-AFRL) AFRL System Safety Analysis Tools for Test Safety Planning:

16.5.1.1. (Added-AFRL) AFRL Form 4. The purpose of the AFRL Form 4 is communicate safety requirements early in a program's life. AFRL Form 4 is required for every AFRL work unit. Work units are defined in AFRLI 61-201. AFRL Form 4 shall be submitted via the WU app. Note: AFRL Form 4 is first and foremost a mechanism to guide project team's planning to ensure they are aware of safety review expectations. It is recognized that the final manifestation of the project may differ significantly from the initial expectation as the systems engineering and planning process progresses. For Form 4 exemptions, see **paragraphs 16.5.1.3**.

16.5.1.1.1. (Added-AFRL) All work units require an AFRL Form 4 to be completed at project initiation unless the work unit meets exemption criteria listed in paragraph **16.5.1.3 or 16.5.1.4**.

16.5.1.1.1.1. (Added-AFRL) Amendment to AFRL Form 4 for contracted work units. Contract changes may drive an amendment to the AFRL Form 4. Changes to blocks 1-6 on AFRL Form 4 do not require an amended AFRL Form 4 unless they drive changes in blocks 7-29. Changes to blocks 7-29 will require an amended AFRL Form 4 if it will result in new, differing, or removal of safety requirements.

16.5.1.1.1.2. (Added-AFRL) Amendment to AFRL Form 4 for in-house work units. Changes to the work unit can be coordinated directly with the SSM who signed the AFRL Form 4. A new AFRL Form 4 is not required.

16.5.1.2. (Added-AFRL) To determine the safety clauses to include in contracts and safety requirements for a program, the SSM will consider the location of testing, who will execute test, ownership of equipment used for test, deliverables for program, and technical specifics (such as weapon use, flight, animal testing, etc.).

16.5.1.3. (Added-AFRL) The SSM may determine a project is exempt from the AFRL Form 4 if it meets all of the following criteria:

16.5.1.3.1. (Added-AFRL) There is no hardware or software deliverable or development.

16.5.1.3.2. (Added-AFRL) The activity does not meet the definition of Human Subjects Research.

16.5.1.3.3. (Added-AFRL) The activity does not involve flight.

16.5.1.3.4. (Added-AFRL) The activity does not include space equipment, will not launch into orbit, or occur in space.

16.5.1.3.5. (Added-AFRL) The activity does not include munition systems, explosives, or propellants

16.5.1.3.6. (Added-AFRL) The activity does not use or include government personnel, equipment, or facilities.

16.5.1.3.7. (Added-AFRL) The activity does not involve infectious agents and toxins, human derived materials, or recombinant deoxyribonucleic acid (DNA).

16.5.1.3.8. (Added-AFRL) The activity does not involve animal use.

16.5.1.4. (Added-AFRL) All SBIR Phase I work units are categorically exempt from the AFRL Form 4 and its associated requirements. The SSM does not need to verify exemption for each work unit.

16.5.4. (Added-AFRL) Documentation and definition of hazards. There are two types of hazards associated with testing: general hazards (also referred to as routine hazards) and test unique hazards.

16.5.4.1. (Added-AFRL) General hazards are not specific to the test, such as bird strikes. If a test team determines a general hazard is relevant to the test, it will be identified and mitigated (when appropriate) in the test plan. The mitigation measures for general hazards will be labeled as General Minimizing Procedures (GMPs). GMPs are stand-alone phrases/statements and are used to address system under test restrictions, test build-up, critical parameter monitoring, go/no-go criteria, weather or environmental criteria, range unique hazards, and flight test chase requirements among other items of test safety concern. An example of a GMP is checking a range for wildlife hazards before starting testing. GMPs can also address minimizing conditions, such as using experienced pilots to fly the aircraft.

16.5.4.2. (Added-AFRL) Test unique hazards are hazards that are either introduced or exacerbated by the test or are associated with the initial testing of a new system. If the nature of the test increases the probability or severity of non-unique hazards, they should also be documented. Test unique hazards will be documented on AFRL Form 5 or AFRL Form 12, as described in paragraphs **16.5.4.2.1 and 16.5.4.2.2**, respectively.

16.5.4.2.1. (Added-AFRL) AFRL Form 5. Test hazards for laboratory research will be documented on AFRL Form 5.

16.5.4.2.1.1. (Added-AFRL) All facilities with an AFRL Form 5 permit require at least one spot inspection per calendar year, to be conducted by AFRL Det/SES. These spot inspections will be documented. Documentation of spot inspection in the Det/SE office's spot inspection log is acceptable but not required. Alternate methods of documentation may be used.

16.5.4.2.1.1.1. (Added-AFRL) AFRL Form 5 permits will be renewed when changes are made to the laboratory, and as determined by local guidance. See **paragraph 16.9.1** for more information.

16.5.4.2.1.1.2. (Added-AFRL) When there is a new risk acceptance authority in place, they will need to be made aware of all AFRL Form 5 permits in their portfolio within 60 days of starting in their position. The risk acceptance authority will re-sign AFRL Form 5s in their portfolio within one year of being in their position.

16.5.4.2.1.2. (Added-AFRL) Alternates to AFRL Form 5 that are used to complete and document lab reviews shall only be granted by AFRL/SE. Alternate methods must meet the requirements listed in paragraphs **16.3.10.2, 16.5.4.2.1.1, 16.5.4.2.1.1.1, 16.5.4.2.1.1.2, 16.6.2.2.1, 16.6.2.4, 16.6.4.3, 16.6.5.1, and 16.9.1**. Use of alternates to AFRL Form 5 will begin after AFRL/SE issues an MFR stating formal approval.

16.5.4.2.2. (Added-AFRL) AFRL Form 12. Hazards for field research will be documented on AFRL Form 12. An identical Microsoft Word version (found on the HQ AFRL/SE SRB Resource SharePoint) can be used for ease. For version control, the SRB Chair should convert the final version to PDF, if not already using PDF, then lock and sign the document with the embedded common access card signature before sending the final out to the test team.

16.5.4.2.2.1. (Added-AFRL) The following items will be included on the form:

16.5.4.2.2.1.1. (Added-AFRL) Hazard risk level

16.5.4.2.2.1.2. (Added-AFRL) Hazard description

16.5.4.2.2.1.3. (Added-AFRL) Hazard causes and effects

16.5.4.2.2.1.4. (Added-AFRL) Mitigations

16.5.4.2.2.1.5. (Added-AFRL) Corrective actions. These are the actions that will occur if the cause is realized. These include ways to correct the cause and the response if a mishap occurs.

16.6.1. (Added-AFRL) Purpose. The Purpose of a Test Safety Review is to ensure hazards are identified, appropriate risk controls are applied, and residual risk is clearly communicated for decision by the appropriate TEA. The Test Safety Review is an objective, independent, and unbiased review process. The final safety review takes place after the technical adequacy of the test plan is determined. Depending on the scope, complexity, similarity to previous tests, and anticipated risk level, the TRB Chair and the SRB Chair can decide to hold a combined TRB/SRB. Combined reviews for flight tests must also meet the requirements described in AFRLI 61-103 Vol 1.

16.6.2. (Added-AFRL) The SRB Chair will determine what type of review is required for any test or research activity. For all field research, AFRL Test Approval Worksheet must be completed and signed regardless of whether a formal board was held. For laboratory research, a signed and completed AFRL Test Approval Worksheet is only required if a formal SRB was held.

16.6.2.1.2.1. (Added-AFRL) At a minimum, the following topics will be identified and considered prior to the SRB:

16.6.2.1.2.1.1. (Added-AFRL) Review of operating environment (e.g., indoor, outdoor, restricted area, airfield, public area, population density, how personnel not associated with test will be kept out of test area, etc.).

16.6.2.1.2.1.2. (Added-AFRL) Location and activity of personnel during test.

16.6.2.1.2.1.3. (Added-AFRL) Personal Protective Equipment (PPE) requirements.

16.6.2.1.2.1.4. (Added-AFRL) Review of operational documents (e.g., Standard Operating Procedures (SOPs), range safety procedures, applicable range risk assessments for test (ground and flight), etc.).

16.6.2.1.2.1.5. (Added-AFRL) Bird/Wildlife Aircraft Strike Hazard (BASH) and Midair Collision Avoidance (MACA) plans (flight tests only).

16.6.2.1.2.1.6. (Added-AFRL) Legal agreements (e.g., Federal Aviation Administration (FAA) Certificate of Authorization (COAs), Memorandum of Agreement (MOAs), State/County/City approvals).

16.6.2.1.2.1.7. (Added-AFRL) Mishap Convening Authority (CA). Take into consideration who owns the equipment being used for testing, who will be operating/conducting the test, who will likely have the preponderance of loss, and who is initiating the test activity. Final CA determination will be made IAW current DoD and 91-series guidance, and consultation with Air Force Safety Center (AFSEC), as applicable.

16.6.2.1.2.1.8. (Added-AFRL) Unexpected event response. This includes hazards associated with emergency services responding to an event, PPE required for responding to unexpected event, and what procedures to take to preserve the scene for an ISB. All wildlife strikes must be reported to the program's AFRL Det/SE office.

16.6.2.1.2.1.9. (Added-AFRL) For UAV testing:

16.6.2.1.2.1.9.1. (Added-AFRL) Range Safety and Containment. Safety planning for unmanned flight operations shall include range safety planning. This may consist of establishment of caution and kill boundaries, quantitative risk analysis, and/or other planning to appropriately protect mission- essential and non-essential personnel and assets.

16.6.2.1.2.1.9.1.1. (Added-AFRL) Caution and kill boundaries. The caution boundaries should provide sufficient airspace to safely conduct the test. The distance between the caution and kill boundaries should be separated enough to provide sufficient reaction time to identify problems and recover the aircraft before transiting the kill boundary. The kill boundary is the outer acceptable limit to initiate flight termination without the aircraft exiting the airspace boundary. Caution and kill boundaries will not be established at the airspace boundary.

16.6.2.1.2.1.9.2. (Added-AFRL) Flight Termination System (FTS). An FTS terminates the flight of a vehicle for the purpose of range safety.

16.6.2.1.2.1.9.3. (Added-AFRL) Lost link, lost communication, and lost Global Positioning System (GPS) procedures as applicable.

16.6.2.1.2.2. (Added-AFRL) The following topics are mandatory discussion items at the SRB:

16.6.2.1.2.2.1. (Added-AFRL) THAs

16.6.2.1.2.2.2. (Added-AFRL) GMPs

16.6.2.1.2.2.3. (Added-AFRL) CA designation

16.6.2.1.2.2.4. (Added-AFRL) Unexpected event notification process and procedures

16.6.2.1.2.2.5. (Added-AFRL) Risk level, as determined by the SRB Chair and board members

16.6.2.1.2.2.5.1. (Added-AFRL) Airworthiness risk will be briefed as it may affect risk assessment

16.6.2.1.2.2.6. (Added-AFRL) Determination of what constitutes a mishap for tests in which damage is a planned and desired result

16.6.2.1.2.3. (Added-AFRL) An SRB checklist can be found in **Attachment 5**.

16.6.2.1.4. (Added-AFRL) An SRB will not be held unless all board members have had sufficient time to review the test plan and provide comments. The SRB Chair will identify the required board members of the SRB. Note that board membership must be compliant with **paragraph 16.6.1**.

16.6.2.1.5. (Added-AFRL) The following are the required and recommended attendees for an SRB:

16.6.2.1.5.1. (Added-AFRL) SRB Chair. Required for all SRBs. The SRB Chair must meet the requirements of **paragraph 16.6.3**.

16.6.2.1.5.2. (Added-AFRL) PM, test lead, test director, or appropriate representative from the program. Required for all SRBs. PM will ensure appropriate representation from the test team attends the SRB, to include test contractors and operators. Not a voting member of the board.

16.6.2.1.5.3. (Added-AFRL) Operations representative. Required board member for all SRBs. Must have experience operating the system under test, the aircraft being used for the test, or similar systems.

16.6.2.1.5.4. (Added-AFRL) Technical representative. Required board member for all SRBs. Must have experience with weapon system used for test, technology under test, or similar systems.

16.6.2.1.5.4.1. (Added-AFRL) If technology under test is adequately unique that there are no technical experts outside the program office, a member of the program not involved with day-to-day planning of the test under SRB review may serve as board member. If no such member of the program office exists, a representative from the program may serve as the technical representative.

16.6.2.1.5.4.2. (Added-AFRL) For a low complexity test, the Technical representative may also serve as the Test & Evaluation or Operations representative. High complexity or high risk tests will have a dedicated technical expert to serve as board member.

16.6.2.1.5.5. (Added-AFRL) System Safety. Recommended board member. Must have received AFMC-approved System Safety training.

16.6.2.1.5.6. (Added-AFRL) Flight Safety. Required for flight tests. Must be a Flight Safety Officer, Flight Safety Manager, or have received Aircraft Mishap Investigation Course (AMIC) training.

16.6.2.1.5.7. (Added-AFRL) Weapon Safety. Required for tests involving explosives, weapons, munitions (live or inert), or DEW. Must have completed Weapon Safety Managers Course.

16.6.2.1.5.8. (Added-AFRL) Test & Evaluation representative. Recommended board member. Must have two years' experience in test & evaluation.

16.6.2.1.5.9. (Added-AFRL) Host, wing, and/or range safety officer, weapons safety manager, or civilian equivalent (e.g., airfield manager) for the test location, as applicable. The safety office must be invited but it is at their discretion whether they will attend the SRB. Host safety office must notified for elevated risk or high-visibility tests per **paragraph 16.3.3.3**.

16.6.2.1.5.10. (Added-AFRL) Airworthiness representative. Required for flight tests. An airworthiness representative must be invited but it is at their discretion whether they will attend the SRB. If an airworthiness representative is not able to attend, they will send the SRB Chair a summary of the airworthiness status on their behalf prior to the SRB.

16.6.2.1.5.11. (Added-AFRL) Any other experts that the SRB Chair has determined are required to conduct a successful SRB. May serve as voting board members.

16.6.2.1.5.12. (Added-AFRL) At a minimum, at least one person assigned to AFRL Safety must be on the board or assigned as Chair for an SRB.

16.6.2.1.6. (Added-AFRL) If the TRB and SRB were not combined, all action items from the TRB that may have an impact on the safety of the test must be briefed by the PM during the SRB.

16.6.2.2.1. (Added-AFRL) Informal reviews in AFRL can include Negligible Risk Reviews (NRRs), as described in AFRLI 61-103 Vol 1.The SRB chair may decide to not hold a formal SRB based on the test's scope, complexity, similarity to previous tests, and anticipated risk level. If an informal board is held, the SRB chair will ensure all test-unique hazards have been identified, documented, and have a risk level assigned to them. Informal SRBs are conducted as electronic/serial reviews but must include required members as defined in the formal SRB requirement. For laboratory research, AFRL Form 5 will be used to document hazards and will be signed by all necessary signatories. The use of AFRL Form 12 is also authorized for expanded clarification of the AFRL Form 5. For field research, the SRB Chair will sign the AFRL Test Approval Worksheet. Test unique hazards will be identified on AFRL Form 12. The SRB Chair and board members will consider all topics listed in paragraph **16.6.2.1.2.1** and **16.6.2.1.2.2** as part of their review.

16.6.2.3. (Added-AFRL) The following timeline will be followed for the safety review process when a formal SRB is held:

16.6.2.3.1. (Added-AFRL) The SRB Chair will schedule the SRB to occur no earlier than five working days from the day of receiving the draft test plan. The SRB Chair may request more time to review the test plan based on complexity and risk level of test. The SRB Chair will send the test plan to SRB Board Members.

16.6.2.3.2. (Added-AFRL) Two working days prior to SRB: Comments on the test plan will be collected by the SRB Chair and submitted to the test team for adjudication.

16.6.2.3.3. (Added-AFRL) If the above timeline cannot be met, the Detachment COS will need to approve the shortened timeline. If the shortened timeline is not approved, the SRB will be rescheduled.

16.6.2.4. (Added-AFRL) Flying UAVs in Enclosed Spaces. An enclosed space that is to be used for flight operations must go through a formal SRB and have a signed AFRL Test Approval Worksheet and AFRL Form 5. The AFRL Form 5 will be the safety permit for the enclosed space. The AFRL Test Approval Worksheet will be used to document the SRB that was conducted to review the enclosed space. Once the facility has been approved for use, any flight operation can be conducted in the space as long as the UAV falls within the defined limits listed on the AFRL Form 5 and in the enclosed space's approved user manual and within the bounds of the facility MFR.

16.6.2.4.1. (Added-AFRL) An enclosed space is defined as any place where it can be reasonably expected that anything flying will not leave the structure and enter the airspace. This includes (but is not limited to): buildings, facilities, and nets.

16.6.2.4.2. (Added-AFRL) The AFRL Form 5 will specify the following criteria for UAVs that are permitted to fly in the enclosed space: group of UAVs, weight restrictions, size restrictions, maximum allowable speed, and any other restrictions specified in the local operating manual(s).

16.6.3.1.1. (Added-AFRL) AFRL COS approval is required if the SRB Chair is not full-time AFRL safety staff.

16.6.3.5.1. (Added-AFRL) SRB Chair training requirements can be found in **Attachment 6**. Det/SE Offices may add requirements as applicable.

16.6.3.5.2. (Added-AFRL) Training must be documented using Attachment 6 and tracked.

16.6.4.1. (Added-AFRL) The SRB Chair will have the final decision on risk level for each hazard and the overall risk level of the test.

16.6.4.2. (Added-AFRL) Attachment 4 includes quantitative and qualitative descriptions for probability. The SRB will use quantitative determinations for probability when possible. If data does not exist for quantitative probability, refer to the qualitative descriptions of probability.

16.6.4.3. (Added-AFRL) The risk level of test hazards will be indicated on AFRL Form 5 for laboratory research or AFRL Form 12 for field research test unique hazards.

16.6.5.1. (Added-AFRL) Laboratory research will use AFRL Form 5 to document hazards. AFRL field research will use AFRL Form 12.

16.6.5.2. (Added-AFRL) SRB minutes will serve as a historical documentation of the SRB. The minutes may list changes made to the test plan during the SRB, but the final test plan must incorporate the changes before being approved. See **Attachment 7** for required SRB minute format when AFRL chairs the SRB or when AFRL is FOA. SRB minutes, THAs, TAW, and other pertinent documents shall be maintained as official documentation of the safety review process.

16.6.5.2.12. (Added-AFRL) Documentation of mishap convening authority.

16.6.5.2.13. (Added-AFRL) Signature of SRB Chair and program manager on the overall minutes.

16.6.5.3.1. (Added-AFRL) Refer to DoDI 4000.19, *Support Agreements,* and AFRLI 25-201, *Formulation and Oversight of Domestic Alliances,* for more information regarding Memorandum of Understandings (MOU), MOAs, Letter of Authorizations (LOA), and suggested formats.

16.6.5.4. (Added-AFRL) All AFRL field research will follow AFRL/DO guidance for unexpected event notification. The test team's AFRL Det/SE office will coordinate with AFRL/SE to determine if further mishap response is required IAW AFI 91-204, Safety Investigations and Reports.

16.7.1.1. (Added-AFRL) The TEA for High risk tests is the AFRL Commander.

16.7.1.2. (Added-AFRL) The TEA for Medium risk tests is the TD Director/711 HPW Commander. For ground tests, this may be delegated to the Division Chief (minimum O-6 or civilian equivalent grade).

16.7.1.3. (Added-AFRL) The TEA for Low risk tests is Division Chief (minimum O-6 or civilian equivalent grade). For ground tests, this may be delegated to the Branch Chief.

16.7.4. (Added-AFRL) TEA Approval briefing.

16.7.4.1. (Added-AFRL) For high risk activities, the SRB Chair is required to brief the AFRL Commander concerning the results of the SRB.

16.7.4.2. (Added-AFRL) For medium and low risk activities, if an approval briefing is requested by the TEA, the SRB Chair will brief the results of the SRB.

16.7.5. (Added-AFRL) Tests with multiple government organization.

16.7.5.1. (Added-AFRL) The TEA will reside in the LDTO's chain of command.

16.7.5.2. (Added-AFRL) If AFRL is not the LTO, the TEA-equivalent in the AFRL chain of command will sign the TAW to document approval of use of AFRL resources in the test. It does NOT signify acceptance of technical and safety risk for the overall test.

16.8.3. (Added-AFRL) Unexpected Event Notification. Following an unexpected event, pause testing and make notifications per Unexpected Event Worksheet within eight hours IAW AFRLI 61-103. AFRL Det/SE will coordinate with AFRL/SE to determine whether the event was a mishap IAW 91-204 and conduct the appropriate level of investigation.

16.8.3.1. (Added-AFRL) An unexpected event is any unexpected occurrence, or series of occurrences, during test that results in (or has the potential to cause) injury or death, damage to systems (excluding normal wear and tear), property damage, anomalous performance, or departure from the airspace. An unexpected event may or may not be classified as a mishap.

16.8.3.2. (Added-AFRL) All wildlife strikes that occur during flight testing must be reported to their AFRL Det/SE office. This is done via the Unexpected Event Worksheet. The AFRL Det/SE office will complete Form 853. If the team makes notification via FAA processes the team will note this on the Unexpected Event Worksheet.

16.9.1. (Added-AFRL) Changes to laboratory research. If a change is made to laboratory research (e.g., new chemicals will be used, new equipment will be added, etc.), the test director, principal investigator, or PM will inform the AFRL Det/SE SSM of the changes. The SSM will update AFRL Form 5, if necessary, based on the changes. It is at the discretion of the SSM whether the changes warrant holding a formal SRB. When the updated AFRL Form 5 is completed, the laboratory is permitted to operate under the new conditions.

16.9.2. (Added-AFRL) Changes to field research. If changes are made to field research for any reason, the SRB chair will decide whether to hold a new SRB. All approved changes will be annotated on AFRL Test Approval Worksheet and be incorporated into version-controlled test documentation. Note that AFRL/DO will make the determination of whether changes are administrative, major, or minor regarding flight tests.

16.10.1. (Added-AFRL) Lessons learned will be submitted to the ALLSTAR system. See **paragraph 16.3.5.11** for more information.

SCOTT A. CAIN, Brigadier General, USAF
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Attachment 1

GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION

References

AFI 10-1202, *Space Test Program Management,* 15 November 2010

AFMAN 91-222, *Space Safety Investigation and Reports,* 17 June 2019

AFRLI 61-106, *Planning and Management of AFRL Space Experiments*, 16 Jun 2023

AFRLI 25-201, *Formulation and Oversight of Domestic Alliances*, 21 July 2020

AFRLI 40-402, *Protection of Human Subjects in Research*, 21 April 2016

AFRLI 61-103, *AFRL Research Test Review, Approval, and Oversight*, 5 October 2020

AFRLI 61-103 Vo1 1, *AFRL Flight Test and Evaluation*, 5 October 2020

AFRLI 61-103 Vo1 2, *AFRL Test Activity Involving Human Participants*, 6 October 2020

AFRLI 61-201, *AFRL Research and Development (R&D) Work Unit Records and Scientific and Technical (S&T) Reporting*, 9 February 2016

AFRL Test Approval Worksheet

AFRL Unexpected Event Worksheet

AF Form 813, *Request for Environmental Impact Analysis*, 1 Sept 1999

DoDI 3100.11, *Management of Laser Illumination of Objects in Space*, 24 October 2016

DoDI 4000.19, *Support Agreements*, 16 December 2020

Worksheet for Assessing Applicability Of Human Subjects Research Regulation

Prescribed Forms

AFRL Form 4, Safety Planning Form

AFRL Form 5, Lab Safety Permit

AFRL Form 12, Test Hazard Analysis

Abbreviations And Acronyms

AFOSR—Air Force Office of Scientific Research

AFRL—Air Force Research Laboratory

ALLSTAR—AFRL Lessons Learned from Science & Technology Advanced Research

AOARD—Asian Office of Aerospace Research and Development

APMR—Annual Program Management Report

BASH—Bird/Wildlife Aircraft Strike Hazard

C2—Command and Control

CA—Convening Authority

CAO—Civil Aircraft Operations

CDR—Critical Design Review

COA—Certificate of Authorization

CRADA—Cooperative Research and Development Agreement

CTA—Center Test Authority

DNA—Deoxyribonucleic Acid

DTA—Delegated Technical Authority

EOARD—European Office of Aerospace Research and Development

EPA—Educational Partnership Agreement

FTS—Flight Termination System

FOA—Flight Operations Authority

GSU—Geographically Separated Unit

GMP—General Minimizing Procedure

GPS—Global Positioning System

HPW—Human Performance Wing

HR—Hazard Report

HTA—Host Tenant Agreement

LDTO—Lead Developmental Test Organization

LTO—Lead Test Organization

LOA—Letter of Authorization

MACA—Mid Air Collision Avoidance

MFR—Military Flight Release

NAS—National Airspace

NLT—No Later Than

NRR—Negligible Risk Review

NTSB—National Transportation Safety Board

OI—Operating Instruction

OL—Operating Location

PAO—Public Aircraft Operations

PDR—Preliminary Design Review

PHL—Preliminary Hazard List

SDPE—Strategic Development Planning and Experimentation

SBIR—Small Business Innovation Research

SEF—Flight Safety

SEG—Occupational Safety

SES—System Safety

SEW—Weapon Safety

SOARD—Southern Office of Aerospace Research and Development

SOP—Standard Operating Procedures

SpSM—Space Safety Manager

SRB—Safety Review Board

STP—Space Test Program

TAW—Test Approval Worksheet

TD—Technical Directorate

THA—Test Hazard Analysis

TRB—Technical Review Board

UAV—Unmanned Aerial Vehicle

WU—Work Unit

Terms

Caution Boundary—A designated boundary at which the test team needs to initiate a corrective action to recover the aircraft before it reaches the kill boundary. The distance between the caution and kill boundaries should be separated enough to provide sufficient reaction time to identify problems and recover the aircraft before transiting the kill boundary. The distance between the caution and kill boundary should be calculated based on worst case altitude, airspeed, winds, and aircraft configuration.

Enclosed Space—Any place where it can be reasonably expected that anything flying will not leave the structure and enter the airspace. This includes (but is not limited to): buildings, facilities, and nets.

Field Research—Any research that does not fall into the laboratory research category. This includes (but is not limited to) any research that involves flying in the National Airspace (NAS), explosives testing, testing rocket engines, testing on ranges, etc.

General Minimizing Procedures—A mitigation measure for general (i.e., not test-unique) hazards. GMPs are stand-alone phrases/statements and are used to address system under test restrictions, test build-up, critical parameter monitoring, go/no-go criteria, weather or environmental criteria, range unique hazards, and flight test chase requirements among other items of test safety concern.

Kill Boundary—The kill boundary is the outer acceptable limit to initiate flight termination without the aircraft exiting the airspace boundary. The distance between the kill boundary and the approved airspace boundary should be calculated based on worst case altitude, airspeed, winds, and aircraft configuration.

Laboratory—A clearly defined space (indoor or outdoor) used for scientific experiments, testing, analysis, or research activities that may involve the use of, but is not limited to, chemicals, ionizing and non-ionizing radiation, remote vehicles, clean rooms, pathology, or entomology. This research can occur in computer labs, chemistry labs, anechoic chambers, laser labs, wind tunnels, clean rooms, approved enclosed structures for UAV flights, etc.

Laboratory Research—Research in which testing or research occurs within a laboratory. This includes (but is not limited to) chemistry labs, indoor laser tests, clean rooms, and flying UAVs in approved enclosed structures. These are generally ongoing activities.

Unexpected Event—Any unexpected occurrence, or series of occurrences, during test that results in (or has the potential to cause) injury or death, damage to system (excluding normal wear and tear), property damage, unplanned performance, or departure from the airspace. An unexpected event may or may not be classified as a mishap.

Attachment 3 (AFRL)

MANDATORY (M) AND RECOMMENDED (R) TRAINING COURSES

Table A3.2. (Added-AFRL) Mandatory (M) and Recommended (R) Training Courses.

	Weapon	Occupational	Flight	System	Range	Test
Facility System Safety Training				M		

Attachment 5

SAFETY REVIEW BOARD CHECKLISTS

Table A5.1. Safety Review Board Checklists.

A5.1. Purpose. This checklist is to serve as a quick-look guide for formal SRBs conducted by AFRL. For more information on each topic, see the paragraph referenced. SRB resources can be found on the AFRL/SE SharePoint.

A5.2. Order of events and requirements.

- The overall safety review process for all SRBs conducted by AFRL can be found in Figure A5.1.
- For more information on the safety review for field research, see Figure A5.2.
- For more information on the safety review for enclosed spaces, see Figure A5.3.
- For more information on the safety review for laboratory research, excluding enclosed spaces, see Figure A5.4.

A5.3. Test Timeline (see paragraph 16.6.2.3.):

- SRB will be scheduled to occur at least five working days after the test plan was sent to the SRB Board members.
- Board members will send comments on test plan to the SRB Chair two working days prior to the SRB.
- Det/SE Chief of Safety can waive timeline requirement if necessary and appropriate.
- SRB Chair may require more time between receiving test plan and holding SRB depending on complexity and risk level of test.

A5.4. Documentation

- AFRL Test Approval Worksheet is required for all formal and informal SRBs for field research (see paragraphs 16.6.2. and 16.6.2.2.).
- All test unique hazards for field research must be documented on AFRL Form 12 (see paragraph 16.5.4.2. and 16.5.4.2.2.).
- All test unique hazards for laboratory research must be documented on AFRL Form 5 (see paragraph 16.5.4.2. and 16.5.4.2.1.)
- SRB minutes must be in the format provided in Attachment 7 for all tests in which AFRL chairs the SRB or AFRL is FOA.
- SRB minutes must include the minimum requirements listed in paragraph 16.6.5.2.

A5.5. Required and Recommended SRB board members (see paragraph 16.6.2.1.5.):

- SRB Chair (required)
- Operations representative (required)
- Technical representative (required)
- System Safety
- Flight Safety (required for tests involving flight)
- Weapon Safety (required for tests involving explosives or directed energy)
- Test & Evaluation representative
- Any other experts required by the SRB Chair

- Note: at least one person assigned to AFRL Safety must participate in the SRB

A5.6. Topics to consider BEFORE the SRB (see paragraph 16.6.2.1.2.1.):

- Review of operating environment
- Location and activity of personnel during test
- Personal Protective Equipment (PPE) requirements
- Review of operational documents (e.g., Standard Operating Procedures (SOPs))
- BASH and MACA plans (flight tests only)
- Legal agreements (e.g., FAA COAs, MOAs, State/County/City approvals)
- Mishap Convening Authority (CA)
- For UAV testing:
    - Range safety and containment, to include caution and kill boundaries
    - Flight termination system
    - Lost link, lost communication, and lost GPS procedures as applicable

A5.7. Mandatory topics DURING the SRB (see paragraph 16.6.2.1.2.2.):

- THAs
- GMPs
- Convening Authority designation
- Unexpected event notification
- Risk level(s)
    - Airworthiness risk will be briefed as it may affect risk assessment
- Define what will constitute a mishap

A5.8. Guidelines for determining whether a hazard is general or test unique (see paragraph 16.5.4.1. and 16.5.4.2.):

- General hazards include hazards that are:
    - Present in normal operation of equipment/system/vehicle
    - Typical in operating environment
    - Not exacerbated by test
    - Required to be documented but can be in team-determined format
- Test unique hazards include hazards that are:
    - Not present in normal operation of equipment/system/vehicle
    - Associated with initial testing of new system
    - Exacerbated by test
    - Introduced by testing being conducted
    - Required to be documented on AFRL Form 12 (.pdf or .doc version) for field tests

A5.9. The following topics are considered outside the scope of the SRB:

- Test success criteria
- Technical risk determination
- Measures of performance
- Executability of test plan
- Grammar and format of the test plan

A5.10. Other general considerations:

- Are all hazards identified using the test hazard matrix in Attachment 4?

A5.11. If changes are made to field research (see paragraph 16.9.2.):

- Document changes on AFRL Test Approval Worksheet
- SRB Chair will determine if the changes warrant holding a new SRB

A5.12. If changes are made to laboratory research (see paragraph 16.9.1.):

- SSM will update Form 5 as necessary
- Facility will be permitted to operate once new Form 5 is signed
- SSM will decide whether the changes warrant holding an SRB

A5.13. If the SRB is held by an organization outside of AFRL (i.e., shadow SRBs) (see paragraph 16.2.3.)

- The Detachment Chief of Safety must approve the adequacy of the SRB proceedings conducted by the LDTO.
- If the LDTO does not conduct an SRB, then AFRL must conduct one (formal or informal).
- At a minimum, one person assigned to safety within AFRL must participate in the safety review process. This person will sign the AFRL Test Approval Worksheet as SRB Chair.
- The TEA must also sign the AFRL Test Approval Worksheet.
- AFRL shadow SRB Chair will provide a summary of the SRB in lieu of SRB minutes to document SRB competency, to include references to hazard and mishap discussions.
- Hazard documentation must meet the minimum requirements listed in paragraph 16.5.4.2.2.1.

Figure A5.1. (Added-AFRL) Overall Safety Review Process.

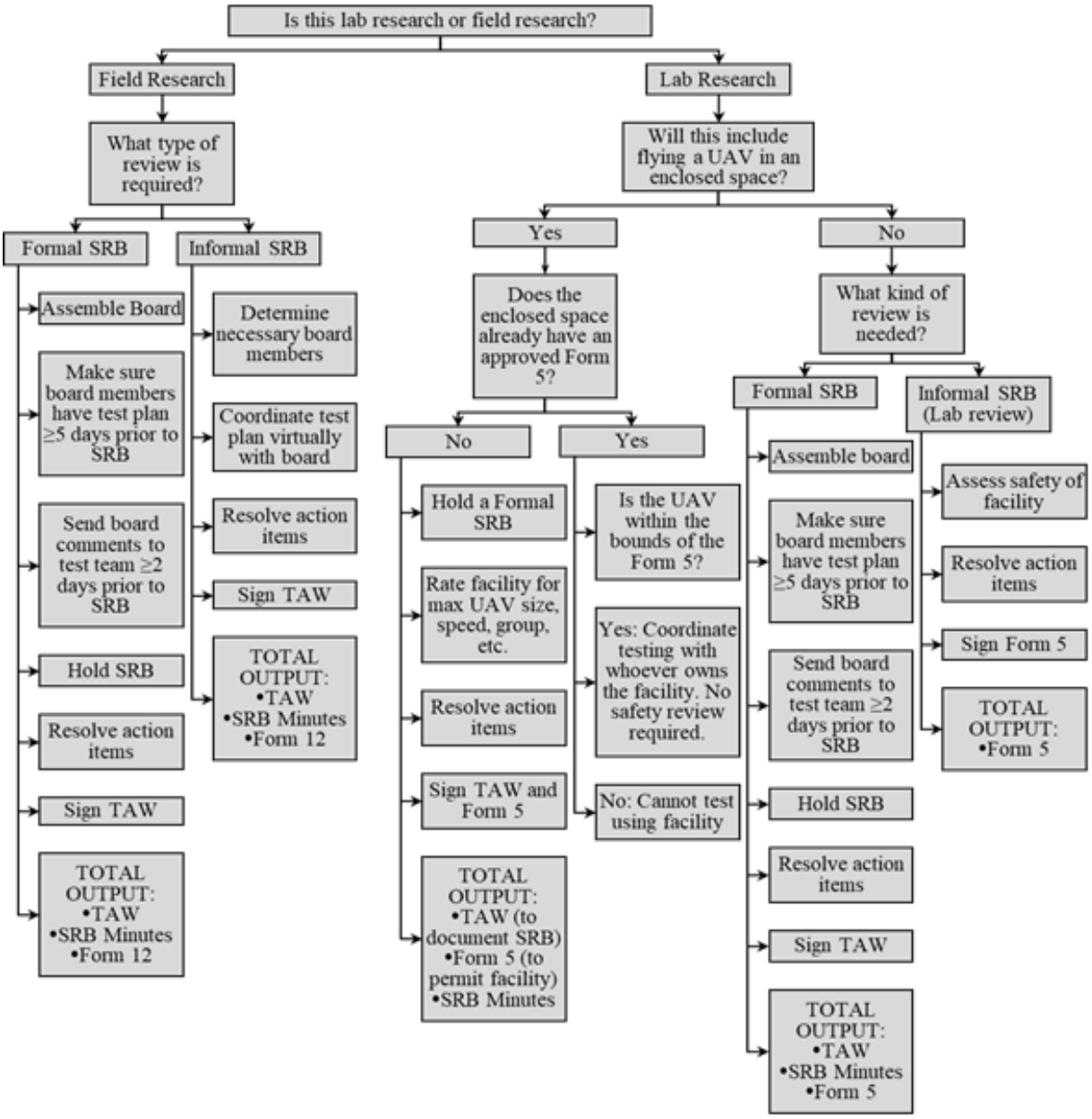


Figure A5.2. (Added-AFRL) Safety Review Process for Field Research.

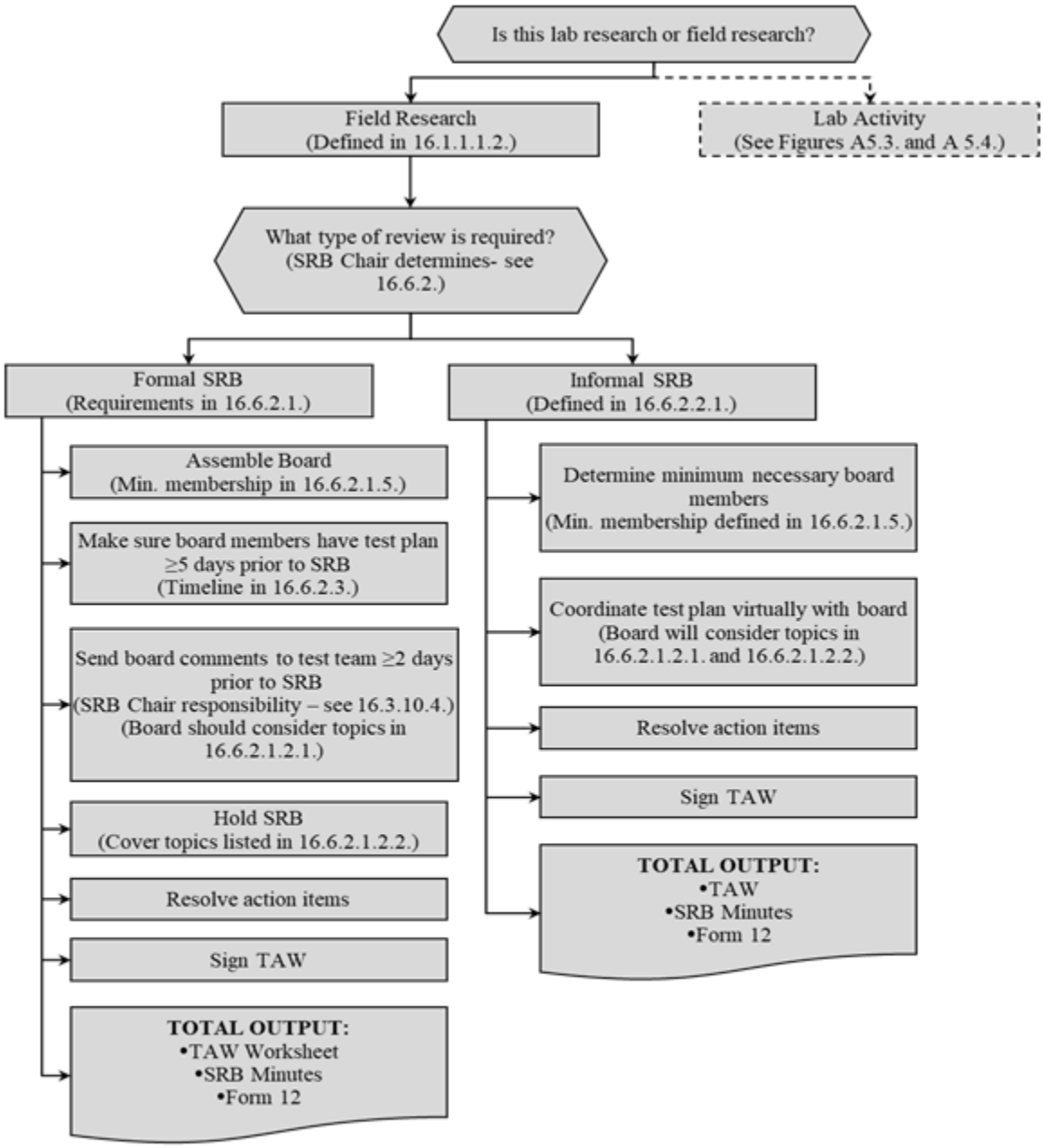


Figure A5.3. (Added-AFRL) Safety Review Process for Flying in Enclosed Spaces.

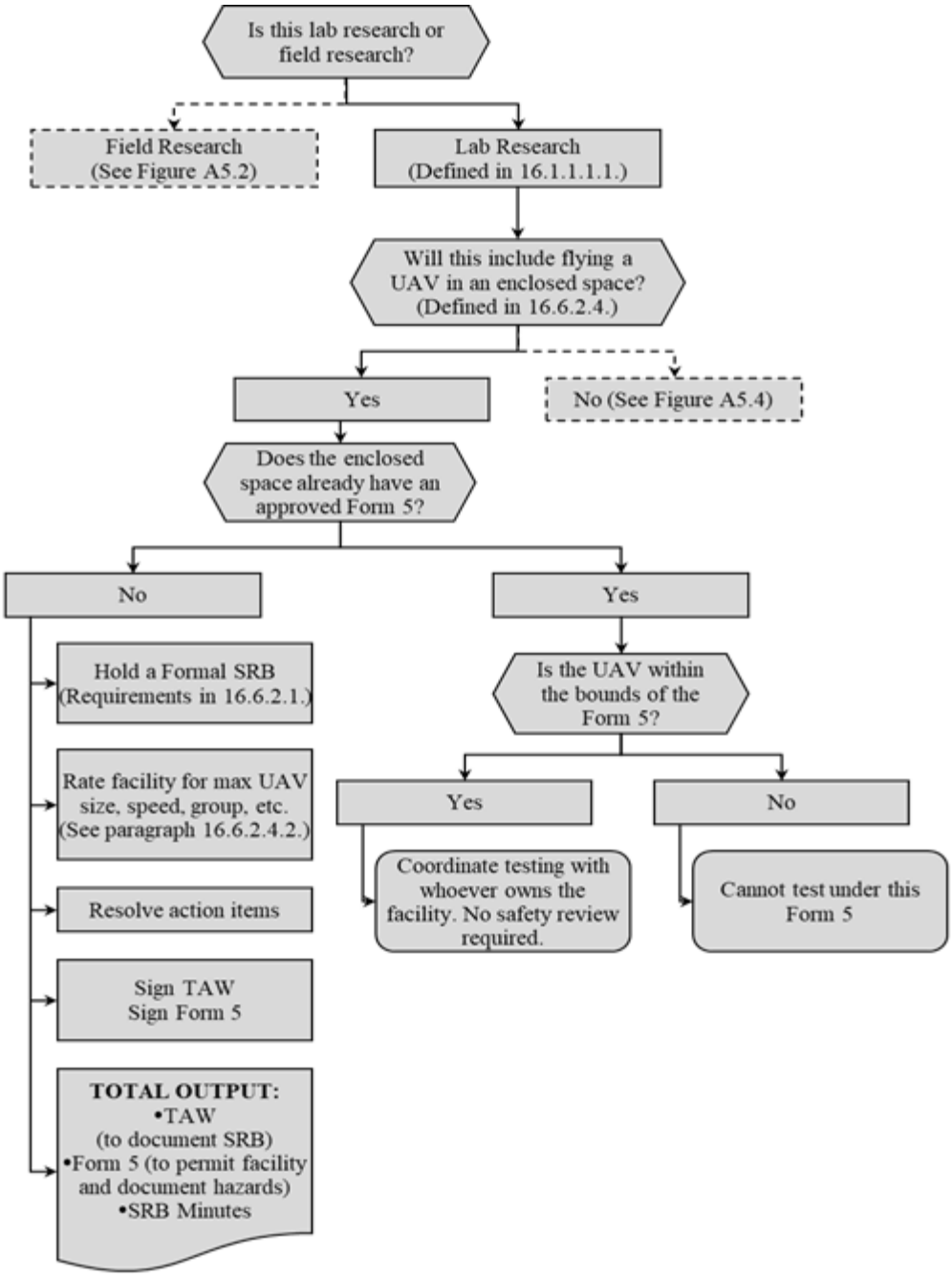
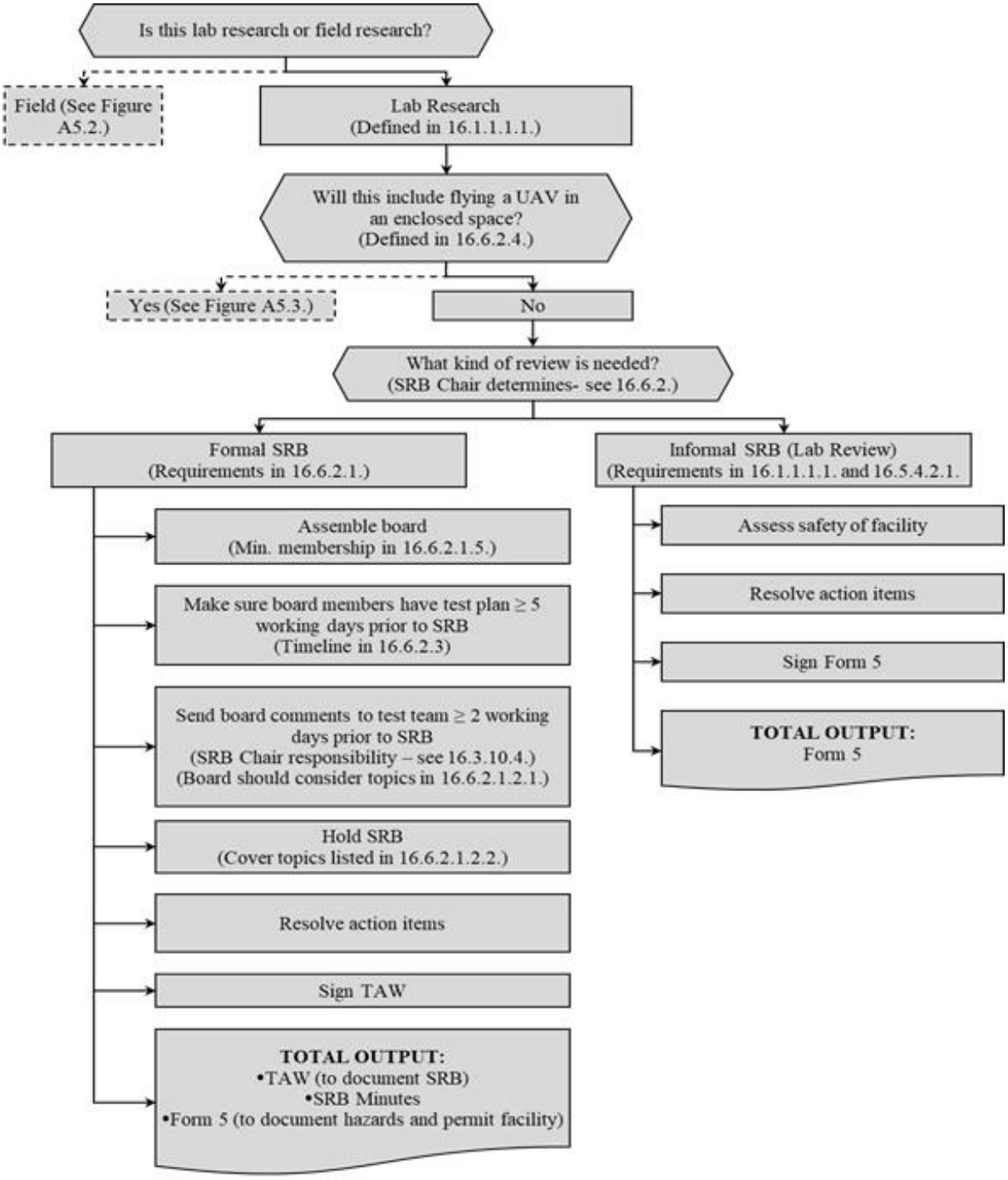


Figure A5.4. (Added-AFRL) Safety Review Process for Laboratory Research, Excluding Flying in Enclosed Spaces.



Attachment 6

SAFETY REVIEW BOARD CHAIR TRAINING

Table A6.1. (Added-AFRL) Safety Review Board Chair Training.

Trainee:			
Trainee Completion Date:			
Task	**Completion Date**	**Trainee's Initials**	**Det/SE Chief of Safety Initials**
REGULATION REVIEW			
Read AFI 91-202, AFMC Supp			
Read AFI 91-202, AFRL Supp			
Read AFRLI 61-103: parent, Vol 1, and Vol 2			
Review mandatory SRB topics (paragraph 16.6.2.1.2.)			
Read AFMAN 91-222 (only required for SRB Chairs when SRB includes space systems)			
SRB EXPERIENCE			
(Before chairing ground SRB) Attend 2 ground SRBs			
(Before chairing flight SRB) Attend 2 flight SRBs			
(Before chairing space SRB) Attend 2 space SRBs			
Act as recorder for 1 SRB			
Chair 1 SRB under mentorship of qualified SRB Chair			
Attend 1 TRB			
OTHER			
Review Lessons Learned on ALLSTARS			
VALIDATION			
Det/SE Chief of Safety signature			
AFRL Chief of Safety signature (if trainee is not assigned to AFRL Safety)			

Attachment 7

SAFETY REVIEW BOARD MINUTE FORMAT

Table A7.1. (Added-AFRL) Safety Review Board Minute Format

(Bolded items are required per paragraph 16.6.5.2.)

[Date] DD MMMYYYY

MEMORANDUM FOR RECORD

SUBJECT: Safety Review Board (SRB) for **Test or project identifier**. Include test plan version number and date.

1. Attendees:

a. SRB Chair: [List name and office symbol]

b. List other attendees and other members as applicable. **If a formal board was not convened list individuals who coordinated on the plan/solution.**

2. Safety Risk Level: [Sample verbiage] Once all of the changes mandated by these minutes are accomplished and the final administrative edits are completed to the satisfaction of the Safety `Review Board, the SRB Chair will recommend a Safety Risk Level of XXX to the AFRL Test Execution Authority.

3. Safety Discussion: List specific: (Note that this section may reference paragraphs in test plan that cover this information)

a. Minimizing procedures (i.e., GMPs):

b. Controls:

c. Restrictions:

d. Go/no-go lists:

e. Concur/non-concurs on risk level, hazards, etc.

f. Convening Authority

4. Airworthiness: [Sample verbiage] The airworthiness representative indicated the operation will be declared [CAO, PAO] and the airworthiness risk level is [High, Medium, Low].

5. Special Considerations: [Sample verbiage for a. thru d. is below. List other special considerations as applicable.]

a. The Technical Review Board (TRB) was conducted on XX XXX XX and assessed [test or project identifier] as an XXX technical risk.

b. AFRL is the [LTO, PTO] for this test.

c. The test team is anticipating test/test start dates of XX XXX XXXX.

d. This test [will/will not] include the participation of AFRLMESPs.

6. Test Hazard Analysis (THA): List any THAs by title only; refer to the test plan for specifics.

a. THA title

b. THA title

c. OR No Test Specific Hazards were identified.

7. Action Items:

a. Indicate the test plan/form/etc. section and what action needs to be taken.

8. Other Agency Coordination: Examples include host installation, range, or non-DoD or N/A

9. Required Waivers: If required or N/A

10. Signatures. Signatures denote minutes are accurate and all action items are complete

_____

SRB Chair and office symbol

_____

PM and office symbol

_____

SRB Recorder and office symbol

X Attachments:
1. AFRL Form 12
2. Test Plan
3. Other supporting documentation, as necessary (specify)