May

2025

Draft

Programmatic Environmental Assessment

Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico

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

PRIVACY ADVISORY

This Draft Programmatic Environmental Assessment (PEA) is provided for public comment in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, (42 United States Code Sections 4321 et seq.) 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 Final PEA. As required by law, comments provided will be addressed in the Final PEA 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 PEA. Only the names of the individuals making comments and specific comments will be disclosed in the Final PEA. Personal information, home addresses, telephone numbers, and email addresses will not be published in the Final PEA.

This PEA has been verified to be compliant with the 75-page limit, not including appendices. A "page" means 500 words and does not include maps, diagrams, graphs, tables, and other means of graphically displaying quantitative or geospatial information.

This document is compliant with Section 508 of the Rehabilitation Act. This allows assistive technology to be used to obtain the available information from the document. Due to the nature of graphics, figures, tables, and images occurring in the document, accessibility is limited to a descriptive title for each item.

DRAFT FINDING OF NO SIGNIFICANT IMPACT

for the Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico

Pursuant to provisions of the National Environmental Policy Act (NEPA), Title 42 United States Code (USC) Sections 4321–4347and 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), Kirtland Air Force Base (AFB), and Air Force Research Laboratory (AFRL) continuing to conduct current research, development, test, and evaluation (RDT&E) activities and implement future RDT&E activities on Kirtland AFB, New Mexico.

Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

Description of the Proposed Action and Alternatives

Proposed Action. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s. There are many existing Environmental Assessments and EIAP documents, including Air Force Form 813s, spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one Programmatic Environmental Assessment (PEA), ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF)/HERTF Canyon, Frustration Canyon, Starfire Optical Range/1-Mile and 2-Mile sites, and Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technologies Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

Alternatives. The PEA considered all reasonable alternatives. Two alternatives were considered and eliminated from further consideration based on the selection standards outlined in **Section 2.4** of the PEA.

No Action Alternative. Under the No Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Planned efforts would not increase over current operating levels and would not deviate from already approved activities. No new test activities would occur; this includes any expanded RDT&E operations that would pose new impacts on environmental resources. This alternative was carried forward for detailed analysis in the PEA. However, the No Action Alternative would not meet the purpose of or need for the Proposed Action as described in **Section 1.2** of the PEA.

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 PEA, 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 PEA 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 2-1** of the PEA.

Conclusion

Based on the description of the Proposed Action as set forth in the PEA, 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 PEA and this FONSI were made available to the public for a 30-day review period on 4 April 2025. Agencies were coordinated with throughout the PEA development process and their comments were incorporated into the analysis of potential environmental impacts performed in the PEA as appropriate.

Finding of No Significant Impact

Based on my review of the facts and analysis contained in the attached PEA, conducted under the provisions of NEPA 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 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: *Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico*

ACRONYMS AND ABBREVIATIONS

µg/m^3	micrograms per cubic meter
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
APE	area of potential effect
BC-TRAIL	Beam Control Targeting Resource Advanced Integration Laboratory
BEL	Battlespace Environment Laboratory
bgs	below ground surface
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	best management practice
C&D	construction and demolition
CATEX	categorical exclusion
CEIEC	Civil Engineering Installation Environmental Compliance
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
CSE	comprehensive site evaluation
CWA	Clean Water Act
DAFI	Department of the Air Force Instruction
DAFMAN	Department of the Air Force Manual
dB	decibel
dBA	A-weighted decibel
DE	directed energy
DoD	Department of Defense
DOE	Department of Energy
EA	Environmental Assessment
EESOH-MIS	Enterprise Environmental, Safety, and Occupational Health Management Information System
EIAP	Environmental Impact Analysis Process
ELTF	Environmental Laser Test Facility
EO	Executive Order
ER	Environmental Restoration
FEMA	Federal Emergency Management Agency
FERMI	Facility for Experimental Reentry Mockup Integration
FONSI	Finding of No Significant Impact
FTU	Formal Training Unit
GHG	greenhouse gas
GT	Ground Terminal
HCPI	Historic Cultural Properties Inventory
HEL	high energy laser
HEML	High Energy Microwave Laboratory
HERTF	High Energy Research and Technology Facility
HiJENKS	High-Power Joint Electromagnetic Non-Kinetic Strike
HPEM	high-power electromagnetic
HPM	high-power microwave

HWMP	Hazardous Waste Management Plan
IAP	initial accumulation point
IPaC	Information for Planning and Consultation
IRP	Installation Restoration Program
ISOON	Improved Solar Observing Optical Network
LBP	lead-based paint
LETF	Laser Effects Test Facility
L_{pk}	peak sound pressure level
LUC	land use control
MD	munitions debris
MEC	munitions and explosives of concern
Melrose	Melrose Air Force Range
METAL	Material Environments Testing and Analysis Laboratory
mgd	millions of gallons per day
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
MSG	Mission Support Group
msl	mean sea level
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
NuDEL	Nuclear Digital Engineering Laboratory
NuIDEA	Nuclear Integration, Experimentation, and Evaluation Data and Environmental Analysis
O_3	ozone
OLPFA	Outdoor Laser Propagation and Firing Area
OSH	Occupational Safety and Healthy
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
RCO	Rapid Capability Office
RCRA	Resource Conservation and Recovery Act
RD	Directed Energy Directorate
RDT&E	research, development, test, and evaluation
REVIL	Re-Entry Vehicle Integration Laboratory
RGR	Rio Grande Rift
RMO	Range Management Office
RV	Space Vehicle Directorate
SALSSA	Satellite Assessment Laboratory for Space Situational Awareness
SATCOM	Satellite Communications
SCAR	Satellite Communication Augmentation Resource
SDA	space domain awareness
SDS	Safety Data Sheet
SHPO	State Historic Preservation Officer
SKYWAVE	Skywave Technologies Laboratory

SO_2	sulfur dioxide
SOP	Standard Operating Procedure
SOR	Starfire Optical Range
South Park	South Park Antenna Field
SOW	Special Operations Wing
SO_X	sulfur oxides
SPCC	Spill Prevention, Control, and Countermeasure
STARCOM	Strategic Training and Readiness Command
STARLORD	Space Technology and Research Laboratory Optical Resiliency Design
sUAS	small unmanned aerial system
Sunport	Albuquerque International Sunport
SWMU	Solid Waste Management Unit
TAC Lab	Telescope/Atmospheric Compensation Laboratory
TCE	trichlorethylene
TES	Test and Evaluation Squadron
tpy	tons per year
UAS	unmanned aerial system
USACE	United States Army Corps of Engineers
USAF	United States Air Force
USC	United States Code
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
UXO	unexploded ordnance
VOC	volatile organic compound
WOTUS	Waters of the United States
WSMR	White Sands Missile Range

COVER SHEET

DRAFT
PROGRAMMATIC ENVIRONMENTAL ASSESSMENT ADDRESSING AIR FORCE RESEARCH LABORATORY RESEARCH, DEVELOPMENT, TEST, AND EVALUATION ACTIVITIES AT KIRTLAND AIR FORCE BASE, NEW MEXICO

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

Affected Location: Kirtland AFB, New Mexico.

Proposed Action: AFRL research, development, test, and evaluation (RDT&E) activities at Kirtland AFB, New Mexico.

Report Designation: Draft Programmatic Environmental Assessment (PEA).

Abstract: This PEA was developed in compliance with the USAF's *Environmental Impact Analysis Process*. It supports a proposal by AFRL for the USAF and USSF to continue conducting current RDT&E activities and implement future RDT&E activities on Kirtland AFB, New Mexico.

AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s. There are many existing Environmental Assessments and Environmental Impact Analysis Process documents, including Air Force Form 813s, spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one Programmatic Environmental Assessment (PEA), ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF)/HERTF Canyon, Frustration Canyon, Starfire Optical Range/1-Mile and 2-Mile sites, and Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technologies Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

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APPENDICES

1.0 PURPOSE AND NEED FOR THE PROPOSED 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.

The Air Force Research Laboratory (AFRL) is the primary scientific research and development center for the United States Air Force (USAF). AFRL plays an integral role in leading the discovery, development, and integration of affordable warfighting technologies for the United States' air, space, and cyberspace force. With a workforce of more than 12,500 individuals across 9 technology areas and 40 other operations across the globe, AFRL provides a diverse portfolio of science and technology ranging from fundamental to advanced research and technology development. AFRL has been conducting research, development, test, and evaluation (RDT&E) activities on Kirtland AFB since the 1960s (see **Appendix A** for the history of AFRL at Kirtland AFB). This Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one Programmatic Environmental Assessment (PEA), ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (RD) and AFRL's Space Vehicle Directorate (RV).

AFRL/RD develops DE weapons (including high energy laser [HEL], high-power microwave [HPM], and high-power electromagnetic [HPEM] system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF)/HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR)/1-Mile and 2-Mile sites, and Outdoor Laser Propagation and Firing Area (OLPFA) to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technologies Laboratory (SKYWAVE), Improved Solar Observing Optical Network (ISOON), and South Park Antenna Field (South Park).

This PEA details the proposed activities under the Proposed Action. The PEA 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 PEA supports a proposal by USAF, United States Space Force (USSF), Kirtland AFB, and AFRL to conduct a range of RDT&E activities at Kirtland AFB.

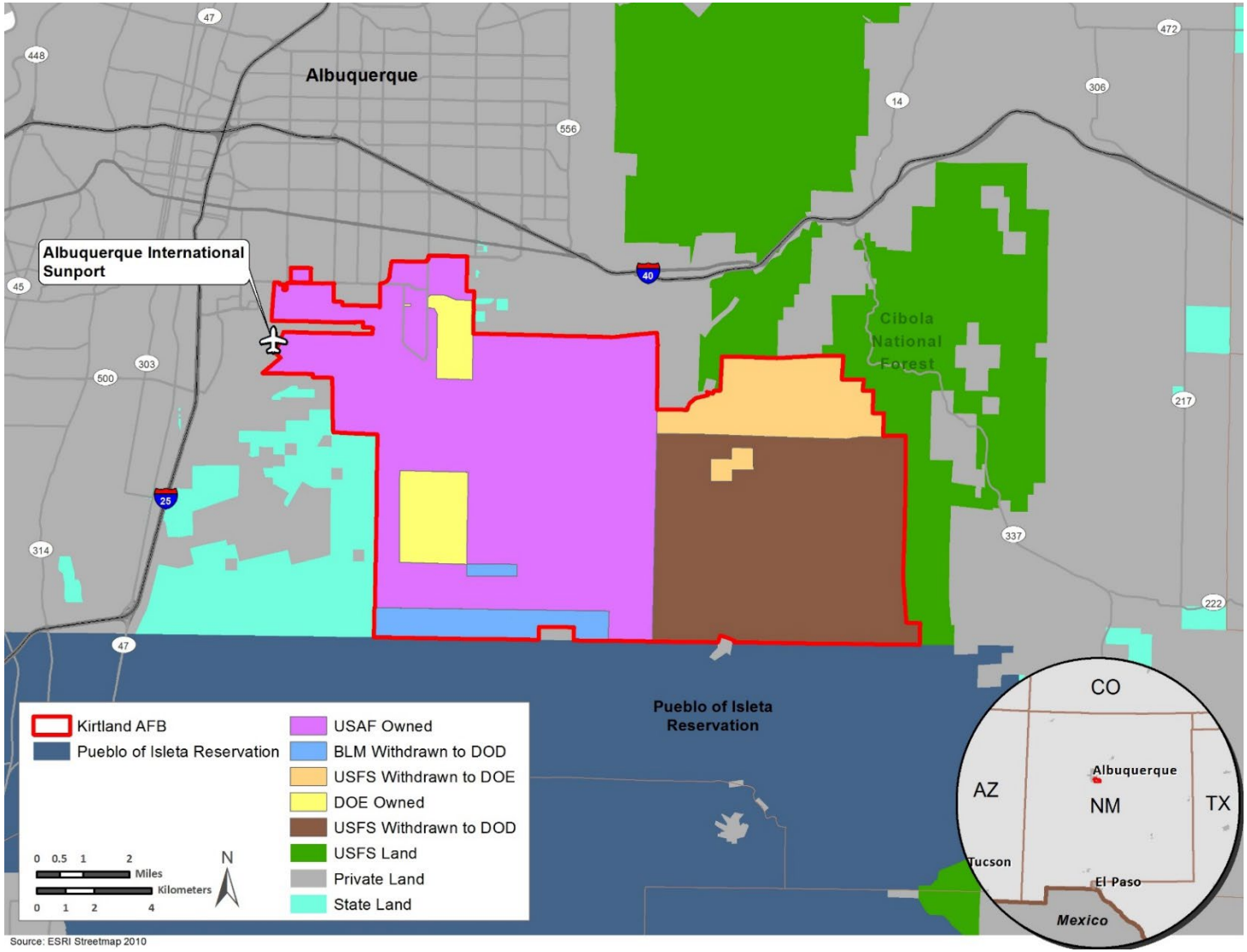


Figure 1-1. Kirtland AFB Vicinity Map

1.1.1 AFRL/RD Operations

The AFRL/RD mission is to "Lead the discovery, development and delivery of DE science and technology for National Security." AFRL/RD specializes in HPM, HPEM, and HEL technology development. These areas of research offer the warfighter innovative technologies that enable a variety of non-traditional counter electronic and thermal effects that can be either lethal or non-lethal. HPM weapons create beams of electromagnetic energy over a broad spectrum of radio and microwave frequencies in both narrow- and wide-band with the intent of coupling/interacting with electronics within targeted systems either by causing damage or temporary disruption from which the system cannot self-recover in time to accomplish its mission. HPEM systems enable low collateral damage methods to disturb, deny, or damage electronics contained in adversary systems or buildings. HEL systems enable pinpoint accurate methods to degrade or destroy adversary systems. These 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 anticipated advances.

1.1.2 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. AFRL/RV develops and transitions space technologies to provide space-based capabilities. Primary mission activities include space-based intelligence, surveillance, and reconnaissance; space domain awareness (SDA); 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 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve the technology discussed in **Section 1.1.1** and **Section 1.1.2**. 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

1.3 DECISION TO BE MADE

This PEA evaluates whether the Proposed Action would result in significant impacts on the environment. If significant impacts are identified, USAF would undertake mitigation measures 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 PEA would be finalized and a Finding of No Significant Impact (FONSI) would be signed and AFRL would continue to conduct current and implement future RDT&E activities on Kirtland AFB. 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 PEA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code [USC] Sections 4321 et seq.) and the USAF Environmental Impact Analysis Process (EIAP) Regulations at 32 CFR Part 989.

1.4 RELATED ENVIRONMENTAL DOCUMENTATION

Tiering is defined as the incorporation of existing Environmental Assessments (EAs) or completed analysis, into other NEPA documents. Tiering allows analysis of actions at a programmatic level for those actions that are similar in nature be used in other analysis efforts in order to keep environmental documents brief. Tiering eliminates repetitive discussions of the same issues and allows analysis to focus on the key issues at each level of project review. The following NEPA documents have been reviewed and are incorporated by reference into this PEA.

- *Environmental Assessment for the Air Force High Energy Laser Program* (KAFB 1976). Hereafter referred to as the HEL EA.
- *Environmental Assessment of the Proposed Addition to the Air Force Weapons Laboratory Optics Development Lab* (KAFB 1984). Hereafter referred to as the Optics Lab EA.
- *Environmental Assessment for the Construction and Operation of the High Energy Microwave Laboratory (HEML)* (KAFB 1987). Hereafter referred to as the HEML EA.
    - *Amendment to Environmental Assessment for the Operation and Maintenance of the High Energy Microwave Laboratory* (KAFB 1992). Hereafter referred to as the Amended HEML EA.
- *Environmental Assessment for the Construction and Operations of the High Energy Research & Technology Facility Kirtland Air Force Base, New Mexico* (KAFB 1989). Hereafter referred to as the HERTF EA.
- *Environmental Assessment for the Laser Effects Test Facility, Kirtland Air Force Base, Bernalillo County, New Mexico* (KAFB 1990). Hereafter referred to as the Laser Effects Test Facility (LETF) EA.
- *Environmental Assessment for the US Air Force Phillips Laboratory Starfire Optical Range Facility Kirtland AFB, New Mexico* (KAFB 1991). Hereafter referred to as the SOR EA.
- *Environmental Assessment Consolidation of Phillips Laboratory Split Directorates Kirtland Air Force Base, New Mexico* (KAFB 1993). Hereafter referred to as the Directorate Consolidation EA.
- *Environmental Assessment for Advanced Laser Facility Kirtland Air Force Base, Albuquerque, New Mexico* (KAFB 1997). Hereafter referred to as the Advanced Laser Facility EA.
- *Environmental Assessment for the ADT Battlelab Phase III Demonstration* (KAFB 1999). Hereafter referred to as the Battlelab EA.
- *Environmental Assessment for the Telescope/Atmospheric Compensation Laboratory* (KAFB 2001). Hereafter referred to as the Telescope/Atmospheric Compensation Laboratory (TAC Lab) EA.
- *Environmental Assessment for Outdoor Laser Propagation Firing Area Including US/UK Focal Plane Array Counter Measures Experiment* (KAFB 2002). Hereafter referred to as the OLPFA EA.
- *Environmental Assessment Air Force Research Laboratory Fixed Panel Array* (KAFB 2006). Hereafter referred to as the Fixed Panel Array EA.
- *Environmental Assessment of the Realignment of the Battlespace Environment Laboratory Kirtland Air Force Base Albuquerque, New Mexico* (KAFB 2007). Hereafter referred to as the Battlespace Environment Laboratory (BEL) EA.

- *Environmental Assessment Addressing the High-Powered Electromagnetic Laboratory at The Air Force Research Laboratory at Kirtland Air Force Base, New Mexico* (KAFB 2019). Hereafter referred to the HPEM Laboratory EA.
- *Environmental Assessment Addressing Construction and Operation of Re-Entry Vehicle Integration Laboratory Facilities at Kirtland Air Force Base, New Mexico* (KAFB 2022a). Hereafter referred to as the Re-Entry Vehicle Integration Laboratory (REVIL) EA.
    - The REVIL EA includes construction, operation, and maintenance of the Facility for Experimental Reentry Mockup Integration (FERMI), as well as the Nuclear Digital Engineering Laboratory (NuDEL)/Nuclear Integration, Experimentation, and Evaluation Data and Environmental Analysis (NuIDEA) complex, which was issued a categorical exclusion (CATEX) off the EA.

1.5 INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

1.5.1 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 13272, as amended; NEPA; and NEPA implementing regulations, Kirtland AFB will notify relevant stakeholders about the Proposed Action and alternatives (see **Appendix B** for all stakeholder coordination materials). The notification process will provide 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 Section 306108), Section 7 of the Endangered Species Act (ESA) and implementing regulations (50 CFR Part 402), findings of effect and a request for concurrence will be 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 included in the Final PEA. All correspondence with SHPO and USFWS will be included in **Appendix B**. Correspondence regarding the findings, concurrence, and resolution of any adverse effect will also be included in **Appendix B**. The following four state and local agency comments were received during the scoping period:

- **New Mexico Historic Preservation Division.** The New Mexico Historic Preservation Division concurred with Kirtland AFB on the area of potential effects (APE) for the project and noted that they looked forward to receiving Section 106 compliance submissions from Kirtland AFB regarding any potential ground disturbance.
- **New Mexico Department of Game and Fish.** The New Mexico Department of Game and Fish (NMDGF) provided several recommendations regarding potential impacts on wildlife or wildlife habitats from the project. Recommendations were added to **Section 3.6**, as applicable.
- **City of Albuquerque Environmental Health Department.** The City of Albuquerque Environmental Health Department noted their regulatory responsibilities are dictated by federal standards and incur periodic updates. They were directed to modify their standards in relation to overburdened areas; and as directed by New Mexico Administrative Rule 20.11.72, new and modified stationary sources that are subject to permitting under 20.11.41 New Mexico Administrative Code (NMAC), 20.11.60 NMAC, or 20.11.61 NMAC may be amended. As stated in NMAC 20.11.72.8 (B), they will publish an initial map on

1 January 2025, with a final map due on 1 July 2025. The City of Albuquerque Environmental Health Department asked that if any new actions or activities were to occur outside of the scope of current air quality permits, Kirtland AFB engage with the Air Quality Program prior to initiating those activities. They also underscored the importance of meaningful engagement with tribal representatives surrounding Albuquerque and vulnerable communities near Kirtland AFB.

- **City of Albuquerque Planning Department.** The City of Albuquerque Planning Department acknowledged that the subject matter of the project was outside their area of technical expertise. They did, however, underscore the importance of meaningful engagement with tribal representatives surrounding Albuquerque and vulnerable communities near Kirtland AFB.

1.5.2 Government to Government Coordination and Consultations

Section 106 of the NHPA and implementing regulations 36 CFR Part 800 requires federal agencies to consult with federally recognized tribes historically affiliated with the APE for the project to determine the presence of and resolve adverse effects to historic properties. To comply with legal mandates, federally recognized tribes that are historically affiliated with the geographic region will be invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes (see **Appendix B** for all tribal coordination materials).

Scoping letters were provided to Native American tribes whose ancestors were historically affiliated with the land underlying Kirtland AFB, inviting them to consult on the proposed undertakings outlined within the PEA. Two comments from Native American tribes were received:

- **Comanche Nation.** Comanche Nation staff reviewed the project to identify areas that may potentially contain prehistoric or historic archeological materials. They stated that the location of the project was cross referenced with Comanche Nation site files and an indication of “No Properties” was identified.

- **San Carlos Apache Tribe.** The San Carlos Apache Tribe stated that they reviewed the Final DOPAA and concurred with the reported findings of no adverse effect.

- **Pueblo of San Felipe.** The Pueblo of San Felipe noted that they were interested in consulting and being involved in the planning process. Kirtland AFB reached back out to schedule either an in person or virtual meeting to further discuss and is awaiting a response.

1.6 PUBLIC AND AGENCY REVIEW OF DRAFT PEA

A Notice of Availability (NOA) will be published in *The Albuquerque Journal* announcing the availability of the Draft PEA. Letters will be provided to relevant federal, state, and local agencies and Native American tribal governments informing them that the Draft PEA is available for review. The publication of the NOA will initiate a 30-day comment period. A copy of the Draft PEA will be made available for review at the San Pedro Public Library, 5600 Trumbull Avenue SE, Albuquerque, New Mexico. A copy of the Draft PEA will also be made available for review online at https://www.kirtland.af.mil/Home/Environment/. 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 PEA, where applicable, and included in **Appendix B** of the Final PEA.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The USAF proposes that AFRL continue to conduct current and implement future RDT&E activities on Kirtland AFB, New Mexico. Given the length of time that has elapsed since the completion of the environmental documents listed in **Section 1.4** and the need to analyze the cumulative impacts of AFRL activities at Kirtland AFB, the USAF determined that a comprehensive PEA was necessary.

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:

- The alternative(s) must meet the purpose of and need for the Proposed Action (see **Section 1.2**) The alternatives must allow users the ability to test concepts to improve the technology discussed in **Sections 1.1.1** and **1.1.2**.
- The alternative(s) must comply with all applicable USAF, federal, state and local requirements.
- 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.

2.3 DETAILED DESCRIPTION OF THE ALTERNATIVES

2.3.1 Proposed Action

This PEA incorporates current and proposed RDT&E activities for both AFRL/RD and AFRL/RV. The following sections describe the types of activities that are proposed at each test site/facility[1]. Radioactive and toxic wastes are not generated during RDT&E activities. Hazardous wastes generated during RDT&E activities and their associated initial accumulation points are discussed in **Section 3.9**.

2.3.1.1 High Energy Microwave Laboratory

The HEML, located on USAF-owned lands (see **Figure 1-1**), consists of 25,484 square feet of laboratory and administration space for developing/testing HPM systems and performing vulnerability studies. HEML has a large anechoic chamber[2] (echo and reverberation free with an attenuation containment factor of 10 billion) that holds airplanes for electronic systems tests.

[1] Due to the sensitive nature of these activities, specific locations or details are not provided.

[2] An anechoic chamber is a room designed to absorb sound and electromagnetic waves to create a completely isolated environment. Anechoic chambers are typically used for testing and measuring acoustic and electronic devices. The walls, ceiling, and floor of an anechoic chamber are covered with materials that absorb sound, such as fiberglass and foam wedges. Additionally, the walls of the chamber may be coated with a layer of radio frequency absorbing material to prevent any electromagnetic interference from entering the space. The design of the chamber allows for minimal sound reflection, creating a space that is almost entirely devoid of echoes.

Shielded rooms contain state-of-the-art instrumentation for operating HPM sources and measuring pulsed radiation characteristics and electrical responses. A suite of narrow- to wide-band sources produce output in the frequency range of the anechoic quiet zone. HEML hosts joint experiments with all three services, other government agencies, and foreign countries. Technologies developed at this facility are field tested on Kirtland AFB at HERTF Canyon, Frustration Canyon, and CHESTNUT Test Range. Activities were previously analyzed in the HEML EA and Amended HEML EA.

2.3.1.2 High-Power Joint Electromagnetic Non-Kinetic Strike Facility and 909 Complex

The High-Power Joint Electromagnetic Non-Kinetic Strike (HiJENKS) Facility and the 909 Complex, located on USAF-owned lands (see **Figure 1-1**), house several laboratories that are used for planning, developing, prototyping, testing, and deploying high-powered radio frequency weapon systems. Technologies developed at this facility are field tested on Kirtland AFB at HERTF Canyon, Frustration Canyon, and CHESTNUT Test Range. Activities in these areas were previously analyzed on various Air Force Form 813s and issued a CATEX.

2.3.1.3 High-Powered Electromagnetic Laboratory

The HPEM Laboratory, to be constructed on USAF-owned lands (see **Figure 1-1**), will consist of 48,000 square feet of modern, flexible HPEM laboratory space for development of advanced HPM and high energy density physics research. Technologies developed at this facility will be field tested on Kirtland AFB at HERTF Canyon, Frustration Canyon, and CHESTNUT Test Range. Construction and operation of this facility were previously analyzed in the HPEM Laboratory EA.

2.3.1.4 High Energy Research and Technology Facility/HERTF Canyon

HERTF and HERTF Canyon are located on United States Forest Service (USFS) lands withdrawn to the Department of Defense (DoD) (see **Figure 1-1**). HERTF provides a unique capability for the development of HPM, high-energy advanced pulse-power (including explosives devices), and very high-energy plasmas. It also provides a research environment for exploring a variety of related technologies. The remote location of the facility on Kirtland AFB is coupled with unique construction, which is designed to withstand blasts and intense radiation from a variety of sources, including high-energy microwaves and x-rays. HERTF has a four-story high-bay laboratory, 80 by 100 feet, with a concrete roof and walls 4 feet thick for blast and radiation shielding. The high bay includes two bridge cranes, cable trays, a 12-foot-deep pit for intense radiation source experiments, and access tunnels to an explosive firing area near the high bay. Up to 1,000 pounds of high explosives can be safely detonated in this area to produce hundreds of mega joules of electrical energy needed for advanced experiments. Additionally, advanced weapons environments can be created to allow scientists to assess the potential threat of these weapons to US military systems. The facility also contains offices and smaller laboratories where advanced weapons technology experiments and demonstrations can be conducted safely and securely. Technologies developed at this facility are field tested at HERTF Canyon. Activities were previously analyzed in the HERTF EA.

2.3.1.5 Frustration Canyon

Frustration Canyon, located on USFS lands withdrawn to DoD (see **Figure 1-1**), is used by AFRL to test HPEM and HEL systems, and to train drone, unmanned aerial system (UAS), and small unmanned aerial system (sUAS) targets that measure the system's parameters. Portable generators are used to power such tests. Drone, UAS, and sUAS pilots are certified and their

operations comply with AFRL/RD sUAS Standard Operating Procedures (SOPs). Frequencies are coordinated with the installation's Frequency Manager.

AFRL also proposes to install a new 50- by 50-foot concrete pad in Frustration Canyon to serve as an alternative test site for firing to SOR's 2-Mile Site. This will enable future HPEM testing with different, more powerful source parameters. Use of microwave systems at Frustration Canyon was previously analyzed in the Battlelab EA.

2.3.1.6 Starfire Optical Range

SOR, located on USAF-owned lands (see **Figure 1-1**), is a world-class optical research facility located on a hilltop site (6,240 feet above sea level) in the southeastern portion of Kirtland AFB. SOR's primary mission is to develop optical sensing, imaging, and propagation technologies to support USAF aerospace missions. It is a major component of AFRL. SOR leads the development of laser beacon adaptive optics for military uses and civilian applications such as astronomy. SOR houses the world's premier adaptive optics telescope capable of tracking low-earth orbiting satellites. Activities were previously analyzed in the SOR and TAC Lab EAs.

Due to encroachment issues in Frustration Canyon and the upgrade of SAR East to fire 0.50-caliber munition items, AFRL proposes to relocate the current 2-Mile Site approximately 4,600 feet south of the current site. The current 2-Mile Site would not be demolished.

2.3.1.7 Outdoor Laser Propagation and Firing Area and Associated Laser Facilities

The OLPFA, located on USAF-owned lands (see **Figure 1-1**), is a laser test area used by USAF, US Navy, and US Army units to perform research, developmental, and limited operational laser testing. This facility is managed by AFRL and leased to other users. The OLPFA has been in continuous operation since 2002. Activities at the OLPFA are coordinated and scheduled with the 377 ABW/Range Management Office (RMO). Research and developmental lasers are brought to evaluate new technologies under development. Operational lasers, including prototype weapon systems, are brought in as part of acceptance testing to determine whether they are ready to be evaluated.

Outdoor environmental conditions have significant impacts on laser propagation. Laser experiments using targets, vehicles, and aircraft with diverse environmental conditions are needed to further the development of systems for countermeasures and weapons. Six target sites are used to measure beam propagation, the 1-, 2-, 4-, 5-, 6-, and 7-Kilometer Sites. Beam propagation is terminated at these locations with specially designed target boards and concrete walls. Any reflections are contained so reflected laser light is not a safety issue to surrounding personnel or aircraft. Activities were previously analyzed in the OLPFA EA.

Additionally, the Environmental Laser Test Facility (ELTF) is designed to provide the ability to propagate a laser to a remote site to exercise customer beam control systems. The ELTF provides risk reduction and technology readiness level verification for various DoD programs. DoD customers and their contractors utilize this facility to test their laser systems prior to integration on aircraft. The Beam Control Targeting Resource Advanced Integration Laboratory (BC-TRAIL) is under the Laser Integration and Demonstration Program. BC-TRAIL is a beam control and laser testbed developed to focus on the research and development of beam control and targeting. Under this Proposed Action, AFRL proposes to continue performing outdoor propagation from both the ELTF and BC-TRAIL to the 1- and 2-Kilometer Sites for testing. These tests occur multiple times a year and are coordinated through 377 ABW/RMO.

Lastly, the LETF conducts laser/material interaction test events using several high-power laser sources. This data is required to assess the effectiveness of lasers on certain materials and components and to assess the response of different materials to laser irradiation. The LETF directly supports the development and demonstration of laser's effects on various materials and provides valuable information necessary to the Laser Technology Program. Activities were previously analyzed in the LETF EA.

2.3.1.8 Plant 1 in the Manzano Mountain Complex

AFRL uses a portion of Plant 1, located on USAF-owned lands (see **Figure 1-1**), as an indoor DE test facility, primarily for Ultrashort Pulsed Laser characterization. Its half-mile long hallways and limited access make it ideal for characterizing laser systems.

2.3.1.9 SKYWAVE Facility

SKYWAVE and the surrounding area composed of the former Digital Ionospheric Sounding System and Tumbleweed Sites are located on USAF-owned lands (see **Figure 1-1**). SKYWAVE is an ionospheric remote sensing laboratory, capable of taking measurements of the ionosphere and providing real-time, on-site processing and analysis to characterize the ionospheric state. Instruments used at SKYWAVE include ionospheric radars, meteor wind radars, optical interferometers, all-sky cameras, global navigation satellite system receivers, and satellite beacon receivers. These data feed models of the ionosphere to better understand the drivers of the dynamic ionospheric state. AFRL researchers use the SKYWAVE facility to foster collaboration with the US and international academic institutions as well as other DoD and Department of Energy laboratories.

As an active antenna deployment test bed, AFRL proposes to temporarily deploy up to 30 antennas per year for a variety of testing purposes. These antennas would not exceed 120 feet in height and would require 36-inch stakes driven into the ground to anchor the antenna via guy wires. The antennas would be installed in areas that are known to be clear of utilities; therefore, AFRL proposes that a dig permit would not be required to bury the stakes for the guy wires in the area presented in **Figure 2-1**. Coaxial cables would be run from the antenna to the SKYWAVE Facility where instrumentation/processing would occur. Cables would be run on the ground surface except for the cables presently running from the Beacon RX antenna to the SKYWAVE Facility. AFRL proposes to bury these 2 to 3 feet below the ground surface. Any permanent antenna installation would be required to undergo separate Kirtland AFB EIAP review. Activities were previously analyzed on various Air Force Form 813s and issued a CATEX.

2.3.1.10 Improved Solar Observing Optical Network

The ISOON telescope, located on Bureau of Land Management (BLM) lands withdrawn to DoD (see **Figure 1-1**), has not been in operation since 2020, but it could potentially be restarted for the current solar maximum. The ISOON location, which is well away from high-traffic areas, makes it suitable for radio applications that wish to minimize electromagnetic interference. Several radio-based studies of the upper atmosphere are sited at ISOON. Activities were previously analyzed in the BEL EA.

Figure 2-1. Proposed Area with No Known Utilities for Antenna Installations at SKYWAVE

2.3.1.11 South Park Antenna Field

South Park is located on BLM lands withdrawn to DoD (see **Figure 1-1**). The current mission is to operate as a satellite communications site and test bed for new types of satellite antennas. Existing AFRL antennas at the site communicate with USSF satellites. South Park is currently utilized by the Space Safari Group, Aerospace Corp, and RVBY; other users may use the site in the future. The site itself consists of approximately 15 acres of flat, open space with unimpeded lines of sight to the atmosphere and little to no vehicle or personnel traffic for optimal sensor readings. AFRL proposes the following actions at the South Park Antenna Field. Activities were previously analyzed in the Fixed Panel Array EA.

Roadway Improvement and Routine Maintenance. AFRL proposes to regrade the gravel road leading from Lovelace Road around South Park, regrade the dirt roads that travel through South Park, and establish a dirt vehicle turn around and staging area. The existing 2-track roadway does not provide an adequate system for transportation.

Installation of Additional Antennas. AFRL proposes to install both permanent and temporary antennas in South Park for future tests over the next 5 years. South Park currently has two parabolic dish antennas, one 5 meters and one 6 meters. Under the Proposed Action, AFRL could install up to 50 antennas at South Park, but would not install more than 5 antennas per year. These antennas would not exceed 70 feet in height. Some antennas would require a new sunken concrete base, while others could make use of existing concrete or gravel pads. The new concrete bases would remain for future use after an antenna is taken down. Coaxial, fiber, and electrical cables would be run from the antenna to containers on site where instrumentation and processing would occur. Cables would be run on the ground surface or buried 3 feet below the ground surface.

South Park Electrical Service and Substation 9 Upgrades. AFRL proposes to install a new 12,470-volt overhead power line to upgrade the electrical service to South Park as well as upgrade Substation 9. The power lines would be installed from Substation 9 to South Park, potentially occurring outside of the 15-acre site. This action would include the demolition of existing overhead lines connected to the site. Additionally, transformers, power panels, and electrical lines would need to be installed or modified throughout the site. This electrical upgrade would be in direct support of the mission critical antenna projects at South Park.

South Park Water System Upgrades. AFRL proposes to repair and improve existing water lines buried beneath South Park. Water access at the site was shut off due to an unidentified leak. AFRL would repair this leak to restore water access and add additional water access points at the site. The upgrades would provide access to a sewer line and potable water for personnel use while working at South Park. Water access allows for washing antennas. It is anticipated that up to 5 acres of the ground surface would be disturbed for the water system upgrades.

South Park Permanent Facility Construction. AFRL proposes the construction of a new permanent facility at South Park. The proposed facility would include areas for personnel to access restrooms, drinkable water, air conditioning, Non-secure Internet Protocol Router/network access, usable electricity, and a designated parking area for personnel to park their vehicles on a regular basis.

2.3.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Planned efforts would not increase over current operating levels and would not deviate from already approved activities. No new test activities would occur; this includes any expanded RDT&E operations that would pose new impacts on environmental resources. The USAF EIAP (32 CFR Section 989.8[d]) requires consideration of the No Action Alternative. Therefore, this alternative will be carried forward for detailed analysis in the PEA. However, the No Action Alternative would not meet the purpose of or need for the Proposed Action as described in **Section 1.2**.

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 100 miles from Kirtland AFB. 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 users to accomplish mission tasks. Therefore, this potential alternative was considered but eliminated from further analysis.

2.4.2 Melrose Air Force Range

Melrose Air Force Range (Melrose) is located approximately 180 miles west of Kirtland 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. All proposed actions in **Section 2.3.1** were 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 mission tasks. 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 2-1. Summary of Potential Impacts

Affected Resource	Proposed Action	No Action Alternative
Noise	Short-term, negligible, and long-term, intermittent, negligible to minor, adverse impacts on the ambient noise environment would occur. The use of heavy equipment during construction and deployment and installation of antennas would result in an increase in noise. Continued test activities involving explosives testing at HERTF Canyon would generate distinct acoustical events that would briefly exceed ambient noise levels; however, noise from these events would not attenuate to levels greater than 65 decibels (dB) at nearby noise sensitive receptors. Test personnel would continue to conduct activities in accordance with Occupational Safety and Health Administration (OSHA) regulations and wear hearing protection equipment.	Existing conditions would remain unchanged.
Air Quality	Short-term, minor, and long-term, intermittent, minor, adverse impacts would occur. Emissions from one-time construction and annual construction/generator use would not exceed thresholds for any criteria pollutant. Fugitive dust emissions would vary from day to day depending on the type of testing activity, vehicle/equipment use, and prevailing weather conditions. Dust suppression techniques would be used during construction and earth moving activities. Short- and long-term, negligible, adverse impact from greenhouse gases (GHGs) would occur. GHG emissions would occur only during one-time construction, annual construction, test site preparation, and testing activities. The net change of GHG emissions would not exceed the threshold.	Existing conditions would remain unchanged.
Geological Resources	No impacts on regional geology or geologic hazards would be expected. Short- and long-term, negligible to minor, adverse impacts on topography and soils would be expected. Continued use of explosive devices at HERTF Canyon and construction of a permanent facility at South Park would result in negligible to minor impacts on topography and soils. Regrading, water system upgrades, and routine maintenance at South Park; relocation of the 2-Mile Site at SOR; and installation of additional antennas at SKYWAVE and South Park would result in negligible to minor impacts on soils. Erosion control measures and best management practices (BMPs) would be implemented to minimize impacts.	Existing conditions would remain unchanged.
Water Resources	No impacts from current or proposed RDT&E activities would be expected; however, short- and long-term, negligible to minor, adverse impacts on groundwater and surface water would be expected as a result of the proposed ground-disturbing activities associated with the Proposed Action at South Park. Proper design and implementation of BMPs and spill prevention and management plans would reduce or eliminate permanent adverse impacts on groundwater and surface water.	Existing conditions would remain unchanged.
Biological Resources	Short- and long-term, negligible to minor, adverse impacts on grassland vegetation, wildlife species, and special status species due to construction and ground-disturbing activities. Vegetation impacts would result from removal and crushing associated with construction and ground-disturbing activities, and temporary displacement of mobile wildlife from noise, lighting, and other ground disturbances would occur from RDT&E activities and construction. Appropriate BMPs for these activities would be implemented to reduce impacts.	Existing conditions would remain unchanged.
Cultural Resources	Ground-disturbing activities within the Frustration Canyon project area have the potential to impact five NRHP-eligible archaeological sites. Short- and long-term, negligible to minor, adverse impacts could be anticipated; however, no adverse impacts would be anticipated if project activities are designed to avoid historic properties. Should the potential for adverse effects from project activities occur, appropriate mitigation would be conducted	Existing conditions would

Affected Resource	Proposed Action	No Action Alternative
	in consultation with the SHPO or Tribal Historic Preservation Officer. Proposed activities related to continued RDT&E activities at HERTF Canyon, ISOON, SKYWAVE, and proposed construction activities at South Park would have no anticipated effects on cultural resources. These projects either have limited potential to affect cultural resources or are in areas where previous surveys have identified no or few cultural resources in the project vicinity. There are six additional archaeological sites and one architectural resource within the APE that have not been evaluated. At present, there are no known Traditional Cultural Properties or Native American burial grounds on Kirtland AFB.	remain unchanged.
Infrastructure	Short-term, negligible to moderate, adverse impacts on transportation systems and solid waste management would occur under the Proposed Action. The Proposed Action would be expected to result in short-term, intermittent, negligible, adverse impacts on area roadways because of a temporary increase in the number of vehicles accessing the installation for construction activities. Project activities associated with the Proposed Action would generate minimal amounts of solid waste and disposal would be conducted in accordance with all federal, state, and local laws and regulations. Short-term, negligible, adverse impacts and long-term, minor to moderate, beneficial impacts would be expected on the electrical system resulting from the Substation 9 upgrades and South Park electrical service upgrades. Short-term, negligible, adverse impacts and long-term, negligible, beneficial impacts would be expected on the natural gas, sanitary sewer/wastewater, and communication systems resulting from the new South Park facility construction. Additionally, short-term, negligible, adverse impacts and long-term, minor to moderate, beneficial impacts would be expected on the water supply system resulting from the new South Park facility construction.	Existing conditions would remain unchanged.
Hazardous Materials and Wastes	Short- and long-term, negligible to minor, adverse impacts would occur. Construction contractors would ensure that the handling, storage, and disposal of hazardous materials, petroleum products, and hazardous and petroleum wastes would be conducted in compliance with applicable laws and regulations. Test personnel would continue to comply with existing Kirtland AFB environmental procedures, AFRL SOPs, and applicable federal and state laws govern the use, storage, transportation, and disposal of hazardous materials, petroleum products, and hazardous and petroleum wastes. Some of the test areas are within active environmental restoration sites and ground-disturbing activities could require unexploded ordnance (UXO) clearance and UXO avoidance training.	Existing conditions would remain unchanged.
Safety	Short-term, negligible, adverse impacts on health and safety of contractor and military and civilian personnel could occur. These impacts would occur in the unlikely event of an accident occurring during the proposed construction and continued and future RDT&E activities. All occupational safety and health (OSH) regulations and BMPs would be followed to avoid any impacts. No impacts on public safety would occur.	Existing conditions would remain unchanged.

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, land use, 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 PEA. 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 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 RDT&E tests would only reach a maximum height of 80 feet, and helicopters fly at an altitude of 500 to 1,000 feet above ground level. Additionally, temporary antennas at the SKYWAVE facility would not exceed 120 feet in height and antennas at South Park would not exceed 70 feet in height. 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 PEA.
- **Land Use.** Under the Proposed Action, no changes to current land use designations would occur. According to the 2016 Installation Development Plan, the proposed activities are located in areas with land designated as Industrial District, Southern Research and Development Area, and the Withdrawn Area and no change to these designations would be required under the Proposed Action (KAFB 2016). No short- or long-term impacts on land use at Kirtland AFB would result from the Proposed Action; therefore, land use has been eliminated from detailed analysis in this PEA.
- **Socioeconomics.** Construction activities associated with the Proposed Action would result in temporary increases in payroll tax revenue from hired construction workers and the purchase of construction materials and goods in the local area. Additionally, the Proposed Action would not result in new personnel at Kirtland AFB. No adverse impacts on socioeconomics would be expected from the Proposed Action. Because the expected beneficial impacts are negligible and there would be no adverse impacts, socioeconomics has been eliminated from detailed analysis in this PEA.

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 Section 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

RDT&E test areas/facilities are 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 (Sunport) are the primary source of noise, with industrial/testing activities and military training as secondary noise sources. Of the RDT&E facilities discussed in **Section 2.3**, the HEML, HiJENKS Facility, HPEM Laboratory, and OLPFA are within the 65 dBA noise contour for the Sunport, meaning the ambient noise environment from aircraft operations at these areas is between 65 and 70 dBA. Noise from testing activities at these facilities is generally contained in the indoor environment.

Most of the RDT&E facilities identified in **Section 2.3**, including HERTF and HERTF Canyon, Frustration Canyon, SOR, Plant 1, SKYWAVE, ISOON, and South Park Antenna Field, are within the central and southern portions of the installation, where the ambient noise environment is generally quieter because development is less concentrated; however, intermittent noise occurs from testing and range activities. 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. Explosives used for some testing activities, such as high explosives up to 1,000 pounds used at HERTF Canyon, produces the highest noise levels, which can reach up to between 160 and 190 dB L_{pk} at the site of testing (NSWC 1981). Overpressures produced from explosive testing have the potential to affect structures; however, blast walls and earthen berms at HERTF Canyon protect the area from noise impacts (KAFB 1989). Noise levels decrease with increasing distance from the noise source.

Laboratories and other facilities where high frequency noise may occur are equipped with surge protection devices to protect lab equipment and computer systems. In addition, some facilities may be equipped with vacuum pumps for filtration in laboratory areas to remove air and other gases. Vacuum pumps are located outside of the building and enclosed by walls to provide noise

attenuation for receptors both inside and outside the facility (KAFB 2007). Noise from vacuum pumps have been measured at 70 dBA (KAFB 1990). Facilities also may be equipped with wind tunnels, which may produce noise levels of over 100 dBA at the noise source inside the facility (KAFB 1990). Other testing equipment (e.g., air compressors, fume hoods, high-pressure equipment) may produce high levels of noise; however, this noise is intermitted and occurs only when such testing equipment is operated. Many testing activities at RDT&E testing areas/facilities, such as operation of directed energy systems, lasers systems, electromagnetic systems, microwave systems, radiation, high-energy plasma, pulse power devices, sensors, telescopes, antenna do not produce noise and do not affect the ambient noise environment. The ambient noise environment also includes low levels of noise, which are produced from operation of drones, generator usage, and test site preparation activities such as equipment installation, minor construction, and vehicles transporting personnel and equipment to and from test areas/facilities.

Noise sensitive receptors within 0.5 mile of RDT&E test areas/facilities include the Pueblo of Isleta Reservation, which is just south of Kirtland AFB and approximately 0.1 mile from the ISOON and South Park Antenna Field. However, the nearest inhabited area of the territory is more than 6 miles (31,680 feet) southwest of the southern boundary of the installation. Noise from existing operations at this distance is less than 65 dBA, which is compatible with noise-sensitive land uses. Kirtland Elementary is approximately 0.5 mile north of the HiJENKS Facility; however, noise at this sensitive noise receptor is influenced by industrial activities within the northwest portion of Kirtland AFB and noise from HiJENKS operations does not exceed 65 dBA at this distance. Most RDT&E facilities are surrounded by uninhabited areas with no nearby noise sensitive receptors.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action

The Proposed Action includes various construction and renovation activities at Frustration Canyon, SOR, SKYWAVE Facility, OLPFA, and South Park Antenna Field (see **Section 2.3**). Short-term, negligible, adverse impacts on the ambient noise environment would occur from the use of heavy equipment during construction, which could result in an increase in noise that is above ambient levels. In addition, long-term, intermittent and temporary, adverse impacts on noise would occur from temporary deployment of up to 30 antennas at the SKYWAVE Facility and installation of up to 5 antennas at South Park Antenna Field per year, and any other minor construction required for test preparation. Noise decreases with distance; therefore, increases to the ambient noise environment from construction are typically confined to within 0.5 mile of a project area. Several pieces of heavy construction equipment would likely be used simultaneously and in general, the addition of a piece of equipment with identical noise levels to another piece of equipment would add approximately 3 dB to the overall noise environment Additive noise associated with multiple pieces of construction equipment would be between 84 and 89 dBA at 50 feet and would attenuate to below 65 dBA between 500 and 1,000 feet from the construction activity (USEPA 1971, TRS Audio 2024). Noise from construction equipment is considered temporary because it only occurs during the duration of construction activities. All construction-related noise impacts would last only for the duration of the construction period and would occur during the daytime hours of 7:00 a.m. to 5:00 p.m. To reduce adverse impacts on the ambient noise environment, construction equipment would include noise abatement components such as mufflers, engine enclosures, engine vibration isolators, or other sound dampening supplements, which could reduce the sound level by up to 10 dBA (USEPA 1974).

Long-term, minor, adverse impacts on noise would occur from the continuation of current RDT&E activities and additional testing activities included in the Proposed Action. Noise from current RDT&E activities was analyzed in previous NEPA documents (see **Section 1.4**), which determined that noise impacts from testing activities are not significant. Many testing activities, such as operation of lasers, DE technology, drones, and non-explosive tests, generate minimal levels of noise that would be consistent with the ambient noise environments of the test areas/facilities throughout Kirtland AFB. These types of noises would be consistent with existing conditions (see **Section 3.2.1**).

Testing activities involving explosives testing at HERTF Canyon would generate distinct acoustical events that would briefly exceed ambient noise levels; however, noise from these events would not attenuate to levels greater than 65 dBA at nearby noise sensitive receptors, such as the Pueblo of Isleta community more than 6 miles southwest of the installation boundary. 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 HERTF Canyon, such as at HERTF. 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. In addition to the existing blast walls and earthen berms, an appropriately sized safety radius would be established prior to testing to protect personnel from the blast and noise impacts. 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.

3.2.2.2 No Action Alternative

Under the No Action Alternative, RDT&E activities at Kirtland AFB would continue and no changes to already authorized operating levels, testing types, or testing frequencies would occur. No new test activities or construction would occur. The existing noise conditions described in **Section 3.2.1** would remain unchanged resulting in no impacts on noise.

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 Section 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 Section 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 NMAC.

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.

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 Section 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 (USEPA 2024a).

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 (µg/m^3) to 9.0 µg/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 2020–2023 annual design value for Bernalillo County is 8.0 µg/m^3 (USEPA 2024b). At the time of this analysis, Bernalillo County was considered in attainment for the 2024 primary annual $PM_{2.5}$ NAAQS. Therefore, Bernalillo County is designated as attainment or unclassified for all criteria pollutants. As a result, the General Conformity Rule is not applicable to federal actions occurring in the county.

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 3-1**. There are no permitted stationary emissions sources within the Range.

Table 3-1. Calendar Year 2023 Air Emissions Inventory for Kirtland AFB

Actual Emissions	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (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_2 = sulfur dioxide

Air emissions produced from current RDT&E activities at Kirtland AFB are from vehicle and equipment operation, minor renovation of and upgrades to existing infrastructure, vehicle movements along dirt and gravel roads while transporting equipment and personnel, test area preparation activities (e.g., temporary installation of equipment and mobile facilities), minor earth moving activities, generator use in remote areas to support testing activities, heating systems (i.e., boilers) at permanent facilities, painting and coating operations, chemical usage, and use of explosives during testing. Estimates for air emissions from existing range activities have not been calculated; however, based on the NEPA documents incorporated by reference (see **Section 1.4**) and the previous analyses identified in **Section 2.3**, it was determined that emissions from RDT&E activities are below the significance thresholds that were applicable at the time of analysis and subsequent impacts on air quality were determined to be insignificant.

Particulate matter, such as fugitive dust, is considered a primary air quality concern for Kirtland AFB. Small amounts of dust or particulate matter is generated from ground-disturbing activities and combustion of fuels in equipment during RDT&E-related activities. These activities include vehicles driving on unpaved roads, minor renovation and construction actions that disturb soils, and some testing activities (e.g., use of UASs that can kick up dust, explosives detonation that can displace soil). The quantity of uncontrolled fugitive dust emissions from RDT&E activities is proportional to the size of the disturbance area and the level of activity. Fugitive dust emissions varies from day to day depending on the type of testing activity, vehicle and equipment use, and prevailing weather conditions. Airborne dust also can occur from dust storms, particularly during dry, windy conditions. These storms lift fine particulates from the soil into the atmosphere, reducing air quality and visibility.

AEHD-AQD issues Fugitive Dust Control Program permits for ground disturbance totaling 0.75 acre or greater under 20.11.20 NMAC. For ground disturbance less than 0.75 acre, the provisions of 20.11.20.12 NMAC must be followed, which requires implementation of control measures or any other effective control measure, as necessary, to prevent the release of fugitive dust and prevent dust from leaving the property. Kirtland AFB also obtains Open Burn Program permits from AEHD-AQD under 20.11.21 NMAC for explosives testing, as required.

GHGs and Weather Trends. In 2020, New Mexico produced approximately 43.3 million tons of CO_2 equivalent (CO_2e), and Bernalillo County produced approximately 5.7 million tons of CO_2e (USEPA 2023). 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.

The climate of Kirtland AFB is considered semi-arid with hot summers and mild winters. Weather trends in the southwestern United States, including Bernalillo County, include increased drought severity, increased frequency of devastating wildfires, and more intense heat and arid weather conditions. These regional weather trends could lead to damaged infrastructure, decreased availability of water supplies in the future, and greater risk of agriculture failure (White et al. 2023). 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. Weather trends linked to Kirtland AFB include increased temperature and drought potential, which could increase dust generation, damage infrastructure, and decrease mission capabilities.

3.3.2 Environmental Consequences

3.3.2.1 Proposed Action

Construction and renovation activities would result in short-term, minor, and long-term, intermittent, minor, adverse impacts on air quality. Bernalillo County is in attainment or 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 2020a, AFCEC 2023a).

The Proposed Action includes RDT&E activities for both AFRL/RD and AFRL/RV throughout AFRL-controlled facilities at Kirtland AFB (see **Section 2.3**). Many testing activities, such as the use of directed energy, high energy laser systems, high power electromagnetics systems, microwave systems, radiation, high-energy plasma, pulse power devices, seismic and other sensors, telescopes, antennas, and drones, and conducting non-explosive tests do not produce air emissions. Therefore, these testing activities would result in no long-term impacts on air quality.

The Proposed Action also includes various construction and renovation activities at Frustration Canyon, SOR, SKYWAVE Facility, and South Park Antenna Field (see **Section 2.3**). The USAF Air Conformity Applicability Model was used to estimate the annual emissions from the one-time construction and renovation activities at Frustration Canyon, SOR, and South Park Antenna Field included in the Proposed Action. It was assumed all one-time construction and renovation activities would occur in the same year and a surrogate year of 2026 was applied. The actual construction period may be different than what was assumed for the analysis. As identified in **Section 2.3**, temporary deployment of up to 30 antennas at the SKYWAVE Facility and installation of up to 5 antennas at South Park Antenna Field would occur annually; therefore, these emissions are included as annual emissions. In addition, the use of portable generators may be required during testing activities to power equipment. Generator use was calculated for testing activities at two sites: Frustration Canyon and the OLPFA. **Table 3-2** summarizes the estimated total net change in annual air emissions from the Proposed Action. Detailed emissions calculations are included in **Appendix C**.

Table 3-2. Estimated Net Annual Air Emissions from the Proposed Action

Activity	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_X (tpy)	$PM_{2.5}$ (tpy)	PM_{10} (tpy)	Lead (tpy)	CO_2e (tpy)
One-time Construction and Renovation Activities (2026)								
Test Area/Facility Improvements	1.770	0.326	2.342	0.003	0.069	18.620	<0.001	385.573
Annual Test Area/Facility Activities (Annual)								
Construction Activities	0.341	0.042	0.485	0.001	0.010	0.797	<0.001	80.478
Generator Use	1.850	1.296	1.205	0.245	0.269	0.269	<0.001	198.552
Total	2.191	1.337	1.690	0.246	0.279	1.066	<0.001	279.030
Annual Maximum	**2.191**	**1.337**	**2.342**	**0.246**	**0.279**	**18.620**	**<0.001**	**385.573**
PSD Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**25**	**75,000**
Exceeds Threshold?	**No**	**No**	**No**	**No**	**No**	**No**	**No**	**No**

Notes: SO_X = sulfur oxides

Emissions from one-time construction and renovation activities would result in short-term, minor, adverse impacts. Annual construction activities and generator use would result in long-term, intermittent, minor, adverse impacts. Emissions from one-time construction and annual construction/generator use would not exceed the PSD thresholds for any criteria pollutant; therefore, these activities would not result in significant impacts on air quality.

As noted in **Section 3.4.1**, emissions are produced from current RDT&E activities at Kirtland AFB and previous analyses determined that such emissions are below applicable significance thresholds. In addition, RDT&E activities may require site preparation or temporary installation of equipment, or one-time infrastructure projects as part of routine testing and maintenance. Potential temporary structures that could be constructed for test activities include antennas (free standing or guywire supported), mobile structures, and trailers. AFRL would construct, operate, maintain, and remove supporting infrastructure as well as conduct routine site preparation, and maintenance. Examples of one-time infrastructure projects that could occur consist of replacing outdated project trailers, replacing/installing underground cables (e.g., fiber optic cables, power lines, etc.), installing and removing test structures, and conducting general clean-up activities (e.g., weed and brush removal, weather proofing). Specific site preparation activities are unknown at this time and subsequent air emissions could not be calculated; however, it is expected that air emissions from these activities would be similar to or less than those estimated for the construction and renovation activities under the Proposed Action (see **Table 3-2**). Therefore, impacts on air quality from current and ongoing RDT&E activities are expected to be less than significant. Separate air quality analyses would be conducted once specific site preparation or infrastructure projects are defined and air emissions would be calculated if required.

Particulate matter, such as fugitive dust, would be generated from ground disturbing activities, combustion of fuels in construction equipment, vehicles traveling on unpaved roads, and dust kicked up from testing activities. As noted in **Section 3.4.1**, fugitive dust emissions would vary from day to day depending on the type of testing activity, vehicle and equipment use, and prevailing weather conditions. Emissions of particulate matter would generally be confined within an area of disturbance and would dissipate rapidly with increasing distance from the disturbance area. Much of the particulate matter kicked up by tire movements would deposit quickly on the ground surface, and particulate matter that becomes airborne during testing activities would fall back down to the ground in the immediate vicinity of the 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 construction and 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 test areas/facilities by approximately 50 percent depending on the number of BMPs and environmental control measures required and the potential for particulate air emissions (USEPA 1985).

AFRL would obtain the appropriate permits from AEHD-AQD prior to site preparation activities, infrastructure projects, or conducting testing activities. These could include Fugitive Dust Control 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) for explosives use at HERTF Canyon. 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.

GHGs and Weather Trends. The Proposed Action would result in short- and long-term, negligible, adverse impacts from GHGs. The USEPA's PSD permitting change threshold of 75,000 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 to warrant any further analysis. The GHG analysis qualitatively assesses whether elements of the Proposed Action would be affected by ongoing weather trends. 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.

As shown in **Table 3-2**, one-time construction activities would produce a total of approximately 386 tons of CO_2e, which represents less than 0.01 percent of annual CO_2e emissions in Bernalillo County and less than 0.001 percent of annual CO_2e emissions in New Mexico. Annual activities would result in a net increase of approximately 279 tons of CO_2e per year, which represents an increase of less than 0.005 percent of annual CO_2e emissions in Bernalillo County and less than 0.001 percent of annual CO_2e emissions in New Mexico. Estimated annual CO_2e emissions is the approximate GHG footprint of 60 passenger vehicles driven for 1 year or 33 homes' energy use for 1 year (USEPA 2024c).

GHG emissions would occur only during one-time construction activities, annual construction activities, during test site preparation, and testing activities, which would occur intermittently throughout the year. As shown in **Table 3-2**, the net change of GHG emissions from the Proposed Action would not exceed the 75,000 tpy PSD threshold for CO_2e. Therefore, net GHG emissions are considered insignificant.

To provide real-world context, **Table 3-3** provides a relative comparison of GHGs from 10 years of annual activities under the Proposed Action and United States, state, and county emissions for the same time period. Enhanced energy efficiency from replacement of outdated buildings and facilities, lower GHG-emitting technology used in testing systems and equipment, more fuel-efficient generators, and other sustainable practices could result in lower energy demand when

compared to existing conditions, and indirectly reduce AFRL's fuel burn requirements for energy production, which could decrease annual GHG emissions.

Table 3-3. 10-Year GHG Emissions from the Proposed Action and Relative Comparison

Reference Scale	CO_2e (tons) [1]	Comparison to Reference Scale
United States	50,519,460,780 [2]	100%
New Mexico	433,455,280 [2]	0.86%
Bernalillo County	56,692,010 [2]	0.11%
Proposed Action	2,896.843	0.0000057%

Notes:
[1] To calculate the total CO_2e, all GHGs are multiplied by their heat-trapping ability, as published in 40 CFR Part 98 (revised April 2024) (CO_2 = 1; methane = 28; nitrous oxide = 265, sulfur hexafluoride = 23,500) and the results are added together.
[2] Annual CO_2e emissions for Bernalillo County, New Mexico, and United States over the 10-year period were assumed to be consistent with 2020 reported emissions.

Ongoing weather trends in the southwestern United States are described in **Section 3.3.1**. These trends are unlikely to affect AFRL's ability to implement the Proposed Action. The weather conditions with the greatest potential to affect the Proposed Action area increased temperatures and drought potential, which could increase dust generation, damage infrastructure, and decrease mission capabilities. The Proposed Action is only indirectly dependent on any of the elements associated with these future weather conditions (e.g., meteorological changes). At the time of this analysis, no future weather scenario would have significant effects on any element of the Proposed Action. .

3.3.2.2 No Action Alternative

Under the No Action Alternative, RDT&E activities at Kirtland AFB would continue and no changes to already authorized operating levels, testing types, or testing frequencies would occur. No new test activities, construction and renovation, nor generator use would occur. The existing air quality conditions described in **Section 3.3.1** would remain unchanged resulting in no impacts on air quality.

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 combination 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.

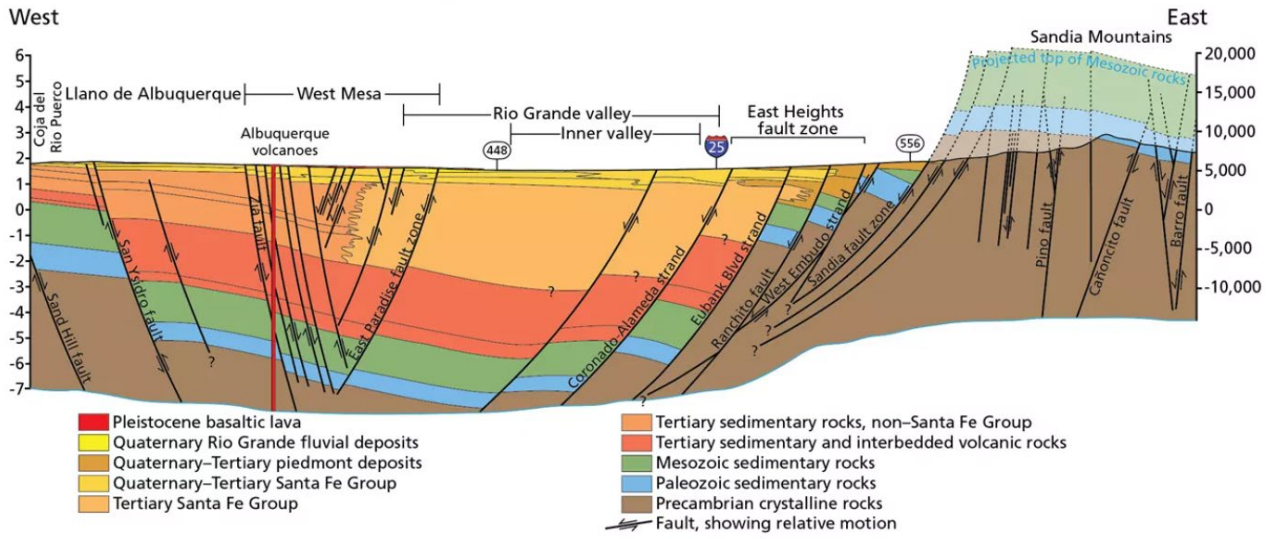
Soils are the unconsolidated materials overlying bedrock or other geologic parent material, and they were formed by chemical and physical weathering forces that modified rock and sediments by breaking them down into smaller and smaller debris. Over time, this debris is subject to different soil-forming 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. Kirtland AFB is located within a substantial geologic rift called the Rio Grande Rift (RGR), which is just east of the Rio Grande River. More specifically, the installation is within the Albuquerque-Belen Basin portion of the RGR, in an area that began to form roughly 20 to 35 million years ago. Heat from deep magmatic movement toward the surface began to stretch the tectonic plate in the area, resulting in lithospheric (crust and mantle) divergence. Over time, as hot and buoyant rock began pushing through the lithospheric surface and cooling into hard rock, the bedrock of the RGR was formed. There are many geologic faults within the RGR, and the known faults within the Albuquerque basin, shown in **Figure 3-1**, are all characterized as normal faults. Kirtland AFB lies within the East Heights fault zone and above numerous faults, shown in **Figure 3-2** (USGS 2024). These faults bisect Kirtland AFB and pose a seismic risk.



Source: NPS 2024

Figure 3-1. Fault Zones of Albuquerque, New Mexico

Source: USGS 2024

Figure 3-2. Known Geologic Faults of Albuquerque, New Mexico

Topography. The average elevation on Kirtland AFB is around 5,600 feet above mean sea level (msl). Topographic relief varies, and many areas throughout and related to the installation can reach up to nearly 8,000 feet above msl. The topography of the installation can be seen in **Figure 3-3**, looking from a vantage point at the western boundary of Kirtland AFB toward the Manzanita Mountains on its eastern border (Google Earth 2024).

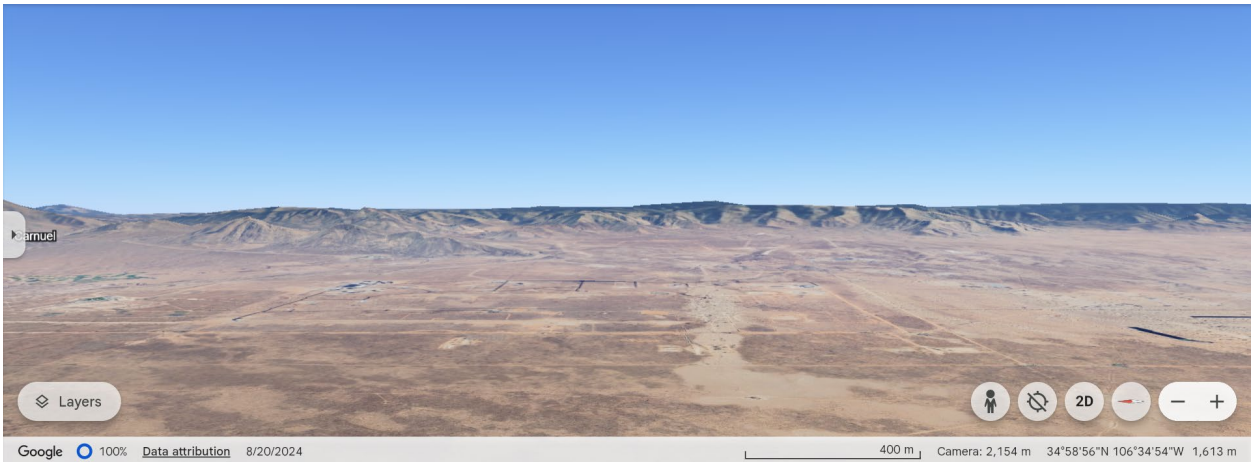


Figure 3-3. Topographic View of Kirtland AFB

Soils. The soil groups listed in **Table 3-4** can be found throughout Kirtland AFB. None of the soils within the installation are listed as prime farmland soils. The parent materials for all soils, excluding rock outcrops made of solid bedrock and the soils from cut and fill activities, are created from alluvial processes, like rivers and streams, and from transportation of sediments and debris that has eroded from the Sandia Mountains during and after precipitation events.

Table 3-4. Chart of Known Soil Groups within Kirtland AFB

Soil Name	Slope Description	Parent Material(s)
Bluepoint loamy fine sand	1 to 9 percent slopes	Alluvium and/or eolian deposits
Bluepoint Kokan association	Hilly	Sandy alluvium and/or eolian sands
Cut and fill land	N/A	N/A
Embudo gravelly fine sandy loam	0 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock
Embudo Tijeras complex	0 to 9 percent slopes	Alluvium derived from igneous and sedimentary rock
Gila fine sandy loam	0 to 2 percent slopes	Alluvium derived from igneous and sedimentary rock
Ildefonso gravelly sandy loam	1 to 9 percent slopes	Calcareous alluvium derived from igneous and sedimentary rock
Laporte Rock outcrop, Escabosa complex	5 to 20 percent slopes	Residuum weathered from igneous and sedimentary rock
Latene sandy loam	1 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock
Madurez loamy fine sand	1 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock
Madurez-Wink association	Gently sloping	Alluvium derived from igneous and sedimentary rock
Nickel-Latene association	5 to 30 percent slopes	Calcareous alluvium derived from igneous and sedimentary rock
Rock outcrop, Orthids complex	40 to 80 percent slopes	Bedrock
Rock outcrop, Ustolls complex	15 to 70 percent slopes	Bedrock
Salas complex	20 to 80 percent slopes	Residuum weathered from igneous and sedimentary rock
Tesajo-Millett stony sandy loams	3 to 20 percent slopes	Alluvium derived from igneous and sedimentary rock
Tijeras gravelly fine sandy loam	1 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock
Tome very fine sandy loam	0 to 2 percent slopes	Alluvium derived from igneous and sedimentary rock
Wink fine sandy loam	0 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock
Wink-Embudo complex	0 to 5 percent slopes	Alluvium derived from igneous and sedimentary rock

Source: USDA 2024

Geologic Hazards. Rockfalls, sinkholes, and minor earthquakes are common in some areas of New Mexico, and the lithology of Kirtland AFB is composed primarily of alluvial soils, which can be unstable when saturated due to the lack of aggregate. Since these sediments were transported by streams, rivers, and precipitation, their small particle sizes make it susceptible to soil subsidence, which is the sinking or settling of the ground surface.

The proximity to some major normal faults means that the area is susceptible to seismic activity, especially since a large fault line bisects the installation. The New Mexico Tech Seismological Observatory reports numerous small earthquakes occur each year, most under magnitude 2, which would likely not cause damage to installation facilities. In 2023, only 17 earthquakes larger than magnitude 3 were observed and only two of those were larger and between magnitude 4 and 5 (NMTSO 2024).

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. No impacts on regional geology would be expected. Certain activities, largely those associated with the continued use of explosive devices at HERTF Canyon, would not be large enough in size to impact regional geology. No activities would alter lithology, stratigraphy, or the geological structures underlying Kirtland AFB or adjacent areas.

Topography. Short-term, negligible to minor, adverse impacts on topography would be expected from the continued use of explosive devices at HERTF Canyon. The proposed construction of a permanent facility at South Park with up to 6,000 square feet of ground disturbance would result in a long-term, negligible, adverse impact on topography and result in alteration of the area's topographic profile. Erosion control measures and BMPs would be implemented to minimize adverse impacts.

Soils. Short-term, negligible to minor, adverse impacts on soils would result from the continued use of explosive devices at HERTF Canyon, regrading activities for the proposed roadway improvement and routine maintenance at South Park, relocation of the 2-Mile Site at SOR, and installation of additional antennas at SKYWAVE and South Park. Antennas would be anchored into the ground using 36-inch stakes and guy wires. Construction of sunken concrete bases and burial of cables 3 feet below ground surface would negligibly impact surface and subsurface soils. Additionally, the proposed water system upgrades at South Park would result in up to 5 acres of ground surface disturbance to repair and improve the existing water lines resulting in short-term, minor, adverse impacts on soils. The proposed construction of a permanent facility with up to 6,000 square feet of ground disturbance would result in short- to long-term, negligible to minor, adverse impacts on soils. The Proposed Action would implement strategies to minimize soil erosion and sedimentation using environmental protection measures and appropriate BMPs.

Geologic Hazards. No impacts on geologic hazards would be expected. The Proposed Action is not anticipated to change or result in short- or long-term impacts on regional geological features or cause an existing feature to become unstable.

3.4.2.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Therefore, the existing geological conditions discussed 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 at Kirtland AFB include groundwater, surface water, floodplains, and wetlands (USFWS 2024a, 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 Section 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 Department of the Air Force Manual (DAFMAN) 32-7003, *Environmental Conservation*, and EO 11990.

The United States Army Corps of Engineers (USACE) (33 CFR Section 328.3) and the USEPA (40 CFR Section 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 Section 328.3; 40 CFR Section 120.2) are considered jurisdictional and subject to the requirements of the CWA. DAFMAN 32-7003, paragraph 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 and 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. Similarly, a 500-year flood is defined as flood levels that have a 0.2 percent chance of occurring in any given year. 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 DAFMAN 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 2023a).

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 2023a). 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 2023a, 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. 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 project areas.

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 2023a). OLPFA is the only project area to fall within the 100-year floodplain; however, no ground disturbing activities would occur in this project area. The nearest project area in which ground disturbing activities

would occur, SKYWAVE, is located approximately 5 meters outside of the 100-year floodplain. The 500-year floodplain has not been surveyed or mapped at Kirtland AFB.

3.5.2 Environmental Consequences

3.5.2.1 Proposed Action

Groundwater. Short-term, negligible, adverse impacts would be expected during construction of a new permanent facility and other ground-disturbing activities proposed for South Park from ground disturbance with heavy equipment. Soil disturbances could lead to increased sediment transportation during rainfall events that could eventually enter groundwater through recharge point. Implementation of stormwater protection BMPs and spill prevention and management plans 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.

Vehicles and equipment used during construction 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, the Proposed Action would not be expected to result in an impact on water resources. No long-term impacts from continued or future AFRL RDT&E activities would be expected.

Surface Water and Wetlands. Short and long-term, negligible to minor, adverse impacts would be expected during and following construction of a permanent facility, and other ground-disturbing activities proposed for South Park. Any activity that would disturb greater than 1 acre would require a Stormwater Pollution Prevention Plan. The addition of the facility would introduce a large, impervious surface to the environment, increasing the potential risk for increased surface runoff and sediment transportation. During rainfall events, stormwater has the potential to transport sediment and hazardous materials to drainage ditches. However, proper design and implementation of typical stormwater protection BMPs and spill prevention and management plans would reduce or eliminate permanent adverse impacts on the water quality of surface waters. No long-term impacts from continued or future AFRL RDT&E activities would be expected.

Floodplains. No impacts on floodplains would be expected. None of the ground-disturbing activities associated with the Proposed Action would occur within the 100-year floodplain. Therefore, no impacts on floodplains would occur.

3.5.2.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Therefore, the existing water resources discussed 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 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 Migratory Bird Treaty Act. Species of Greatest Conservation Need (SGCN) are species that are most in need of conservation action in a particular state or US territory. SGCN species are identified in each state's State Wildlife Action Plans.

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). The Kirtland AFB 2023 Integrated Natural Resources Management Plan provides guidance and SOPs for biological resources and special status species (KAFB 2023a).

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. 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.

3.6.1.1 Vegetation

Four main plant communities occur on Kirtland AFB, including grassland (such as sagebrush steppe and juniper woodlands), piñon-juniper woodlands, ponderosa pine woodlands, and riparian/wetland/arroyo. The Proposed Action occurs within the grassland community. This community is found between elevations of 5,200 and 5,700 feet at Kirtland AFB. In the foothills of the Manzanita Mountains, grasslands are found as high as 6,900 feet. Before the land was acquired by the military, the area was rangeland. Since grazing has been eliminated for the past 60 years, much of these grasslands are in good condition.

Primary grass species include ring muhly (*Muhlenbergia torreyi*), Indian ricegrass (*Achnatherum hymenoides* [syn. *Oryzopsis hymenoides*]), blue grama (*Bouteloua gracilis*), black grama (*Bouteloua eriopoda*), six-weeks grama (*Bouteloua barbata*), and spike dropseed (*Sporobolus contractus*). Shrubs commonly found in the grassland community include sand sage brush (*Artemisia filifolia*), winterfat (*Krascheninnikovia lanata* [syn. *Eurotia lanata*]), and broom snakeweed (*Gutierrezia sarothrae*). Other species encountered include red three-awn (*Aristida purpurea var. longiseta*), purple three-awn (*Aristida purpurea var. purpurea*), sixweeks threeawn (*Aristida adscensionis*), hairy grama (*Bouteloua hirsuta*), mesa dropseed (*Sporobolus flexuosus*), fourwing saltbush (*Atriplex canescens*), Apache plume (*Fallugia paradoxa*), plains prickly pear (*Opuntia polyacantha*), and great plains yucca (*Yucca glauca*). Transitional shrublands can be found between the grassland and piñon-juniper woodland communities, with many species from both communities inhabiting these areas (KAFB 2023a).

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. The following provides information on the wildlife found or expected to be found on Kirtland AFB by vegetation community. Species may be transient and travel or inhabit several communities or exist in transitional areas between vegetation communities.

Common birds associated with the grasslands at Kirtland AFB include the horned lark (*Eremophila alpestris)*, scaled quail (*Callipepla squamata)*, mourning dove (*Zenaida macroura)*, greater roadrunner (*Geococcyx californianus)*, American crow (*Corvus brachyrhynchos)*, northern mockingbird (*Mimus polyglottos)*, Crissal thrasher (*Toxostoma crissale)*, lark sparrow (*Chonedestes grammacus)*, black-throated sparrow (*Amphispiza bilineata)*, western meadowlark (*Sturnella neglecta)*, brown-headed cowbird (*Molothrus ater)*, and house finch (*Haemorhous mexicanus)*. Raptor species known or expected to be found in the grassland habitat include the northern harrier (*Circus cyaneus)*, red-tailed hawk (*Buteo jamaicensis)*, Swainson's hawk (*Buteo swainsoni)*, ferruginous hawk (*Buteo regalis)*, American kestrel (*Falco sparverius)*, prairie falcon (*Falco mexicanus)*, great horned owl (*Bubo virginianus)*, and burrowing owl (*Athene cunicularia ssp. hypugaea*). Additionally, turkey vultures (*Cathartes aura)* are common scavengers in this habitat. Raptors use the Kirtland AFB grassland areas for hunting throughout the year, but the lack of nesting sites (e.g., trees and cliffs) in these areas limits the use of this habitat for breeding. However, manmade structures may occasionally be used by some species for nesting (KAFB 2023a).

Rabbits, hares, and rodents dominate the mammal community in the grasslands. These include desert cottontail (*Sylvilagus audubonii)*, black-tailed jack rabbit (*Lepus californicus*), spotted ground squirrel (*Xerospermophilus spilosoma*), Gunnison's prairie dog (*Cynomys gunnisoni*), silky pocket mouse (*Perognathus flavus*), Ord's kangaroo rat (*Dipodomys ordii*), banner-tailed kangaroo rat (*Dipodomys spectabilis*), Merriam's kangaroo rat (*Dipodomys merriami*), western harvest mouse (*Reithrodontomys megalotis)*, deer mouse (*Peromyscus maniculatus)*, white-footed mouse (*Peromyscus leucopus*), and northern grasshopper mouse (*Onychomys leucogaster*). Mammalian predators in the grassland community include the coyote (*Canis latrans*), kit fox (*Vulpes macrotis)*, badger (*Taxidea taxus)*, striped skunk (*Mephitis mephitis*), and bobcat (*Lynx rufus*) (KAFB 2023a).

A variety of reptiles and amphibians are found within Kirtland AFB grasslands. Many of these species have extensive periods of dormancy during dry conditions, and rapid breeding cycles when temporary ponds appear after rains. Reptiles and amphibians found on Kirtland AFB include the Woodhouse's toad (*Anaxyrus woodhousii)*, red-spotted toad (*Anaxyrus punctatus)*, New Mexico spade foot toad (*Spea multiplicata)*, western box turtle (*Terrapene ornata)*, little-striped whiptail lizard (*Cnemidophorus inornatus)*, short-horned lizard (*Phrynosoma hernandesi)*, lesser earless lizard (*Holbrookia maculata)*, bull snake (*Pituophis catenifer sayi)*, western rattlesnake (*Crotalus* oreganus), and glossy snake (*Arizona elegans*) (KAFB 2023a).

3.6.1.3 Special Status Species

According to USFWS's Information for Planning and Consultation (IPaC) Database, there are five federally listed threatened or endangered species and one candidate species with the potential to occur on Kirtland AFB (USFWS 2024b). These species include 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*) (USFWS candidate species). However, none of these species have been identified on the installation nor do they have suitable habitat on Kirtland AFB. To ensure no impact on listed species, an updated species list from USFWS is required to be obtained within 90 days of starting construction activities.

According to the Biota Information System of New Mexico (BISON-M), there are 16 species listed by NMDGF as threatened or endangered that are known to occur in Bernalillo County (BISON-M 2024). These species are listed below in **Table 3-5**, which summarizes all special status species and their potential to occur on Kirtland AFB. Data was collected from the USFWS IPaC resource list, New Mexico Environmental Review Tool, NMDGF BISON-M, and New Mexico Rare Plants List for Bernalillo County. Subject to the availability of funds, biological surveys are conducted annually to monitor the presence of federal-listed, state-listed, and other special status species on Kirtland AFB (KAFB 2023a).

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. 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. The Proposed Action would result in short- and long-term, negligible to minor, adverse impacts on grassland vegetation. 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 project areas during RDT&E activities and construction. Additionally, ground disturbance and transport of construction 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, which would be coordinated with and approved by the Kirtland AFB Natural Resources Program Manager. BMPs could include the following:

- Equipment would be cleaned 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.
- Revegetation and stabilization would be required per the USEPA, helping to reduce the potential for long-term, adverse impacts on vegetation.
- Only native plant species would be used in revegetation seed mix, and the mix would be designed to enhance local pollinator habitat. Seed mix and mulch would be certified weed-free to avoid inadvertently introducing non-native species to the reclamation site.

Table 3-5. Special Status Species with Potential to Occur at Kirtland AFB

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Mammals							
Gunnison's Prairie Dog (*Cynomys gunnisoni*)	-	-	X	-	-	Level to gently sloping grasslands and semi-desert and montane shrublands, at elevations from 6,000 to 12,000 feet (1,830 to 3,660 meters).	Occur primarily within grasslands in the northern half of Kirtland AFB and in the cantonment area.
Mexican Wolf *(Canis lupus baileyi)*	Experimental Population, Non-Essential	-	-	-	-	Occupy a variety of habitats in southwestern Mexico and the United States, including mountain woodlands, the Chihuahuan and Sonoran deserts, and grasslands.	Documented twice on Kirtland AFB in Bonito Canyon during the winter of 2024.
New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*)	E	E	X	-	-	Found primarily near streams and wetlands in parts of New Mexico, eastern Arizona, and southern Colorado	Not known to occur on Kirtland AFB. Habitat is of poor quality and lacks attributes necessary to support a population.
Pale Townsend's Big-Eared Bat (*Corynorhinus townsendii pallescens*)	-	-	X	-	-	Low and mid-elevation shrub, piñon-juniper, and ponderosa pine types, and probably includes all forest types up to 10,000 feet.	Habitat on the installation suitable for these species includes cliffs and abandoned mines throughout the withdrawn area.
Spotted Bat (*Euderma maculatum*)	-	T	X	-	-	Arid environments in western North America from south-central British Columbia to central Mexico; the core area of its distribution appears to be the southwestern United States.	Habitat on the installation suitable for these species includes cliffs and abandoned mines throughout the withdrawn area.
Tricolored Bat *(Perimyotis subflavus)*	PE	-	-	-	-	Forested habitats where they roost in trees, primarily among leaves.	Not known to occur on Kirtland AFB.
Birds							
American Bittern (*Botaurus lentiginosus*)	-	-	X	-	-	Freshwater wetlands with tall, dense vegetation.	Not known to occur on Kirtland AFB.
Aplomado Falcon (*Falco femoralis*)	-	E	X	-	-	Require open grassland or savannah habitat with scattered trees or shrubs.	Not known to occur on Kirtland AFB.
Baird's Sparrow (*Ammodramus bairdii*)	-	T	X	-	-	Prefer native prairies, but also use other habitats. Breed in undisturbed mixed grass and tallgrass prairies with fairly tall grass and scattered tall weeds or low bushes. Can also be found in hayfields or pastures with some native grasses, but these habitats are inferior to native grasslands.	Known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
Bald Eagle (*Haliaeetus leucocephalus*)	-	T	X	-	-	Live within 2-1/2 miles of the coast, bays, rivers, lakes, or other bodies of water, reflecting the availability of their main food source. They typically nest in large, mature, accessible trees, as well as cliffs and man-made structures.	Known to occur on Kirtland AFB.
Bank Swallow (*Riparia riparia*)	-	-	X	-	-	Prefer open, wet areas and steer clear of forested habitats.	Low potential to occur on Kirtland AFB.
Bell's Vireo (*Vireo bellii*)	-	T	X	-	-	Dense, shrubby habitats near water, such as brushy fields, riverine scrub, coastal chaparral, scrub oak, and mesquite forests.	Not known to occur on Kirtland AFB.
Bendire's Thrasher (*Toxostoma bendirei*)	-	-	X	-	-	Desert habitats including arid grasslands, shrublands, and even some agricultural habitats.	Not known to occur on Kirtland AFB.
Black Swift (*Cypseloides niger*)	-	-	X	-	-	Nest on cliff ledges behind or near waterfalls and sea caves.	Known to occur on Kirtland AFB.
Black-chinned Sparrow (*Spizella atrogularis*)	-	-	X	-	-	Arid scrublands, chaparral, and desert grasslands in the southwestern United States and Mexico.	High potential to occur on Kirtland AFB.
Black-Throated Gray Warbler (*Setophaga nigrescens*)	-	-	X	-	-	Open pine forests, pine-oak woodlands, and piñon-juniper forests with a brushy understory.	Not known to occur on Kirtland AFB.
Broad-billed Hummingbird (*Cynanthus latirostris*)	-	T	X	-	-	Nest mostly along streams in canyons, usually below 6,500 feet elevation. Forage in canyons and mountain meadows as high as 9,800 feet, especially in summer after the monsoonal rains cause flowers to bloom en masse.	Not known to occur on Kirtland AFB.
Brown Pelican (*Pelecanus occidentalis*)	-	E	-	-	-	Coastal marine habitats and estuaries year-round along the Atlantic, Pacific, and Gulf coasts.	Not known to occur on Kirtland AFB.
Brown-capped Rosy-Finch (*Leucosticte australis*)	-	-	X	-	-	Breeds almost entirely in Colorado, in high alpine areas near remote glaciers and snowy meadows where they feed on seeds and insects along the edge of melting snow. In winter, they descend in flocks into forested habitats at lower elevations.	Not known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
Cassin's Finch (*Haemorhous cassinii*)	-	-	X	-	-	Coniferous forests of North America's western interior mountains. Breed in the upper elevations of mountains, usually between 3,000 and 10,000 feet.	Not known to occur on Kirtland AFB.
Chestnut-collared Longspur (*Calcarius ornatus*)	-	-	X	-	-	Breed in the shortgrass and mixed-grass prairies of the northern Great Plains. Typically found in areas where the grass is shorter than 1 foot, but occasionally found in tallgrass prairie that has been grazed or mowed.	Known to occur on Kirtland AFB.
Clark's Grebe (*Aechmophorus clarkii*)	-	-	X	-	-	Breed on freshwater lakes and marshes with extensive open water bordered by emergent vegetation. During winter they move to saltwater or brackish bays, estuaries, or sheltered sea coasts and are less frequently found on freshwater lakes or rivers.	Not known to occur on Kirtland AFB.
Clark's Nutcracker (*Nucifraga columbiana*)	-	-	X	-	-	Open subalpine forests near the tree line in the West.	Not known to occur on Kirtland AFB.
Common Black-Hawk (*Buteogallus anthracinus*)	-	T	X	-	-	Riparian forests in canyons and deserts in the United States and northern Mexico.	Not known to occur on Kirtland AFB.
Common Nighthawk (*Chordeiles minor*)	-	-	X	-	-	Coastal sand dunes and beaches, logged or burned forests, forest openings, grassland and sagebrush prairies, dryland farm fields, and rock outcrops.	Could potentially occur on Kirtland AFB.
Eared Grebe (*Podiceps nigricollis*)	-	-	X	-	-	Breed in shallow lakes and ponds with emergent vegetation, especially around the edges.	Not known to occur on Kirtland AFB.
Evening Grosbeak (*Coccothraustes vespertinus*)	-	-	X	-	-	Northern North American coniferous forests, including spruce-fir, pine-oak, piñon-juniper, and aspen forests.	Could potentially occur on Kirtland AFB.
Flammulated Owl (*Psiloscops flammeolus*)	-	-	X	-	-	Dry, mature mountain forests of large coniferous trees, such as ponderosa pine, aspen, or oak.	Low potential to occur on Kirtland AFB.
Grace's Warbler (*Setophaga graciae*)	-	-	X	-	-	Mature pine forests in the southwestern United States, Mexico, and Central America.	Moderate potential to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
Gray Vireo (*Vireo vicinior*)	-	T	X	-	-	Nest in piñon pine-juniper, mesquite scrub, oak scrub, and chaparral habitats of the Southwest, from lowlands into foothills and mountains as high as 7,800 feet elevation, including portions of the Mojave, Sonoran, and Chihuahuan Deserts.	Occur in colonies in several locations on Kirtland AFB, primarily throughout the juniper woodland community in an elevational belt of 5,850 to 6,600 feet.
Juniper Titmouse (*Baeolophus ridgwayi*)	-	-	X	-	-	Dry, open piñon-juniper woodlands of the Great Basin and Upper Sonoran Zone.	High potential to occur on Kirtland AFB.
Least Tern (*Sternula antillarum*)	-	E	X	-	-	Bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs.	Not known to occur on Kirtland AFB.
Lewis' Woodpecker (*Melanerpes lewis*)	-	-	X	-	-	Open pine forests, woodlands, and burned forests.	Not known to occur on Kirtland AFB.
Loggerhead Shrike (*Lanius ludovicianus*)	-	-	X	-	-	Open habitats with short grasses, scattered shrubs, and low trees or shrubs, especially those with spines or thorns.	Occupies the grasslands and shrublands on the west end of the installation and juniper savannah in the southeast/ central region of the installation that approaches piñon-juniper canyons and foothills. Most of the nests on Kirtland AFB are found in four-wing saltbush.
Long-billed Curlew (*Numenius americanus*)	-	-	X	-	-	Open habitats with short grasses and little woody vegetation during breeding season.	Known to occur on Kirtland AFB.
Lucy's Warbler (*Leiothlypis luciae*)	-	-	X	-	-	Most commonly found in dense mesquite woodlands, or "bosques," near streambeds. Breed in cottonwood-willow riparian woodlands, sycamore-oak woods, and salt cedar stands.	Not known to occur on Kirtland AFB.
Mexican Spotted Owl (*Strix occidentalis lucida*)	T	-	X	-	-	Forested mountains and canyonlands throughout the southwestern United States and Mexico.	Could potentially occur on Kirtland AFB.
Mexican Whip-poor-will (*Antrostomus arizonae*)			X			Mountain forest and woodland, often occurring in pine and pine-oak forest.	Known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
Mountain Bluebird (*Sialia currucoides*)	-	-	X	-	-	Open woodlands at elevations of up to 12,500 feet above sea level in western North America, as far north as Alaska.	High potential to occur on Kirtland AFB.
Mountain Plover (*Charadrius montanus*)	-	-	X	-	-	Open, flat, dry tablelands with low, sparse vegetation. Nest in areas with bare ground or sparse vegetation, such as prairie dog towns, shortgrass prairies, and high, open, semidesert habitats up to nearly 11,000 feet elevation.	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 could be used as brood-rearing habitat or during migration.
Neotropic Cormorant (*Phalacrocorax brasilianus*)	-	T	X	-	-	Occupies a tremendous variety of fresh, brackish, and saltwater wetlands.	Not known to occur on Kirtland AFB.
Olive-sided Flycatcher (*Contopus cooperi*)	-	-	X	-	-	Breed mostly in the boreal forest and in western coniferous forests, from sea level to over 10,000 feet elevation in some parts of the Rocky Mountains.	Low potential to occur on Kirtland AFB.
Painted Redstart (*Myioborus pictus*)	-	-	X	-	-	Shady forests in the mountains of Arizona and New Mexico, including oak, pine-oak, and oak-juniper habitats with lush undergrowth.	Not known to occur on Kirtland AFB.
Peregrine Falcon (*Falco peregrinus*)	-	T	X	-	-	Mountains, forests, cities, valleys, deserts, and coastlines.	Known to occur or potentially breed on Kirtland AFB.
Piñon Jay (*Gymnorhinus cyanocephalus*)	-	-	X	-	-	Piñon-juniper woodlands, sagebrush, scrub oak, chaparral communities, and pine forests.	High potential to occur on Kirtland AFB.
Pygmy Nuthatch (*Sitta pygmaea*)	-	-	X	-	-	Open, park-like forests with long-needled pines, especially ponderosa pines.	Could potentially occur on Kirtland AFB.
Red-faced Warbler (*Cardellina rubrifrons*)			X			Breed in higher elevations (6,500 to 9,200 feet) of mountains in Arizona and New Mexico, mostly in forests with pine, oak, and fir trees.	Not known to occur on Kirtland AFB.
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	-	-	X	-	-	Forest edges, orchards, open pine woods, groves of tall trees in open country.	Not known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
Sagebrush Sparrow (*Artemisiospiza nevadensis*)	-	-	X	-	-	Shrub-steppe habitats, especially big sagebrush communities, with high shrub cover, low grass and litter cover, and large patches.	Known to occur on Kirtland AFB.
Snowy Plover (*Charadrius nivosus*)	-	-	X	-	-	Found in areas with little or no cover on sandy coastal beaches, salt pans, dry salt ponds, gravel bars, and salt pond levees.	Not known to occur on Kirtland AFB.
Southwestern Willow Flycatcher *(Empidonax traillii extimus)*	E	E	X	-	-	Require moist microclimatic and vegetative conditions, and breed only in dense riparian vegetation near surface water or saturated soil.	Not known to occur on Kirtland AFB.
Sprague's Pipit (*Anthus spragueii*)	-	-	X	-	-	Prefers native, medium to intermediate height prairie and in a short grass prairie landscape, can often be found in areas with taller grasses.	Not known to occur on Kirtland AFB.
Vesper Sparrow (*Pooecetes gramineus*)	-	-	X	-	-	Breed in open areas with short, sparse grass and scattered shrubs including, old fields, pastures, weedy fence lines and roadsides, hayfields, and native grasslands.	Known to occur on Kirtland AFB.
Virginia's Warbler (*Leiothlypis virginiae*)	-	-	X	-	-	Breeds in arid, shrubby, mixed conifer, piñon-juniper, montane chaparral, and possibly montane riparian habitats at elevations of 7,000 to 9,000 feet (2,200 to 2,800 meters).	Known to occur on Kirtland AFB.
Western Bluebird (*Sialia mexicana*)	-	-	X	-	-	Partly open terrain of the west, from valley farms and orchards to clearings in mountain pine forest.	Could potentially occur on Kirtland AFB.
Western Burrowing Owl (*Athene cunicularia ssp. hypugaea*)	-	-	X	-	-	Prefers habitats that are level to gently sloping, well-drained, and have sparse vegetation and bare ground. These habitats include deserts, grasslands, shrub-steppe, prairies, and agricultural fields.	Generally, occur on Kirtland AFB between March and October before migrating south, although a few birds may remain on the installation during mild winters. The population of burrowing owls on Kirtland AFB has experienced a sharp decline in size and reproduction, and much of the recent nest failure has been attributed to predation.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Birds (continued)							
White-eared Hummingbird (*Basilinna leucotis*)	-	T	-	-	-	Montane forest, pine-oak woods. In Mexico and Central America found mostly in clearing and edges of coniferous forest in higher mountains, as well as pine-oak woods at middle elevations.	Not known to occur on Kirtland AFB.
Williamson's Sapsucker (*Sphyrapicus thyroideus*)	-	-	X	-	-	Nests in open coniferous and mixed woodlands in mountains of western North America, especially mature forests with pine, larch, fir, Douglas-fir, and aspen.	Could potentially occur on Kirtland AFB.
Yellow-billed Cuckoo *(Coccyzus americanus)*	T	-	X	-	-	Wooded habitat with dense cover and water nearby, including woodlands with low, scrubby, vegetation, overgrown orchards, abandoned farmland and dense thickets along streams and marshes.	Could potentially occur on Kirtland AFB.
Amphibians							
Boreal Chorus Frog (*Pseudacris maculata*)	-	-	X	-	-	Inhabits marshes, ponds, small lakes in all life zones including lower alpine. Regularly found in the water only during the breeding period in spring.	Not known to occur on Kirtland AFB.
Northern Leopard Frog (*Lithobates pipiens*)	-	-	X	-	-	Breed in a variety of aquatic habitats that include slow-moving or still water along streams and rivers, wetlands, permanent or temporary pools, beaver ponds and human-constructed habitats like earthen stock tanks and borrow pits.	Known to occur at Kirtland AFB.
Reptiles							
Big Bend Slider (*Trachemys gaigeae*)	-	-	X	-	-	Primarily aquatic, often seen basking on rocks or logs in the water, and when approached quickly dives to the bottom.	Not known to occur on Kirtland AFB.
Desert Massasauga (*Sistrurus catenatus edwardsii*)	-	-	X	-	-	Inhabits xeric grasslands, which are rocky, semiarid, and arid areas, mostly desert grasslands.	Known to occur at Kirtland AFB.
Sonoran Mud Turtle (*Kinosternon sonoriense sonoriense*)	-	-	X	-	-	Freshwater habitats such as streams, ponds, springs, and pools.	Not known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Reptiles (continued)							
Western Massasauga (*Sistrurus tergeminus*)	-	-	X	-	-	Lives in a variety of habitats in the American Midwest, including grasslands, marshes, woodlands, and open wetlands.	Known to occur at Kirtland AFB.
Fishes							
Rio Grande Chub (*Gila pandora*)	-	-	X	-	-	Lives in both rivers and lakes at elevations up to 11,370 feet. Prefers small streams, impoundments, and lakes, and is also known to live in engineered waterways like canals, irrigation ditches, and stock ponds.	Not known to occur on Kirtland AFB.
Rio Grande Cutthroat Trout (*Oncorhynchus clarki virginalis*)	C	-	-	-	-	High-elevation streams and lakes in Colorado and New Mexico. Require clear, cold, highly oxygenated water, clean gravel substrates, a network of pools and runs, and an abundance of food.	Not known to occur on Kirtland AFB.
Rio Grande Silvery Minnow (*Hybognathus amarus*)	E	E	X	-	-	Typically occupy stream habitats where water depths are less than 15.75 inches and have low to moderate velocity.	Not known to occur on Kirtland AFB.
Insects							
Monarch Butterfly (*Danaus plexippus*)	C	-	-	-	-	May be found throughout North America feeding on milkweed, their toxic host plant. Live mainly in prairies, meadows, grasslands and along roadsides, across most of North America.	Not known to occur on Kirtland AFB.
Plants							
Great Plains Ladies'-tresses (*Spiranthes magnicamporum*)	-	-	-	S2	G3G4	Wetlands, cienegas, stream sides. In New Mexico from 4,560 to 6,500 feet in elevation.	Could potentially occur on Kirtland AFB.
Ivey's bladderpod, Sandia Mountain Bladderpod (*Physaria iveyana*)	-	-	-	-	-	Restricted to the west-facing Sandia Crest of the Sandia Mountains, where it occurs along the wind-swept barren grey limestone escarpment of the Madera Formation.	Not known to occur on Kirtland AFB.
La Jolla prairie clover (*Dalea scariosa*)	-	-	-	S3	G3	Open sandy clay banks and bluffs, often along roadsides, at about 1,450 to 1,500 meters (4,750 to 4,900 feet)	Not known to occur on Kirtland AFB.

Name	USFWS Status	NMDGF Status	SGCN	State Rank[1]	Global Rank[1]	Habitat	Presence at Kirtland AFB
Plants (continued)							
Paperspine fishhook cactus (*Sclerocactus papyracanthus*)	-	-	-	S4	G4	Piñon-juniper woodlands and in desert grasslands and is almost always associated with grama (*Bouteloua spp*.), especially blue grama (*B. gracilis*).	Not known to occur on Kirtland AFB.
Plank's campion, Plank's catchfly (*Silene plankii*)	-	-	-	S2	G2	Igneous cliffs and rocky outcrops; 1,500 to 2,800 meter (5,000 to 9,200 feet).	Not known to occur on Kirtland AFB.
Sandia Mountain alumroot (*Heuchera pulchella*)	-	-	-	S2	G2	Limestone cliffs in lower and upper montane coniferous forest; 2,450 to 3,260 meters (8,000 to 10,700 feet).	Could potentially occur on Kirtland AFB.
Santa Fe Milkvetch (*Astragalus feensis*)	-	-	X	S3	G3	Sandy benches and gravelly hillsides in piñon-juniper woodland or plains-mesa grassland; 1,550 to 1,830 meters (5,100 to 6,000 feet).	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.
Sapello Canyon larkspur (*Delphinium sapellonis*)	-	-	-	S3	G3	Canyon bottoms and aspen groves in lower and upper montane coniferous forest; 2,450 to 3,500 meters (8,000 to 11,500 feet).	Not known to occur on Kirtland AFB.
Todilto stickleaf (*Mentzelia todiltoensis*)	-	-	-	S3	G3	Outcrops of gypsum in the Todilto Formation; 1,700 to 1,910 meters (5,600 to 5,840 feet).	Not known to occur on Kirtland AFB.
Tough muhly, Navajo muhly (*Muhlenbergia arsenei*)	-	-	-	S3	G5	On limestone rock outcrops in piñon-juniper woodland; 1,400 to 2,000 meters (4,600 to 6,500 feet).	Not known to occur on Kirtland AFB.

1 – New Mexico Rare Plants Ranking
Key: E = Endangered, T = Threatened, C = Candidate, CH = Critical Habitat, SGCN = Species of Greatest Conservation Need
Sources: KAFB 2023a, USFWS 2024b, BISON-M 2024, NMERT 2024, New Mexico Rare Plants 2024

Wildlife Species and Habitat. The Proposed Action would result in short- and long-term, minor, adverse impacts on wildlife species and habitat. RDT&E activities would result in temporary, short-term, minor degradation of wildlife habitat, while construction activities would result in short- and long-term, minor degradation of habitat. The overhead power lines associated with the South Park Electrical Service and Substation 9 Upgrades would be avian-safe to avoid long-term impacts. Additionally, adherence to BMPs would minimize unnecessary disturbances to habitat. If disturbance of habitat occurs, reseeding with native species would be conducted.

Temporary displacement of mobile wildlife from noise, lighting, and other disturbances would occur from RDT&E activities and construction. High-impact construction, operation, maintenance, and demolition 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. No active nest would be impacted by project disturbances without coordination with USFWS and Kirtland AFB. However, in order to avoid nest abandonment and other adverse impacts, surveys would be conducted prior to the start of construction. These impacts would be short-term and BMPs would be implemented to minimize adverse impacts.

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. However, vehicles associated with construction, operation, maintenance, and demolition activities would be used primarily on the established pathways, which limits the potential for impacts on burrowing species. Adverse impacts on wildlife would be minimized with the use of appropriate BMPs, such as the following:

- If ground-disturbing and clearing activities are conducted during the breeding season, the area would be surveyed for active nest sites and project personnel would avoid disturbing active nests until the young have fledged. For active nests, adequate buffer zones would be established to minimize disturbance to nesting birds. Recommended USFWS buffer distances would be at least 100 feet from songbird and raven nests; 0.25 miles from most raptor nests and burrowing owls; and 0.5 miles for ferruginous hawk, golden eagle, peregrine falcon, and prairie falcon nests. Active nest sites in trees or shrubs that must be removed would be mitigated by qualified biologists or wildlife rehabilitators. No nest would be impacted by project disturbances without coordination with USFWS and Kirtland AFB. All permitting requirements would be followed.
- Project personnel would avoid, to the greatest extent practicable, activities that vaporize metals or use drones during the breeding season or until the young have fledged from active nests. If activities cannot be avoided during the breeding season, Kirtland AFB would apply buffers to any active nests.
- Wherever possible, occupied prairie dog colonies would be left undisturbed, and all project activities would be directed off the colony. Any burrows located on the project site would be surveyed by a qualified biologist to determine whether burrows are active or inactive and whether burrowing owls may be utilizing the site. If ground-disturbing activities cannot be relocated off the prairie dog colony, or if project activities involved control of prairie dogs, Kirtland AFB would live-trap and relocate the prairie dogs.
- Because of potential impacts on night-migrating migratory bird populations, the following BMPs would be implemented where possible.

- Communications equipment, antennas, etc. would be collocated on existing towers or buildings (e.g., water towers) or within existing groups of towers or "antenna farms," when feasible.
- If possible, towers would not be located in or near wetlands, riparian areas, playas, lakes, or other known bird concentration areas (e.g., state or federal waterfowl refuges, staging areas, rookeries); in known migratory or daily movement flyways; or in the habitat of threatened or endangered bird species that could be prone to tower-caused mortality (i.e., night-migrating species).
- Local meteorological conditions would be reviewed, and areas with an especially high incidence of fog, mist, and low cloud ceilings should be avoided, if possible.
- If possible, new towers would be designed structurally and electrically to accommodate the applicant's antenna(s), and comparable antennas for at least two additional users, to reduce the number of future towers, unless this design would require the building of a larger tower with lights or guy wires.
- Security lighting for on-ground facilities and equipment would be down-shielded to keep light within the boundaries of the site and minimize its potential attraction for birds.
- Tower construction, including road access and fencing, would be implemented to minimize habitat loss and fragmentation and to reduce above-ground obstacles that might impact birds in flight.

- Where possible, Kirtland AFB would follow the general trenching conservation measures below to help minimize unnecessary mortality of wildlife.
  - Trenching activities would be located within previously disturbed areas, such as existing road or pipeline rights-of-way. To the extent possible, trenching in undisturbed habitat would be avoided.
  - Trenching would occur during the cooler months (October to March).
  - Concurrent trenching, pipe- or cable-laying, and backfilling would be used. Trenching, pipe- or cable-laying, and backfilling crews would be kept as close together as possible to minimize the amount of open trench at any given time. When trenching activities are temporarily halted (e.g., overnight, weekends, holidays, weather shutdowns), wildlife would be protected from accessing any open trench between digging and backfilling operations.
- Kirtland AFB would follow the guidelines below to minimize disturbance to roosting bats:
  - Use of pesticides, firearms, open-flame torches, or heavy smoke-producing equipment would be avoided, especially from April through September.
  - If artificial lighting is needed, only light sources powered by batteries or cyalume glow/light sticks would be used. The site would be kept clean by picking up refuse or materials from project lighting or operations whenever they are shut down. Shielding would be used to direct lights downward to prevent sky glow and associated impacts on bats and nocturnal migrating birds.
  - For any surface disturbing activities, the project footprint (including a 350-foot buffer) would avoid potential roost sites such as caves or mines, especially from April through July. Tree clearing activities and prescribed burns would include a minimum 0.5-mile buffer from any such features.
  - If caves, mines, bridges, or other man-made structures suitable as potential bat roosts are encountered within the project area, they would not be entered

during any time of year, and no roosting or hibernating bats would be contacted or disturbed.

Special Status Species. The Proposed Action could result in short-term, minor, adverse impacts on western burrowing owls on Kirtland AFB. As noted above, ground-disturbing activities could indirectly impact the owls and their habitats, and RDT&E activities and construction would result in temporary, minor degradation of habitat. To help mitigate these impacts, Kirtland AFB has developed a burrowing owl management plan with BMPs, including maintaining a 30-meter buffer around occupied burrows, conducting surveys prior to any construction, having a monitor onsite during construction to observe the owls' response to construction 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 it is the responsibility of the United States Department of Agriculture Animal and Plant Health Inspection Service. No effect on threatened or endangered species would be expected to occur as a result of the Proposed Action. To ensure no effect, an updated species list from USFWS is required to be obtained within 90 days of starting any construction (Chaon et al. 2020, USFWS 2024b).

3.6.2.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Therefore, the existing biological conditions discussed 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 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 all current and proposed RDT&E activities at each test site/facility.

3.7.1 Affected Environment

Kirtland AFB has conducted an installation-wide survey of archaeological and cultural resources. Kirtland AFB has significant historic and prehistoric resources from most of the cultural periods recognized in central New Mexico, dating from the Paleoindian through the recent historic periods. Both archaeological sites and historic structures have been evaluated for eligibility for inclusion in the NRHP. A total of 741 archaeological sites were recorded within the boundaries of the installation, and 251 have been determined to be eligible for the NRHP. NRHP eligibility for many of the sites are undetermined. These sites contain artifacts such as pottery, ground stone, stone tools, and historic artifacts. In addition to artifacts, many of the archaeological and historic sites on Kirtland AFB contain features that 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 buildings and structures have been evaluated for NRHP eligibility, 271 of which were found to be eligible and 312 were found to be not eligible (KAFB 2023b).

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

The APE for the Proposed Action has been defined as the boundaries of all current and proposed RDT&E activities at each test site/facility. A review of the Kirtland AFB cultural resources database as well as the New Mexico Cultural Resources Inventory System database was conducted to identify all historic properties within the APE.

HERTF Canyon.

Technologies developed at the HERTF, HiJENKS, HPEM Laboratory, and HEML facilities are field tested at HERTF Canyon. The entire HERTF Canyon project location has been covered by previous cultural resources surveys. In particular, Butler Service Group, Inc. completed a cultural resources investigation in 1994 of 1,635.8 acres on Kirtland AFB (Hoagland and Dello-Russo 1995) and e^2M, Inc. completed an archaeological survey of 6,654 acres on Kirtland AFB in 2004, both of which covered the HERTF Canyon project site (Gallison et al. 2005a). No resources were recorded within HERTF Canyon.

Frustration Canyon

Frustration Canyon is used by AFRL to test HPEM and HEL systems, and to train drone and UAS targets. AFRL proposes to install a new 50- by 50-foot concrete pad to serve as an alternative test site for firing to SOR's 2-Mile Site. Use of microwave systems at Frustration Canyon was previously analyzed in the Battlelab EA.

Eight previous cultural resources surveys intersect Frustration Canyon. Of these, two surveys completed in 2003 (Gallison et al. 2005b) and 2004 (Gallison et al. 2005a) cover the Frustration Canyon project area. These surveys identified 18 archaeological sites that overlap with the project area. These include five archaeological sites determined eligible for the NRHP, eight sites determined not eligible for the NRHP, and five sites that have not been evaluated (see **Table 3-6**). No historic buildings or structures are within the Frustration Canyon project area.

Table 3-6. Archaeological Sites at Frustration Canyon

Property Type	LA Number	NRHP Eligibility
Site	87435	Eligible
Site	88084	Eligible
Site	103147	Eligible
Site	103161	Eligible
Site	113905	Unevaluated
Site	133746	Unevaluated
Site	133748	Not Eligible
Site	133749	Not Eligible
Site	133751	Not Eligible
Site	133753	Unevaluated
Site	133754	Unevaluated
Site	133755	Eligible
Site	133756	Not Eligible
Site	133757	Not Eligible
Site	133758	Not Eligible
Site	142124	Not Eligible
Site	149388	Not Eligible
Site	149389	Unevaluated

Sources: Gallison et al. 2005a, Gallison et al. 2005b

SOR

Activities at SOR were previously analyzed in the SOR and TAC Lab EAs. AFRL proposes to relocate the 2-Mile Site approximately 4,600 feet south of the current site. Eight previous cultural resources surveys intersect the project component area. Most of the area was covered by a 2004 survey completed by e^2M, Inc. (Gallison et al. 2005a) and a 1980 survey completed by the Center for Anthropological Studies (Rodgers 1980a). Previous surveys identified one site, LA148016, within the SOR location. LA148016 consists of a prehistoric lithic artifact scatter. The site was determined not eligible by the lead agency.

Additionally, two historic buildings constructed in 1971 are within the SOR boundary. These include Historic Cultural Properties Inventory (HCPI) 48796 (Security Police Entry Control) and

HCPI 48798 (Base Engineer Maintenance Shop). Both buildings were recommended not eligible for the NRHP by the recorder. No official concurrence of ineligibility has been made by the SHPO. The Kirtland AFB database also includes four historic structures within the SOR location (Buildings 66001, 66041, 66042, and 66019). These buildings are recommended eligible, but no official concurrence of eligibility has been made by the SHPO.

OLPFA

The OLPFA was covered by two previous cultural resources surveys, one completed by AMEC Earth and Environmental, Inc. in 2000 (Sullivan et al. 2002) and one completed by HDR, Inc. in 2012 (Gallison et al. 2014). The laser area crosses through one site, LA134261, a historic segment of McCormick Road. The road has not been evaluated for the NRHP. Six additional sites, including LA134606, LA134607, LA134612, LA155815, LA176161, and LA176162 are adjacent. Of these, LA134607 and LA134612 have been determined eligible for the NRHP, LA134606 has been determined ineligible, and the remaining sites have not been evaluated for the NRHP.

Previous surveys identified one building, HCPI 48789, within the OLPFA and three adjacent buildings constructed in 1976. HCPI 48789 is the Laser Science Laboratory. The building has not been evaluated for the NRHP. Adjacent historic buildings include HCPI 48787, the Civil Engineering Science Lab (Building 760); HCPI 48788, the Missile and Space Research Lab (Building 765); and Research Equipment Storage (Building 774), all of which are eligible for the NRHP.

Laser testing activities were previously analyzed under the OLPFA and ELFT EAs.

SKYWAVE Facility

AFRL proposes to temporarily deploy up to 30 antennas per year for a variety of purposes. The antennas would not exceed 120 feet in height and would require 36-inch stakes driven into the ground to anchor the antenna via guy wires. Coaxial cables would be buried 2 to 3 feet below the ground surface.

The SKYWAVE project area was completely covered by three cultural resources surveys completed in 1979 (Rodgers 1980b), 2000 (Sullivan et al. 2002), and 2012 (Gallison et al. 2014), resulting in the recording of an archaeological site that overlaps with the SKYWAVE project area, LA109319. LA109319 consists of a series of water and erosion control features constructed in 1940. The site was determined not eligible for the NRHP by the New Mexico SHPO.

ISOON

Several radio-based studies of the upper atmosphere are sited at ISOON. The entire ISOON project area was covered by a 1981 survey completed by the Center for Anthropological Studies (Franklin and Rodgers 1981) and a 2000 survey complete by AMEC Earth and Environmental, Inc. (Sullivan et al. 2002). No cultural resources have been recorded within the ISOON area. Activities associated with ISOON were previously analyzed in the BEL EA.

South Park Antenna Field

AFRL proposes to regrade gravel and dirt roads through South Park, install permanent and temporary antennas, install a new 12,470-volt overhead power line to upgrade the electrical service, repair and improve existing water lines buried beneath South Park, and construct a new permanent facility at South Park. Four previous cultural resources surveys intersect South Park.

The South Park project areas were covered by a 1981 survey completed by the Center for Anthropological Studies (Franklin and Rodgers 1981) and a 2000 survey completed by AMEC Earth and Environmental, Inc. (Sullivan et al. 2002). No cultural resources have been recorded within the South Park Antenna Field project area.

Traditional Cultural Properties. 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.

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 Section 800.5).

3.7.2.1 Proposed Action

Implementation of the Proposed Actions at Kirtland AFB have the potential for impacts on cultural resources. Frustration Canyon is within a high-density area for archaeological sites. Ground-disturbing activities within the Frustration Canyon project area have the potential to impact five NRHP-eligible archaeological sites. Short- and long-term, negligible to minor, adverse impacts could be anticipated; however, project activities would be designed to avoid or minimize impacts to these sites.

Proposed activities related to continued RDT&E activities at HERTF Canyon, ISOON, SKYWAVE, and proposed construction activities at South Park would have no anticipated effects on cultural resources. These projects either have limited potential to affect cultural resources or are in areas where previous surveys have identified no or few cultural resources in the project vicinity. There are six additional archaeological sites and one architectural resource within the APE that have not been evaluated. At present, there are no known Traditional Cultural Places, or Native American burial grounds or sacred areas on Kirtland AFB (KAFB 2023b).

Some areas of the APE have not been surveyed in over 20 years. Additional surveys may be necessary as determined by 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 during project activities, work in the area shall be halted, the immediate vicinity of the resource would be secured, and the Kirtland AFB Cultural Resources Program Manager would be notified and procedures outlined in the installations ICRMP would be followed. Work would not continue until the Kirtland AFB 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, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Environmental impacts associated with these activities were evaluated in previous EAs and no significant impacts were expected. Therefore, the existing cultural resources conditions discussed in **Section 3.7.1** 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 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 2024). 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 (KAFB 2016).

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 is 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 jet propellant – 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 2023, Kirtland AFB pumped a total of approximately 837 million gallons (approximately 2,569 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, Kirtland AFB did not purchase any water from the city of Albuquerque in 2023 (KAFB 2024c).

Stormwater Discharge/Collection System. Most stormwater on Kirtland AFB flows through the drainage patterns created by the natural topography and terrain. When required by project designs, a retention basin is typically installed to maintain and collect stormwater. The northern portion of the installation, including housing areas, discharges by sheet flow and culverts towards Gibson Boulevard along the Kirtland AFB-city of Albuquerque boundary. The majority of the stormwater collected on the installation is discharged through sheet flow, culverts, or open channel flow towards Tijeras Arroyo on the south side of the installation. The Tijeras Arroyo, a tributary to the Rio Grande, divides Kirtland AFB. Kirtland AFB is included in the existing Multi-Sector General Permit, Municipal Separate Storm Sewer System Permit, and Construction General Permit for authorization for stormwater discharge. Stormwater runoff from the runway and associated airfield is discharged to the city of Albuquerque to the north and west. However, stormwater that discharges to the south is managed by the installation. During significant rain events, where the Tijeras Arroyo leaves the west side of the installation, the fence and drop inlet structure will wash out with flood waters (KAFB 2016).

Sanitary Sewer/Wastewater System. There are approximately 491,000 linear feet of sanitary system mains transporting 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 minor, adverse impacts on the transportation system could occur. The Proposed Action would be expected to result in short-term, intermittent, negligible, adverse impacts on area roadways from the temporary increase in the number of vehicles accessing the installation for construction activities. 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, construction-related traffic would be timed to not occur during peak travel periods. Typical construction-related traffic would include delivery trucks, haul trucks, and passenger vehicles. The influx of construction-related traffic may result in short-term, negligible, adverse impacts on parking. Project activities may 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 hazardous materials used for research, testing, and training 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 hazardous materials are discussed in **Section 3.10.2**.

Electrical System. Short-term, negligible, adverse and long-term, minor to moderate, beneficial impacts on the electrical system would occur. Under the Proposed Action, AFRL would install a new 12,470-volt overhead power line to upgrade the electrical service to South Park as well as upgrade Substation 9. Power lines would be installed from Substation 9 to South Park. Additionally, the new permanent facility at South Park would be connected to the installation's electrical distribution system. Interruptions to the electrical system may occur during connection of the newly installed overhead power line, upgraded substation, and newly constructed facility to the installation's electrical distribution system. Kirtland AFB purchases power from Western Area Power Administration; therefore, the net change to the global electrical power grid is expected to be negligible.

Natural Gas and Propane. 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. Short-term, negligible, adverse and long-term, minor to moderate, beneficial impacts on the water supply system would occur. Water system upgrades, including the repair and improvement of existing water lines buried beneath South Park, would occur under the Proposed Action. Interruptions to the water supply system may occur during connection of upgraded water lines and the newly constructed facility to the installation's water distribution system. Operation of the newly constructed facility would result in a slight increase in water usage on the installation; however, as discussed in **Section 3.8.1**, there are sufficient water resources available on the installation to accommodate the slight increase in use without exceeding current capacity.

Stormwater Discharge/Collection System. Short- and long-term, negligible, adverse impacts would occur. Construction activities would potentially result in adverse impacts on stormwater handling by disruption of natural drainage patterns, contamination of stormwater discharge, and heavy sediment loading. Implementation of strategies described in **Section 3.5.2.1** would reduce these impacts. Construction of the new permanent facility at South Park would include the installation of stormwater drainage infrastructure. Additionally, the increase in impervious surfaces from the newly constructed facility at South Park could increase erosion and sedimentation and result in changes in downstream direction and flow of stormwater, which could

affect the topography and soil resources. Implementation of techniques described in **Section 3.5.2.1** would reduce these impacts.

Sanitary Sewer/Wastewater System. Construction of the new permanent facility at South Park would include restrooms, resulting in short-term, negligible, adverse impacts and long-term, negligible, beneficial impacts on the sanitary sewer/wastewater system.

Communications System. Construction of the new permanent facility at South Park would include Non-secure Internet Protocol Router/network access, resulting in short-term, negligible, adverse and long-term, negligible, beneficial impacts on the installation's communication system.

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, etc.). 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 and/or 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 impact on solid waste management. Whenever possible, clean construction debris (e.g., concrete, asphalt, etc.) 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 Action Alternative, operations would continue as usual for Kirtland AFB, consistent with mission and management plans. Therefore, the existing 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 Section 171.8, are hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (49 CFR Section 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 Section 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, including common PFAS, 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 Department of Energy (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/ 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). Air Force Manual (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 2023b).

Hazardous materials and petroleum products are used during AFRL RDT&E test activities. Use and storage of these materials are conducted in accordance with Kirtland AFB environmental procedures; AFRL 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 AFRL RDT&E test activities. All hazardous and petroleum wastes generated are stored within established initial accumulation points (IAPs) and disposed of in compliance with the installation's HWMP and all federal, state, and local regulations. The IAPs are inspected quarterly by AFRL Unit Environmental Coordinators (UECs) and annually by NMED.

Toxic Substances. There are several structures used to support AFRL RDT&E activities 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 2023b). New construction is not likely to include the use of these substances because federal policies and laws limit their use in building construction applications. Therefore, there is no potential for toxic substances to be disturbed or introduced by the Proposed Action and toxic substances are not discussed further in this PEA.

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 2023b). The closest potential AFFF release area to an AFRL RDT&E test area is AFFF Area 3, which is approximately 0.5 mile east of the HEML. Under the Proposed Action, no ground-disturbing activities are proposed at the HEML and there is no potential to encounter PFAS. Therefore, PFAS is not discussed further in this PEA.

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. 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, which include three groundwater areas of concern and three SWMUs at active test facilities (SNL 2023).

The OLPFA is within the boundary of IRP Site ST-105; SKYWAVE is adjacent to IRP Site ST-314; and portions of the SOR are within the boundaries of IRP Sites ST-333, ST-343, and ST-344. ISOON and South Park are within the site boundaries for MMRP Site AL120e; the 1-Mile Site, proposed new 2-Mile Site, and a majority of the SOR are within the boundaries of MMRP Site ML125; a small portion of SKYWAVE is within the boundaries of MMRP Site ML201; and the OLPFA is within the boundaries of MMRP Site SR-766 (see **Figure 3-4**). There are no active DOE ER sites on or adjacent to AFRL RDT&E test sites. There are no groundwater monitoring wells within or immediately adjacent to AFRL RDT&E test sites where ground-disturbing activities would occur.

- IRP Site ST-105, Trichloroethylene (TCE) and Nitrate Contaminated Groundwater, is an installation-wide area of contaminations to address broad perched and regional groundwater issues across the installation. ST-105 is divided into two components, one related to TCE contamination and the other related to nitrate contamination in groundwater. Suspected sources of the nitrate contamination include the closed sewage lagoons, the golf course main pond, city of Albuquerque sanitary sewer line breaks that occurred in 1994 and 2003, and the Sandia National Laboratories' acid waste outfall line. Both components are currently open with NMED and being monitored for natural attenuation (AFCEC 2023c).
- IRP Sites ST-314, ST-333, ST-343, and ST-344 are septic systems associated with Buildings 48506/48509, 66001, 66999/66008, and 66042, respectively. A 2021 Site Investigation report determined that these sites do not pose a threat to the environment and the sites were recommended for NFA (AFCEC 2021).
    - ST-314 consisted of three 1,000-gallon septic tanks connected to Buildings 48506 and 48509. Building 48506 was demolished and the drain line to the tank was removed and plugged. Building 48509 is vacant and was never used for storage and disposal of industrial waste (AFCEC 2021).
    - ST-333 consisted of a 960-gallon septic tank, inflow and outflow lines, and a leach field. The septic system was replaced with an aboveground septic tank with inflow and flow lines that discharge to a new leach field downslope to the south/southeast. However, the new leach field became inactive after the effluent septic tank was rerouted in the mid-1990s through a drainpipe to the southwest and tied to the ST-343 septic system (AFCEC 2021).

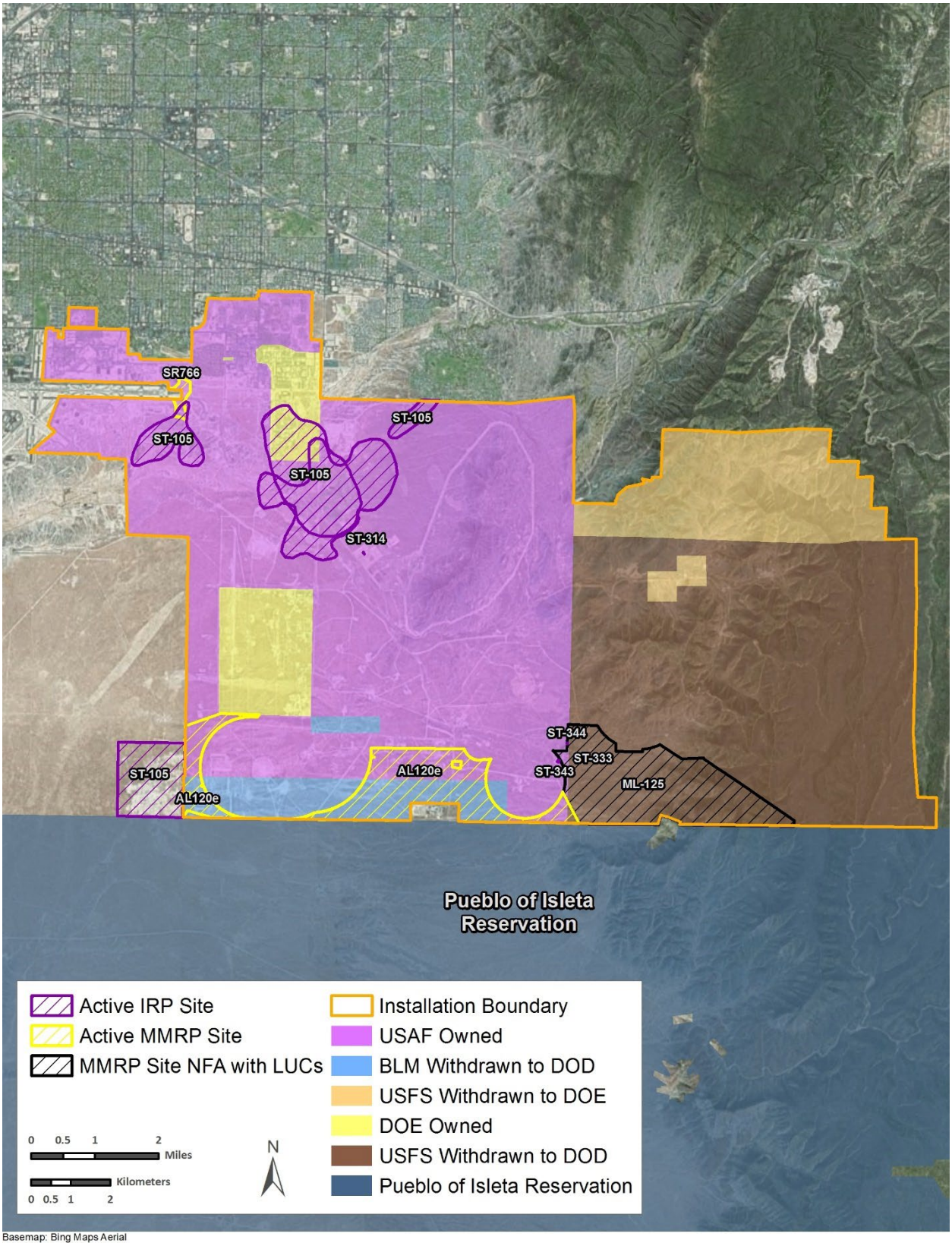


Figure 3-4. IRP and MMRP Sites Within and Adjacent to AFRL RDT&E Test Sites

- ST-343 consists of a 5,500-gallon septic tank, inflow and outflow lines, and leach field. ST-343 was initially designed to receive wastewater from Buildings 66000 and 66049. Building 66000 is the ice plant, which manufactures massive volumes of clear ice used for cooling telescope mirrors for SOR support activities. This building does not contain a toilet or shower room and makes ice from fresh water that is delivered to the site. Building 66049 is a latrine used by workers. Additionally, as previously stated, the septic system for Building 66001 was modified and rerouted to discharge sanitary sewer and wastewater through a pipe to the ST-343 leach field (AFCEC 2021).
- ST-344 consisted of an unknown size septic tank, inflow and outflow lines, and a leach field. The septic system is sporadically used and on exposed bedrock. The system is tied to one restroom with one sink and one toilet, and the trench lines are set into granite bedrock. Therefore, removal or replacement of the septic system to support the sporadic use of Building 66042 was determined to be not warranted (AFCEC 2021).

- MMRP Site AL120e, Proximity Fuze Range Munitions Response Site (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 was moved into Remedial Investigation under CERCLA. During the Comprehensive Site Evaluation (CSE) Phase I and II investigations numerous munitions and explosives of concern (MEC) and munitions debris (MD), to include a 2.75-inch rocket, 5-inch projectile, unfired rifle grenade, and 5-inch rocket were found within the MRS. The MRS is working through the CERCLA process and the Remedial Investigation is being conducted to characterize the nature and extent of MEC and MD within this MRS (AFCEC 2013, AFCEC 2024).
- MMRP Site ML125, Field Firing Range, is an approximately 2,231-acre multi-use range in the southern portion of the installation. The MRS was the impact area for the New Mexico Proving Ground and the primary target area during World War II development of the variable time fuze. The site consists of mountainous, thickly vegetated, and often steep slopes and ridgelines. Rocky outcrops are present in the eastern portion of the MRS and remaining portions of the MRS are relatively inaccessible. However, site history does not suggest that the eastern portion of the MRS contains increased MEC, MD, or potential contamination relative to the western, accessible, portion of the MRS. MEC surface clearance of approximately 828 acres in the western portion of the MRS was conducted in 2009/2010 and a total of 148,294 pounds of MEC and MD were recovered and demilitarized. A Human Health Risk Assessment concluded that constituents of potential concern identified in the site soil did not pose a threat to human health under current or future conditions. The site was granted NFA in January 2020 with administrative land use controls (LUCs) with on-site construction support and engineering controls (signage). The LUCs include prohibiting construction and intrusive activities within the MRS without the implementation of activities outlined in the Management Action Plan (AFCEC 2020b).
- MMRP Site ML201, Sandia Base Howitzer Range Buffer, was a medium- to large-caliber range consisting of approximately 710 acres in the western portion of the installation. This MRS is within a buffer of the 75mm Howitzer Range. During the 2007/2008 CSE Phase II investigation, no historical MEC use information was found for ML201 and no MEC was observed within the MRS. Therefore, the MRS was recommended for NFA (AFCEC 2013).

- MMRP Site SR766, Sub-Machine Gun Range, consists of approximately 64 acres in the northwest portion of the installation. Although included in a 1950s Sandia Base Range Regulation, no evidence of its existence could be found in historical installation maps or aerial photographs. Additionally, no MEC was observed at the MRS during the 2007/2008 CSE Phase II investigation. Therefore, the MRS was recommended for NFA (AFCEC 2013).

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. 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.

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 the 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.

Long-term, negligible to minor, adverse impacts on hazardous materials management could result from current and new test activities under the Proposed Action. Hazardous materials and petroleum products are used and stored within AFRL RDT&E facilities. Test personnel would continue to comply with existing Kirtland AFB environmental procedures, AFRL SOPs, and applicable federal and state laws governing the use, storage, and transportation of hazardous materials or petroleum products. Therefore, continued negligible to minor adverse impacts on the hazardous materials program would be expected from current or future AFRL RDT&E activities.

Hazardous and Petroleum Wastes. Short-term, negligible, adverse impacts on hazardous and petroleum waste generation would be expected during construction. It is anticipated that the quantity of hazardous and petroleum wastes generated would be negligible. All wastes generated during construction would be characterized and documented by contractors and site personnel in accordance with 40 CFR Section 262.11. Any wastes characterized as universal or hazardous

would be disposed of in accordance with the installation's HWMP; AFRL SOPs; and federal, state, and local laws and regulations.

Long-term, negligible to minor, adverse impacts on the hazardous waste program could result from current and new test activities under the Proposed Action. As new RDT&E activities are planned, AFRL must ensure that associated waste-generating activities comply with 40 CFR requirements to ensure an accurate waste determination and manage the waste in accordance with the installation's HWMP. New or updated activities could introduce or alter a waste stream or require establishment of a new IAP. Personnel would continue to coordinate with the AFRL UECs and Kirtland AFB Hazardous Waste Program personnel to ensure hazardous and petroleum wastes generated are properly managed and disposed of.

Environmental Restoration Program. Short-term, negligible to minor, adverse impacts on or from IRP and MMRP sites could occur. As noted in **Section 3.10.1**, the OLPFA is within the boundary of IRP Site ST-105; SKYWAVE is adjacent to IRP Site ST-314; and portions of the SOR are within the boundaries of IRP Sites ST-333, ST-343, and ST-344. ISOON and South Park are within the site boundaries for MMRP Site AL120e; the 1-Mile Site, proposed new 2-Mile Site, and a majority of the SOR are within the boundaries of MMRP Site ML125; a small portion of SKYWAVE is within the boundaries of MMRP Site ML201; and the OLPFA is within the boundaries of MMRP Site SR-766.

Although the OLPFA is within an active IRP site, no ground-disturbing activities are proposed to occur within this site. Therefore, this site is not expected to result in adverse impacts on or from IRP Site ST-105. No impacts on or from IRP Sites ST-314, ST-333, ST-343, and ST-344 and MMRP Site SR-766 would be expected to occur from activities occurring at SKYWAVE and SOR. Ground-disturbing activities at ISOON and South Park, within MMRP Site AL120e, would require UXO clearance and UXO avoidance training prior to any soil disturbance. In accordance with the administrative LUCs for MMRP Site ML125, ground-disturbing activities associated with the development of the proposed new 2-Mile Site would require implementation of activities outlined in the Management Action Plan for this site. Additionally, due to the potential to encounter UXO, any ground-disturbing activities proposed to occur south of Hardin Boulevard would require UXO avoidance training

3.9.2.2 No Action Alternative

Under the No Action Alternative, operations would continue as usual and planned efforts would not increase over current operating levels or deviate from already approved activities. No new test activities would occur. 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. Department of the Air Force Instruction (DAFI) 91-202, *The Department of the Air Force 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 Raymond G. Murphy Department of 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, Albuquerque ER and Hospital, 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 (City of Albuquerque 2024a). AFR is comprised of numerous uniformed personnel, including 760 full-time firefighters, 39 civilian employees, 471 basic emergency medical technicians and 212 paramedics within AFR staffing levels, 22 fire stations, 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 employs multiple police bureaus (City of Albuquerque 2024b) available within seven geographical area commands to provide law enforcement services (City of Albuquerque 2024c). The Foothills Area Command (Jeffrey Cole Russell Memorial Substation) borders the northeastern 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

Project activities would result in short-term, negligible, adverse impacts on the safety of contractors, military and civilian personnel. No short- or long-term impacts are expected to affect the public. While unlikely, short- and long-term, negligible to moderate, adverse impacts could result from an accident at Kirtland AFB resulting from RDT&E activities. However, Kirtland AFB and AFRL have numerous SOPs and safety protocols in place to prevent and minimize potential impacts.

3.10.2.1 Proposed Action

Contractor Safety. Short-term, negligible, adverse impacts on the health and safety of contractor personnel would occur. RDT&E activities would slightly increase the health and safety risk to personnel within the project areas. 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 would be expected from RDT&E activities carried out at Kirtland AFB. Short-and long-term, negligible to moderate, adverse impacts in the unlikely event of an accident taking place during the proposed RDT&E activities could also occur. All such

activities would comply with DoD and OSHA standards (29 CFR Section 1910.109), all other applicable safety requirements, SOPs, and installation-specific protocols and procedures in order to minimize possible injuries, accidents, or other impacts on safety. Kirtland AFB follows all safety standards listed in DAFI 91-202.

Public Safety. No impacts on the safety of the public would occur. Because the proposed RDT&E 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, project areas 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, operations would continue as usual for Kirtland AFB, consistent with mission and management plans, with no occurrences of new testing activities or operation expansion. Therefore, 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

Cumulative effects or impacts are defined 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. 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 PEA. 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.

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.

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 REVIL, FERMI, and Material Environments Testing and Analysis Laboratory (METAL)	Southgate Road	AFRL is proposing to construct two modern and flexible laboratories: REVIL (5,200 square feet) and FERMI (8,000 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 METAL – 15–20 years
Construction of Nuclear Integration, Experimentation, and Evaluation Data and Environmental Analysis (NuIDEA) and Nuclear Digital Engineering Laboratory (NuDEL)	Corner of Griffin Avenue and Pennsylvania Street	The NuDEL and NuIDEA projects involve designing two buildings that support the AFRL/RV Nuclear Mission Branch in expanding Modeling and Simulation and International Test and Evaluation capabilities. NuDEL is a proposed FLEX4 construction project to provide a facility with secure laboratories and office space. NuIDEA is a proposed military construction project to expand NuDEL to include additional secure laboratories, office space, and parking to expand the mission's capacities further. The total NuDEL/NuIDEA Complex area will be roughly 15,000 to 20,000 square feet.	5–10 years
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 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	STARQUEST would upgrade/renovate the 40-year-old laboratory, add a new optics laboratory and office space (including restrooms), and demolish several smaller sheds and storage facilities. The new construction would be less than 1,000 square feet.	0–5 years

Name of Action	Location	Project Description	Timeframe
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, 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.	1–5 years
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	11+ years

Name of Action	Location	Project Description	Timeframe
		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.	
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 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.	Fiscal Year 2025–Fiscal Year 2029
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, 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 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	0–5 years

Name of Action	Location	Project Description	Timeframe
		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
Construction of a Satellite Assessment Laboratory for Space Situational Awareness (SALSSA)	TAC Lab	AFRL would construct up to a 6,500 square foot secure addition and renovate up to 4,000 square feet of the TAC Lab to provide a centralized facility for satellite analyses supporting SDA strategies. SALSSA would add office space and update restrooms, breakrooms, conference rooms, and the facility's heating and cooling systems. SALSSA would require the relocation of the TAC Lab's existing emergency generator. The area of ground to be disturbed would be approximately 10,000 square feet.	Ongoing (since February 2020)
Space Technology and Research Laboratory Optical Resiliency Design (STARLORD) Project	SOR	STARLORD would increase emergency power capability at SOR enabling 24/7 operations and upgrade water capacity and storage to provide backup capability for potable use as well as critical cooling systems. STARLORD would also provide additional protection for critical infrastructure from damage during power brownouts and loss. SOR has had power interruptions for many years and the water system is at capacity and cannot support the modernization of SOR. The interruptions often cause equipment issues that need resolution. In the case of a power interruption, SOR must provide 24/7 security/fire watch personnel, thus affecting critical missions and the safety and security of personnel. The main requirements of STARLORD would include emergency power system upgrades at the site as well as the offsite substation; water distribution and storage system upgrades for a 5-day redundant water supply and a 54,000-gallon storage capacity; and installation of up to five 1-megawatt paralleled generators and their associated infrastructure to replace the existing generator system.	Ongoing (since May 2023)
USSF Space Rapid Capability Office (RCO) Satellite Communication Augmentation Resource (SCAR) Test and Site Construction for Test	South Park	The Space RCO proposes to use South Park for initial qualification and subsequent acceptance testing of the SCAR systems. The systems would be tested as units comprised of four transportable phased-array antennas (BADGERs) and a Mission Support CONEX. The systems would augment the increasingly strained capacity of the Satellite Control Network, a legacy satellite control system that supports the communication and command and control of satellites operated by the DoD and other government agencies.	Ongoing (since October 2023)

Name of Action	Location	Project Description	Timeframe
		Space RCO is charged with testing and shipping the first unit to Guam to restore capability lost by a typhoon in May 2023. Space RCO anticipates testing up to 12 units over the course of the next 6 years. Major on-site activities would include transition and reception of satellite communication signals, failure mode operations, as well as formal testing. The first SCAR unit is planned for testing in early 2025. An additional 11 units would be delivered between 2027 and 2030, adding up to a total of 12. Space RCO anticipates 6 months of continuous or near continuous testing for the initial SCAR unit, to include completion of Developmental Tests and Operational Tests.	

4.2.1 Noise

The Proposed Action, when combined with past, present, and reasonably foreseeable future 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. 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 future 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 past, present, and reasonably foreseeable future actions on the installation and within the surrounding area, may result in negligible, adverse cumulative impacts on geologic resources, namely topography and soils. Other projects would include construction of buildings and expanding infrastructure to facilitate those new buildings, thus increasing soil disturbances and resulting in topographical changes at Kirtland AFB. However, BMPs would be implemented that would minimize potential impacts. Therefore, the Proposed Action, in conjunction with other foreseeable actions both on and off the installation, would not result in significant cumulative impacts to geological resources.

4.2.4 Water Resources

The Proposed Action, when combined with past, present, and reasonably foreseeable future actions on the installation and within 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

RDT&E activities and construction under the Proposed Action, when combined with past, present, and reasonably foreseeable future actions on the installation and within the surrounding area 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 construction 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.

Project 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 appropriate BMPs, such as conducting surveys prior to any construction taking place 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 on these resources would not be expected.

4.2.6 Cultural Resources

No significant adverse cumulative impacts would result from the Proposed Action when combined with past, present, and 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 present and 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 area, would result in short-term, negligible, cumulative impacts on transportation; electrical, natural gas, water supply, stormwater discharge/collection, sanitary sewer/wastewater, and communications systems; and solid waste management. Impacts on transportation would be from potential intermittent and temporary increases in traffic at the installation. Impacts on the electrical, natural gas, water supply, stormwater discharge/collection, sanitary sewer/wastewater, and communications systems would be from the construction of a new permanent facility at South Park. Impacts on solid waste management would be from the generation of additional solid waste, both resulting from increased activity on the installation. Additionally, the Proposed Action, as well as past, present, and reasonably foreseeable future actions would result in long-term, negligible to minor, beneficial impacts on electrical, natural gas, water supply, stormwater discharge/collection, sanitary sewer/wastewater, and systems at Kirtland AFB. These beneficial impacts would result from the construction of the new facility at South Park.

4.2.8 Hazardous Materials and Wastes

The Proposed Action, when combined with past, present, and reasonably foreseeable future actions on the installation and within the surrounding area, 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 past, present, and reasonably foreseeable actions, would not result in a significant cumulative impact on hazardous materials and waste management.

4.2.9 Safety

The Proposed Action, when combined with past, present, and reasonably foreseeable future actions on the installation and within the surrounding area, would result in short- and long-term, negligible to moderate, adverse safety impacts on the safety of contractors, military and civilian personnel. Contractor personnel would continue to follow the appropriate protocol and BMPs, resulting in short-term, negligible, adverse impacts on the safety of contractor employees. Ongoing testing activities and potential accidents could result in short- and long-term, negligible to moderate, adverse impacts on military and civilian personnel; however, safety protocols and SOPs are in place to prevent and minimize future impacts. The public would continue to expect no health and safety impacts from the Proposed Action, as future activities would occur within Kirtland AFB boundaries that are not available to the public. Therefore, the Proposed Action would not result in significant cumulative impacts on safety.

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6.0 REFERENCES

ABQ RIDE 2024 — ABQ RIDE 2024. *ABQ RIDE Bus Routes & Schedule*. Available online: <http://www.cabq.gov/transit/bus-routes-and-schedules>. Accessed 20 February 2024.

AFCEC 2013 — Air Force Civil Engineer Center (AFCEC). 2013. *Final No Further Action Confirmation Report Military Munitions Response Program*. March 2013.

AFCEC 2020a — AFCEC. 2020. *Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II – Advanced Assessments*. July 2020.

AFCEC 2020b — AFCEC. 2020. *Final Record of Decision ML125 Field Firing Range Munitions Response Site Military Munitions Response Program*. January 2020.

AFCEC 2021 — AFCEC. 2021. *Site Investigation Report 13 Septic System Sites Kirtland Air Force Base New Mexico*. September 2021.

AFCEC 2023a — AFCEC. 2023. *Level II, Air Quality Quantitative Assessment, Insignificance Indicators*. April 2023.

AFCEC 2023b — AFCEC. 2023. *Relative Risk Site Evaluation Kirtland Air Force Base, Albuquerque, NM*. 2 June 2023.

AFCEC 2023c — AFCEC. 2023. *Kirtland Air Force Base Albuquerque, New Mexico Final Fiscal Year 2022 Long-Term Monitoring Report ST-105 – Nitrate Impacted Groundwater*. March 2023.

AFCEC 2024 — AFCEC. 2024. Email conversations between Mr. Scott Clark, AFCEC/CZO, and Ms. Michelle Bare, HDR, providing updated IRP and MMRP site status and numbers for the installation. 23 January and 6 February 2024.

ANSI 2013 — American National Standard Institute (ANSI). 2013. *American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present*. ANSI S12.9-1993 (R2013)/Part 3. 15 January 2013.

BISON-M 2024 — Biota Information System of New Mexico (BISON-M). 2024. BISON-M home page. Available online: <http://www.bison-m.org>. Accessed 26 September 2024.

Chaon et al. 2020 — Chaon, P., K. Ongman, C. Lundblad, and C. J. Conway. 2020. Burrowing Owls (*Athene cunicularia hypugaea*) on Kirtland Air Force Base: *Monitoring, Management, and Population Status -2020 Annual Report.* Idaho Cooperative Fish & Wildlife Research Unit, Moscow, ID

City of Albuquerque 2024a — City of Albuquerque. 2024. *Albuquerque Fire Rescue*. Available online: <https://www.cabq.gov/fire>. Accessed 1 October 2024.

City of Albuquerque 2024b — City of Albuquerque. 2024. *Albuquerque Police: Organizational Chart*. Available online: <https://www.cabq.gov/police/documents/apd-division-org-chart-8-28-24.pdf>. Accessed 1 October 2024.

City of Albuquerque 2024c — City of Albuquerque. 2024. *Area Commands*. Available online: <https://www.cabq.gov/police/area-commands>. Accessed 1 October 2024.

FEMA 2011 — Federal Emergency Management Agency (FEMA). Definitions. Def 4. 1 October 2011. Available online: <https://www.fema.gov/pdf/nfip/manual201205/content/22_definitions.pdf>. Accessed 30 October 2023.

Franklin and Rodgers 1981 — Franklin Hayward H. and J. B. Rodgers. 1981. *Archaeological Survey Project 1981C, Bernalillo County, New Mexico* (NMCRIS No. 9039). Center for Anthropological Studies. 31 December 1981.

Gallison et al. 2005a — Gallison, James, D. Kilby, R. Hererra, M. Church, N. Ramirez, and L. Kellett. 2005. *Archaeology of the Western Manzanita Foothills: 6,654 Acre Survey of the Western Portions of Kirtland Air Force Base and Department of Energy Lands Withdrawn from the U.S. Forest Service, Bernalillo County, New Mexico* (NMCRIS No. 90687). Engineering-Environmental Management, Inc. 31 December 2005.

Gallison et al. 2005b — Gallison, James, David Kilby, and Roberto Herrera. 2005. *Archaeology of the Western Manzanita Mountains: Cultural Resource Survey of the West-Central Portion of Kirtland Air Force Base and Department of Energy Lands Withdrawn from the US Forest Service, Bernalillo County, New Mexico* (NMCRIS No. 86172). Engineering-Environmental Management, Inc. 31 December 2005.

Gallison et al. 2014 — Gallison, James, Michael Jennings, Christine Hajek, and T. De Pree. 2014. *Archaeological Survey of the Lower Tijeras Arroyo and Arroyo del Coyote, Kirtland Air Force Base, Bernalillo County, NM.* HDR, Albuquerque. (NMCRIS No. 125941). 28 February 2014.

Google Earth 2024 — Google Earth, 2024. Available online: <https://earth.google.com/web/>. Accessed 3 October 2024.

Hoagland and Dello-Russo 1995 — Hoagland, Steve and Robert Dello-Russo. 1995. *Cultural Resource Investigation for Sandia National Laboratories, New Mexico Environmental Restoration Program, Kirtland Air Force Base, New Mexico, Volumes I and II* (NMCRIS No. 47604). Prepared for Sandia National Laboratories by Butler Service Group, Inc 31 December 1995.

KAFB 1984 — Kirtland Air Force Base (KAFB). 1984. *Environmental Assessment of the Proposed Addition to the AFWL Optics Development Lab*. August 1984.

KAFB 1987 — KAFB. 1987. *Environmental Assessment for the Construction and Operation of the High Energy Microwave Laboratory (HEML)*. February 1987.

KAFB 1989 — KAFB. 1989. *Environmental Assessment for the Construction and Operations of the High Energy Research & Technology Facility (HERTF) Kirtland Air Force Base, New Mexico*. 9 June 1989.

KAFB 1990 — KAFB. 1990. *An Environmental Assessment for the Laser Effects Test Facility, Kirtland Air Force Base, Bernalillo County, New Mexico*. March 1990.

KAFB 1991 — KAFB. 1991. *Environmental Assessment for the US Air Force Phillips Laboratory Starfire Optical Range Facility Kirtland AFB, New Mexico*. May 1991.

KAFB 1992 KAFB. 1992. *Amendment to Environmental Assessment for the Operation and Maintenance of the High Energy Microwave Laboratory (HEML)*. 27 March 1992.

KAFB 1993 KAFB. 1993. *Environmental Assessment Consolidation of Phillips Laboratory Split Directorates Kirtland Air Force Base, New Mexico*. July 1993.

KAFB 1995 KAFB. 1995. *Wetland Inventory Survey, Kirtland Air Force Base.*

KAFB 1997 KAFB. 1997. *Environmental Assessment for Advanced Laser Facility Kirtland Air Force Base, Albuquerque, New Mexico*. April 1997.

KAFB 1999 KAFB. 1999. *Environmental Assessment for the ADT Battlelab Phase III Demonstration*. July 1999.

KAFB 2001 KAFB. 2001. *Environmental Assessment for the Telescope/Atmospheric Compensation Laboratory*. June 2001.

KAFB 2002 KAFB. 2002. *Final Environmental Assessment for Outdoor Laser Propagation Firing Area Including US/UK Focal Plane Array Counter Measures Experiment*. Revision 1. October 2002.

KAFB 2006 KAFB. 2006. *Final Environmental Assessment Air Force Research Laboratory Fixed Panel Array*. June 2006.

KAFB 2007 KAFB. 2007. *Final Environmental Assessment of the Realignment of the Battlespace Environment Laboratory Kirtland Air Force Base Albuquerque, New Mexico*. September 2007.

KAFB 2016 KAFB. 2016. *Installation Development Plan: Kirtland Air Force Base, New Mexico.*

KAFB 2019 KAFB. 2019. *Final Environmental Assessment Addressing the High-Powered Electromagnetic Laboratory at The Air Force Research Laboratory at Kirtland Air Force Base, New Mexico*. November 2019.

KAFB 2022a KAFB. 2022. *Final Environmental Assessment Addressing Construction and Operation of Re-Entry Vehicle Integration Laboratory Facilities at Kirtland Air Force Base, New Mexico*. May 2022.

KAFB 2022b KAFB. 2022. *US Air Force Hazardous Waste Management Plan Kirtland Air Force Base*. 19 September 2022.

KAFB 2023a KAFB. 2023. *US Air Force Integrated Natural Resources Management Plan Kirtland Air Force Base Albuquerque, New Mexico.* April 2023.

KAFB 2023b KAFB. 2023. *Kirtland Air Force Base Albuquerque, New Mexico Spill Prevention Control and Countermeasure Plan*. August 2023.

KAFB 2024a KAFB. 2024. *2023 Emissions Inventory Report, Kirtland Air Force Base*. March 2024.

KAFB 2024b KAFB. 2024. *Kirtland Air Force Base Annual Drinking Water Quality Consumer Confidence Report (Report Year 2023)*. Available online: <https://www.kirtland.af.mil/Portals/52/1_%20%202023%20KAFB%20Consumer%20Confidence%20Report%20%281%29.pdf>. Accessed 30 October 2024.

KAFB 2024c	KAFB. 2024. Information provided by Ms. Katrina Wheelock, 377 MSG/ CEIEC, on the Comment Response Matrix in response to a preparer's note in the Kirtland AFB CHESTNUT Check Draft EA. April 2024.
New Mexico Rare Plants 2024	New Mexico Rare Plants Database. 2024. Available online: <https://nmrareplants.unm.edu/>. Accessed 16 January 2024.
NMBGMR 2003	New Mexico Bureau of Geology and Mineral Resources (NMBGMR). 2003. *New Mexico, Earth Matters: Caves and Karst in New Mexico.* Accessed on 3 October 2024.
NMERT 2024	New Mexico Environmental Review Tool (NMERT). 2024. Available online: <https://nmert.org/>. Accessed 26 September 2024.
NMTSO 2024	New Mexico Tech Seismological Observatory (NMTSO). 2024. *Recent Seismic Events.* Accessed on 4 October 2024. Available at <https://geoinfo.nmt.edu/nmtso/events/home.cfml>.
NPS 2024	National Park Service (NPS). 2024. *NPS Geodiversity Atlas—Petroglyph National Monument, New Mexico*. Available online: <https://www.nps.gov/articles/nps-geodiversity-atlas-petroglyph-national-monument-new-mexico.htm>. Accessed 3 October 2024.
NSWC 1981	Naval Surface Weapons Center (NSWC). 1981. *Far Field Overpressure from TNT Explosives: A Survey of Available Models*. April 1981.
Rodgers 1980a	Rodgers, James B. 1980. *Kirtland Air Force Base 1980 Archaeological Survey Project, Bernalillo County, New Mexico* (NMCRIS No. 38250). Prepared for Sandia National Laboratories by the Center for Anthropological Studies. 31 December 1980.
Rodgers 1980b	Rodgers, James B. 1980. *Kirtland Air Force Base (KAFB) 1979 Archaeological Survey Project, Bernalillo County, New Mexico* (NMCRIS No. 9051). Center for Anthropological Studies. 31 December 1980.
SNL 2023	Sandia National Laboratories (SNL). 2023. *2022 Annual Site Environmental Report for Sandia National Laboratories, Albuquerque, New Mexico*.
Sullivan et al. 2002	Sullivan, Richard B. E. A. Giedraitis, A. J. Schilz, and R. Burleson. 2002. *Report on the Results of an Archaeological Inventory of 16,090 Acres on Kirtland Air Force Base, New Mexico*. AMEC Earth and Environmental, Inc., Albuquerque. (NMCRIS No. 72870). 31 March 2002.
TRS Audio 2024	Tontechnik-Rechner-SengPiel Audio (TRS Audio). 2024. *Damping of Sound Level (decibel dB) vs. Distance*. Available online: <http://www.sengpielaudio.com/calculator-distance.htm>. Accessed 6 October 2024.
USAF 1991	United States Air Force (USAF). 1991. *Installation Restoration Program, Stage 2A, Work Plan, Draft*. 2 February 1991.
USDA 2024	United States Department of Agriculture (USDA), 2024. *Web Soil Survey*. Available online: <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed 3 October 2024.

USEPA 1971	United States Environmental Protection Agency (USEPA). 1971. *Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances*. 31 December 1971.
USEPA 1974	USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with and Adequate Margin of Safety*. March 1974.
USEPA 1981a	USEPA. 1981. *Noise and its Measurement*. January 1981.
USEPA 1981b	USEPA. 1981. *Noise Effects Handbook*. July 1981. Available online: <https://www.nonoise.org/library/handbook/handbook.htm#Contents>. Accessed 1 November 2023.
USEPA 1985	USEPA. 1985. *Dust Control at Hazardous Waste Sites*. November 1985.
USEPA 2023	USEPA. 2023. *2020 National Emissions Inventory (NEI) Data for New Mexico*. 30 March 2023. Available online: <https://www.epa.gov/air-emissions-inventories/2020-nei-supporting-data-and-summaries>. Accessed 31 October 2023.
USEPA 2024a	USEPA. 2024. *New Mexico Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants*. 31 December 2023. Available online: <https://www3.epa.gov/airquality/greenbook/anayo_nm.html>. Accessed 1 October 2024.
USEPA 2024b	USEPA. 2024. *$PM_{2.5}$ Design Values, 2023*. 8 August 2024. Available online: <https://www.epa.gov/air-trends/air-quality-design-values>. Accessed 1 October 2024.
USEPA 2024c	USEPA. 2024. Greenhouse Gas Equivalencies Calculator. Updated January 2024. Available online: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>. Accessed 4 October 2024.
USFWS 2024a	USFWS. 2024. *National Wetlands Inventory*. Available online: <https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>. Accessed 1 February 2024.
USFWS 2024b	United States Fish and Wildlife Service (USFWS). 2024. *Information for Planning and Consultation Official Species List Event Code: 2024-0092739*. Generated 20 May 2024.
USGS 2004	United States Geological Survey (USGS). 2004. U.S. Geological Survey Open-File Report 2004-1352. *Digital Engineering Aspects of Karst Map: A GIS Version*. Accessed 3 October 2024.
USGS 2024	USGS, 2024. *Earthquakes Hazard Program*. Available online: <https://earthquake.usgs.gov/earthquakes/eventpage/tx2024tgrx/map>. Accessed 3 October 2024.
White et al. 2023	White, D.D., E.H. Elias, K.A. Thomas, C.E. Bradatan, M.W. Brunson, A.M. Chischilly, C.A.F. Enquist, L.R. Fisher, H.E. Froehlich, E.A. Koebele, M. Méndez, S.M. Ostoja, C. Steele, and J.K. Vanos. 2023. *Chapter 28. Southwest*. In: Fifth National Climate Assessment [Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock (eds.)]. Available online: <https://nca2023.globalchange.gov/chapter/28/>. Accessed 3 October 2024.

APPENDIX A

HISTORY OF AIR FORCE RESEARCH LABORATORY OPERATIONS AT KIRTLAND AIR FORCE BASE

Appendix A

Brief History of Air Force Research Laboratory Operations at Kirtland Air Force Base

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 Chapter 139. In 1949, the United States Air Force (USAF) established its own Special Weapons Center and test laboratory at Kirtland Field near Sandia Base, 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 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. In 1990, AFSC reorganized 13 laboratories across the country into four super laboratories and AFWL became Phillips Laboratory at Kirtland Air Force Base (AFB), devoted to space and missiles research and development. Then in 1997, the laboratories were reorganized again and named the Air Force Research Laboratory (AFRL), as it is known today. Two directorates of AFRL remained at Kirtland AFB to continue research in space (AFRL/RV) and directed energy (AFRL/RD). All current training activities and facilities are situated on lands owned by the USAF or on lands withdrawn from public use by the Bureau of Land Management or the United States Forest Service (USFS) and given to the USAF for military research, testing, and development activities.

Today, AFRL is the primary scientific research and development center for the USAF. AFRL's mission is to lead the discovery, development, and integration of affordable warfighting technologies for United States air, space, and cyberspace forces. With a workforce of more than 12,500 across 9 technology areas and 40 other operations across the globe, AFRL provides a diverse portfolio of science and technology ranging from fundamental to advanced research and technology development.

DIRECTED ENERGY DIRECTORATE

BACKGROUND

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 directed energy (DE) weapons to counter, disable, and attack adversary sources. As this technology develops, scientists and engineers expand the concepts to ensure they can work for the warfighter.

AFRL/RD specializes in high energy laser (HEL), high-power microwave (HPM), and high-power electromagnetic (HPEM) technology development. These areas of research offer the warfighter innovative technologies that enable a variety of non-traditional counter electronic and thermal effects that can be either lethal or non-lethal. HPM weapons create beams of electromagnetic energy over a broad spectrum of radio and microwave frequencies in both narrow- and wide-band with the intent of coupling/interacting with electronics within targeted systems either by causing damage or temporary disruption from which the system cannot self-recover in time to accomplish

its mission. HPEM systems enable low collateral damage methods to disturb, deny, or damage electronics contained in adversary systems or buildings. HEL systems enable pinpoint accurate methods to degrade or destroy adversary systems. These 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.

HISTORY OF OPERATIONS

High Energy Microwave Laboratory

Since its opening in 1993, a variety of counter electronic/HPM tests have been performed in the High Energy Microwave Laboratory (HEML). The following sections describe examples of tests that have historically occurred at the HEML.

HPEM Empirical Effects Test Activities. The AFRL/RD HPEM Effects Program conducts effects testing to improve weapons effectiveness for platforms needed by the warfighter to include the Tactical High-Power Microwave Operational Responder (THOR).

MAX POWER System Test Activities. These tests were part of a program to develop an Improvised Explosive Device neutralization system. The tests included integration of the HPM device on a Palletized Loading System vehicle at the HEML with antenna characterization and system demonstration outside at HERTF Canyon.

Ground Mobile HPM (GMHPM) Source Test Activities. The GMHPM System was a developmental system intended for the military counter-electronics mission. It was a self-contained HPM source, including an internal battery system and fixed horn antenna designed to defeat electronic systems. The tests included characterization of the system's output power and beam pattern, effects tests on targets, and an operational assessment of the system's potential military utility.

High Energy Research and Technology Facility and HERTF Canyon

HERTF has been operated for over 30 years by AFRL for the purposes of HPM source testing. It has developed safety processes to minimize potential negative impacts on licensed radio frequency (RF) services, as well as established safety controls for other potential hazards to test personnel and the public. AFRL has established and maintains the Manzano Mountain Controlled Firing Area agreement with the Federal Aviation Administration which contains specific safety requirements for the performance of HPM testing at the site. At the time of its construction, no facility such as HERTF existed in the free world, though several similar facilities exist in the Soviet Union. Research and development at high energy is needed not only to advance technology to the military application level, but to avoid technological surprises that may occur as energy thresholds are surpassed. At the time, it was thought that the Soviets were conducting an aggressive research and development program in an energy regime unexplored in the United States. HERTF made it feasible and economical for the United States to explore this energy regime and gain insight into possible Soviet activities.

High-Power Joint Electromagnetic Non-Kinetic System (HiJENKS) Program Test Activities. HiJENKS was a joint effort between AFRL and the Office of Naval Research (ONR) to integrate an HPM payload into an airborne platform. HiJENKS was a follow-on to the Counter-electronics High-Power Microwave Advanced Missile Project (CHAMP) Program. During tests, the HiJENKS

HPM device illuminated targets inside a facility near HERTF to determine effectiveness. One 10-kilowatt diesel generator was used to operate the payload for a total of 80 hours for these tests.

Frustration Canyon

Frustration Canyon has been the home of active denial testing since 1995 and has been used for other DE testing since the 2000s. The following sections describe examples of tests that have historically occurred at Frustration Canyon.

THOR Test Activities. THOR is an AFRL-developed HPM system to counter unmanned aerial systems (UASs). THOR was operated in Frustration Canyon to characterize its RF beam parameters and assess its effectiveness against UAS.

Active Denial Testing. The Active Denial System is a counter-personnel, non-lethal, directed energy weapon. Traveling at the speed of light, the energy strikes the subject and only reaches a skin depth of about 1/64th of an inch. It produces a heat sensation that within seconds becomes intolerable and forces the targeted individual to instinctively move.

Air Force Life Cycle Management Center Architecture and Integration Directorate Prototype Counter Unmanned Aerial System (CUAS) Phase 2B Test Activities. To counter threats to US bases and civilian airports posed by sUAS, these tests focused on understanding the capabilities and limitations offered by existing off-the-shelf HEL systems against UASs. The Counter Small Unmanned Aerial Systems (C-sUAS) tested were HEL systems designated Low-Cost CUAS for Targeting (LOCUST and the Kord HEL-Sword). Both the Blue Halo LOCUST and Kord HEL-Sword were ground-based, palletized HEL systems that incorporated mid-wave infrared, short wave infrared, visible electro-optical camera, target illuminating laser, and laser rangefinder. The C-sUASs were launched and flown from different locations in HERTF Canyon. Downed targets were immediately recovered. The laser was not propagated over the canyon walls or over the horizon.

Starfire Optical Range

The Starfire Optical Range (SOR), located in an isolated area of Kirtland AFB, has long been utilized as a test site by various agencies of the US Government. As part of Sandia Base, the area now known as SOR was the subject of a Memorandum of Understanding (MOU) between the Armed Forces Special Weapons Project and the US Atomic Energy Commission as early as 22 October 1952. Sandia Base, which was under the jurisdiction of the Armed Forces Special Weapons Project, was merged with Kirtland AFB in 1972. Subsequent modifications to the MOU made in 1957, 1958, and 1961 clearly defined the US Government's interest in the area for advanced research and development testing.

On 9 May 1969, the US Atomic Energy Commission (now the US Department of Energy) entered into an agreement with the AFWL to allow for the construction of an optical test range. SOR was established by the AFWL as the Sandia Optical Range as a major USAF facility for HEL research and development. SOR was chosen to be located at Kirtland AFB in part because the installation was the center of a region where a large amount of the nation's most advanced weapons research and development was conducted. The AFWL and Sandia National Laboratories are collocated at Kirtland AFB and Los Alamos National Laboratory and White Sands Missile Range are located with 150 to 300 kilometers of Kirtland AFB, all of which are heavily involved in the development of laser weapons systems. In addition, SOR is bound on the east, south, and north by the Manzano and Manzanita mountains which act as a shield to block any potential stray laser radiation from irradiating populated areas.

Facilities at the Sandia Optical Range initially were used to support beam propagation and effects research for HELs. State-of-the-art equipment was installed at SOR in 1970 and 1971. The Field Test Telescope, a three gim-balled telescope stabilized by two gyroscopes, featured hydraulically actual inner gimbals allowing for azimuth and elevation movements. The Field Test Telescope was designed to point an HEL beam generated by the laser to various static targets located at sites with ranges of 350 meters, 750 meters, and 1 mile types of DE technologies, such as microwaves and particle beams.

The Directed Energy Experimental Range (DEER) became the home of RADLAC II, a relativistic electron beam device in 1985. Until late 1990, RADLAC II was operated from existing SOR facilities by personnel of Sandia National Laboratories. RADLAC II demonstrated for the first time stable electron beam propagation in the air, a significant advance in the vulnerability and damage effects arena.

During 1985 to 1986, SOR was inactive with no laser propagation experiments being conducted. In late 1987, the 1.5-meter telescope facility became operational and a pulsed copper vapor laser operating at approximately 250 watts was utilized for the propagation of beams in the atmosphere 45 to 90 degrees above the horizon. The 1.5-meter telescope is currently in operation for atmospheric propagation experiments in support of the DoD's ground-based laser technology development program.

In December 1988, DEER was redesignated as SOR. Planning for a proposed 3.5-meter telescope facility was initiated in earnest in 1988 and an EA with a FONSI was completed and approved by Headquarters, Military Airlift Command in September 1990 for the construction of the 3.5-meter telescope SOR Facility. The most recent EA was signed in June 2001 and was for the construction of a 54,000 square foot Telescope/Atmospheric Compensation Laboratory (TAC Lab) within the USFS withdrawn area that included a coating chamber to provide an on-site capability for the required periodic recoating of the 3.5-meter telescope.

The following sections describe recent construction projects that have occurred or are currently underway at SOR.

Construction of a Satellite Assessment Laboratory for Space Situational Awareness (SALSSA). AFRL would construct up to a 6,500 square foot secure addition and renovate up to 4,000 square feet of the TAC Lab to provide a centralized facility for satellite analyses supporting space domain awareness (SDA) strategies. SALSSA would add office space and update restrooms, breakrooms, conference rooms, and the facility’s heating and cooling systems. SALSSA would require the relocation of the TAC Lab’s existing emergency generator. The area of ground to be disturbed would be approximately 10,000 square feet.

Renovation, Expansion, and Modernization of an Existing Optical Research Facility at SOR (Project Name: STARQUEST). STARQUEST would enable next-generation technologies in support of SDA applications for the United States Space Force (USSF) and DoD as well as future research. The goal of STARQUEST is to provide essential infrastructure for mission critical science and technology efforts. STARQUEST would upgrade/renovate the 40-year-old laboratory, add a new optics laboratory and office space (including restrooms), and demolish several smaller sheds and storage facilities. The new construction would be less than 1,000 square feet. Construction would be anticipated to begin in 2025.

Space Technology and Research Laboratory Optical Resiliency Design (STARLORD) Project. STARLORD would increase emergency power capability at SOR enabling 24/7 operations and upgrade water capacity and storage to provide backup capability for potable use

as well as critical cooling systems. STARLORD would also provide additional protection for critical infrastructure from damage during power brownouts and loss. SOR has had power interruptions for many years and the water system is at capacity and cannot support the modernization of SOR. The interruptions often cause equipment issues that need resolution. In the case of a power interruption, SOR must provide 24/7 security/fire watch personnel, thus affecting critical missions and the safety and security of personnel. The main requirements of STARLORD would include emergency power system upgrades at the site as well as the offsite substation; water distribution and storage system upgrades for a 5-day redundant water supply and a 54,000-gallon storage capacity; and installation of up to five 1-megawatt paralleled generators and their associated infrastructure to replace the existing generator system.

The following section describes an example testing that has historically occurred at SOR.

Low-Power Microwave Source Site Verification Test Activities. AFRL/RD previously conducted Low-Power Microwave Source Site Verification Tests near SOR and the 2-Mile Site. These tests compared the received power and what was expected from the Joint RF Effectiveness Models, allowing for AFRL/RD to verify the model's performance and understand how the selected site performs as a test site for HPM events. For proper utility of the site, AFRL/RD constructed a dirt road that was graded and a 75- by 75-foot ground pad. Additionally, AFRL/RD cleared a 10- by 10-foot patch directly outside of the SOR 2-Mile Site.

Outdoor Laser Propagation and Firing Area and Associated Laser Facilities

The Airborne Laser (ABL) Program at Kirtland AFB developed an ABL to destroy ballistic missiles during their boost phase. The ABL system, which flew aboard a modified Boeing 747 aircraft, incorporated an Active Ranging System (ARS) laser, a Track Illuminator Laser (TILL), and a Beacon Illuminator Laser (BILL); a laser-beam control system designed to focus the beam on a target; and a Chemical Oxygen Iodine Laser (COIL) designed to destroy the target. The ARS, a lower-power gas laser, was the first to fire, sending a beam to the proposed target using the returned signal to provide continuous, high-resolution tracking data. The TILL, a lower-power solid-state laser, produced a pulsed laser beam that illuminated the body of the missile and the beam from the BILL, also a lower-power solid-state laser, would bounce off the target and return to the aircraft where optical/software equipment would measure and compensate for distortion in the atmosphere between the aircraft and the target. Finally, the COIL, an HEL, would heat the skin of the missile causing it to deform resulting in internal depressurization, which caused the missile to explode.

The Advanced Laser Facility originally was used for research and development of chemical, electric, and hybrid lasers for ground-, airborne-, and space-based systems. It consisted of several laboratories; a central vacuum building; a device test area; administrative areas; and a central heating, ventilation, and cooling building. The laser research conducted at the Advanced Laser Facility covered a wide spectrum of laser technology, including chemical and electric lasers. Some experiments focused on research and development of new lasers and laser systems, while others explored optical or other aspects of the field. Experiments concentrated on chemical laser research and development and range from small installations utilizing a few hundred square feet for a duration of several months to a relatively permanent installation utilizing over 1,000 square feet. Experiments also concentrated on electric laser and laser research and development and range from large, relatively permanent experiments to small installations that could be in place for only a few weeks. The following sections describe examples of tests and construction activities that have historically occurred at the OLPFA.

Plasma Enhanced Chemical Vapor Deposition (PECVD) System. The purpose of the PECVD System was to provide AFRL researchers optical-quality dielectric thin films on gallium antimonide semiconductor laser material. These optical thin films were engineered to operate as anti- and high-reflective coatings on the semiconductor laser facets. It also provided silicon nitride electrical isolation thin film layers deposited on gallium antimonide for electrically pumped semiconductor lasers. These thin-film systems allow AFRL researchers to further their scientific advances in development of mid-infrared semiconductor lasers for military applications such as military asset self-protection.

Advanced COIL Test Stand (ACTS). ACTS was a COIL test stand that was set up to develop and research COIL technologies. ACTS evaluated new COIL technologies including chemical fuel mixtures, singlet oxygen generators, and injection nozzle designs.

High-Power Adaptive Directed Energy System (HADES). HADES originated as a Small Business Innovation Research effort to develop coherent beam combining technology. This effort started in 2011 and concluded in 2019. The OLPFA was used for some of the concept testing.

Laser System Integration Technology Program. The Laser System Integration Technology Program conducted research in laser vibration and thermal management to improve laser quality and efficiency. The program performed various experiments to examine efficient means to dissipate heat generated by HEL operations. Initially, experiments were performed to determine if ammonium carbamate could be used to cool laser devices. Ammonia was then generated from chemical dissociation of ammonium carbamate in a heat exchanger creating a cooling effect for the laser device.

Sonic Anemometer Turbulence Characterization Data Collection. The AFRL atmospheric propagation team conducted a series of data collections to aid in the development of a point turbulence characterization capability using sonic anemometers. The primary purpose of these sonic anemometer data collects was to (1) provide data for the evaluation of processing methods; (2) determine optimum sampling rates and effects of other measured meteorological parameters such as humidity; and (3) compare turbulence measurements based on sonic anemometer to path averaged and path resolved optically based techniques of determining turbulence parameters.

For the experiments comparing anemometer results to optically based devices, two test locations were utilized, the Environmental Laser Test Facility (ELTF)-R arroyo and ELTF-R remote sites. The first location was the ELTF-R arroyo because the infrastructure needed was already in place. Light emitting diode beacons were set up at the 1-or 2-Kilometer Sites and the receivers at the ELTF with anemometers placed at each end. The third location was the road leading to the remote sites, 4- to 7-kilometer berms. This path is flat dirt and provides a different geometry than the arroyo path. The initial path was 500 meters, but the road allows for paths up to 5 kilometers and anemometers were placed along the path length. Initial ELTF-R testing consisted of a few short (less than 1 day) data collections followed by a few longer duration data collections.

Temporary Tower Installation and Test. AFRL/RD has previously conducted laser propagation test utilizing the OLPFA. These tests propagated lasers between facilities and required atmospheric instrumentation to be installed along the path to collect data in support of model validation. As part of this test, AFRL/RD installed six temporary 10-meter-tall towers. The towers contained atmospheric diagnostic equipment used as inputs for laser propagation models. The tower heights were needed to get the atmospheric equipment up to the beam height since the atmospheric parameters being measured varied depending on height above the ground. A 5-foot grounding rod was installed at each location.

Plant 1 in the Manzano Mountain Complex

AFRL began working in Plant 1 in 1994. The following sections describe examples of tests that have historically occurred at Plant 1.

Seismic Acoustic Detection and Ranging (SADAR) and SADAR-3D Prototype Installations. SADAR and SADAR-3D prototype installations were required to test developmental prototype sensor arrays to localize and identify equipment/activity in underground facilities. SADAR and SADAR-3D were passive (collect only) seismic detection systems composed of an array of 3-inch by 3-inch by 3-inch seismic sensors to point a vector to a noise (vibration) source (walkers, vehicles, etc.). 3D added the capability to better localize underground activity such as digging or tracking movement in underground facilities.

Propagation High Energy Electron and Nonlinear Interaction Experiments (PHEENIX). The objective of this ultra-short pulsed laser (USPL) research was to demonstrate a femtosecond laser capability to generate militarily relevant plasmas. The focus of the work was on generating RF from ultra-short pulse laser interactions with various materials, both conductors and insulators. Plant 1 houses a state-of-the-art laser system designed to facilitate this research.

SPACE VEHICLE DIRECTORATE

BACKGROUND

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.

HISTORY OF OPERATIONS

South Park Antenna Field

The South Park Antenna Field (South Park) was first established as the Fixed Panel Array Site following the Fixed Panel Array EA in 2006. At that time, it was to be a passive, fixed panel array experiment area on approximately 15 acres to establish a robust capability to quantify the accuracy of sensing tools in a realistic test environment. Peripheral structures with power and Local Area Network, concrete and gravel pads of various sizes up to 200 feet long, and some green metal structures were erected to support satellite calibration activities from space. In 2019, AFRL/RV assumed responsibility for the site and built upon the existing infrastructure to install two satellite communications antennas. At this point, the site became the South Park and began active transmissions.

The following sections describe examples of tests and construction activities that have been approved to occur at South Park since 2019.

Installation of 13 Meter Antenna for National Space Test and Training Complex. AFRL is installing a 13-meter parabolic dish antenna in South Park. The antenna will be enclosed in a radome 68 feet in diameter (widest point) and 55 feet tall. All support equipment for the antenna will be within the radome. The project also requires installation of a concrete pad approximately 60 by 60 feet and electrical and communication line modifications at the site. Trenching between the concrete pad and the tower on Pad 1 will be performed to tie in the 13-meter system with the site network. Conduit will be installed in a trench and mated to the existing conduit system and buried. Fiber optic cable will be pulled through the conduit to connect the pad to the site's fiber drop.

Space Development Agency Optical Ground Entry Point. The Space Development Agency selected Kirtland AFB as one of the four optimal locations for an optical ground station. An existing concrete pad required modification to accommodate the foundation and anchoring of the telescope. An 8- by 10-foot CONEX was placed directly adjacent to the concrete pad to house network and modem equipment. On the concrete pad, a small structure was built to house the optical telescope. The telescope is roughly 20 feet off ground level. Fencing was placed in accordance with designated protection levels. The system was designed to incorporate its own backup generator to provide reliable power to the system.

USSF Space Rapid Capability Office (SpRCO) Satellite Communication Augmentation Resource (SCAR) Test and Site Construction for Test. The SpRCO proposes to use South Park for initial qualification and subsequent acceptance testing of the SCAR systems. The systems would be tested as units comprised of four transportable phased-array antennas (BADGERs) and a Mission Support CONEX. The systems would augment the increasingly strained capacity of the Satellite Control Network, a legacy satellite control system that supports the communication and command and control of satellites operated by the DoD and other government agencies. Major on-site activities would include transition and reception of satellite communication signals, failure mode operations, as well as formal testing.

Skywave Technologies Laboratory

The Digital Ionospheric Sounding System (DISS) Site was relocated from Hanscom AFB in Massachusetts to Kirtland AFB as a result of the Base Realignment and Closure Commission’s 2005 decision. This site was needed by AFRL researchers and customers, such as the Air Force Weather Agency (AFWA) who sponsor the deployment and support of ionospheric sounders and subsequently use the data in various models.

The original site proposal included a 30- by 30-foot air-conditioned facility to house electronic equipment, computers, a small office and workshop area, and spare part storage. A concrete pad adjacent to the building supports a 40-foot trailer with connections to power and communication lines, and a 16-square foot concrete pad for a small satellite dish was also required. The testbed was to have up to 100-foot antenna towers for transmitters and space for receiver antennas. All antennas required guywires. DISS housed a high frequency ionospheric radar system capable of making measurements of the overhead ionosphere. It was both an active transceiver (radar), as well as a passive receiver system.

The facility was not constructed under the original request, only the testbed, concrete pads that housed portable trailers, and limited infrastructure were constructed. In 2012, a 101-foot tall digisonde antenna was installed on the DISS Site. In 2018, the requirement to have a 3,500-square foot facility on-site reemerged and in 2023 the Skywave Technologies Laboratory was constructed.

Improved Solar Observing Optical Network

The facility was constructed in 2012 to house the Improved Solar Observing Optical Network (ISOON) telescope. The telescope was designed and constructed over a period of more than 10 years at the Sacramento Peak Observatory in southern New Mexico by an AFRL detachment. The telescope was a joint project between AFRL and the National Solar Observatory, to act as a replacement for an aging solar optical network run by the AFWA for operational space weather applications. In 2014, the AFWA decided not to proceed with ISOON, and the building and telescope were reverted to AFRL. The telescope has been conducting solar observations since 2012.

The following sections describe examples of tests and construction activities that have historically occurred at ISOON.

Installation of 40-Foot-Tall Antenna. AFRL previously installed a 40-foot-tall antenna within the fenced area of the ISOON Facility. This equipment required 36-inch stakes driven into the ground to anchor the antenna. The antenna receives signals transmitted from an AFRL site on the east coast. Data collected at this site assists with research advancing high frequency communication data rates, range, and reliability.

Installation of Variometer (Magnetometer) Station. AFRL previously installed and currently operates a prototype Variometer (Magnetometer) Station west of ISOON. This station was part of a program to provide the USAF with state-of-the-art monitoring of the Earth's magnetic field. It required the installation of concrete piers to mount the instruments.

APPENDIX B

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION FOR ENVIRONMENTAL PLANNING AND PUBLIC INVOLVEMENT MATERIALS

Appendix B

Interagency and Intergovernmental Coordination for Environmental Planning and Public Involvement Materials

Federal, State, and Local Agencies – Scoping & Public Notice Letter Distribution List

Mr. Matt Wunder, Chief
Ecological & Environmental Planning
New Mexico Department of Game and Fish
PO Box 25112
Santa Fe NM 87504-9210

Ms. Patricia Mattingly, Regional Director
and Regional Environmental Specialist
Bureau of Indian Affairs
Southwest Regional Office
1001 Indian School Road NW
Albuquerque NM 87104-2303

Ms. Sabrina Flores, District Manager
Bureau of Land Management
Albuquerque District Office
100 Sun Avenue NE
Pan American Building, Suite 330
Albuquerque NM 87109-4676

Ms. Becky Collins, Regional Environmental Officer
Office of Environmental Policy and Compliance, Albuquerque Region
US Department of the Interior
1001 Indian School Road NW, Suite 348
Albuquerque NM 87104-2303

Mr. Rob Lowe, Regional Administrator
Federal Aviation Administration
Southwest Region
10101 Hillwood Parkway
Fort Worth TX 76177-1524

Mr. Nickolas Goodman
District Conservationist
Natural Resources Conservation Service
Albuquerque Service Center
100 Sun Avenue NE, Suite 160
Albuquerque NM 87109-4674

Ms. Danielle Galloway, Chief
Environmental Resources Section
US Army Corps of Engineers - Albuquerque District
4101 Jefferson Plaza NE
Albuquerque NM 87109-3435

Dr. Earthea Nance, Regional Administrator
US Environmental Protection Agency
Region 6
1201 Elm Street, Suite 500
Dallas TX 75270-2162

Ms. Cheryl Prewitt
Regional Environmental Coordinator
US Forest Service, Southwestern Region
333 Broadway Boulevard SE
Albuquerque NM 87102-3426

Board of Directors
Mid-Region Council of Governments
809 Copper Avenue NW
Albuquerque NM 87102-3009

Mr. Jeff M. Witte, Director/Secretary
New Mexico Department of Agriculture
PO Box 30005, MSC 3189
Las Cruces NM 88003-8005

Mr. Bruce Baizel, Director
Office of Compliance and Enforcement,
New Mexico Environment Department
PO Box 5469
Santa Fe NM 87502-5469

Ms. Elvira Lopez
Development Manager/Department Director
Bernalillo County Planning Section
111 Union Square SE, Suite 100
Albuquerque NM 87102-3225

Ms. Cindy Chavez
Bernalillo County Manager
Bernalillo County Manager's Office
415 Silver SW, 8th Floor
Albuquerque NM 87102-3225

Mr. Jim Sanderson
Department of Energy
National Nuclear Security Administration
Headquarters General Council (NA-GC-10)
1000 Independence Avenue SW
Washington DC 20585-0001

Ms. Adria Bodour, NEPA Compliance Officer
Department of Energy
National Nuclear Security Administration
Sandia Field Office
PO Box 5400
Albuquerque NM 87187-5400

Ms. Kelly Bowles, NEPA Program Manager
Sandia National Laboratories, New Mexico
PO Box 5800, MS 0915
Albuquerque NM 87185-0100

The Honorable Martin Heinrich
Senator
United States Senate
303 Hart Senate Office Building
Washington DC 20510-0001

The Honorable Ben Ray Luján
Senator
United States Senate
498 Russell Senate Office Building
Washington DC 20510-0001

The Honorable Gabe Vasquez
Representative
United States House of Representatives
1517 Longworth House Office Building
Washington DC 20515-0001

The Honorable Melanie Stansbury
Representative
United States House of Representatives
1421 Longworth House Office Building
Washington DC 20515-0001

The Honorable Teresa Leger Fernandez
Representative
United States House of Representatives
1432 Longworth House Office Building
Washington DC 20515-0001

Ms. Stephanie Garcia Richard
Commissioner of Public Lands
New Mexico State Land Office
310 Old Santa Fe Trail
Santa Fe NM 87501-2708

Ms. Melanie A. Kenderdine, Cabinet Secretary
New Mexico Energy, Minerals and Natural Resources Department
Wendell Chino Building
1220 South St. Francis Drive
Santa Fe NM 87505-0001

Commissioners
Bernalillo County Board of Commissioners
One Civic Plaza NW, 10th Floor
Albuquerque NM 87102-2111

Councilmember
Albuquerque City Councilmembers
PO Box 1293
Albuquerque NM 87103-1293

Ms. Staci Drangmeister, Director of Communications and Marketing
City of Albuquerque: Communications and Marketing Department
PO BOX 1293
Albuquerque NM 87103-1293

Mr. Alan Varela, Director of Planning
City of Albuquerque: Planning Department
Plaza Del Sol Building
600 Second Street NW
Albuquerque NM 87102-2265

Mr. Shawn Sartorius, Field Supervisor
USFWS New Mexico Ecological Services Field Office
2105 Osuna Road NE
Albuquerque NM 87113-1001

Federal, State, and Local Agencies – Example Scoping Letter

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

04 December 2024

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

Mr. Matt Wunder
Chief of Ecological & Environmental Planning
New Mexico Department of Game and Fish
One Wildlife Way
Santa Fe NM 87507-9210

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) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories before being tested outdoors at the High Energy Research and Technology Facility (HERTF), HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR), SOR 1-Mile and 2-Mile sites, and the Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

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 Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, Albuquerque, 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 the date of this letter to ensure your concerns are adequately addressed in the Draft PEA.

Please send your written responses to Ms. Martha Garcia, AFRL Unit Environmental Coordinator, 3550 Aberdeen Avenue SE, Building 464, Kirtland AFB NM 87117. Comments are encouraged to be sent by email to martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.12.04 18:36:54 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Federal, State, and Local Agencies – Scoping Letter Responses

From: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI
To: Hannah Patel; Sarah Thompson; Bare, Michelle
Cc: Price, Dana M CIV USARMY CESPA (USA)
Subject: [External] - FW: Final (DOPAA) for the (PEA) Addressing Air Force Research Laboratory (AFRL) (RDT&E) Activities at Kirtland Air Force Base
Date: Thursday, January 2, 2025 10:11:54 AM
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.

Please see below email from NMDGF. -Martha

From: Salano, Erin, DGF <erin.salano@dgf.nm.gov>
Sent: Tuesday, December 31, 2024 3:12 PM
To: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI <martha.garcia.3@spaceforce.mil>
Cc: DGF-EEP-TG <DGF-EEP-TG@state.nm.us>
Subject: [Non-DoD Source] Final (DOPAA) for the (PEA) Addressing Air Force Research Laboratory (AFRL) (RDT&E) Activities at Kirtland Air Force Base

You don't often get email from erin.salano@dgf.nm.gov. Learn why this is important

Project: EC Structure 8
Project ID: NMERT 4100
Organization: Department of the Air Force

Dear Martha Garcia,

The Department of Game and Fish has received and reviewed your mailed letter dated 12/12/2024, NMERT 4100 in the New Mexico Environmental Review Tool (NMERT). This email contains several recommendations regarding potential impacts on wildlife or wildlife habitats from your project.

The proposed project occurs near an important bat area. This area may contain important bat roosting resources, such as caves or mines, that potentially could be affected by certain project activities. Follow the guidelines below to minimize disturbance to roosting bats.

- Avoid use of pesticides, firearms, open-flame torches, or heavy smoke-producing equipment, especially from April through September.
- If artificial lighting is needed, use only light sources powered by batteries, or cyalume glow/light sticks.
- Keep the site clean by picking up refuse or materials from project lighting or operations whenever they are shut down. If the use of permanent outdoor lights cannot be avoided, design all outdoor lighting in accordance with the New Mexico

Night Sky Protection Act, which requires that outdoor lighting be fitted with shielding that directs light downward, rather than upward or laterally, to prevent sky glow and associated impacts to bats.

- For any surface disturbing activities, the project footprint (including a 350 foot buffer) should avoid potential roost sites such as caves or mines, especially from April through July. Tree clearing activities and prescribed burns should include a minimum 0.5 mile buffer from any such features.
- If caves, mines, bridges, or other man-made structure suitable as potential bat roosts are encountered within the project area, they should not be entered during any time of year, and no roosting or hibernating bats should be contacted or disturbed. Report any dead or injured bats to the Department, who can facilitate contacts with other appropriate personnel.

Open trenches excavated for underground water or oil and gas pipelines, powerlines, or fiber optic communication lines can unintentionally entrap and cause the unnecessary mortality of amphibians, reptiles, and small mammals, and can cause injury to large mammals. Trapped animals can die from exposure, starvation, crushing from pipe-laying, entombment from trenching backfilling, drowning, and predation. This unnecessary wildlife mortality can be avoided by implementing conservation measures including concurrent trenching, pipe-laying, and backfilling operations to minimize the amount of trench left open overnight or longer; construction escape ramps; and employing biological monitors to remove trapped animals. Periods of highest activity for amphibians and reptiles vulnerable to entrapment include summer months and wet weather, and they can be active both day and night. Small mammals subject to entrapment are active year-round and generally most active at night.
Implementing the general trenching conservation measures outlined in the Department's *Trenching Project Guidelines* will help minimize unnecessary mortality of wildlife. Best management practices should include, at minimum, the following mitigation measures.

- Whenever possible, locate trenching activities within previously disturbed areas, such as existing road or pipeline rights-of-way. To the extent possible, avoid trenching in undisturbed habitat.
- Trench during the cooler months (October – March).
- Utilize concurrent trenching, pipe- or cable-laying, and backfilling. Keep trenching, pipe- or cable-laying, and backfilling crews as close together as possible to minimize the amount of open trench at any given time. When trenching activities are temporarily halted (e.g., overnight, weekends, holidays, weather shutdowns), protect wildlife from accessing any open trench between digging and backfilling operations by using one or more of the methods described below.

- Avoid leaving trenches open overnight. When trenches cannot be backfilled immediately, escape ramps should be constructed at least every 90 meters and preferably 30 meters. Escape ramps can be constructed parallel or perpendicular to the existing trench. The escape ramp slope should be less than 45 degrees (1:1). If pipe or cable has been installed but backfilling has not occurred, escape ramps may need to be constructed on both sides of the trench, since, unless the pipe is elevated enough to allow animals to move underneath it, the pipe or cable may block access of amphibians, reptiles, and small mammals to the ramps if only constructed on one side.
- Trenches that have been left open overnight should be inspected the following day by a qualified biological monitor and trapped animals removed as soon as possible, especially where state- or federally listed threatened or endangered amphibians, reptiles, or small mammals occur. Untrained personnel should not attempt to remove trapped wildlife because of the potential to injure animals and the possibility of injury from venomous snakes. Required tools for removal will include snake tongs for removing snakes and a dip net for capturing and removing amphibians and small mammals. Many animals trapped in a trench will burrow under loose soil. To the extent possible, the biological monitor should disturb loose soil in the trench to uncover and remove trapped animals. Animals should be relocated at least 50 meters away from the open trench in undisturbed habitat.
- When the pipe has been laid in the trench, end caps should be placed on the open end(s) of the pipe to preclude animals from entering. Pipes staged outside the trench should be capped until placed in the trench or checked for wildlife before being placed into the trench.
- Most wildlife can be protected by constructing a silt fence completely around the open trench. A silt fence should be supported from sagging by t-posts, rebar, or stakes and buried at the base to preclude animals from moving below the fence. If construction of a silt fence is a required best management practice for erosion control, then, to preclude the need for a biological monitor, escape ramps, and concurrent backfilling, the guidelines for silt fence installation and maintenance in the *Trenching Project Guidelines* should be followed.

Because of the potential for communications towers to cause significant impacts on night-migrating migratory bird populations, we submit the following recommendations:

- We recommend co-locating communications equipment, antennas, etc. on existing towers or buildings (e.g., water towers) or within existing groups of towers or "antenna farms", if feasible.
- If possible, towers should not be located in or near wetlands, riparian areas, playas, lakes, or other known bird concentration areas (e.g., state or federal

waterfowl refuges, staging areas, rookeries); in known migratory or daily movement flyways; or in the habitat of threatened or endangered bird species that could be prone to tower-caused mortality (i.e., night-migrating species). If a location near or within one of these areas is deemed necessary, the Department requests the opportunity for additional consultation.

- Local meteorological conditions should be reviewed, and areas with an especially high incidence of fog, mist, and low cloud ceilings should be avoided, if possible.
- If significant numbers of breeding, feeding, or roosting birds are known to habitually use a proposed tower construction site, relocation of the tower to an alternate site is recommended. If this is not an option, seasonal restrictions on construction may be advisable to avoid disturbance during nesting (i.e., avoid construction during spring and summer).
- If possible, new towers should be designed structurally and electrically to accommodate the applicant's antenna(s), and comparable antennas for at least two additional users, to reduce the number of future towers, unless this design would require the building of a larger tower with lights or guy wires.
- Any security lighting for on-ground facilities and equipment should be down-shielded to keep light within the boundaries of the site and minimize its potential attraction for birds.
- Tower construction, including road access and fencing, should be implemented to minimize habitat loss and fragmentation and to reduce above-ground obstacles that might impact birds in flight. A larger tower footprint, however, is preferable to the construction of a taller, guy-supported tower.
- Towers that involve any trenching activities, especially the creation of any trenches that may be left open overnight, should follow the Department's *Trenching Guidelines*.
- If constructing multiple towers, project proponents should consider the cumulative impacts of all of those towers on migratory birds, as well as the impacts of each tower.
- Towers no longer in use or determined to be obsolete should be removed within 12 months of the cessation of use.

See *Communication Tower Project Guidelines NMDGF* and *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* from the USFWS for more information.

-

Since the proposed highway project includes bridge or road construction activities, the Department recommends implementation of its *Bridge and Culvert Construction Guidelines for Stream, Riparian, and Wetland Habitats* for any rivers, streams, washes, springs, seeps, or riparian areas that fall within the impact footprint of

this project. These guidelines should assist in minimizing impacts on the river or wetland and should be incorporated into the standard best management practices for these types of construction activities. The Department also recommends that pre-construction bat surveys be conducted during summer months to determine if bats occur. If bats are determined to occur at bridge sites, work should be scheduled to avoid impacting bats that may roost there (i.e., conduct work in winter months).

In the event of shrub/tree removal, please note that all migratory birds are protected against direct take under the federal Migratory Bird Treaty Act (16 U.S.C. Sections 703-712), and hawks, falcons, vultures, owls, songbirds, and other insect-eating birds are protected under New Mexico State Statutes (17-2-13 and 17-2-14 NMSA) unless permitted by the applicable regulatory agency. To minimize the likelihood of adverse impacts to migratory birds, nests, eggs, or nestlings, the Department recommends that ground disturbance and vegetation removal activities be conducted outside of the primary migratory bird breeding season of April 15-September 1. Breeding season may begin earlier for raptors or when working in low-elevation habitats such as deserts. Suppose ground disturbing and clearing activities must be conducted during the breeding season. In that case, the area should be surveyed for active nest sites (with birds or eggs present in the nesting territory) and avoid disturbing active nests until young have fledged. For active nests, establish adequate buffer zones to minimize disturbance to nesting birds. Buffer distances should be at least 100 feet from songbird and raven nests; 0.25 miles from most raptor nests; and 0.5 miles for ferruginous hawk (*Buteo regalis*), golden eagle (*Aquila chrysaetos canadensis*), peregrine falcon (*Falco peregrinus*), and prairie falcon (*Falco mexicanus*) nests. Active nest sites in trees or shrubs that must be removed should be mitigated by qualified biologists or wildlife rehabilitators. Department biologists are available to consult on nest site mitigation and can facilitate contact with qualified personnel.
The list of New Mexico SGCN (see link, page 14, table 5) and the federal list of Birds of Conservation Concern should be reviewed to fully evaluate the potential effects on migratory birds from your proposed project. Federal agencies are also required under Executive Order 13186 to implement standards and practices that lessen the amount of unintentional take attributable to agency actions. These conservation measures are strongly recommended to ensure the persistence of migratory bird species whose populations are small and/or declining within New Mexico.

Prairie dog colonies may occur within the vicinity of your project area. Both black-tailed prairie dogs (Cynomys ludovicianus) and Gunnison's prairie dogs (Cynomys gunnisoni) are designated as New Mexico SGCN, and their colonies provide important habitat for other grassland wildlife. Wherever possible, occupied prairie dog colonies

should be left undisturbed, and all project activities should be directed off the colony. Any burrows that are located on the project site should be surveyed by a qualified biologist to determine whether burrows are active or inactive and whether burrowing owls may be utilizing the site. Colonies within the range of the black-tailed prairie dog can be surveyed by a qualified biologist diurnally, year-round using binoculars. Colonies within the range of the Gunnison's prairie dog can be surveyed by a qualified biologist diurnally, using binoculars during the warmer months from April through October and by searching for fairly fresh scat and lack of cobwebs or debris at the mouths of burrows during the cold months (November through March). If ground-disturbing activities cannot be relocated off the prairie dog colony, or if project activities involve control of prairie dogs, the Department recommends live-trapping and relocation of prairie dogs. The Department can provide recommendations regarding suitability of potential translocation areas and procedures.

Burrowing owl (Athene cunicularia) may occur within your project area. Burrowing owls are protected from take by the Migratory Bird Treaty Act and under New Mexico state statute. Before any ground disturbing activities occur, the Department recommends that a preliminary burrowing owl survey be conducted by a qualified biologist using the Department's Burrowing Owl Survey Protocol. Should burrowing owls be documented in the project area, please contact the Department or USFWS for further recommendations regarding relocation or avoidance of impacts.

The proposed project occurs within or near a riparian area. Because riparian areas are important wildlife habitats, the project footprint should avoid removing any riparian vegetation or creating ground disturbance either directly within or affecting the riparian area, unless the project is intended to restore riparian habitat through non-native plant removal and replanting with native species. If your project involves removal of non-native riparian trees or planting of native riparian vegetation, please refer to the Department's habitat handbook guideline for Restoration and Management of Native and Non-native Trees in Southwestern Riparian Ecosystems. The New Mexico Riparian Habitat Map (NMRipMap) may also provide useful information on local riparian habitat composition and structure. Your proposed project occurs within an area where springs or other important natural water features occur. This may result in the presence of a high use area for wildlife relative to the surrounding landscape. To ensure continued function of these important wildlife habitats, your project should consider measures to avoid the following.

- Altering surface or groundwater flow or hydrology, Disturbance to soil that modifies geomorphic properties or facilitates invasion of non-native vegetation.
- Affecting local surface or groundwater quality.

- Creating disturbance to wildlife utilizing these water features.
- Disturbance to wildlife can be reduced through practices including clustering infrastructure and activity wherever possible, avoiding large visual obstructions around water features, and limiting nighttime project operations or activities.

Department biologists are available for site-specific consultation regarding measures to assist with management and conservation of these habitat resources.

Thank you for collaborating with the agency to protect the state's wildlife, please reach out with any further questions/comments.

Best,

Erin Salano

Terrestrial Habitat Specialist

New Mexico Department of Game and Fish
Wildlife Management Division
(505)-321-5485
erin.salano@dgf.nm.gov

From: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI
To: Hannah Patel
Cc: BARE, MICHELLE; Sarah Thompson; Price, Dana M CIV USARMY CESPA (USA)
Subject: [External] - FW: Programmatic Environmental Assessment
Date: Thursday, January 2, 2025 10:06:09 AM
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.

Please see below.

From: Rogers, Paul J. <progers@cabq.gov>
Sent: Monday, December 30, 2024 1:49 PM
To: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI <martha.garcia.3@spaceforce.mil>
Cc: Smith, Terrance <terrancesmith@cabq.gov>; Varela, Alan M. <avarela@cabq.gov>
Subject: [Non-DoD Source] RE: Programmatic Environmental Assessment

You don't often get email from progers@cabq.gov. Learn why this is important

Good afternoon,

I received a copy of Colonel Power's letter from our planning director, Alan Varela. I understand the memo's purpose is to notify us of the assessment and solicit comments. Our regulatory responsibilities are dictated by federal standards and incur periodic updates.

We have been directed to modify our standards in relation to overburdened areas. As directed In New Mexico Administrative Rule 20.11.72, new and modified stationary sources that are subject to permitting under 20.11.41 NMAC, 20.11.60 NMAC or 20.11.61 NMAC, may be amended.

As stated in NMAC 20.11.72.8 (B), we will publish an initial map on 01/01/2025, with a final map due on 07/01/2025.

Please let me know if you have any questions.

Paul

PAUL J. ROGERS
director environmental health department
o 505.768.2606
m 505.401.7800
e progers@cabq.gov
cabq.gov

CITY OF ALBUQUERQUE

Environmental Health Department
One Civic Plaza NW
3rd floor, Room 3300
Albuquerque, NM 87102
Tel: (505) 768-1972

January 13, 2025

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

Subject: Response to Programmatic Assessment Preparation

Dear Colonel Powers,

Thank you for the opportunity to provide comments on the proposed consolidation of current planned research conducted by the Air Force Research Laboratory's Directed Energy Directorate and Space Vehicles Directorate into a single programmatic assessment.

As part of the Albuquerque-Bernalillo County Air Quality Program, our authority includes oversight of air quality standards for stationary sources within the framework of the Clean Air Act. Along with 20.11.41 NMAC (Construction Permits), 20.11.40 NMAC (Source Registrations), 20.11.42 NMAC (Operating Permits), and 20.11.61 NMAC (National Emission Standards for Hazardous Air Pollutants). Disclaimer: This list may not encompass all applicable sections of the New Mexico Administrative Code relevant to air quality management. Notably, your base operates under a Title V permit, which we oversee, as well as permits for 20.11.20 NMAC (Fugitive Dust Control), 20.11.21 NMAC (Open Burning), and any 61.45 CFR (Asbestos Demolition and Renovation).

If your assessment anticipates any new actions or activities outside the scope of your current permits, we kindly request that you engage with the Air Quality Program prior to initiating those activities. This will ensure compliance with applicable regulations and maintain alignment with our shared goals of preserving air quality.

We also want to emphasize the importance of engagement with tribal representatives in the Albuquerque area and the communities surrounding KAFB. Additionally, with the Health Environmental and Equity Impact (HEEI) rule we trust that KAFB will take the necessary steps to ensure adherence to the standards outlined in New Mexico Administrative Code 20.11.72 NMAC.

Once again, we appreciate your diligence in notifying us of your assessment. Should you have any questions or require further assistance, please feel free to contact our office directly at 505-768-1972 or via email at aqd@cabq.gov.

We look forward to your continued collaboration.

Sincerely,

Paul Rogers
Director
Environmental Health Department

PO Box 1293
Albuquerque
NM 87103
www.cabq.gov

Albuquerque - Making History 1706-2006

CITY OF ALBUQUERQUE
PLANNING DEPARTMENT
600 2nd Street NW Room 190
Albuquerque, NM 87102
Tel: (505) 924-3320

January 12, 2025

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

Re: Environmental Assessment for Air Force Research Laboratory on Kirtland AFB

Dear Colonel Power,

Thank you for the opportunity to comment on the proposed action consolidating current and proposed research of the Air Force Research Laboratory Directed Energy Directorate and Space Vehicle Directorate into a single Environmental Assessment. Based on review of the Description of Proposed Actions and Alternatives (DPAA), we have concluded that most activities included in the proposal have been evaluated under previous Environmental Assessments.

The City of Albuquerque Planning Department reviews applications for projects constructed within the Albuquerque city limits for compliance with City regulations, including land use, subdivision, and development standards. The activities identified in the DPAA that may involve future construction, such as development of 70-foot antennae, would be constructed outside of the Albuquerque city limits. As such, the City's zoning and development procedures would not apply.

We acknowledge that the subject matter of the DPAA pertaining specifically to activities of the Air Force Research Laboratory is outside our areas of technical expertise.

The City's policy guidance in the Comprehensive Plan is relevant to coordinating planning efforts across jurisdictions, and we appreciate the opportunity to review the DPAA to remain aware of activities on KAFB that may impact surrounding neighborhoods and businesses, as well as future City planning efforts and infrastructure projects.

We want to underscore the importance of meaningful engagement with tribal representatives surrounding Albuquerque and vulnerable communities near KAFB. We understand that federal environmental planning rules include rigorous outreach requirements, including to federally recognized tribal governments. This is consistent with Goal 11.1 of our Comprehensive Plan, which emphasizes the importance of preserving and protecting traditional, rural & agricultural heritage, and Goal 13.5.3, which encourages coordination to ensure that public infrastructure systems do not compromise the health, safety, and welfare of the community.

Sincerely,

Alan Varela (Jan 4, 2025 08:35 MST)

Alan M. Varela, Director
Planning Department of the City of Albuquerque

Kirtland EA Planning Comments-letterhead_fin

Final Audit Report 2025-01-04

Created:	2025-01-04
By:	Lucinda Montoya (lucindamontoya@cabq.gov)
Status:	Signed
Transaction ID:	CBJCHBCAABAAdEm8IZZ5YQWP4trFBFqIb2USiNMd1Wcx

"Kirtland EA Planning Comments-letterhead_fin" History

Document created by Lucinda Montoya (lucindamontoya@cabq.gov)
2025-01-04 - 2:00:21 PM GMT

Document emailed to Alan Varela (avarela@cabq.gov) for signature
2025-01-04 - 2:00:25 PM GMT

Email viewed by Alan Varela (avarela@cabq.gov)
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Document e-signed by Alan Varela (avarela@cabq.gov)
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Federal, State, and Local Agencies – Example Public Notice Letter

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

01 May 2025

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

Mr. Matt Wunder
Chief of Ecological & Environmental Planning
New Mexico Department of Game and Fish
One Wildlife Way
Santa Fe NM 87507-9210

Dear Mr. Wunder

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended; and United States Air Force (USAF) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, AFRL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF), HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR), SOR 1-Mile and 2-Mile sites, and the Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 mission demands. Because of ever-changing threat scenarios, the RDT&E activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and feedback on the Draft PEA. If after review of the Draft PEA and proposed Finding of No Significant Impact, 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 process. A copy of the *Draft Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at 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 provide your written questions or comments on the Draft PEA at your earliest convenience, but no later than 30 days from the date of this correspondence. Please send your written responses to Ms. Martha Garcia, AFRL Unit Environmental Coordinator, 3550 Aberdeen Avenue SE, Building 464, Kirtland AFB NM 87117. Comments are encouraged to be sent by email to martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2025.05.01 17:55:44 -06'00'

MICHAEL J. POWER, Colonel, USAF
Commander

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

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

Joint Land Use Study Memorandum of Understanding – Example Scoping Letter

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

04 December 2024

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

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

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, Kirtland AFB is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

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The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

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. A copy of the *Final Description of the Proposed Action and Alternatives for the Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, Albuquerque, 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 the date of this letter to ensure your concerns are adequately addressed in the Draft PEA.

Please send your written responses to Ms. Martha Garcia, AFRL Unit Environmental Coordinator, 3550 Aberdeen Avenue SE, Building 464, Kirtland AFB NM 87117. Comments are encouraged to be sent by email to martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.12.04 18:37:43 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Joint Land Use Study Memorandum of Understanding – Example Public Notice Letter

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

01 May 2025

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

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

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, as amended; and United States Air Force (USAF) NEPA regulations, Kirtland AFB is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, AFRL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

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AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 mission demands. Because of ever-changing threat scenarios, the RDT&E activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

In accordance with Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, as amended by EO 12416, *Intergovernmental Review of Federal Programs*, we request your participation and feedback on the Draft PEA. If after review of the Draft PEA and proposed Finding of No Significant Impact, 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 process. A copy of the *Draft Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico* is available at http://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 no later than 30 days from the date of this letter to ensure your concerns are adequately addressed in the Draft PEA. Please send your written responses to Ms. Martha Garcia, AFRL Unit Environmental Coordinator, 3550 Aberdeen Avenue SE, Building 464, Kirtland AFB NM 87117. Comments are encouraged to be sent by email to martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2025.05.01 17:58:58 -06'00'

MICHAEL J. POWER, Colonel, USAF
Commander

State Historical Preservation Office – Scoping & Public Notice Letter Distribution List

Ms. Michelle Ensey, State Historic Preservation Officer
New Mexico Historic Preservation Division
Department of Cultural Affairs
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe NM 87501-2834

State Historical Preservation Office – Example Scoping Letter

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

12 December 2024

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

Ms. Michelle Ensey
State Historic Preservation Office and Director
New Mexico Historic Preservation Division
Department of Cultural Affairs
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe NM 87501-2834

Dear Ms. Ensey

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

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and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

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The USAF has determined that the Area of Potential Effects (APE) for this Undertaking consists of the various test areas encompassing approximately 530.95 acres of ground-based activities and 42,485.26 acres of air-based activities within airspace over Kirtland AFB (see attachment). Pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 (36 CFR Part 800), as amended, the USAF would like to initiate 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 Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, Albuquerque, New Mexico* is available at https://www.kirtland.af.mil/Home/Environment/. A hardcopy can also be provided upon request. 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, AFRL Unit Environmental Coordinator, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB NM 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: 2024.12.04 18:38:49 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

State Historical Preservation Office – Scoping Letter Response

New Mexico Historic Preservation Division
407 Galisteo Street, Suite 236
Santa Fe, NM 87501
Telephone: (505) 827.6320
Email: nm.shpo@dca.nm.gov

December 30, 2024

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

Colonel Power:

The New Mexico State historic Preservation Office has completed its review of your Section 106 submission, which is dated 12 December 2024, on the Area of Potential Effects (APE) for high-energy testing.

We concur with Kirtland Air Force Base on the APE as delineated on pages 3-18 of your letter. We look forward to receiving Section 106 compliance submissions from Kirtland Air Force Base regarding any potential ground disturbance related to this project.

In addition, please be sure to consult with Isleta Pueblo on the APE because of its proximity to their lands.

Sincerely,

SMoffson

Steven Moffson
State and National Register Coordinator

Log 124321

State Historical Preservation Office – Example Public Notice Letter

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

01 May 2025

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

Ms. Michelle Ensey
State Historic Preservation Office and State Archaeologist
New Mexico Historic Preservation Division, Department of Cultural Affairs
Bataan Memorial Building
407 Galisteo Street, Suite 236
Santa Fe NM 87501-2834

Dear Ms. Ensey

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended; and United States Air Force (USAF) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, AFRL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF), HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR), SOR 1-Mile and 2-Mile sites, and the Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Undertaking is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Undertaking is to allow users the ability to test concepts to improve 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 mission demands. Because of ever-changing threat scenarios, the RDT&E activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

We initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) (36 CFR Part 800) with a letter dated 9 December 2024, in which we defined the Area of Potential Effect (APE). In accordance with Section 110 of the NHPA the APE has been surveyed and historic properties were identified, some of which are eligible for listing on the National Register of Historic Places. Prior to and during implementation of the projects, the areas would be further evaluated for cultural resource concerns and, if appropriate, the USAF will consult with your office and Native American tribes. Therefore, the USAF recommends the Undertaking would likely have no adverse effect on historic properties. Documentation supporting these findings is contained in the Draft PEA. A copy of the *Draft Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico* is available at http://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.

Kirtland AFB requests your concurrence with the determination or your comments. We welcome your comments on the Draft PEA no later than 30 days from the date of this correspondence. Please address your correspondence to Ms. Martha Garcia, Unit Environmental Coordinator 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: 2025.05.01 17:56:31 -06'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Native American Tribes – Scoping Letter Distribution List

Governor Randall Vicente
Pueblo of Acoma
PO Box 309
Acoma Pueblo NM 87034-0309

Governor Joel A. Aquero
Pueblo of Cochiti
PO Box 70
Cochiti Pueblo NM 87072-0070

Chairman Timothy L. Nuvangyaoma
The Hopi Tribe
PO Box 123
Kykotsmovi AZ 86039-0123

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

Governor Peter Madalena
Pueblo of Jemez
PO Box 100
Jemez Pueblo NM 87024-0100

President Adrian Notsinneh
Jicarilla Apache Nation
PO Box 507
Dulce NM 87528-0507

Governor Wilfred Herrera, Jr.
Pueblo of Laguna
PO Box 194
Laguna NM 87026-0194

President Thora Walsh Padilla
Mescalero Apache Tribe
PO Box 227
Mescalero NM 88340-0227

Governor Nathanial S. Porter
Pueblo of Nambe
15A NP102 West
Santa Fe NM 87506 -2731

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

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

Governor Craig Quanchello
Pueblo of Picuris
PO Box 127
Peñasco NM 87553-0127

Governor Jenelle Roybal
Pueblo of Pojoaque
78 Cities of Gold Road
Santa Fe NM 87506-0918

Governor Felix Chaves
Pueblo of Sandia
481 Sandia Loop
Bernalillo NM 87004-7076

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

Governor Christopher A. Moquino
Pueblo of San Ildefonso
02 Tunyo Po
Santa Fe NM 87506-7258

Governor Myron Armijo
Pueblo of Santa Ana
2 Dove Road
Santa Ana Pueblo NM 87004-5906

Governor J. Michael Chavarria
Pueblo of Santa Clara
PO Box 580
Española NM 87532 -0580

Governor Frank P. Nieto
Pueblo of Santo Domingo
PO Box 99
Santo Domingo Pueblo NM 87052-0099

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

Governor Milton Herrera
Pueblo of Tesuque
20 TP 828
Santa Fe NM 87506-5512

Chairman Kasey Velasquez
White Mountain Apache Tribe
PO Box 700
Whiteriver AZ 85941-0700

Governor E. Michael Silvas
Ysleta del Sur Pueblo
117 S Old Pueblo Road PO Box 17579
El Paso TX 79917-7579

Governor Ben Shije
Pueblo of Zia
135 Capitol Square Drive
Zia Pueblo NM 87053-6013

Governor Arden Kucate
Pueblo of Zuni
PO Box 339
Zuni NM 87327-0339

Chairman Manuel Heart
Ute Mountain Ute Tribe
PO Box JJ
Towaoc CO 81334-0188

Chairwoman Jennifer Heminokeky
Fort Sill Apache Tribe of Oklahoma
Rt 2, Box 121
Apache OK 73006-9668

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

Chairman Lawrence SpottedBird
Kiowa Tribe of Oklahoma
PO Box 369
Carnegie OK 73015-0369

Chairman Forrest Tahdooahnippah
Comanche Nation of Oklahoma
PO Box 908
Lawton OK 73502-0908

President Walter Echo-Hawk
Pawnee Nation of Oklahoma
PO Box 470
Pawnee OK 74058-0470

Chairman Terry Rambler
San Carlos Apache Tribe
PO Box 0
San Carlos AZ 85550-1379

Chairman Melvin J. Baker
Southern Ute Indian Tribe
PO Box 737
Ignacio CO 81137-0737

Dr. Deejay Chino, Executive Director
All Pueblo Council of Governors
2401 12th Street NW
Albuquerque NM 87103-2302

Mr. Joshua Madalena, Executive Director
Five Sandoval Indian Pueblos
4321-B Fulcrum Way NE
Rio Rancho NM 87144-8410

Mr. Gilbert Vigil, Executive Director
Eight Northern Indian Pueblos Council
327 Eagle Drive
Ohkay Owingeh NM 87566-3600

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

Lt. Governor Natividad Herrera, Tribal
Historic Preservation Officer
Pueblo of Nambe
15A NP 102 West
Santa Fe NM 87506-2731

Dr. Henry Walt, Tribal Historic Preservation Officer
Pueblo of Isleta
PO Box 1270
Isleta NM 87022-1270

Native American Tribes – Example Scoping Letter

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

04 December 2024

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

Governor Randall Vicente
Pueblo of Acoma
PO Box 309
Acoma Pueblo NM 87034-0309

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) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action (herein "Undertaking" pursuant to the National Historic Preservation Act [NHPA]) consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

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The USAF has determined that the Area of Potential Effects (APE) for this Undertaking consists of the various test areas encompassing approximately 530.95 acres of ground-based activities and 42,485.26 acres of air-based activities within airspace over Kirtland AFB (see attachment). USAF is currently conducting research and investigations to identify historic properties within the APE to determine the potential effects, if any, of the Undertaking.

Pursuant to Section 106 of the National Historic Preservation Act (36 Code of Federal Regulations Part 800) and Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, the USAF would like to initiate government-to-government consultation concerning the Undertaking to allow you and your designee 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 Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, Albuquerque, New Mexico* is available at https://www.kirtland.af.mil/Home/Environment/. A hardcopy can also be provided upon request. 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 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. Thank you in advance for your assistance in this effort.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.12.04 18:40:31 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

Native American Tribes – Scoping Letter Responses

COMANCHE NATION

Department of the Air Force
377th Air base Wing (AFGSC)
Attn: Mr. David Reynolds
2000 Wyoming Boulevard SE. Building 20604
New Mexico 87117

January 29, 2025

Re: Kirkland Air Force Base is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico

Dear Mr. Reynolds:

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

Please contact this office at (580) 492-1153) if you require additional information on this project.

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

Regards

Comanche Nation Historic Preservation Office
Theodore E. Villicana , Technician
#6 SW "D" Avenue, Suite C
Lawton, OK. 73502

COMANCHE NATION P.O. BOX 908 / LAWTON, OK 73502
PHONE: 580-492-4988 TOLL FREE:1-877-492-4988

Received from Tribal Admin 12/20/24 MW
E-mailed 12/20/24 MW (initials & date)
Scanned 12/20/24 MW (initials & date)

SAN CARLOS APACHE TRIBE
Historic Preservation & Archaeology Department
P.O. Box 0
San Carlos Arizona 85550
Tel. (928) 475-5797, apachevern@yahoo.com

Tribal Consultation Response Letter

Date: December 20, 2024
Contact Name: Michael J. Power (505) 846-7377/david.reynolds.37@us.af.mil
Company: Department of the Air Force – Kirkland Air Force Base
Address: 377th Air Base Wing 200 Wyoming Blvd. SE Building 20604 Kirkland Air Force Base, NM, 87117
Project Name/#: Preparing a Programmatic Environmental Assessment associated with the Air Force Research Laboratory on Kirtland AFB

Dear Sir or Madam:

Under Section 106 and 110 of the National Historic Preservation Act, we are replying to the above referenced project. Please see the appropriate marked circle, including the signatures of Vernelda Grant, Tribal Historic Preservation Officer (THPO), and the concurrence of the Chairman of the San Carlos Apache Tribe:

- O **NO INTEREST/NO FURTHER CONSULTATION/NO FUTURE UPDATES**
  We defer to the Tribe located nearest to the project area.
- X **CONCURRENCE WITH REPORT FINDINGS & THANK YOU**
- O **REQUEST ADDITIONAL INFORMATION**
  I require additional information in order to provide a finding of effect for this proposed undertaking, i.e. Project description ___ Map ___ Photos ___ Other _____
- O **NO EFFECT**
  I have determined that there are no properties of religious and cultural significance to the San Carlos Apache Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
- X **NO ADVERSE EFFECT**
  Properties of cultural and religious significance within the area of effect have been identified that are eligible for listing in the National Register for which there would be no adverse effect as a result of the proposed project.
- O **ADVERSE EFFECT**
  I have identified properties of cultural and religious significance within the area of potential effect that are eligible for listing in the National Register. I believe the proposed project would cause an adverse effect on these properties. Please contact the THPO for further discussion.

We were taught traditionally not to disturb the natural world in a significant way, and that to do so may cause harm to oneself or one's family. Apache resources can be best protected by managing the land to be as natural as it was in pre-1870s settlement times. Please contact the THPO, if there is a change in any portion of the project, especially if Apache cultural resources are found at any phase of planning and construction. Thank you for contacting the San Carlos Apache Tribe, your time and effort is greatly appreciated.

DIRECTOR/THPO: VJGrant 01/06/25
Vernelda J. Grant, Tribal Historic Preservation Officer — Date

CONCURRENCE: 2/24/25
Terry Rambler, Tribal Chairman — Date

From: GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI
To: Hannah Patel; BARE, MICHELLE; Sarah Thompson
Cc: Price, Dana M CIV USARMY CESPA (USA); Long, Kristen M CIV USARMY CESPA (USA)
Subject: [External] - FW: Programmatic Environmental Assessment
Date: Wednesday, April 16, 2025 9:49:07 AM
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.

Correspondence from the base CR PM to San Felipe Pueblo.

From: REYNOLDS, DAVID H CIV USAF AFGSC 377 MSG/CEIEC <david.reynolds.37@us.af.mil>
Sent: Tuesday, April 15, 2025 4:29 PM
To: 'Leon Ortiz' <lortiz@sfpueblo.com>; Pinu'u Stout <pstout@sfpueblo.com>; Ricardo Ortiz <ROrtiz@sfpueblo.com>
Cc: SISNEROS, BRIANNE L CIV USAF AFGSC 377 MSG/CEIEC <brianne.sisneros@us.af.mil>; GARCIA, MARTHA E CIV USSF AFMC AFRL/RVOI <martha.garcia.3@spaceforce.mil>
Subject: RE: Programmatic Environmental Assessment

Good afternoon,

Thank you for participating in AFRL's Environmental Assessment (EA) review and consultation, we look forward to working with the Pueblo.

Please let me know if you would like to meet in person or via phone/TEAMS. We are available anytime, if you would like to schedule something before the draft EA is published let me know. For meetings I can set up something with environmental staff/project proponents or with leadership. Typically, other Pueblos have engaged at the staff level before setting up meetings with leadership, either way works fine.

Contact me when you are ready to discuss scheduling.

Respectfully,

David Reynolds, 377 MSG/CEIEC
Cultural and Natural Resources Program Manager
Cell (505) 301-7181
Comm (505) 846-0226
DSN 246-0226

From: Leon Ortiz <lortiz@sfpueblo.com>

Sent: Friday, April 11, 2025 10:40 AM
To: REYNOLDS, DAVID H CIV USAF AFGSC 377 MSG/CEIEC <david.reynolds.37@us.af.mil>
Cc: Pinu'u Stout <pstout@sfpueblo.com>; Ricardo Ortiz <ROrtiz@sfpueblo.com>
Subject: [Non-DoD Source] Programmatic Environmental Assessment

> You don't often get email from lortiz@sfpueblo.com. Learn why this is important

Good Morning,

The Pueblo of San Felipe has received your letter dated December 12th, 2024, regarding Programmatic Environmental Assessment (PEA)
to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research,
development, test and evaluation (RDT&E) Activities on Kirtland Air Force Base (AFB) in Albuquerque, New Mexico. We are interested
to consult and to be involved in the planning process.

Thank you for reaching out to the Pueblo of San Felipe.
We require additional information and communication on this project.

Please contact Pinu'u Stout, Natural Resources Director and Ricardo Ortiz, Tribal Historic Preservation Officer, both cc'd here.

Thank you

Leon Ortiz
THPO Monitor
127 Hagen Road
San Felipe Pueblo, NM 87001

Native American Tribes – Public Notice Letter Distribution List

Governor Charles Riley
Pueblo of Acoma
PO Box 309
Acoma Pueblo NM 87034-0309

Governor Joseph B. Herrera
Pueblo of Cochiti
PO Box 70
Cochiti Pueblo NM 87072-0070

Chairman Timothy L. Nuvangyaoma
The Hopi Tribe
PO Box 123
Kykotsmovi AZ 86039-0123

Governor Eugene Jiron
Pueblo of Isleta
PO Box 1270
Isleta NM 87022-1270

Governor George Shendo, Jr.
Pueblo of Jemez
PO Box 100
Jemez Pueblo NM 87024-0100

President Adrian Notsinneh
Jicarilla Apache Nation
PO Box 507
Dulce NM 87528-0507

Governor Harry Antonio, Jr.
Pueblo of Laguna
PO Box 194
Laguna NM 87026-0194

President Thora Walsh Padilla
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PO Box 7440
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PO Box 1099
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Governor Wayne Yazza
Pueblo of Picuris
PO Box 127
Peñasco NM 87553-0127

Governor Jenelle Roybal
Pueblo of Pojoaque
78 Cities of Gold Road
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Governor Felix L. Chaves
Pueblo of Sandia
481 Sandia Loop
Bernalillo NM 87004-7076

Governor Anthony Ortiz
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PO Box 4339
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Governor Christopher Moquino
Pueblo of San Ildefonso
02 Tunyo Po
Santa Fe NM 87506-7258

Governor Myron Armijo
Pueblo of Santa Ana
2 Dove Road
Santa Ana Pueblo NM 87004-5906

Governor James Naranjo
Pueblo of Santa Clara
PO Box 580
Española NM 87532 -0580

Governor Thomas Moquino, Jr.
Pueblo of Santo Domingo
PO Box 99
Santo Domingo Pueblo NM 87052-0099

Governor Edwin Concha
Pueblo of Taos
PO Box 1846
Taos NM 87571-1846

Governor Earl Samuel
Pueblo of Tesuque
20 TP 828
Santa Fe NM 87506-5512

Chairman Kasey Velasquez
White Mountain Apache Tribe
PO Box 700
Whiteriver AZ 85941-0700

Governor E. Michael Silvas
Ysleta del Sur Pueblo
117 S Old Pueblo Road PO Box 17579
El Paso TX 79917-7579

Governor Lambert Pino
Pueblo of Zia
135 Capitol Square Drive
Zia Pueblo NM 87053-6013

Governor Arden Kucate
Pueblo of Zuni
PO Box 339
Zuni NM 87327-0339

Chairman Manuel Heart
Ute Mountain Ute Tribe
PO Box JJ
Towaoc CO 81334-0188

Chairwoman Jennifer M. Heminokeky, VC
Fort Sill Apache Tribe of Oklahoma
Rt 2, Box 121
Apache OK 73006-9668

Chairman Durell Cooper
Apache Tribe of Oklahoma
PO Box 1330
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Carnegie OK 73015-0369

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Pawnee Nation of Oklahoma
PO Box 470
Pawnee OK 74058-0470

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San Carlos Apache Tribe
PO Box 0
San Carlos AZ 85550-1379

Chairman Melvin J. Baker
Southern Ute Indian Tribe
PO Box 737
Ignacio CO 81137-0737

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Honorable Seth Damon
Speaker of the Navajo Nation
25th Navajo Nation Council
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Lt. Governor Natividad Herrera, Tribal
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15A NP 102 West
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Dr. Henry Walt, Tribal Historic Preservation Officer
Pueblo of Isleta
PO Box 1270
Isleta NM 87022-1270

Native American Tribes – Example Public Notice Letter

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

12 May 2025

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

Governor Eugene Jiron
Pueblo of Isleta
PO Box 1270
Isleta NM 87022-1270

Dear Governor Jiron

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The purpose of this Undertaking is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Undertaking is to allow users the ability to test concepts to improve 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 mission demands. Because of ever-changing threat scenarios, the RDT&E activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

We initiated consultation under Section 106 of the National Historic Preservation Act (NHPA) (36 CFR Part 800) with a letter dated 9 December 2024, in which we defined the Area of Potential Effect (APE). In accordance with Section 110 of the NHPA the APE has been surveyed and historic properties were identified, some of which are eligible for listing on the National Register of Historic Places. Prior to and during implementation of the projects, the areas would be further evaluated for cultural resource concerns and, if appropriate, the USAF will consult with Native American tribes and the New Mexico State Historic Preservation Officer. Therefore, the USAF recommends the Undertaking would likely have no adverse effect on historic properties. Documentation supporting these findings is contained in the Draft PEA. A copy of the *Draft Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico* is available at http://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.

We request your review and comments on the Draft PEA and Section 106 of the NHPA recommendations at your earliest convenience. As we move forward through this process, we welcome your participation and input. Please address your correspondence to Ms. Martha Garcia, Unit Environmental Coordinator RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland AFB, New Mexico 87117, or martha.garcia.3@spaceforce.mil. Contact Mr. David Reynolds, Cultural Resources Program Manager, at david.reynolds.37@us.af.mil if you have any technical questions. 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.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2025.05.01 17:57:28 -06'00'

MICHAEL J. POWER, Colonel, USAF
Commander

US Fish and Wildlife Service - Scoping & Public Notice Letter Distribution List

Ms. Amy Lueders, Regional Director
US Fish and Wildlife Service, Southwest Regional Office
500 Gold Avenue SW
Albuquerque NM 87102-3118

US Fish and Wildlife Service – Example Scoping Letter

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

12 December 2024

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

Ms. Amy Lueders, Regional Director
US Fish and Wildlife Service
Southwest Regional Office
500 Gold Avenue SW
Albuquerque NM 87102-3118

Dear Ms. Lueders

In accordance with the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality regulations, and United States Air Force (USAF) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB in Albuquerque, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, ARFL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories before being tested outdoors at the High Energy Research and Technology Facility (HERTF), HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR), SOR 1-Mile and 2-Mile sites, and the Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

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 20 May 2024 under Consultation Code 2024-0092739. The USFWS IPaC tool listed a total of eight federally listed threatened or endangered species with the potential to occur within the project area, listed below.

	Name	Status	Anticipated Impact
Mammals	Mexican Wolf (*Canis lupus baileyi*)	Experimental Population, Non-Essential	No Adverse Effect
	New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus)*	Endangered	No Adverse Effect
	Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered	No Adverse Effect
Birds	Mexican Spotted Owl (*Strix occidentalis lucida*)	Threatened	No Adverse Effect
	Southwestern Willow Flycatcher (*Empidonax trailii extimus*)	Endangered	No Adverse Effect
	Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened	No Adverse Effect
Fishes	Rio Grande Silvery Minnow (*Hybognathus amarus*)	Endangered	No Adverse Effect
Insects	Monarch Butterfly (*Danaus Plexippus*)	Candidate	No Adverse Effect

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 Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, Albuquerque, 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 the date of this letter to ensure your concerns are adequately addressed in the PEA.

Please send your written responses to Ms. Martha Garcia, AFRL Unit Environmental Coordinator, 3550 Aberdeen Avenue SE, Building 464, Kirtland AFB NM 87117 or by email to martha.garcia.3@spaceforce.mil. Thank you in advance for your assistance in this effort.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2024.12.04 18:41:22 -07'00'

MICHAEL J. POWER, Colonel, USAF
Commander

US Fish and Wildlife Service – Example Public Notice Letter

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

01 May 2025

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

Ms. Amy Lueders, Regional Director
US Fish and Wildlife Service
Southwest Regional Office
500 Gold Avenue SW
Albuquerque NM 87102-3118

Dear Ms. Lueders

In accordance with the National Environmental Policy Act (NEPA) of 1969, as amended; and United States Air Force (USAF) regulations, Kirtland Air Force Base (AFB) is preparing a Programmatic Environmental Assessment (PEA) to evaluate potential environmental impacts associated with the Air Force Research Laboratory (AFRL) continuing to conduct research, development, test, and evaluation (RDT&E) activities on Kirtland AFB, New Mexico. AFRL has been conducting RDT&E activities on Kirtland AFB since the 1960s and there are many existing Environmental Assessments and Environmental Impact Analysis Process documents spanning the decades from 1970 to present day. The Proposed Action consolidates all current and proposed future AFRL RDT&E activities into one PEA, ensuring these activities can continue to occur on Kirtland AFB into the future. Two units of AFRL conduct these activities, AFRL's Directed Energy Directorate (AFRL/RD) and AFRL's Space Vehicle Directorate (AFRL/RV).

AFRL/RD develops directed energy weapons (including high energy lasers, high-power microwave, and high-power electromagnetic system prototypes) to counter, disable, and attack adversary sources. Equipment, components, and designs for warfighter weapons are created and tested in laboratories across Kirtland AFB before being tested outdoors at the High Energy Research and Technology Facility (HERTF), HERTF Canyon, Frustration Canyon, Starfire Optical Range (SOR), SOR 1-Mile and 2-Mile sites, and the Outdoor Laser Propagation and Firing Area to evaluate performance of the new technology.

AFRL/RV ensures that the United States and its allies maintain space superiority by developing and transitioning technologies that provide space-based capabilities to the nation. Equipment, components, and designs for space-based technologies are created in laboratories across Kirtland AFB and then tested outdoors at the Skywave Technology Laboratory, Improved Solar Observing Optical Network, and South Park Antenna Field.

The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland AFB into the future. The need for the Proposed Action is to allow users the ability to test concepts to improve 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 mission demands. Because of ever-changing threat scenarios, the RDT&E activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

For this consultation, AFRL has integrated the requirements of NEPA and the Endangered Species Act (ESA) so that all procedures run concurrently. As such, in accordance with 50 Code of Federal Regulations Section 402.06(a), Kirtland AFB intends to have the PEA stand as the biological resources review for threatened and endangered species that could be affected by the project. A copy of the *Draft Programmatic Environmental Assessment Addressing Air Force Research Laboratory Research, Development, Test, and Evaluation Activities at Kirtland Air Force Base, New Mexico* is available at http://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.

As previously stated in a letter to your office dated 9 December 2024, pursuant to Section 7(a)(2) of the ESA, as amended (16 United States Code Section 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 20 May 2024 under Consultation Code 2024-0092739. The USFWS IPaC tool listed a total of five federally listed threatened or endangered species and one 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*) (candidate species). No critical habitat has been designated on Kirtland AFB. Prior to and during implementation of the projects, Kirtland AFB will consult with the USFWS in accordance with the ESA of 1973. Additionally, Kirtland AFB is closely monitoring the potential listing of the piñon jay (*Gymnorhinus cyanocephalus*).

We request your concurrence with the finding of no adverse effect and welcome your comments on the Draft PEA no later than 30 days from the date of the correspondence. Please address all questions and comments to Ms. Martha Garcia, Unit Environmental Coordinator RV & RD, Building 464, Room 405, 3550 Aberdeen Avenue SE, Kirtland Air Force Base, New Mexico 87117, or martha.garcia.3@spaceforce.mil.

Sincerely

POWER.MICHAEL.J.1017246581 Digitally signed by POWER.MICHAEL.J.1017246581 Date: 2025.05.01 17:58:18 -06'00'

MICHAEL J. POWER, Colonel, USAF
Commander

APPENDIX C

AIR QUALITY SUPPORT DOCUMENTATION

Appendix C

Air Quality Analysis Supporting Documentation

This appendix discusses emission factor development and calculations including assumptions employed in the analyses presented in **Section 3.3** of the Environmental Assessment.

C.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 a net change in emissions analysis to assess the potential air quality impact/s associated with the action. The analysis was performed in accordance with the Air Force Manual 32-7002, *Environmental Compliance and Pollution Prevention*; the *Environmental Impact Analysis Process* (EIAP, 32 CFR 989); the *General Conformity Rule* (GCR, 40 CFR 93 Subpart B); and the *USAF Air Quality Environmental Impact Analysis Process (EIAP) Guide*. This report provides a summary of the ACAM analysis.

Report generated with ACAM version: 5.0.23a

a. Action Location:

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

b. Action Title: PEA for AFRL RDT&E Activities at Kirtland AFB, NM

c. Project Number/s (if applicable):

d. Projected Action Start Date: 1 / 2026

e. Action Description:

The Proposed Action includes incorporation of current and proposed RDT&E activities for both AFRL/RD and AFRL/RV. The Proposed Action includes testing activities at the following test sites/facilities (see Section 2.3 of the EA for a description of test activities):
- High Energy Microwave Laboratory (HEML)
- High-Power Joint Electromagnetic Non-Kinetic Strike (HiJENKS) Facility and 909 Complex
- High-Powered Electromagnetic (HPEM) Laboratory
- High Energy Research and Technology Facility (HERTF)/HERTF Canyon
- Frustration Canyon
- Starfire Optical Range (SOR)
- Outdoor Laser Propagation and Firing Area (OLPFA) and Associated Laser Facilities
- Plant 1 in the Manzano Complex
- Skywave Technology Laboratory (SKYWAVE) Facility
- Improved Solar Observing Optical Network (ISOON)
- South Park Antenna Field

In addition to the test activities, the Proposed Action includes the following construction, renovation, and maintenance activities that were modeled as part of this analysis:
- Frustration Canyon: Install a new 50- by 50-foot concrete pad to serve as an alternative test site for firing to SOR's 2-Mile Site.
- SOR: Relocate the current 2-Mile Site approximately 4,600 feet south of the current site. The current 2-Mile Site would not be demolished.
- SKYWAVE Facility: Temporarily deploy up to 30 antennas per year. Antennas would be less than 120 feet in height and would require 36-inch stakes driven into the ground to anchor the antenna via guy wire. Coaxial cables would be run from the antenna to the SKYWAVE Facility. Cables would be run on the ground surface except for the cables presently running from the Beacon RX antenna to the SKYWAVE Facility. These cables would be buried 2–3 feet below the ground surface.
- South Park Antenna Field: Roadway improvements and routine maintenance to include regrading the gravel road from Lovelace Road around South Park, regrading dirt roads that travel through South Park, and establishing a dirt vehicle turnaround and staging area; installation of up to five antennas per year not to exceed 70 feet in height, including new sunken concrete bases and cables running from the antennas to the instrumentation site (either on the ground surface or underground); installation of a new 12,470-volt overhead power line from Substation 9 to South Park and demolition of old lines; and

improvements to existing water lines buried beneath South Park to include up to 5 acres of ground disturbance.

The analysis assumes the construction, renovation, and maintenance activities would occur within a single year. A surrogate year of 2026 was used. The actual construction period may be different than what was assumed for the analysis. Some activities would occur annually, such as deployment of up to 30 antennas per year at the SKYWAVE Facility and installation of up to 5 antennas per year at South Park. Emissions modeled for these activities were included in both the construction analysis and the operations analysis.

Many testing activities, such as the use of directed energy, high energy laser systems, high power electromagnetics systems, microwave systems, radiation, high-energy plasma, pulse power devices, seismic and other sensors, telescopes, antennas, and drones, and conducting non-explosive tests do not produce air emissions. Emissions from these activities were not calculated.

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. Users of the test areas/facilities would construct, operate, maintain, and remove supporting infrastructure as well as conduct routine construction, site preparation, and maintenance. Examples of infrastructure projects that could occur consist of replacing outdated project T&F trailers, replacing/installing underground cables (e.g., fiber optic cables, power lines, etc.), installing and removing test structures, and conducting general clean-up activities (e.g., weed and brush removal, weather proofing). Specific site preparation activities are unknown at this time and therefore were not included in the model. Separate air quality analyses would be conducted once specific activities are defined and emissions modeling would be completed if required.

The use of portable generators may be required during testing activities to power equipment. Generator use was calculated for testing activities at two sites: Frustration Canyon and the OLPFA. Annual generator use assumptions are as follows:
- Frustration Canyon: Use of portable generators up to 5-kW. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators would be used for up to 10 hours a day, 20 days a month (2,400 hours per year).
- The OLPFA and Associated Laser Facilities: Most commonly, 5-kW generators are used; however, larger generators, including 10-kW and 60-kW generators may be used. For the purpose of this analysis, it was assumed three 60-kW diesel-fired generators would be used for up to 10 hours a day for 2 weeks (14 days) up to four times a year (560 hours per year).

Due to the limited capability of the Air Conformity Applicability Model (ACAM), ACAM was used only for the construction, renovation, and maintenance activities identified above, as well as estimated generator use.

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 GCR are:

____ applicable
_X_ not applicable

Total reasonably foreseeable net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving “steady state” (i.e., no net gain/loss in emission stabilized and the action is fully implemented) emissions. The ACAM analysis

uses the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the *USAF Air Emissions Guide for Air Force Stationary Sources*, the *USAF Air Emissions Guide for Air Force Mobile Sources*, and the *USAF Air Emissions Guide for Air Force Transitory Sources*.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of the proposed Action's potential impacts to local air quality. The insignificance indicators are trivial (*de minimis*) rate thresholds that have been demonstrated to have little to no impact to air quality. These insignificance indicators are the 250 ton/year Prevention of Significant Deterioration (PSD) major source threshold and 25 ton/year for lead for actions occurring in areas that are "Attainment" (i.e., not exceeding any National Ambient Air Quality Standard [NAAQS]). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutants is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQS. For further detail on insignificance indicators, refer to *Level II, Air Quality Quantitative Assessment, Insignificance Indicators*.

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

Analysis Summary:

2026

Pollutant	Action Emissions (ton/year)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/year)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.663	250	No
NO_x	3.961	250	No
CO	4.032	250	No
SOx	0.249	250	No
PM_{10}	19.686	250	No
$PM_{2.5}$	0.348	250	No
Pb	0.000	25	No
NH_3	0.004	250	No

2027 - (Steady State)

Pollutant	Action Emissions (ton/year)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/year)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	1.296	250	No
NO_x	1.850	250	No
CO	1.205	250	No
SO_x	0.245	250	No
PM_{10}	0.269	250	No
$PM_{2.5}$	0.269	250	No
Pb	0.000	25	No
NH_3	0.000	250	No

None of the estimated annual net emissions associated with this action are above the insignificance indicators; therefore, the action will not cause or contribute to an exceedance of one or more NAAQS and will have an insignificant impact on air quality. No further air assessment is needed.

Carolyn Hein, Contractor — Oct 04, 2024

Name, Title — **Date**

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

1. General Information

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

- Action Title: PEA for AFRL RDT&E Activities at Kirtland AFB, NM

- Project Number/s (if applicable):

- Projected Action Start Date: 1 / 2026

- Action Purpose and Need:
The purpose of the Proposed Action is to ensure that all current and proposed AFRL RDT&E activities can continue to occur on Kirtland into the future.

The need for the Proposed Action is to allow users the ability to test concepts to improve 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 activities conducted by these agencies are a critical element in the development of new capabilities for the nation's security and provide an important component of the United States' global leadership in safety, science, and technology.

- Action Description:
The Proposed Action includes incorporation of current and proposed RDT&E activities for both AFRL/RD and AFRL/RV. The Proposed Action includes testing activities at the following test sites/facilities (see Section 2.3 of the EA for a description of test activities):
- High Energy Microwave Laboratory (HEML)
- High-Power Joint Electromagnetic Non-Kinetic Strike (HiJENKS) Facility and 909 Complex
- High-Powered Electromagnetic (HPEM) Laboratory
- High Energy Research and Technology Facility (HERTF)/HERTF Canyon
- Frustration Canyon
- Starfire Optical Range (SOR)
- Outdoor Laser Propagation and Firing Area (OLPFA) and Associated Laser Facilities
- Plant 1 in the Manzano Complex
- Skywave Technology Laboratory (SKYWAVE) Facility
- Improved Solar Observing Optical Network (ISOON)
- South Park Antenna Field

In addition to the test activities, the Proposed Action includes the following construction, renovation, and maintenance activities that were modeled as part of this analysis:
- Frustration Canyon: Install a new 50- by 50-foot concrete pad to serve as an alternative test site for firing to SOR's 2-Mile Site.
- SOR: Relocate the current 2-Mile Site approximately 4,600 feet south of the current site. The current 2-Mile Site would not be demolished.
- SKYWAVE Facility: Temporarily deploy up to 30 antennas per year. Antennas would be less than 120 feet in height and would require 36-inch stakes driven into the ground to anchor the antenna via guy wire. Coaxial cables would be run from the antenna to the SKYWAVE Facility. Cables would be run on the ground surface except for the cables presently running from the Beacon RX antenna to the SKYWAVE Facility. These cables would be buried 2–3 feet below the ground surface.
- South Park Antenna Field: Roadway improvements and routine maintenance to include regrading the gravel road from Lovelace Road around South Park, regrading dirt roads that travel through South Park, and establishing a dirt vehicle turnaround and staging area; installation of up to five antennas per

year not to exceed 70 feet in height, including new sunken concrete bases and cables running from the antennas to the instrumentation site (either on the ground surface or underground); installation of a new 12,470-volt overhead power line from Substation 9 to South Park and demolition of old lines; and improvements to existing water lines buried beneath South Park to include up to 5 acres of ground disturbance.

The analysis assumes the construction, renovation, and maintenance activities would occur within a single year. A surrogate year of 2026 was used. The actual construction period may be different than what was assumed for the analysis. Some activities would occur annually, such as deployment of up to 30 antennas per year at the SKYWAVE Facility and installation of up to 5 antennas per year at South Park. Emissions modeled for these activities were included in both the construction analysis and the operations analysis.

Many testing activities, such as the use of directed energy, high energy laser systems, high power electromagnetics systems, microwave systems, radiation, high-energy plasma, pulse power devices, seismic and other sensors, telescopes, antennas, and drones, and conducting non-explosive tests do not produce air emissions. Emissions from these activities were not calculated.

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. Users of the test areas/facilities would construct, operate, maintain, and remove supporting infrastructure as well as conduct routine construction, site preparation, and maintenance. Examples of infrastructure projects that could occur consist of replacing outdated project T&F trailers, replacing/installing underground cables (e.g., fiber optic cables, power lines, etc.), installing and removing test structures, and conducting general clean-up activities (e.g., weed and brush removal, weather proofing). Specific site preparation activities are unknown at this time and therefore were not included in the model. Separate air quality analyses would be conducted once specific activities are defined and emissions modeling would be completed if required.

The use of portable generators may be required during testing activities to power equipment. Generator use was calculated for testing activities at two sites: Frustration Canyon and the OLPFA. Annual generator use assumptions are as follows:
- Frustration Canyon: Use of portable generators up to 5-kW. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators would be used for up to 10 hours a day, 20 days a month (2,400 hours per year).
- The OLPFA and Associated Laser Facilities: Most commonly, 5-kW generators are used; however, larger generators, including 10-kW and 60-kW generators may be used. For the purpose of this analysis, it was assumed three 60-kW diesel-fired generators would be used for up to 10 hours a day for 2 weeks (14 days) up to four times a year (560 hours per year).

Due to the limited capability of the Air Conformity Applicability Model (ACAM), ACAM was used only for the construction, renovation, and maintenance activities identified above, as well as estimated generator use.

- Point of Contact

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

Report generated with ACAM version: 5.0.23a

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

- Activity List:

Activity Type		Activity Title
2.	Construction / Demolition	Frustration Canyon: concrete pad
3.	Construction / Demolition	SOR: Relocate 2-Mile Site
4.	Construction / Demolition	SKYWAVE Facility: deploy up to 30 temporary antennas per year
5.	Construction / Demolition	South Park Antenna Field: Roadway improvements and routine maintenance
6.	Construction / Demolition	South Park Antenna Field: installation of up to five antennas per year
7.	Construction / Demolition	South Park Antenna Field: installation of a new overhead power line
8.	Construction / Demolition	South Park Antenna Field: water line improvements
9.	Emergency Generator	Frustration Canyon: generators
10.	Emergency Generator	OLPFA and Associated Laser Facilities: generators

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

General Information & Timeline Assumptions

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

- Activity Title: Frustration Canyon: concrete pad

- Activity Description:
This project includes installing a new 50- by 50-foot concrete pad to serve as an alternative test site for firing to SOR's 2-Mile Site. Grading, trenching, and paving would occur on 2,500 square feet. construction activity would occur over approximately 2 months in 2026.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 2
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.049407
SO_x	0.000764
NO_x	0.404202
CO	0.541200

Pollutant	Total Emissions (TONs)
PM_{10}	0.116915
$PM_{2.5}$	0.016038
Pb	0.000000
NH_3	0.000804

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.003392
N_2O	0.000733

Pollutant	Total Emissions (TONs)
CO_2	83.375888
CO_2e	83.678889

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

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.003392
N_2O	0.000733

Pollutant	Total Emissions (TONs)
CO_2	83.375888
CO_2e	83.678889

2.1 Site Grading Phase

2.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 2
Number of Days: 0

2.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (square feet): 2,500
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Site Grading Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

2.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.31292	0.00490	2.52757	3.39734	0.14041	0.12918
Other Construction Equipment Composite [HP: 82] [LF: 0.42]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.28160	0.00487	2.73375	3.50416	0.15811	0.14546
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.35280	0.00491	3.22260	2.72624	0.14205	0.13069
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02153	0.00431	530.81500	532.63663
Other Construction Equipment Composite [HP: 82] [LF: 0.42]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02140	0.00428	527.54121	529.35159
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02160	0.00432	532.54993	534.37751
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

2.1.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

2.2 Trenching/Excavating Phase

2.2.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 2
Number of Days: 0

2.2.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (square feet): 2,500
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Trenching Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

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 (default)
Average Hauling Truck Round Trip Commute (miles): 20 (default)

- 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 (default)

- 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 Criteria Pollutant Emission Factors (g/horsepower-hour) (default)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.39317	0.00542	3.40690	4.22083	0.09860	0.09071
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.45335	0.00542	3.58824	4.59368	0.11309	0.10404

Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour) (default)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02381	0.00476	587.02896	589.04350
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02385	0.00477	587.87714	589.89459
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

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 * HP * LF * EF_{POL}* 0.002205) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower

LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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 Paving Phase

2.3.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 2
Number of Days: 0

2.3.2 Paving Phase Assumptions

- General Paving Information
Paving Area (square feet): 2,500

- Paving Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

- Construction Exhaust (default)

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

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

- 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 (default)

- Worker Trips Vehicle Mixture (%)

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

2.3.3 Paving Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour) (default)

Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.55280	0.00854	4.19778	3.25481	0.16332	0.15025
Pavers Composite [HP: 81] [LF: 0.42]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.23717	0.00486	2.53335	3.43109	0.12904	0.11872
Rollers Composite [HP: 36] [LF: 0.38]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.54202	0.00541	3.61396	4.09268	0.15387	0.14156
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour) (default)

Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02313	0.00463	570.16326	572.11992
Pavers Composite [HP: 81] [LF: 0.42]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02133	0.00427	525.80405	527.60847

Rollers Composite [HP: 36] [LF: 0.38]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02381	0.00476	586.91372	588.92786
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

2.3.4 Paving Phase Formula(s)

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

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (square feet)
0.25: Thickness of Paving Area (feet)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 cubic yard / 27 cubic feet)
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

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560 / 2000$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (pounds/acre)
PA: Paving Area (square feet)
43560: Conversion Factor square feet to acre (43,560 square feet / acre)^2 / acre)
2000: Conversion Factor square pounds to TONs (2000 pounds / TON)

3. Construction / Demolition

3.1 General Information & Timeline Assumptions

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

- Activity Title: SOR: Relocate 2-Mile Site

- Activity Description:
Relocation of the 2-Mile Site would occur over a 1-year period, from January 2026 through December 2026. The current 2-Mile Site would not be demolished.
It was assumed the new 2-Mile Site (approximately 50,000 square feet) would be cleared and graded. Grading would begin in January 2026 and last approximately 3 months.
Trenching may be required for the entire site (approximately 50,000 square feet). Trenching would begin in April 2026 and last approximately 3 months. Excavated material would remain in place.

It was assumed the new 2-Mile Site would include permanent buildings totaling approximately 10,000 square feet. Construction would begin in July 2026 and last approximately 4 months.

Architectural coatings would be applied to new buildings totaling approximately 10,000 square feet. Architectural coating application would begin in November 2026 and last approximately 1 month.

Paving may be required for some areas. It was assumed 20,000 square feet would be paved. Paving would begin in December 2026 and last approximately 1 month.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 12
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.197766
SO_x	0.001388
NO_x	0.688951
CO	0.924322

Pollutant	Total Emissions (TONs)
PM_{10}	3.013529
$PM_{2.5}$	0.026804
Pb	0.000000
NH_3	0.001569

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.006278
N_2O	0.002079

Pollutant	Total Emissions (TONs)
CO_2	157.416493
CO_2e	158.192873

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.006278
N_2O	0.002079

Pollutant	Total Emissions (TONs)
CO_2	157.416493
CO_2e	158.192873

3.1 Site Grading Phase

3.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 3
Number of Days: 0

3.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (square feet): 50,000
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

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

- Site Grading Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

3.1.3 Site Grading Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.31292	0.00490	2.52757	3.39734	0.14041	0.12918
Other Construction Equipment Composite [HP: 82] [LF: 0.42]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.28160	0.00487	2.73375	3.50416	0.15811	0.14546
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.35280	0.00491	3.22260	2.72624	0.14205	0.13069
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02153	0.00431	530.81500	532.63663
Other Construction Equipment Composite [HP: 82] [LF: 0.42]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.54121	529.35159
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02160	0.00432	532.54993	534.37751

Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

3.1.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

3.2 Trenching/Excavating Phase

3.2.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 3
Number of Days: 0

3.2.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (square feet): 50,000
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

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

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): 40

- 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

3.2.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.39317	0.00542	3.40690	4.22083	0.09860	0.09071
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.45335	0.00542	3.58824	4.59368	0.11309	0.10404
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02381	0.00476	587.02896	589.04350
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02385	0.00477	587.87714	589.89459
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

3.2.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

3.3 Building Construction Phase

3.3.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 7
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 4
Number of Days: 0

3.3.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 10,000
Height of Building (feet): 12
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

3.3.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Cranes Composite [HP: 367] [LF: 0.29]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.19758	0.00487	1.83652	1.63713	0.07527	0.06925
Forklifts Composite [HP: 82] [LF: 0.2]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.24594	0.00487	2.34179	3.57902	0.11182	0.10287
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Cranes Composite [HP: 367] [LF: 0.29]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.46069	529.27080
Forklifts Composite [HP: 82] [LF: 0.2]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02138	0.00428	527.09717	528.90603
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595

	CH_4	N_2O	CO_2	CO_2e
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

3.3.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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 / 1000 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

3.4 Architectural Coatings Phase

3.4.1 Architectural Coatings Phase Timeline Assumptions

- Phase Start Date
Start Month: 11
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

3.4.2 Architectural Coatings Phase Assumptions

- General Architectural Coatings Information
Building Category: Non-Residential
Total Square Footage (square feet): 10,000
Number of Units: N/A

- Architectural Coatings Default Settings
Default Settings Used: Yes
Average Day(s) worked per week: 5 (default)

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

- Worker Trips Vehicle Mixture (%)

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

3.4.3 Architectural Coatings Phase Emission Factor(s)

- Worker Trips Criteria Pollutant Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

- Worker Trips Greenhouse Gases Emission Factors (grams/mile)

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

3.4.4 Architectural Coatings Phase Formula(s)

- Worker Trips Emissions per Phase
$VMT_{WT} = (1 * WT * PA) / 800$

VMT_{WT}: Worker Trips Vehicle Miles Travel (miles)
1: Conversion Factor man days to trips (1 trip / 1 man * day)
WT: Average Worker Round Trip Commute (miles)
PA: Paint Area (square feet)
800: Conversion Factor square feet to man days (1 square foot / 1 man * day)

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

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

- Off-Gassing Emissions per Phase
$VOC_{AC} = (AB * 2.0 * 0.0116) / 2000.0$

VOC_{AC}: Architectural Coating VOC Emissions (TONs)
BA: Area of Building (square feet)
2.0: Conversion Factor total area to coated area (2.0 square feet coated area / total area)
0.0116: Emission Factor (pounds/square foot)
2000: Conversion Factor pounds to tons

3.5 Paving Phase

3.5.1 Paving Phase Timeline Assumptions

- Phase Start Date
Start Month: 12
Start Quarter: 1
Start Year: 2026

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- Phase Duration
Number of Month: 1
Number of Days: 0

3.5.2 Paving Phase Assumptions

- General Paving Information
Paving Area (square feet): 20,000

- Paving Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Cement and Mortar Mixers Composite	4	6
Pavers Composite	1	7
Rollers Composite	1	7
Tractors/Loaders/Backhoes Composite	1	7

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (miles): 40

- 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

3.5.3 Paving Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.55280	0.00854	4.19778	3.25481	0.16332	0.15025
Pavers Composite [HP: 81] [LF: 0.42]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.23717	0.00486	2.53335	3.43109	0.12904	0.11872
Rollers Composite [HP: 36] [LF: 0.38]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.54202	0.00541	3.61396	4.09268	0.15387	0.14156
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02313	0.00463	570.16326	572.11992

Pavers Composite [HP: 81] [LF: 0.42]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02133	0.00427	525.80405	527.60847
Rollers Composite [HP: 36] [LF: 0.38]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02381	0.00476	586.91372	588.92786
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

3.5.4 Paving Phase Formula(s)

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

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
2000: Conversion Factor pounds to tons

- Vehicle Exhaust Emissions per Phase
$VMT_{VE} = PA * 0.25 * (1 / 27) * (1 / HC) * HT$

VMT_{VE}: Vehicle Exhaust Vehicle Miles Travel (miles)
PA: Paving Area (square feet)
0.25: Thickness of Paving Area (feet)
(1 / 27): Conversion Factor cubic feet to cubic yards (1 cubic yard / 27 cubic feet)

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

- Off-Gassing Emissions per Phase
$VOC_P = (2.62 * PA) / 43560 / 2000$

VOC_P: Paving VOC Emissions (TONs)
2.62: Emission Factor (pounds/acre)
PA: Paving Area (square feet)
43560: Conversion Factor square feet to acre (43,560 square feet / acre)^2 / acre)
2000: Conversion Factor square pounds to TONs (2,000 pounds / TON)

4. Construction / Demolition

4.1 General Information & Timeline Assumptions

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

- Activity Title: SKYWAVE Facility: deploy up to 30 temporary antennas per year

- Activity Description:
Antennas would be less than 120 feet in height and would require 36-inch stakes driven into the ground to anchor the antenna via guy wire. Coaxial cables would be run from the antenna to the SKYWAVE Facility. Cables would be run on the ground surface except for the cables presently running from the

Beacon RX antenna to the SKYWAVE Facility. These cables would be buried 2–3 feet below the ground surface.

It was assumed no grading would be required and the antennas would be installed directly on the ground surface.

Trenching would be required for burying cables running from the Beacon RX to the SKYWAVE Facility, estimated at 10,000 linear feet. A 1-foot trench-width was assumed. Trenching would begin in January 2026 and last approximately 1 month.

Installation of 30 antennas would require stakes driven into the ground and equipment use. This activity was modeled as a construction phase. Installation of antennas was assumed to begin in February 2026 and last approximately 1 month.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 2
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.016099
SO_x	0.000307
NO_x	0.132149
CO	0.180520

Pollutant	Total Emissions (TONs)
PM_{10}	0.103803
$PM_{2.5}$	0.003977
Pb	0.000000
NH_3	0.000276

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001271
N_2O	0.000291

Pollutant	Total Emissions (TONs)
CO_2	31.336503
CO_2e	31.455067

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001271
N_2O	0.000291

Pollutant	Total Emissions (TONs)
CO_2	31.336503
CO_2e	31.455067

4.1 Trenching/Excavating Phase

4.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

4.1.2 Trenching / Excavating Phase Assumptions

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

- General Trenching/Excavating Information

Area of Site to be Trenched/Excavated (square feet): 10,000
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Trenching Default Settings

Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

4.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.39317	0.00542	3.40690	4.22083	0.09860	0.09071
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.45335	0.00542	3.58824	4.59368	0.11309	0.10404
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02381	0.00476	587.02896	589.04350
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02385	0.00477	587.87714	589.89459
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

4.1.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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 yard)
(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

4.2 Building Construction Phase

4.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 2
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

4.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 30
Height of Building (feet): 120
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Bore/Drill Rigs Composite	1	8
Cement and Mortar Mixers Composite	1	8

Equipment Name	Number Of Equipment	Hours Per Day
Concrete/Industrial Saws Composite	1	8
Cranes Composite	1	8
Generator Sets Composite	1	8
Welders Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (miles): 40

- 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

4.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Bore/Drill Rigs Composite [HP: 83] [LF: 0.5]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.12817	0.00485	1.63926	3.25251	0.04004	0.03684
Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.55280	0.00854	4.19778	3.25481	0.16332	0.15025
Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.41257	0.00743	3.52633	4.31513	0.08509	0.07828
Cranes Composite [HP: 367] [LF: 0.29]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.19758	0.00487	1.83652	1.63713	0.07527	0.06925
Generator Sets Composite [HP: 14] [LF: 0.74]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.53947	0.00793	4.32399	2.85973	0.17412	0.16019
Welders Composite [HP: 46] [LF: 0.45]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.46472	0.00735	3.57020	4.49314	0.09550	0.08786

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Bore/Drill Rigs Composite [HP: 83] [LF: 0.5]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02130	0.00426	525.08186	526.88381

Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02313	0.00463	570.16326	572.11992
Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02330	0.00466	574.35707	576.32812
Cranes Composite [HP: 367] [LF: 0.29]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02140	0.00428	527.46069	529.27080
Generator Sets Composite [HP: 14] [LF: 0.74]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02305	0.00461	568.32694	570.27730
Welders Composite [HP: 46] [LF: 0.45]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02305	0.00461	568.29068	570.24091

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

4.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

5. Construction / Demolition

5.1 General Information & Timeline Assumptions

- Activity Location

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

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

- Activity Title: South Park Antenna Field: Roadway improvements and routine maintenance

- Activity Description:
Roadway improvements include regrading the gravel road from Lovelace Road around South Park, regrading dirt roads that travel through South Park, and establishing a dirt vehicle turnaround and staging area. Grading was estimated to occur on 350,000 square feet. Grading would begin in January 2026 and last approximately 3 months.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 3
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.054087
SO_x	0.000848
NO_x	0.473271
CO	0.557271

Pollutant	Total Emissions (TONs)
PM_{10}	8.975156
$PM_{2.5}$	0.020227
Pb	0.000000
NH_3	0.000401

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.003793
N_2O	0.000784

Pollutant	Total Emissions (TONs)
CO_2	93.375053
CO_2e	93.703349

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.003793
N_2O	0.000784

Pollutant	Total Emissions (TONs)
CO_2	93.375053
CO_2e	93.703349

5.1 Site Grading Phase

5.1.1 Site Grading Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 3
Number of Days: 0

5.1.2 Site Grading Phase Assumptions

- General Site Grading Information
Area of Site to be Graded (square feet): 300,000
Amount of Material to be Hauled On-Site (cubic yards): 0

Amount of Material to be Hauled Off-Site (cubic yards): 0

- Site Grading Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Graders Composite	1	8
Other Construction Equipment Composite	1	8
Rubber Tired Dozers Composite	1	8
Tractors/Loaders/Backhoes Composite	2	7

- Vehicle Exhaust
Average Hauling Truck Capacity (cubic yards): 20
Average Hauling Truck Round Trip Commute (miles): 40

- 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 Site Grading Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.31292	0.00490	2.52757	3.39734	0.14041	0.12918
Other Construction Equipment Composite [HP: 82] [LF: 0.42]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.28160	0.00487	2.73375	3.50416	0.15811	0.14546
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.35280	0.00491	3.22260	2.72624	0.14205	0.13069
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Graders Composite [HP: 148] [LF: 0.41]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02153	0.00431	530.81500	532.63663
Other Construction Equipment Composite [HP: 82] [LF: 0.42]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.54121	529.35159
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02160	0.00432	532.54993	534.37751

Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

5.1.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

6. Construction / Demolition

6.1 General Information & Timeline Assumptions

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

- Activity Title: South Park Antenna Field: installation of up to five antennas per year

- Activity Description:
New sunken concrete bases for the five antennas would require excavation. It was assumed the dimensions of each concrete base would be 60 feet by 60 feet, for a total area of 18,000 square feet. In addition, excavation would be required for cables that could be placed underground from each antenna to the instrumentation site. Excavation for underground cables was estimated at 5,000 linear feet (1-foot trench width assumed). Therefore, up to 23,000 square feet of excavation would be required. Excavation would begin in January 2026 and last approximately 3 months. Excavated material would remain in place.

Installation of five antennas would require stakes driven into the ground and equipment use. This activity was modeled as a construction phase. Installation of antennas was assumed to begin in April 2026 and last approximately 1 month.

- Activity Start Date

Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 4
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.025694
SO_x	0.000457
NO_x	0.208509
CO	0.304693

Pollutant	Total Emissions (TONs)
PM_{10}	0.693080
$PM_{2.5}$	0.006135
Pb	0.000000
NH_3	0.000527

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001968
N_2O	0.000532

Pollutant	Total Emissions (TONs)
CO_2	48.815038
CO_2e	49.022696

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001968
N_2O	0.000532

Pollutant	Total Emissions (TONs)
CO_2	48.815038
CO_2e	49.022696

6.1 Trenching/Excavating Phase

6.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 3
Number of Days: 0

6.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (square feet): 23,000
Amount of Material to be Hauled On-Site (cubic yards): 150
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 10
Average Hauling Truck Round Trip Commute (miles): 40

- 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

6.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.39317	0.00542	3.40690	4.22083	0.09860	0.09071
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.45335	0.00542	3.58824	4.59368	0.11309	0.10404
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02381	0.00476	587.02896	589.04350
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02385	0.00477	587.87714	589.89459
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267

	CH_4	N_2O	CO_2	CO_2e
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

6.1.4 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 * HP * LF * EF_{POL}* 0.002205) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

6.2 Building Construction Phase

6.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 4
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

6.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 5
Height of Building (feet): 70
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- Construction Exhaust

Equipment Name	Number Of Equipment	Hours Per Day
Bore/Drill Rigs Composite	1	8
Cement and Mortar Mixers Composite	1	8
Concrete/Industrial Saws Composite	1	8
Cranes Composite	1	8
Generator Sets Composite	1	8
Welders Composite	1	8

- Vehicle Exhaust
Average Hauling Truck Round Trip Commute (miles): 40

- 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

6.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Bore/Drill Rigs Composite [HP: 83] [LF: 0.5]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.12817	0.00485	1.63926	3.25251	0.04004	0.03684
Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.55280	0.00854	4.19778	3.25481	0.16332	0.15025
Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.41257	0.00743	3.52633	4.31513	0.08509	0.07828
Cranes Composite [HP: 367] [LF: 0.29]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.19758	0.00487	1.83652	1.63713	0.07527	0.06925
Generator Sets Composite [HP: 14] [LF: 0.74]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.53947	0.00793	4.32399	2.85973	0.17412	0.16019
Welders Composite [HP: 46] [LF: 0.45]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.46472	0.00735	3.57020	4.49314	0.09550	0.08786

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Bore/Drill Rigs Composite [HP: 83] [LF: 0.5]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02130	0.00426	525.08186	526.88381
Cement and Mortar Mixers Composite [HP: 10] [LF: 0.56]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02313	0.00463	570.16326	572.11992
Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02330	0.00466	574.35707	576.32812
Cranes Composite [HP: 367] [LF: 0.29]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.46069	529.27080
Generator Sets Composite [HP: 14] [LF: 0.74]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02305	0.00461	568.32694	570.27730
Welders Composite [HP: 46] [LF: 0.45]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02305	0.00461	568.29068	570.24091

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

6.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

7. Construction / Demolition

7.1 General Information & Timeline Assumptions

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

- Activity Title: South Park Antenna Field: installation of a new overhead power line

- Activity Description:
The project includes installation of a new 12,470-volt overhead power line from Substation 9 to South Park and demolition of old lines.

Demolition of existing lines was estimated at 2,500 linear feet. Demolition would begin in January 2026 and last approximately 1 month.

Construction of new overhead lines was estimated at 2,500 linear feet. Construction would begin in February 2026 and last approximately 1 month.

- Activity Start Date
Start Month: 1

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Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 2
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.010431
SO_x	0.000214
NO_x	0.090862
CO	0.134560

Pollutant	Total Emissions (TONs)
PM_{10}	0.011109
$PM_{2.5}$	0.002974
Pb	0.000000
NH_3	0.000354

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.000943
N_2O	0.000537

Pollutant	Total Emissions (TONs)
CO_2	24.539800
CO_2e	24.723390

- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.000943
N_2O	0.000537

Pollutant	Total Emissions (TONs)
CO_2	24.539800
CO_2e	24.723390

7.1 Demolition Phase

7.1.1 Demolition Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

7.1.2 Demolition Phase Assumptions

- General Demolition Information
Area of Building to be demolished (square feet): 2,500
Height of Building to be demolished (feet): 15

- Default Settings Used: No

- Average Day(s) worked per week: 5

- 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): 40

- 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

7.1.3 Demolition Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.41257	0.00743	3.52633	4.31513	0.08509	0.07828
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.35280	0.00491	3.22260	2.72624	0.14205	0.13069
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Concrete/Industrial Saws Composite [HP: 33] [LF: 0.73]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02330	0.00466	574.35707	576.32812
Rubber Tired Dozers Composite [HP: 367] [LF: 0.4]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02160	0.00432	532.54993	534.37751
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267

	CH_4	N_2O	CO_2	CO_2e
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

7.1.4 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 * HP * LF * EF_{POL}* 0.002205) / 2000

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

7.2 Building Construction Phase

7.2.1 Building Construction Phase Timeline Assumptions

- Phase Start Date
Start Month: 2
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 1
Number of Days: 0

7.2.2 Building Construction Phase Assumptions

- General Building Construction Information
Building Category: Office or Industrial
Area of Building (square feet): 2,500
Height of Building (feet): 15
Number of Units: N/A

- Building Construction Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

7.2.3 Building Construction Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Cranes Composite [HP: 367] [LF: 0.29]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.19758	0.00487	1.83652	1.63713	0.07527	0.06925
Forklifts Composite [HP: 82] [LF: 0.2]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.24594	0.00487	2.34179	3.57902	0.11182	0.10287
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	**SO_x**	**NO_x**	**CO**	**PM_{10}**	**$PM_{2.5}$**
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Cranes Composite [HP: 367] [LF: 0.29]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02140	0.00428	527.46069	529.27080
Forklifts Composite [HP: 82] [LF: 0.2]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02138	0.00428	527.09717	528.90603
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	**N_2O**	**CO_2**	**CO_2e**
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

7.2.4 Building Construction Phase Formula(s)

- Construction Exhaust Emissions per Phase
$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

8. Construction / Demolition

8.1 General Information & Timeline Assumptions

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

- Activity Title: South Park Antenna Field: water line improvements

- Activity Description:
This project includes improvements to existing water lines buried beneath South Park to include up to 5 acres of ground disturbance.

It was assumed the 5-acre (217,800 square feet) disturbance area would be excavated to access buried water lines. Excavation would begin in January 2026 and last approximately 3 months. Excavated material would be reused on site.

- Activity Start Date
Start Month: 1
Start Month: 2026

- Activity End Date
Indefinite: False
End Month: 3
End Month: 2026

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.014308
SO_x	0.000222
NO_x	0.112606
CO	0.185100

Pollutant	Total Emissions (TONs)
PM_{10}	6.503487
$PM_{2.5}$	0.003206
Pb	0.000000
NH_3	0.000321

- Activity Emissions of GHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001026
N_2O	0.000225

Pollutant	Total Emissions (TONs)
CO_2	25.181927
CO_2e	25.274630

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- Global Scale Activity Emissions for SCGHG:

Pollutant	Total Emissions (TONs)
CH_4	0.001026
N_2O	0.000225

Pollutant	Total Emissions (TONs)
CO_2	25.181927
CO_2e	25.274630

8.1 Trenching/Excavating Phase

8.1.1 Trenching / Excavating Phase Timeline Assumptions

- Phase Start Date
Start Month: 1
Start Quarter: 1
Start Year: 2026

- Phase Duration
Number of Month: 3
Number of Days: 0

8.1.2 Trenching / Excavating Phase Assumptions

- General Trenching/Excavating Information
Area of Site to be Trenched/Excavated (square feet): 217,800
Amount of Material to be Hauled On-Site (cubic yards): 0
Amount of Material to be Hauled Off-Site (cubic yards): 0

- Trenching Default Settings
Default Settings Used: No
Average Day(s) worked per week: 5

- 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): 40

- 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

8.1.3 Trenching / Excavating Phase Emission Factor(s)

- Construction Exhaust Criteria Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.39317	0.00542	3.40690	4.22083	0.09860	0.09071
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.45335	0.00542	3.58824	4.59368	0.11309	0.10404
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]						
	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$
Emission Factors	0.18406	0.00489	1.88476	3.48102	0.06347	0.05839

- Construction Exhaust Greenhouse Gases Pollutant Emission Factors (g/horsepower-hour)

Excavators Composite [HP: 36] [LF: 0.38]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02381	0.00476	587.02896	589.04350
Other General Industrial Equipment Composite [HP: 35] [LF: 0.34]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02385	0.00477	587.87714	589.89459
Tractors/Loaders/Backhoes Composite [HP: 84] [LF: 0.37]				
	CH_4	N_2O	CO_2	CO_2e
Emission Factors	0.02149	0.00430	529.70686	531.52468

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

	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	NH_3
LDGV	0.27744	0.00159	0.13852	3.83872	0.00497	0.00440	0.04852
LDGT	0.21600	0.00197	0.16970	3.28614	0.00554	0.00490	0.04104
HDGV	0.73715	0.00451	0.62429	10.01846	0.02095	0.01853	0.08939
LDDV	0.10930	0.00122	0.15785	5.38562	0.00368	0.00339	0.01614
LDDT	0.15876	0.00138	0.44012	4.67603	0.00560	0.00515	0.01670
HDDV	0.10384	0.00424	2.35595	1.41441	0.04087	0.03760	0.06719
MC	2.90785	0.00195	0.77534	12.79439	0.02347	0.02076	0.05541

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

	CH_4	N_2O	CO_2	CO_2e
LDGV	0.01557	0.00499	315.23920	317.11282
LDGT	0.01416	0.00653	389.46150	391.76031
HDGV	0.04939	0.02481	892.51825	901.13888
LDDV	0.05554	0.00064	361.75261	363.33267
LDDT	0.03916	0.00092	408.58241	409.83595
HDDV	0.02456	0.16542	1262.86353	1312.77088
MC	0.10495	0.00272	394.83433	398.26759

8.1.4 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

$CEE_{POL} = (NE * WD * H * HP * LF * EF_{POL} * 0.002205) / 2000$

CEE_{POL}: Construction Exhaust Emissions (TONs)
NE: Number of Equipment
WD: Number of Total Work Days (days)
H: Hours Worked per Day (hours)
HP: Equipment Horsepower
LF: Equipment Load Factor
EF_{POL}: Emission Factor for Pollutant (g/horsepower-hour)
0.002205: Conversion Factor grams to pounds
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

9. Emergency Generator

9.1 General Information & Timeline Assumptions

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

- Add or Remove Activity from Baseline? Add

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

- Activity Title: Frustration Canyon: generators

- Activity Description:
Frustration Canyon: Use of portable generators up to 5-kW. For the purpose of this analysis, it was assumed 10 5-kW gasoline-fired generators would be used for up to 10 hours a day, 20 days a month (2,400 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	1.061280
SO_x	0.047516
NO_x	0.884400
CO	0.559584

Pollutant	Emissions Per Year (TONs)
PM_{10}	0.057968
$PM_{2.5}$	0.057968
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gases:

Pollutant	Emissions Per Year (TONs)
CH_4	0.003722
N_2O	0.000744

Pollutant	Emissions Per Year (TONs)
CO_2	86.832000
CO_2e	86.832000

9.2 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

9.3 Emergency Generator Emission Factor(s)

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

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

- Emergency Generators Greenhouse Gases Pollutant Emission Factor (pounds/horsepower-hour)

CH_4	N_2O	CO_2	CO_2e
0.000046297	0.000009259	1.08	1.08

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 (pounds/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: The OLPFA and Associated Laser Facilities: generators

- Activity Description:
The OLPFA and Associated Laser Facilities: Most commonly, 5-kW generators are used; however, larger generators, including 10 and 60-kW generators may be used. For the purpose of this analysis, it was assumed three 60-kW diesel-fired generators would be used for up to 10 hours a day for 2 weeks (14 days) up to four times a year (560 hours per year).

- Activity Start Date
Start Month: 1
Start Year: 2026

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions of Criteria Pollutants:

Pollutant	Emissions Per Year (TONs)
VOC	0.234360
SO_x	0.197400
NO_x	0.966000
CO	0.645120

Pollutant	Emissions Per Year (TONs)
PM_{10}	0.210840
$PM_{2.5}$	0.210840
Pb	0.000000
NH_3	0.000000

- Global Scale Activity Emissions of Greenhouse Gases:

Pollutant	Emissions Per Year (TONs)
CH_4	0.003889
N_2O	0.000778

Pollutant	Emissions Per Year (TONs)
CO_2	96.600000
CO_2e	111.720000

10.2 Emergency Generator Assumptions

- Emergency Generator
Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 3

- Default Settings Used: No

- Emergency Generators Consumption
Emergency Generator's Horsepower: 100
Average Operating Hours Per Year (hours): 560

10.3 Emergency Generator Emission Factor(s)

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

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

- Emergency Generators Greenhouse Gases Pollutant Emission Factor (pounds/horsepower-hour)

CH_4	N_2O	CO_2	CO_2e
0.000046297	0.000009259	1.15	1.33

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 (pounds/horsepower-hour)