

Final

Environmental Assessment

Advanced Gunfire

White Sands Missile Range, New Mexico

January 2018

Approved for Public Release - Distribution is Unlimited.
OPSEC review conducted by WSMR on 21 September 2017.
OPSEC review conducted by the Navy on 26 September 2017.

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FINDING OF NO SIGNIFICANT IMPACT

Name of the Proposed Action: Advanced Gunfire Environmental Assessment (EA) White Sands Missile Range (WSMR), New Mexico (NM)

Description of the Proposed Action: The DoD is carrying out a multi-year program to develop and mature the science and technologies supporting hypervelocity projectiles (HVPs) and future naval electromagnetic (EM) Railgun weapon systems. The HVP is a low drag, guided projectile capable of executing multiple missions for a number of powder gun systems, including the Navy 5-inch; Navy, Marine Corps, and Army 155-mm systems; along with future EM Railguns. The types of missions performed depends on the gun system and platform. The EA addresses the potential environmental impacts associated with the development of this capability.

The preferred alternative for this EA is Alternative 4. Under this alternative, the proposed action is to construct new facilities at the WSMR Launch Complex 35 East (LC-35E); conduct powder gun HVP tests from LC-35E, Arthur, and Vandal sites at WSMR; and conduct EM Railgun tests from LC-35E. All powder gun tests would utilize inert (no high explosive [HE]) HVPs. The EM Railgun tests would utilize inert slugs, inert HVPs, and live (containing less than 2 lbs HE) HVPs. Impact areas would be limited to existing WSMR weapon impact targets (WITs) and the newly established inert target areas. Live HVPs with HE warheads would only impact in existing WSMR WITs. A 10-ac (4-ha) impact area would be established within a 1,000-ac (405-ha) project impact area within the Northern Call-Up Area (NCA) that would be evacuated for all tests. The use of this impact area outside WSMR boundaries would only be conducted on an as-needed basis and would not be expected to exceed 20 operations per year.

Under the No-Action Alternative, no EM Railgun HVP activities would be conducted at WSMR or on the NCA, and the proposed construction activities at LC-35E would not be conducted. Powder gun tests utilizing HVP would continue to be conducted at the Arthur and Vandal sites.

Purpose and Need: The purpose of the proposed action is to construct supporting facilities, and establish the capability to test, develop, and evaluate conventional powder guns, EM Railgun and HVP weapon technology.

Environmental Consequences: The EA contains the results of an impact analysis of the proposed action and the No-Action Alternative on the affected environment, including cultural resources; soil erosion effects; biological resources; electric utilities; land use; traffic and transportation systems; and human health and safety. No significant impacts on the environment have been identified for the HVP and EM Railgun testing activities and no significant cumulative impacts are expected.

Conclusion: Based on the analysis in this EA and consideration of the described best management practices and mitigation measures listed in Chapter 3, and in accordance with the guidelines for determining the significance of proposed federal actions (40 C.F.R. 1508.27) and Environmental Protection Agency (EPA) criteria for initiating an Environmental Impact Statement (EIS) (40 C.F.R. 6.207), WSMR has concluded that the construction of new facilities at WSMR and HVP and EM Railgun testing activities will not result in a significant effect on the environment. Applicable federal, state, and local laws and regulations would be followed. The White Sands Test Center and WSMR have determined that an EIS pursuant to the NEPA is not required, and this Finding of No Significant Impact is hereby submitted.


ERIC L. SANCHEZ
BG, USA
Commanding


Date

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U.S. ARMY WHITE SANDS MISSILE RANGE
WHITE SANDS MISSILE RANGE, NEW MEXICO 88002-5048
ENVIRONMENTAL ASSESSMENT

TITLE: Environmental Assessment for Advanced Gunfire, White Sands Missile Range, New Mexico

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14. ABSTRACT This Environmental Assessment contains the results of an impact analysis of the proposed action and the No-Action Alternative on the affected environment, including cultural resources; soil erosion effects; biological resources; electric utilities; land use; traffic and transportation systems; and human health and safety. No significant impacts on the environment have been identified for the hypervelocity projectiles and Electromagnetic Railgun testing activities and no significant cumulative impacts are expected.					
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Acronyms and Abbreviations

ac	acre	lb	pound
ACHP	Advisory Council on Historic Preservation	LC-35E	Launch Complex 35 East
AR	Army Regulation	LUASP	Land Use and Airspace Strategy Plan
ARMS	Archaeological Records Management Section	M	medium
ARPA	Archaeological Resources Protection Act	m	meter
ATEC	U.S. Army Test and Evaluation Command	m/s	meters per second
ATV	all-terrain vehicle	MBTA	Migratory Bird Treaty Act
BLM	Bureau of Land Management	mi	mile
BMP	best management practice	mph	miles per hour
CEQ	Council on Environmental Quality	NAVSEA	Naval Sea Systems Command
CFR	Code of Federal Regulations	NCA	Northern Call-Up Area
CRM	Cultural Resources Manager	NEPA	National Environmental Policy Act
DA PM	Department of the Army Pamphlet	NHPA	National Historic Preservation Act
DoD	Department of Defense	NM	nautical mile
E	endangered	NMCRIS	New Mexico Cultural Resources Information System
EA	environmental assessment	NMDGF	New Mexico Department of Game and Fish
EIS	environmental impact statement	NRHP	National Register of Historic Places
EM	electromagnetic	NSWC	Naval Surface Warfare Center
EPEC	El Paso Electric Company	ONR	Office of Naval Research
EOD	explosive ordnance disposal	PHD	Port Hueneme Division
ESA	Endangered Species Act	QD	quantity-distance
FAA	Federal Aviation Administration	RDT&E	research, development, test, and evaluation
FEIS	final environmental impact statement	REC	Record of Environmental Consideration
FONSI	Finding of No Significant Impact	ROI	region of influence
ft/s	feet per second	SGCN	species of greatest conservation need
FTS	flight termination system	SHPO	State Historic Preservation Office
GPS	Global Positioning System	SLO	State Land Office
GHz	Gigahertz	SOC	species of concern
H	high	SOP	standard operating procedure
ha	hectare	T	threatened
HCPI	Historic Cultural Properties Inventory	U.S.	United States
HE	high explosives	USC	United States Code
HERO	Hazards of Electromagnetic Radiation to Ordnance	USFWS	U.S. Fish and Wildlife Service
HPD	Historic Preservation Division	UXO	unexploded ordnance
HVP	hypervelocity projectile	VEC	valued environmental components
I-10	Interstate Highway 10	VH	very high
I-25	Interstate Highway 25	VL	very low
IA	Impact Area	WCA	Western Call-Up Area
ICNIRP	International Commission on Non-Ionizing Radiation Protection	WEG	wind erodibility group
ILP	integrated launch package	WIT	weapon impact target
INCRMP	Integrated Natural and Cultural Resources Management Plant	WSD	White Sands Detachment
km	kilometer	WSMR	White Sands Missile Range
kVA	kilovolt-ampere	WSPG	White Sands Proving Grounds
L	low		
LA	Laboratory of Anthropology		

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CHAPTER 1 INTRODUCTION

This environmental assessment (EA) evaluates possible environmental effects associated with the proposed research, development, testing, and evaluation (RDT&E) activities and construction of a test facility in support of the Department of Defense's (DoD's) hypervelocity projectile (HVP) and electromagnetic (EM) Railgun technologies on White Sands Missile Range (WSMR). This EA also provides an update to conventional gun (powder gun) RDT&E activities analyzed in the *Environmental Assessment for the Proposed Advanced Gun Weapons System Technology Programs at White Sands Missile Range, New Mexico* (NAWCWD 1995).

This EA has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (42 United States Code [USC] §§ 4321-4370d), and the Department of the Army Environmental Analysis of Army Actions: Final Rule (32 Code of Federal Regulations [CFR] Part 651).

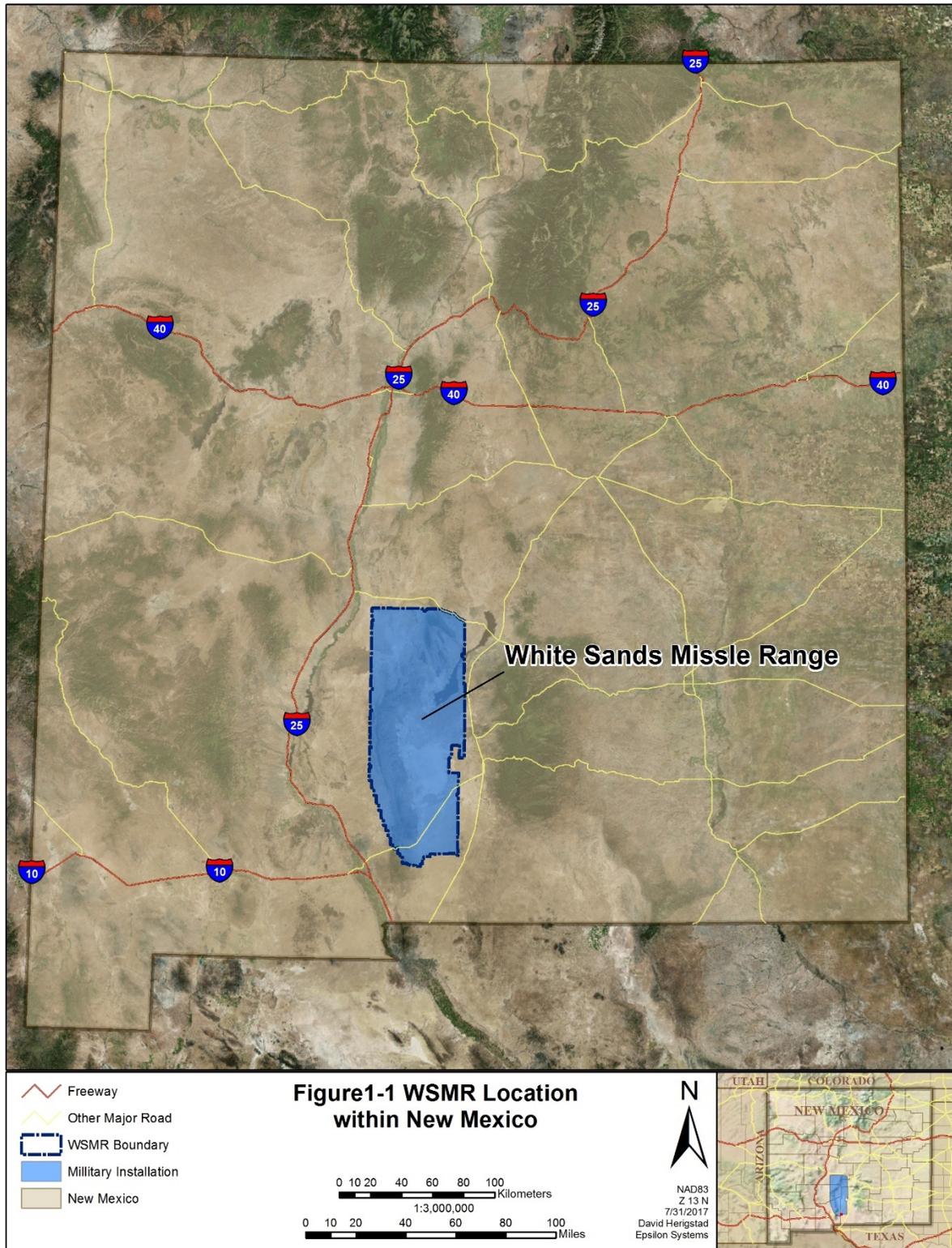
1.1 BACKGROUND

In 1945, the War Department established the White Sands Proving Grounds (WSPG), totaling approximately 810,400 acres (ac), through a combination of land purchases and other acquisitions. In 1952, by way of Public Land Order 833, the area was expanded significantly to nearly its present size of 2.2 million ac (886,000 hectares [ha]) through the withdrawal of federal land for military purposes. Other minor acquisitions and land adjustments have also contributed to the total acreage within the current station boundaries (WSMR 2009).

WSPG became known as WSMR in April 1958. The current mission of WSMR is to provide the Army, Navy, Air Force, DoD, and other customers high-quality services for RDT&E and training operations in support of national defense. WSMR currently functions as an outdoor laboratory consisting of a large complex of test ranges, launch sites, impact areas, and instrumentation sites required to develop and test tactical and strategic weapons and weapons systems (Figure 1-1).

Associated with the land area, restricted airspace overlies and extends beyond the WSMR land boundary. The Federal Aviation Administration (FAA) authorizes WSMR to control WSMR-restricted airspace when needed, and WSMR returns control of its airspace to the FAA when not in use.

WSMR also uses two airspace extension areas: the Western Call-up Area and the Northern Call-up Area (WCA and NCA), which provide an additional 611,146 and 867,330 ac (247,323 and 350,997 ha), respectively, of land and restricted special use airspace, resulting in approximately 3,676,450 total ac (1,487,812 ha) available for testing at WSMR.



The DoD is carrying out a multi-year program to develop and mature the science and technologies supporting HVPs and future naval EM Railgun weapon systems. The HVP is a low drag, guided projectile capable of executing multiple missions for a number of gun systems, including the Navy 5-inch; Navy, Marine Corps, and Army 155-mm systems; along with future EM Railguns. The types of missions performed depends on the gun system and platform. The HVP's low drag aerodynamic design enables high-velocity maneuverability and decreased time-to-target. These attributes, coupled with accurate guidance electronics, provide low-cost mission effectiveness against current threats and the ability to adapt to future air and surface threats (ONR 2012). The high-velocity compact design of the HVP eliminates the need for a rocket motor to extend gun range. Firing smaller, more accurate rounds decreases the likelihood for collateral damage and provides for deeper magazines and improved safety.

Rather than using gun powder and rocket motors for propulsion, the EM Railgun uses electrical power to propel projectiles. Magnetic fields created by high electrical currents accelerate a sliding metal conductor, or armature, between two rails to launch projectiles up to 8,200 feet per second (ft/s) or 2,500 meters (m) per second (m/s). Defense planners are targeting an initial EM Railgun 50- to 100-nautical miles (NM; 93 to 185 km) firing capability with the potential for expansion up to 220 NM (407 kilometers [km]). Testing beyond 103 NM (191 km) would not be conducted at WSMR. In contrast, the standard 5-inch gun used on Navy ships has a range of slightly more than 13 NM (24 km) and a muzzle velocity of 2,600 ft/s (800 m/s) (Navy 2014).

With their increased velocity and extended range, EM Railguns, will give warfighters a multi-mission capability, allowing them to conduct precise naval surface fire support for land strikes, ship defense, and surface warfare to deter enemy vessels. The extended range will allow ships to operate well offshore, beyond the reach of shore guns, keeping personnel and physical assets safer. The ability of the EM Railgun to deliver persistent, time-critical, precision strikes without the use of propellants will revolutionize war-fighting capabilities from the sea.

As provided in the *Environmental Assessment for U.S. Navy Testing of Hypervelocity Projectiles and an EM Railgun at Wallops Flight Facility, Wallops Island, Virginia* (Navy 2014), the following mission requirement criteria must be met by the test range conducting HVP/EM Railgun RDT&E operations:

- a. Location on a DoD-controlled range capable of flight distances up to 100 NM (185 km);
- b. Ability to support projectile firings from relevant gun systems, including EM Railguns, 5-inch guns, and other conventional guns;
- c. Incorporates a fire control sensor, enabling the acquisition of the projectile upon leaving the gun barrel; and
- d. Accommodates current relevant combat systems interfaces.

The proposed action would involve land range testing of the HVP and EM Railgun technologies, allowing for long-range firing and recovery of HVPs as needed.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to advance HVP and EM Railgun technology RDT&E programs to meet the modern warfighter's needs in a manner that allows:

- HVP RDT&E activities involving numerous gun platforms for multiple military services;

- EM Railgun firing distances up to 100 NM (185 km) with the ability to traverse and fire in more than one direction;
- Integration of the HVP and EM Railgun technologies with current Defense-relevant combat systems; and
- Recovery of HVP for post-test evaluation, as needed.

The need for the proposed action is to enable the DoD to meet current and future mission requirements, including:

- The requirements for current land-based powder gun systems to fire projectiles at higher velocities, over greater distances, with greater accuracy.
- Time critical strike capability “hypervelocity weapons for attacking time critical targets.”
- High lethality (energy on target) weapons with the ability to defeat “bunkers and hardened targets”
- All-electric ship requirements for current and future ships. This fundamental shift to electric propulsion opens the door for a new generation of electric weapons, including the EM Railgun.
- Long-range firepower support from the sea. The modern military needs to operate farther from hostile shores because of exposure to longer-range enemy anti-ship weapons
- Reduced cost in munitions spending; HVP and EM Railgun munitions are more cost effective than a missile.
- Shipboard logistics advantages; EM Railgun projectiles are smaller, requiring less storage room compared to existing onboard munitions.
- Shipboard safety advantages; EM Railgun projectiles are fired with electricity instead of chemical propellants (gun powder). This switch to electric weapons reduces the explosive hazards on a ship.

1.3 DECISIONS TO BE MADE

WSMR has served as the lead agency in preparing this EA. As the federal landowner, WSMR possesses both jurisdiction by law and special expertise pertaining to the environmental resources within and adjacent to WSMR. Moreover, as a federal agency, the U.S. Army has its own NEPA policies and procedures (32 CFR Part 651) with which it must comply. As such, this EA has been prepared to satisfy the Army’s NEPA obligations.

The decisions to be made by WSMR on the basis of the analysis contained within the EA include:

- Whether to establish new impact areas for inert HVP (no high explosives [HE]) on WSMR lands; and
- Whether to establish a new impact area for inert HVP within the NCA on state lands in Socorro County, New Mexico. This new impact area is needed to accommodate the maximum 100 NM (185 km) firing range specified in the purpose of the proposed action.

This EA provides data for analysis and consideration of potential environmental impacts. WSMR will be responsible for approving the EA.

This EA is required to assess the potential environmental impacts of implementing the operation of these HVP/EM Railgun RDT&E operations. Based on an examination of the data generated and an assessment of the magnitude of the potential impacts, a determination would be made indicating if further study is

required, via an Environmental Impact Statement (EIS), or if a Finding of No Significant Impact (FONSI) is warranted.

1.4 RELATED ENVIRONMENTAL DOCUMENTATION

Army agencies are encouraged to tier off existing NEPA documentation. Tiering allows analysis of actions at a programmatic level for those programs that are similar in nature or broad in scope (40 CFR 1502.4[c], 1502.20, and 1508.23). This level of analysis will eliminate repetitive discussions of the same issues and focus on the key issues at each appropriate level of project review. When a broad programmatic EA or EIS has been prepared, any subsequent EIS or EA on an action included within the entire program or policy (particularly a site-specific action) need only summarize issues discussed in the broader statement and concentrate on the issues specific to the subsequent action. This EA tiers off the *Final Environmental Impact Statement for Development and Implementation of Range-Wide Mission and Major Capabilities at White Sands Missile Range, New Mexico* (WSMR Final Environmental Impact Statement [FEIS; WSMR 2009]). The WSMR FEIS serves as a baseline document for subsequent project-specific environmental analysis and provides only a general evaluation of gunfire RDT&E activities. The WSMR FEIS provides information about siting an action on the range, defines land use categories, and considers impacts from groups of activities conducted on WSMR. The evaluations, environmental descriptions, and pertinent information associated with WSMR testing procedures, policies, and plans are hereby incorporated by reference.

Other documents have been reviewed and used as references, supporting the analysis of the proposed action. These documents include:

- *Environmental Assessment for the Proposed Advanced Gun Weapons System Technology Programs at White Sands Missile Range, New Mexico*, March 1995 (NAWCWD 1995). This EA analyzed the potential effects of the construction and operation of two permanent and two portable gun sites and the designation and use of related extended range impact areas. The gun systems included in the analysis were 5-in through 8-in gun systems used by the Navy and/or future gun systems proposed by the Navy or other military organizations.
- *Environmental Assessment – U.S. Navy Testing of Hypervelocity Projectiles and an Electromagnetic Railgun at Wallops Flight Facility, Wallops Island, Virginia*, May 2014 (Navy 2014). This EA analyzed the impacts associated with the installation and operation of a 5-in powder gun and an EM Railgun, testing of HVPs, integration of HVPs with the EM Railgun, and integration the HVP/EM Railgun weapon system with combat systems at Naval Sea Command's (NAVSEA's) Surface Combat Systems Center, located at the National Aeronautics and Space Administration's Wallops Flight Facility on Wallops Island, Virginia.
- *Final Programmatic Environmental Assessment for Surface-to-Surface Testing on White Sands Missile Range, New Mexico*, August 2004 (Army 2004). The surface-to-surface systems analyzed in this EA fit within ranges for fuel type, overall weight, and payload type criteria. The testing includes missile assembly, test preparations, and launch and flight test activities at established sites on Fort Bliss (Texas) and WSMR for impact and engagement of approved ground targets with associated debris recovery.
- *Draft Environmental Assessment for Extended Range Capabilities, White Sands Missile Range, New Mexico*, August 2017 (WSMR 2017). This EA analyzes the effects of testing a suite of

extended range launch test articles comprised of surface-to-air, surface-to-surface, and air-to-air articles while operating new extended airspace corridors in and beyond WSMR's restricted airspace over the NCA. It also designates and utilizes a new 1,000-ac (405-ha) debris impact area in the NCA.

1.5 PUBLIC PARTICIPATION

A public meeting was held on October 5, 2017, at the Macey Center on the Campus of New Mexico Institute of Mining and Technology in Socorro, New Mexico to solicit public comments on the preliminary draft EA. Notice of this meeting will be published in area newspapers including the *El Defensor Chieftain*, the *Las Cruces News-Sun*, and the *Alamogordo Daily News*, the *Valencia County News-Bulletin*, and the *Albuquerque Journal*. Public input was taken in the form of written comments. The preliminary draft EA was posted on a DoD public website and hardcopies were placed in area libraries. The libraries included the Socorro Public Library and the Thomas Branigan Memorial library in Las Cruces. All public comments are provided in Appendix A of this EA.

Once the final EA is complete, a FONSI for the document will be published in the same newspapers listed above, with the final draft EA placed in local libraries and on the same DoD public website for a 30-calendar-day public comment period.

CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

This section provides a general overview of the proposed action, which is to advance HVP and EM Railgun technology RDT&E programs to meet the modern warfighter's needs. The conventional powder gun tests would be conducted by multiple DoD groups, including the U.S. Navy; the U.S. Army, and Engineering Center; and the U.S. Marine Corps. The subsections below provide details including testing locations, construction activities, description of test procedures, ground and aerial targets, impact areas, recovery of test articles, and testing frequency. Section 2.2 describes the alternative scenarios under which the proposed action may be conducted.

2.1.1 Testing Locations

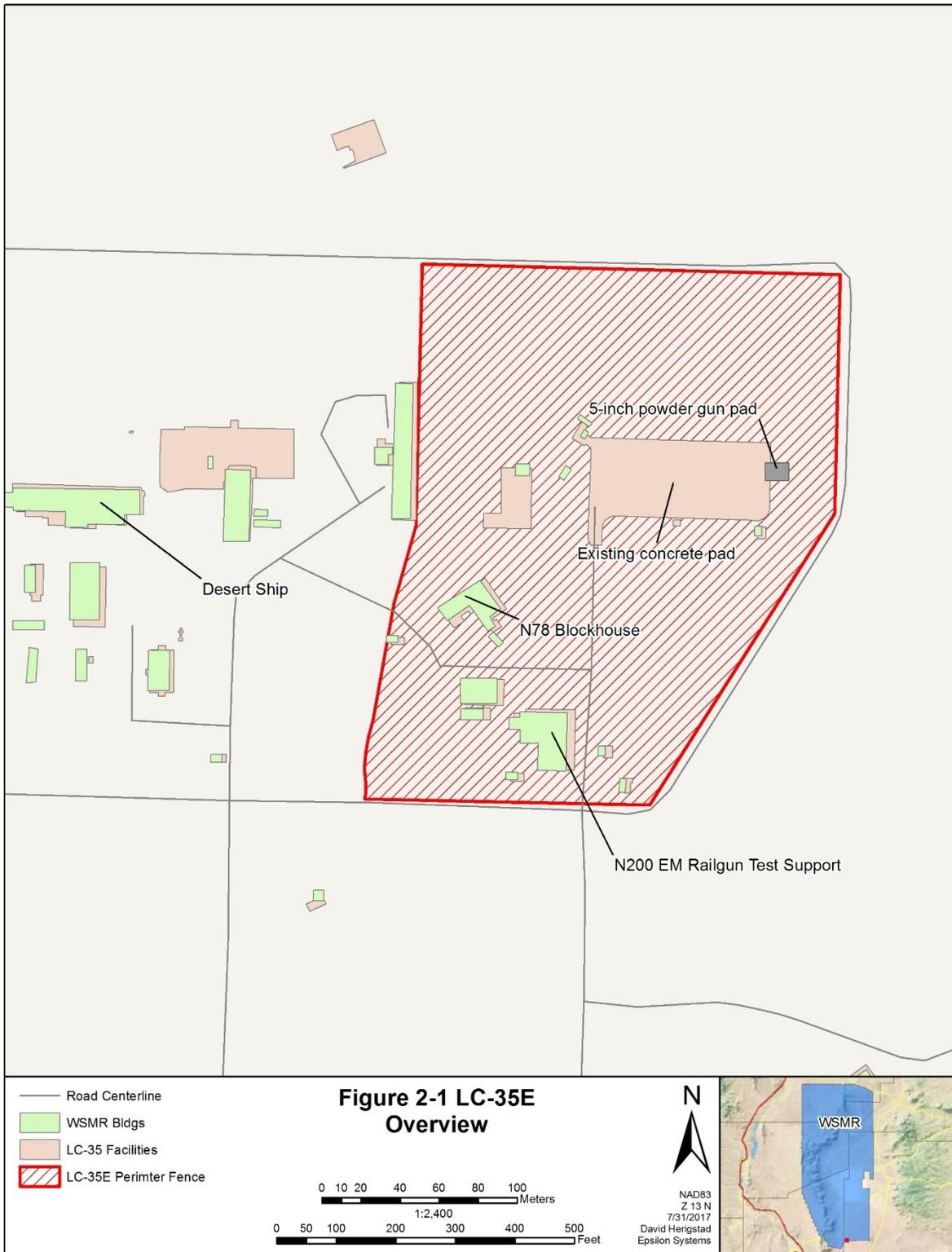
2.1.1.1 LC-35E

Launch Complex 35 East (LC-35E) is an approximately 14.4-ac (5.8-ha) site surrounded by a perimeter fence (Figure 2-1). Building N78, the Navy Blockhouse, would provide personnel shelter and test control for the proposed action activities. LC-35 is immediately west of LC-35E and houses the Desert Ship. The Desert Ship contains the combat system interfaces as specified in mission requirement (d) Section 1.1 of this EA.

Proposed construction activities at LC-35E include:

- Improvements to an existing 125 ft x 300 ft (38 m x 91 m) concrete pad to house the EM Railgun;
- Upgrade of electrical service to support EM Railgun;
- Refurbishment of the N78 Blockhouse for test operations and personnel shelter;
- Repurposing of the N200 building for EM Railgun test support;
- Construction of a new 30 ft x 40 ft (9 m x 12 m) concrete pad to mount the 5-inch powder gun; and
- Installation of the EM Railgun, 5-inch powder gun, and support equipment.

The EM Railgun system would include the EM Railgun launcher, a test stand, consolidation van(s), and pulsed power containers (Figure 2-2). A contractor lay-down area would be graded and temporarily fenced during construction. Construction equipment and building materials would be stored within this area. When construction has ended, the lay-down area would be cleaned and the fence removed.



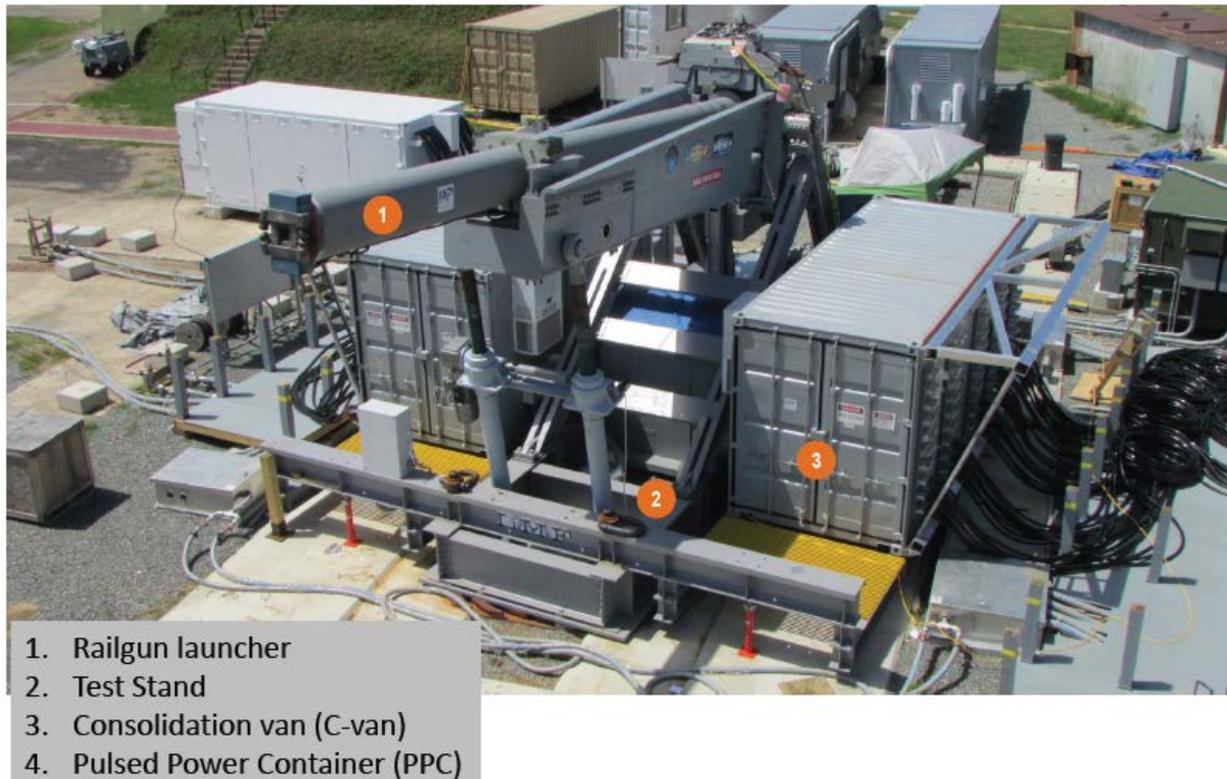
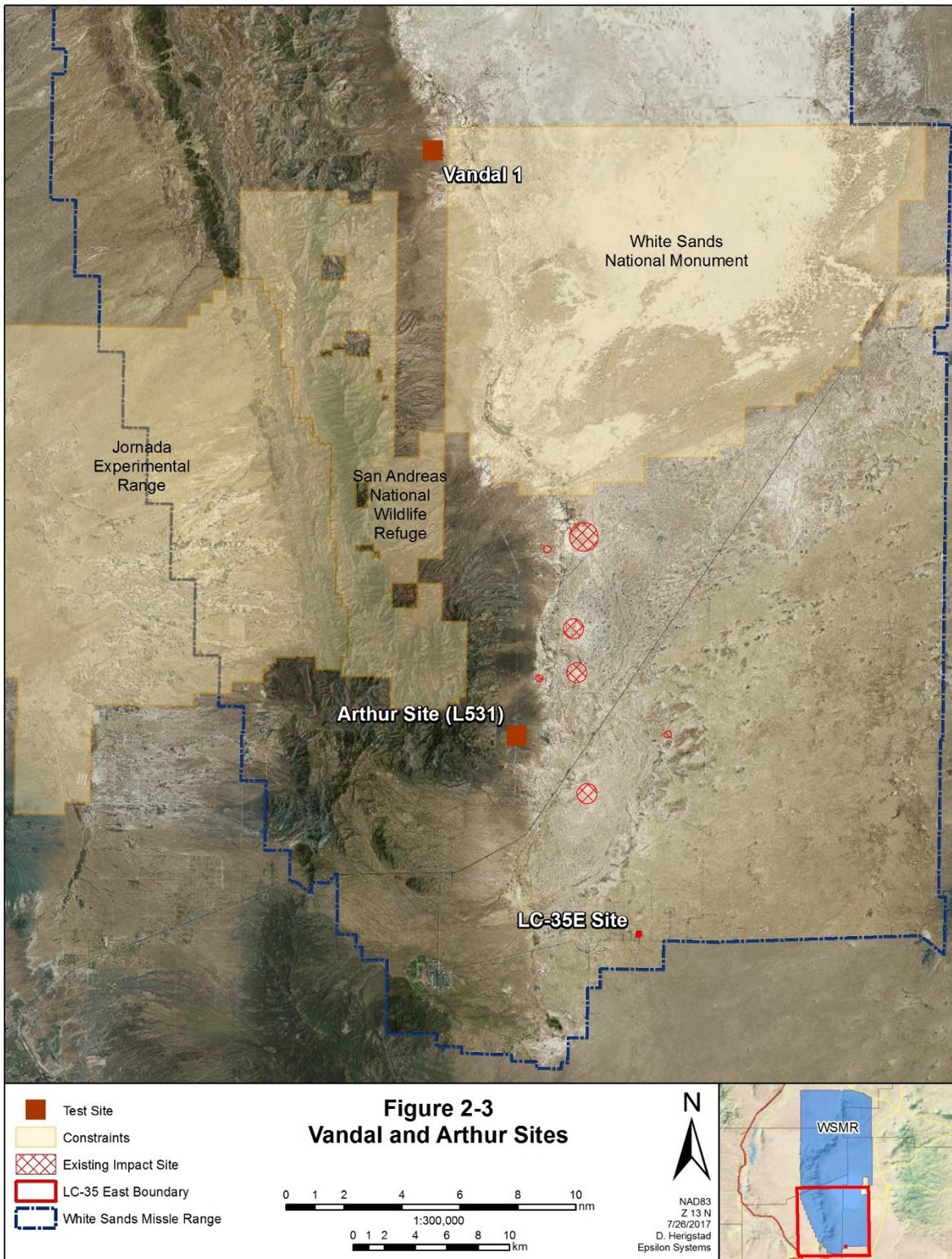


Figure 2-2. Representative EM Railgun Layout

2.1.1.2 Other Gun Sites

In addition to the stationary 5-inch gun position at LC-35E, multiple existing locations would be used for proposed mobile powder gun tests. These other locations would allow firing distances to meet a wide range of mission requirements to various impact sites that are known to not contain sensitive biological or cultural resources. The candidate locations include Arthur and Vandal sites (Figure 2-3). Tests from the Arthur Site would use impact areas south of the White Sands National Monument, and the Vandal Site tests would impact an area approximately 32 NM (59 km) north of the site. The gun systems at these sites would include, but not be limited to, 5-inch guns and 155-mm guns.



2.1.2 Test Descriptions

There would be three types of tests conducted under the proposed action: checkout shots, HVP shots from the EM Railgun, and HVP shots from conventional powder guns. The HVP assembly for a gun test is referred to as the integrated launch package (ILP). EM Railgun ILPs are comprised of an armature, the projectile (slug or HVP), and sabots. A powder gun test ILP contains a pusher plate, an HVP, and sabots. Figures 2-4, 2-5, and 2-6 are diagrams of the ILPs to be used in the proposed action.

Energy to fire the EM Railgun is provided by a pulse power system, comprised of capacitors for energy storage and power supplies to charge the capacitors. An EM Railgun accelerates the ILP down the launcher barrel through a phenomenon called Lorentz Force. In a routine EM Railgun firing:

1. A switch closes, allowing current to flow through the gun rails and the ILP armature;
2. A magnetic field is generated as current flows through the circuit;
3. The magnetic field interacts with the armature current generating a Lorentz Force, propelling the armature down the barrel; and
4. The armature falls off and sabot petals separate from the projectile after the ILP exits the muzzle.

Figure 2-7 provides an overview of how an EM Railgun system fires a projectile.

EM Railgun Checkout Tests

Checkout tests would be performed to determine the operational condition of the EM Railgun launcher and its associated instrumentation systems. The projectiles used in this test category are non-aerodynamic slugs, which follow ballistic (unguided) flight paths. The armatures and slugs would be inert, containing no hazardous or explosive materials. Initial checkout tests would utilize ILPs with 5.5-pound ([lb], 2.5-kilogram [kg]) armatures and 34-lb (15.5-kg) slugs, totaling 39.5 lb (18 kg). The maximum distance of a checkout test slug would be approximately 4.3 NM (8 km).

EM Railgun HVP Tests

Under the proposed action, HVPs would be fired from the EM Railgun for various system-level demonstrations at speeds up 6,560 ft/s (2,000 m/s) and ranges to 100 NM (185 km). Projectiles may be guided and include telemetry. Typical gun range instrumentation would be used. HVP tests would be performed against ground and aerial targets.

Three types of projectiles would be tested:

- An inert variant with no electronics that flies a ballistic trajectory
- An inert variant with electronics that has the ability to maneuver
- A live (containing HE) variant with electronics that has the ability to maneuver

The live variant would contain less than 2 lb (0.9 kg) of explosives and would be used against ground or air targets. These projectiles are intended to burst and fragment just prior to striking the target.

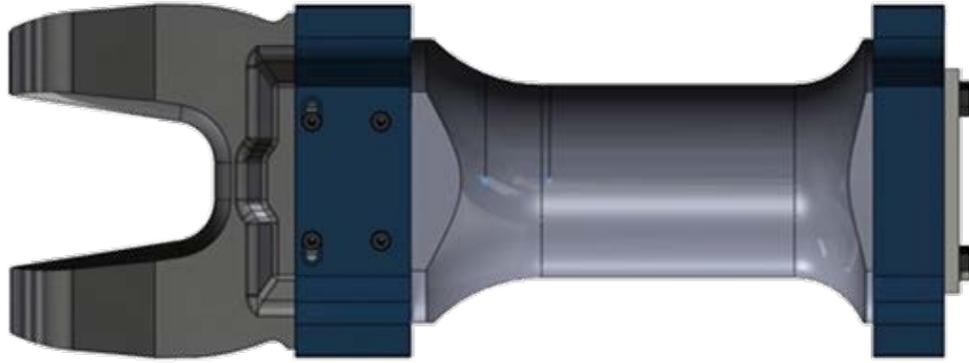


Figure 2-4. Slug Integrated Launch Package

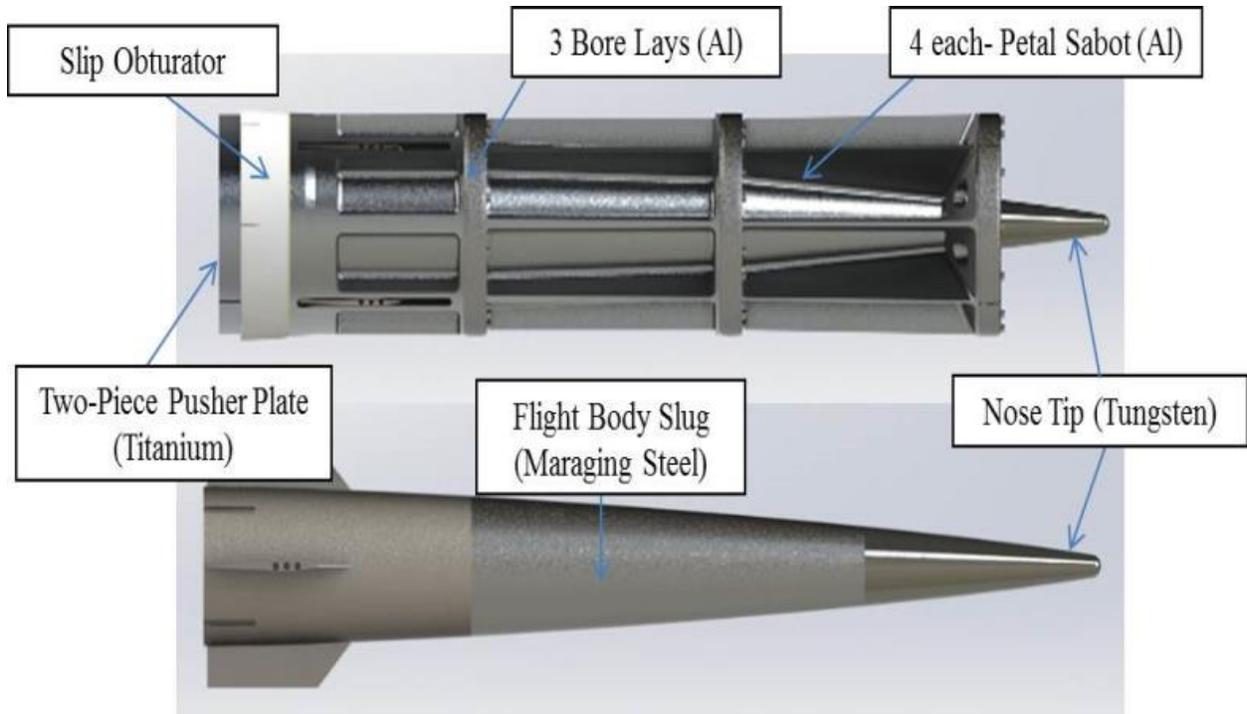


Figure 2-5. Powder Gun HVP Integrated Launch Package

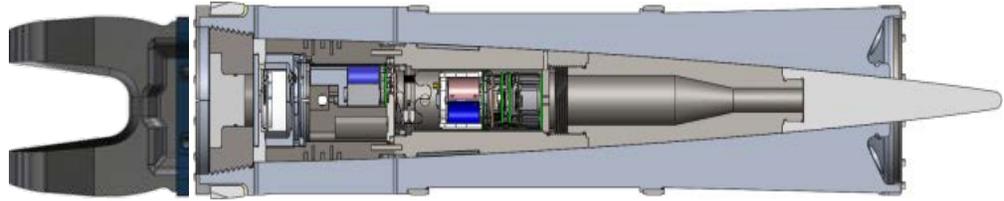


Figure 2-6. EM Railgun HVP Integrated Launch Package

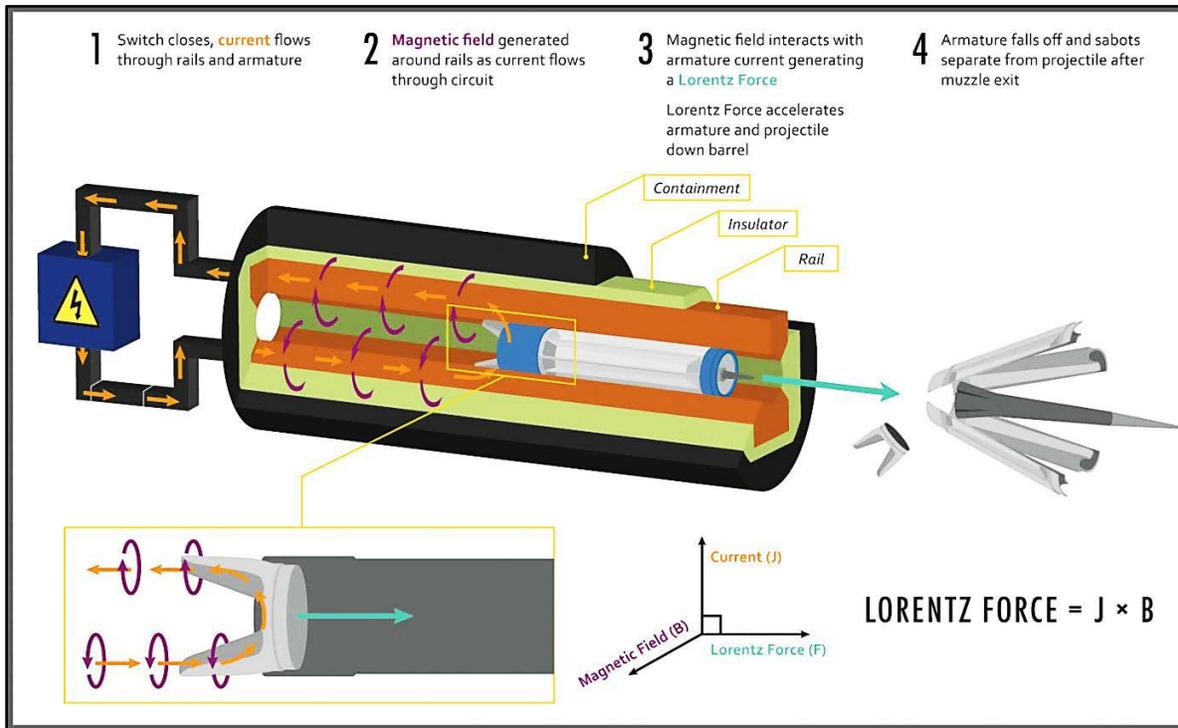


Figure 2-7. EM Railgun Mechanics

Powder Gun HVP Tests

HVPs would be fired from various conventional powder guns at speeds up to 2,908 miles per hour ([mph], 1,300 m/s) and at ranges of approximately 35 NM (65 km). The same three types of projectiles described above may be fired from the conventional guns. Typical gun range instrumentation is expected to be used. Figure 2-8 shows a representative powder gun to be used as part of the proposed action.



Figure 2-8. Conventional 5-in Powder Gun

2.1.3 Ground and Aerial Targets

Various approved ground and aerial targets would be used in support of the proposed action. More in-depth descriptions of the approved targets, impact areas, and flight paths are provided in the *Programmatic Environmental Assessment for Surface-to-Surface Testing on White Sands Missile Range, New Mexico* (Army 2004) and the *Final Environmental Impact Statement for Development and Implementation of Range-Wide Mission and Major Capabilities at White Sands Missile Range, New Mexico* (WSMR 2009).

2.1.4 Impact Areas

This section provides descriptions of the impact areas expected to be utilized through execution of the proposed action.

2.1.4.1 Sabot Debris Areas

When the projectile is fired, the sabots fall to the ground at distances between 50 and 2,000 ft (15 and 610 m) from the gun, in the direction of fire. The sabots are comprised of inert aluminum or plastic and would be recovered after each test.

2.1.4.2 Slug Impact Area

Checkout slugs would be expected to fall within a rectangular area 4.3 NM (8 km) long x 0.54 NM (1 km) wide, immediately north of the LC-35E launch site (Figure 2-9). All checkout slugs would be recovered after tests.

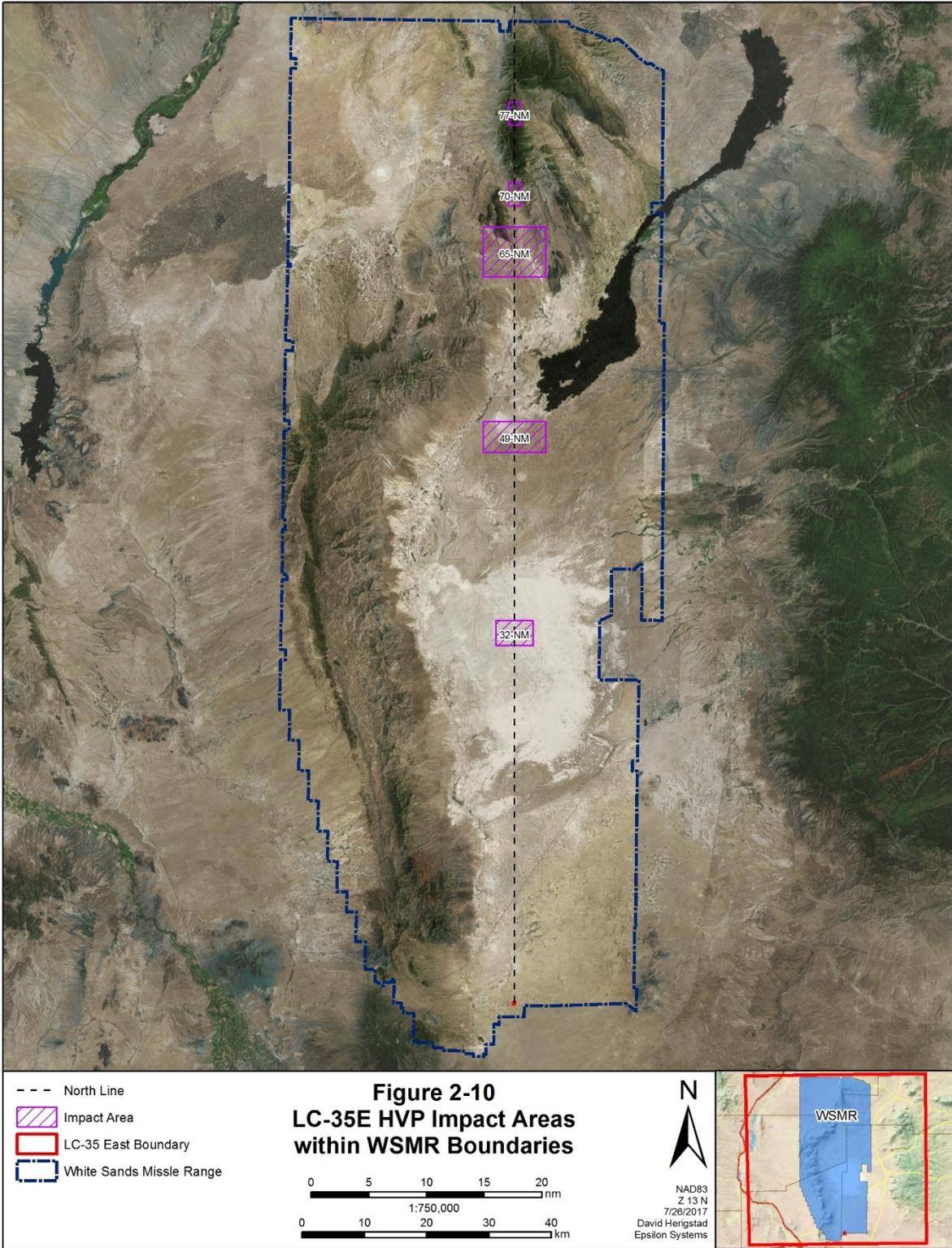
2.1.4.3 Impact Sites Associated with LC-35E HVP Tests

The EM Railgun and 5-inch gun guided HVP at LC-35E would be fired along a true north trajectory. The 5-inch gun tests would be fired at impact areas at 32 NM (59 km) from LC-35E. To test EM Railgun shots at different power levels and firing angles, a variety of impact area distances would be needed. Figure 2-10 provides an overview of the guided HVP test impact areas. Further description of each area is provided below.

Initial HVP tests would involve inert projectiles without guidance electronics. These tests would follow ballistic trajectories with relatively high variance in final impact areas. To accommodate this level of variance, impact areas for this category of HVP test would need to be larger than those for the guided HVPs.

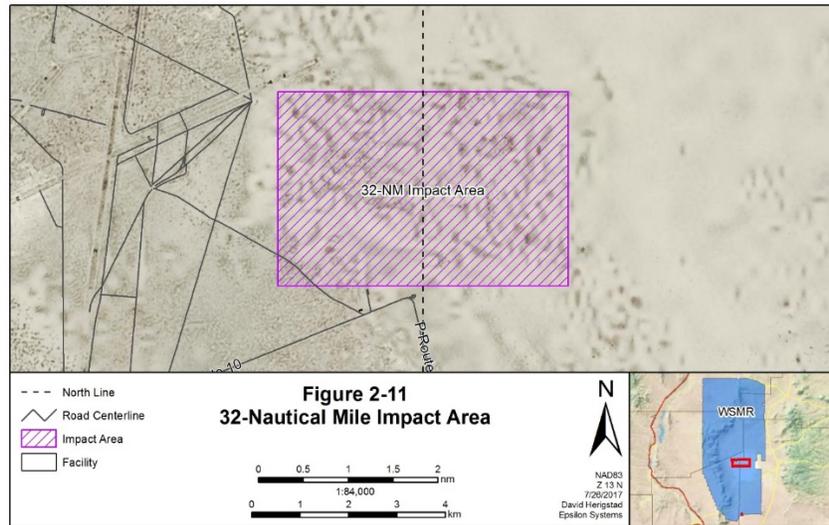
Guided HVP test impact areas would range +/-0.5 NM (0.93 km) east/west and +/- 1 NM (1.85 km) north/south from the center point. As such, each guided HVP impact area would be a 1 NM x 2 NM (1.85 km x 3.7 km) rectangle. Guided HVP would also impact in existing weapon impact targets (WITs) within WSMR boundaries. All HVP tests would avoid any intentional impact to range infrastructure or known sensitive environmental resources.





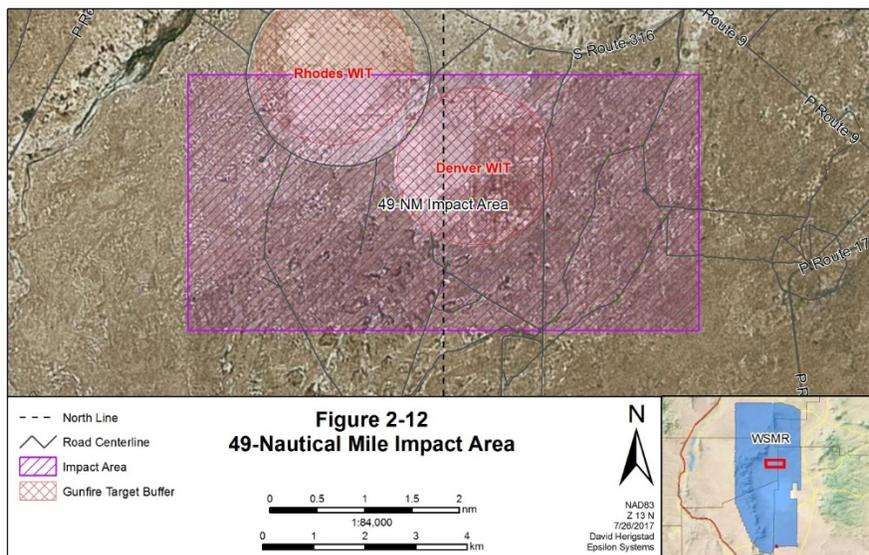
32-Nautical Mile

Located on the true north trajectory line 32 NM (59 km) from the LC-35E site, this impact area would be critical in establishing test parameters of the EM Railgun operations, as it would be used to compare the EM Railgun performance to powder guns at their nominal distance. This impact area would be 2.2 NM x 3.2 NM (4 km x 6 km) and would be used for inert unguided and guided HVP tests. Figure 2-11 provides an overview of this impact area.



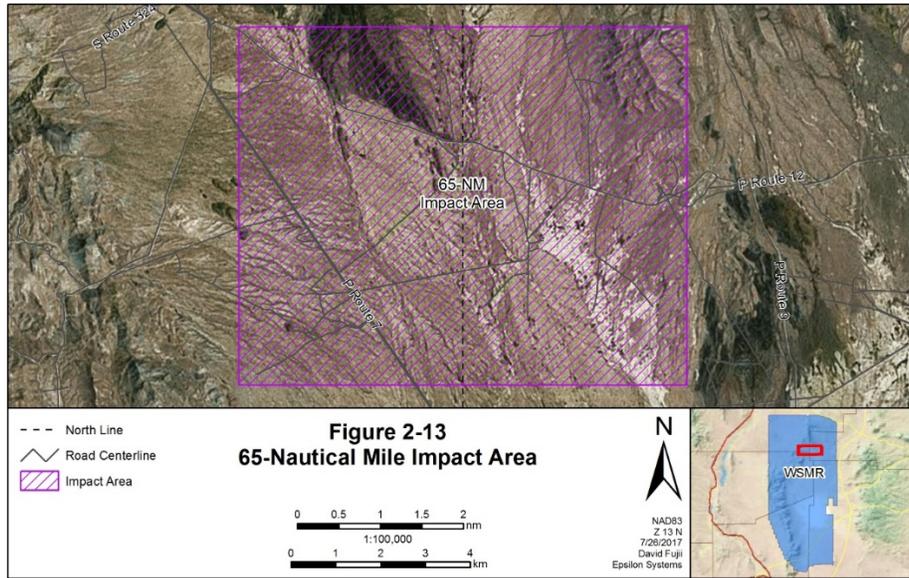
49-Nautical Mile

This impact area centered on the true north trajectory 49 NM (91 km) from the LC-35E site would utilize the Denver and Rhodes WITs and could accommodate live HVP tests with HE warheads, as well as inert HVP tests (Figure 2-12). This impact area would be 2.7 NM x 5.4 NM (5 km x 10 km) and would be used for unguided and guided HVP tests.



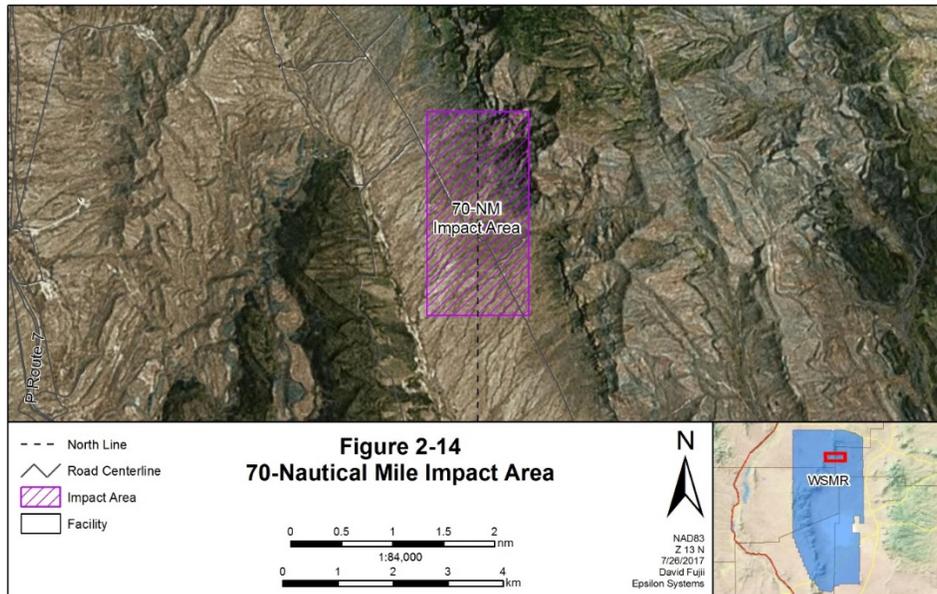
65-Nautical Mile

This impact area would be centered on the true north trajectory 65 NM (120 km) from the LC-35E site (Figure 2-13). This impact area would be 4.3 NM x 5.4 NM (8 km x 10 km) and would be used for inert unguided and guided HVP tests.



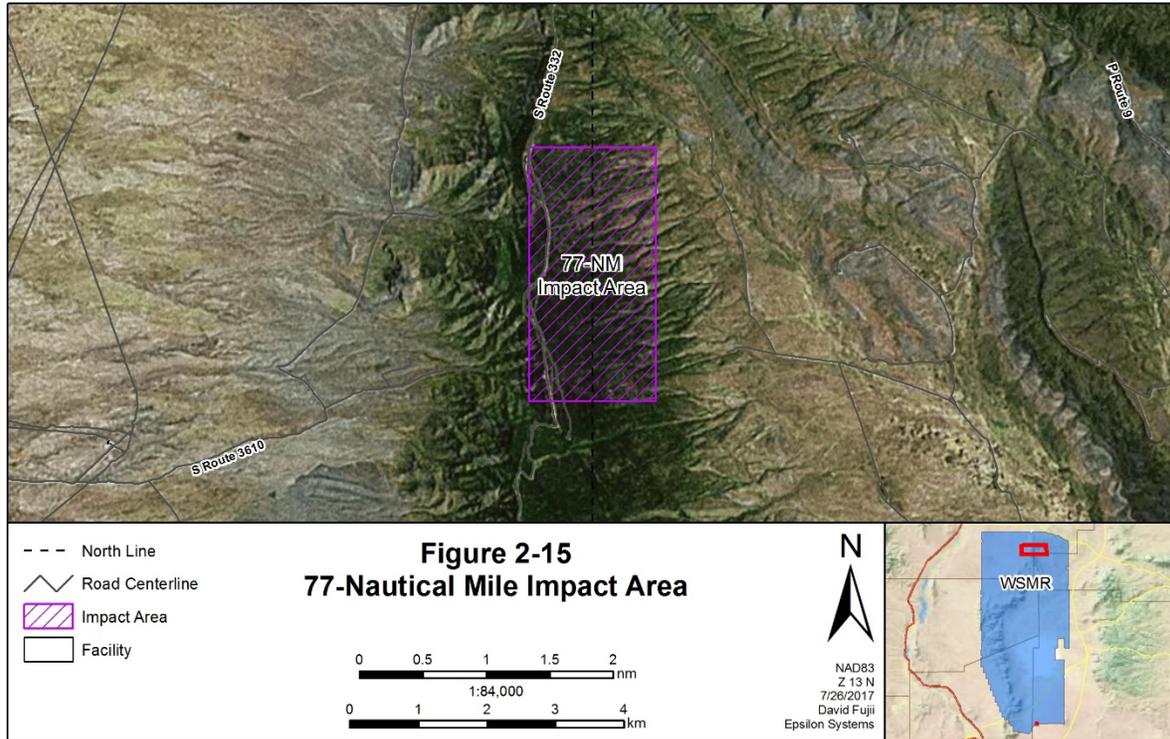
70-Nautical Mile

This impact area would be centered on the true north trajectory 70 NM (130 km) from the LC-35E site (Figure 2-14). The 70-NM Impact Area would be 1 NM x 2 NM (1.85 km x 3.7 km) and would be used for inert guided HVP tests only.



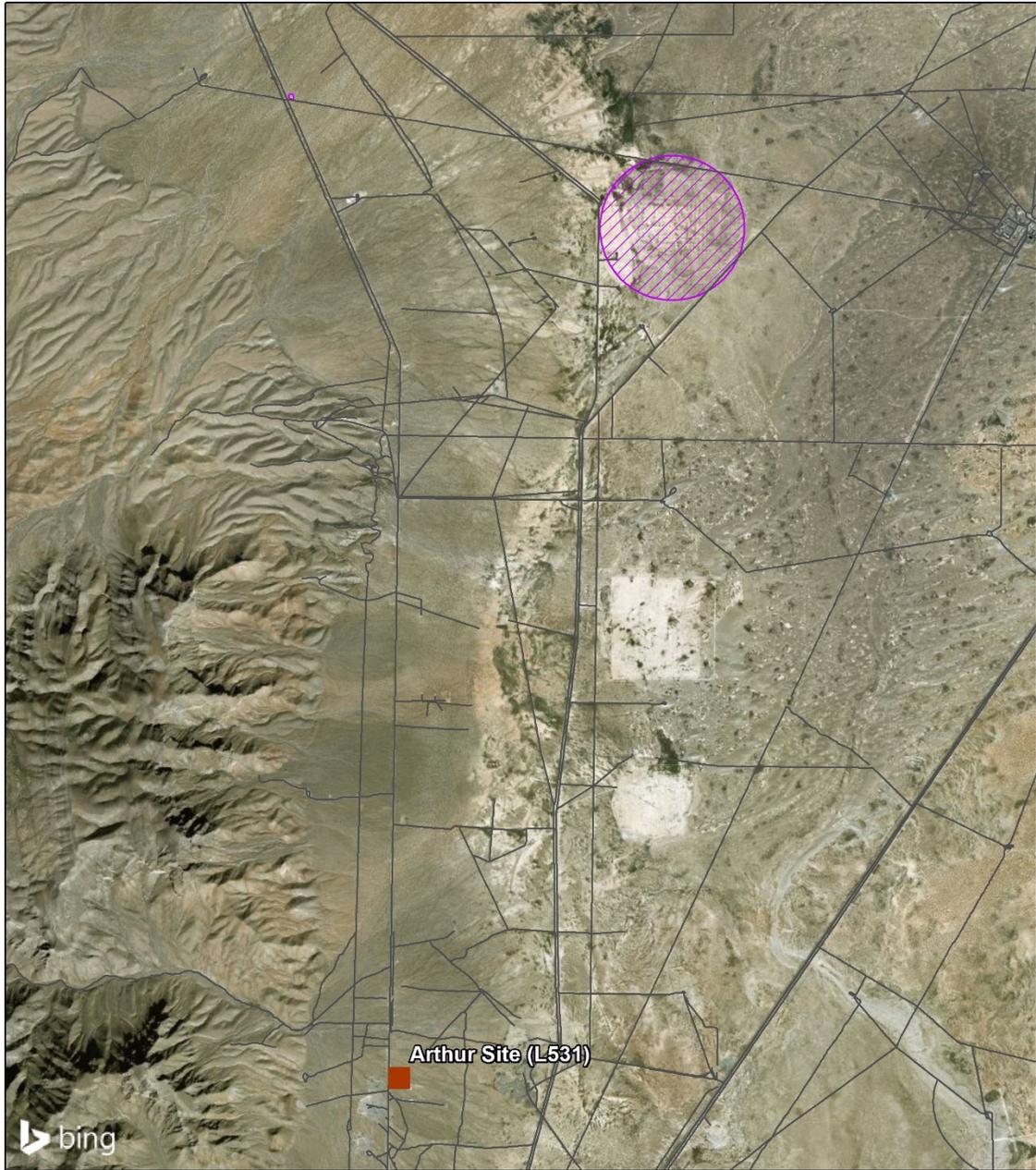
77-Nautical Mile

This impact area would be centered on the true north trajectory 77 NM (143 km) from the LC-35E site (Figure 2-15). The 77-NM Impact Area would be 1 NM x 2 NM (1.85 km x 3.7 km) and would be used for inert guided HVP tests only.

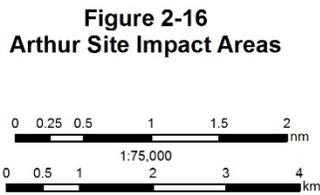


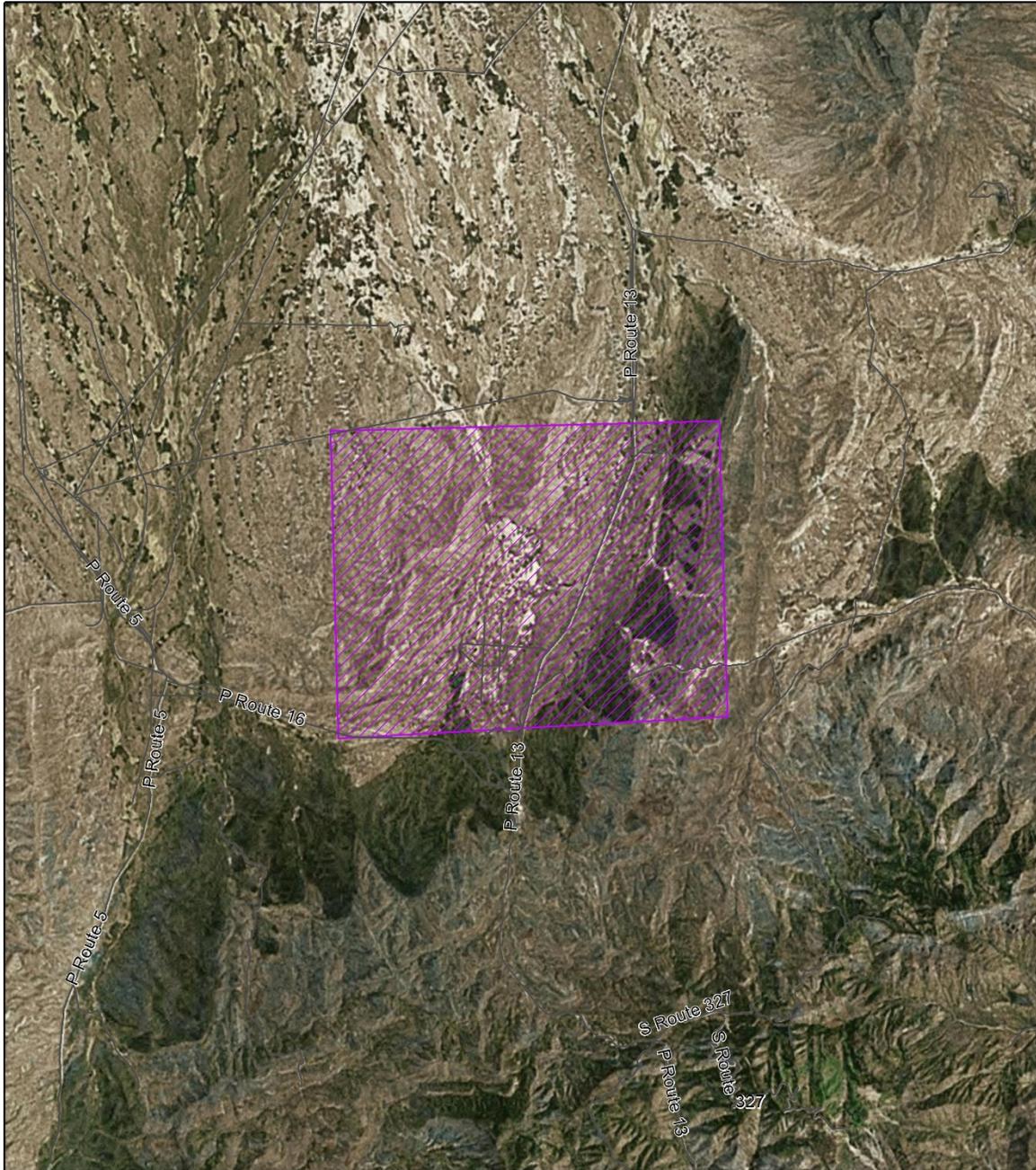
2.1.4.4 Impact Sites Associated with Arthur and Vandal HVP Tests

Powder gun HVP tests from the Arthur and Vandal sites would utilize impact areas analyzed in the *Environmental Assessment for the Proposed Advanced Gun Weapons System Technology Programs at White Sands Missile Range, New Mexico* (NAWCWD 1995). Tests from the Arthur Site would impact existing impact areas south of the White Sands National Monument (Figure 2-16). Powder gun tests from the Vandal Site would impact in a 3.5 NM x 2.7 NM (6.5 km x 5.0 km) portion of the NG-3 Impact Area analyzed in the NAWCWD 1995 document (Figure 2-17).



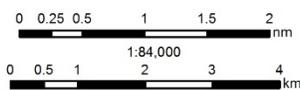
-  Road Centerline
-  Arthur Site Impact Area





- Road Centerline
- ▨ Vandal Powder Gun Impact Area

Figure 2-17
Vandal Powder Gun
Impact Area



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Epsilon Systems



2.1.4.1 Northern Call-Up Inert Impact Area and Buffer

On a limited basis, EM Railgun guided HVP tests from the LC-35E site would utilize an impact area within the NCA, which is outside the WSMR boundaries and administered by the New Mexico State Land Office (SLO). This impact area is comprised of a 10-ac (4-ha) impact area centered within a 1,000-ac (405-ha) buffer area (Figure 2-18). This impact area would be bladed to remove all existing juniper shrub vegetation. The removed vegetation would be mulched and spread across the 10-ac (4-ha) area. The center of the impact site is approximately 103 NM (191 km) from the LC-35E site. Only inert HVP would impact within this area. Currently, there are no roads providing access to the proposed 10-ac (4-ha) impact area. Approximately 700 ft (213 m) of unpaved road would be installed, linking an existing unpaved road to the impact area.

2.1.5 Post-Test HVP Location and Recovery

Following each test, the project proponent would geotag (assign geographical location using global positioning system [GPS] technology) HVP impact sites, utilizing helicopters or all-terrain vehicles (ATV) and document them so that future test managers and WSMR personnel would be aware of locations of HVP left in place. The HVP impact sites would be identified by the 3-inch (8-centimeter [cm]) holes resulting from the tests.

Occasionally, HVP would be recovered for post-test evaluation or as prescribed by U.S. Army Test and Evaluation Command (ATEC) recovery requirements. HVP recovery would not be conducted in the areas with the following:

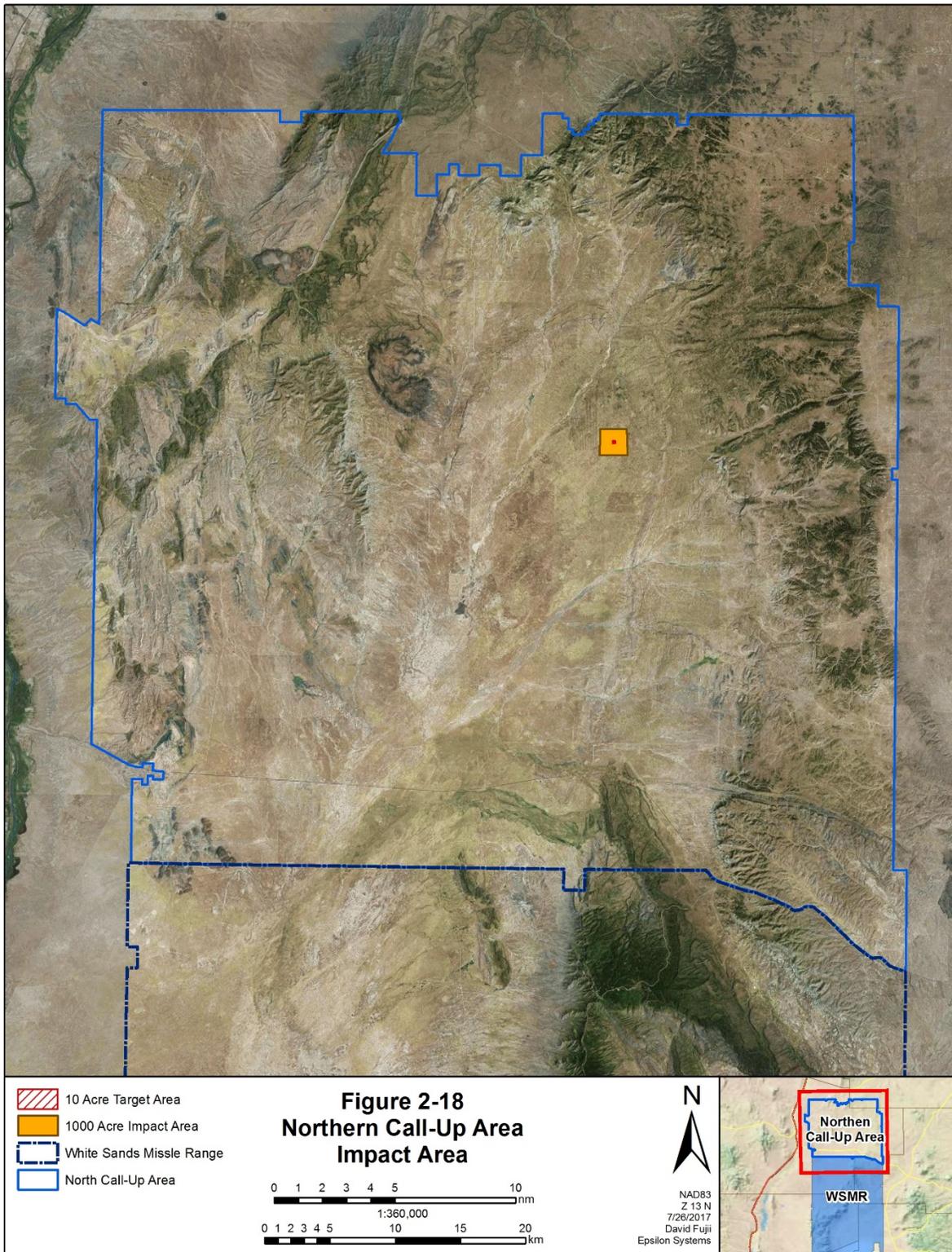
- Shallow groundwater;
- Known archaeological sites;
- Known sensitive natural resources (including 0.5-mi [0.8-km] buffers around active golden eagle nests); and
- Unexploded ordnance (UXO) or other safety constraints.

HVP recovery would be conducted using 4-ft (1.2-m) diameter augers. It is anticipated that most HVP would burrow to depths of 50 ft (15.2 m) or less. Should groundwater be encountered, recovery activities would stop.

2.1.6 Test Frequency

Under the proposed action, the following annual testing tempos are anticipated:

- 100 slugs fired from the EM Railgun;
- 50 HVP firings from the EM Railgun; and
- 50 HVP firings from powder guns.



2.2 ALTERNATIVES CONSIDERED

This section describes the three action alternatives considered in this EA, as well as the No-Action Alternative.

2.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, no EM Railgun or HVP RDT&E activities would be conducted at WSMR or on the NCA, and the proposed construction activities at LC-35E would not be conducted. Powder gun tests utilizing HVP would continue to be conducted at the Arthur and Vandal sites. However, the mission requirement criteria and purpose and need for the proposed action would not be met under the No-Action Alternative.

2.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Under Alternative 2, construction activities would be conducted at LC-35E, EM Railgun tests would be conducted at LC-35E, and powder gun tests would be conducted at LC-35E and at the Arthur and Vandal sites. The EM Railgun tests would utilize only inert slugs and HVPs, with impact areas limited to existing WSMR WITs and the newly established inert target areas.

2.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Under Alternative 3, construction activities would be conducted at LC-35E, EM Railgun tests would be conducted at LC-35E, and powder gun tests would be conducted at LC-35E and at the Arthur and Vandal sites. The EM Railgun tests would utilize inert slugs, inert HVPs, and live HVPs, with impact areas limited to existing WSMR WITs and the newly established inert target areas. Live HVPs with HE warheads would only impact in existing WSMR WITs.

2.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Under Alternative 4, construction activities would be conducted at LC-35E, EM Railgun tests would be conducted at LC-35E, and powder gun tests would be conducted at LC-35E and at the Arthur and Vandal sites. The EM Railgun tests would utilize inert slugs, inert HVPs, and live HVPs, with impact areas limited to existing WSMR WITs and the newly established inert target areas. Live HVPs with HE warheads would only impact in existing WSMR WITs.

In addition to the impact areas within WSMR boundaries, an inert projectiles impact area would be established within the NCA to test the EM Railgun's capabilities at a distance of approximately 100 NM (185 km). Under this alternative, a 10-ac (4-ha) impact area would be established within a 1,000-ac (405-ha) project impact area that would be evacuated for all tests (Figure 2-18). The use of this impact area outside WSMR boundaries would only be conducted on an as-needed basis and would not be expected to exceed 20 operations per year.

2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

2.3.1 Use of Other WSMR Facilities

Test sites other than LC-35E were considered for installation of the EM Railgun, but no other site was found to meet the physical space requirements and be in close enough proximity to the Defense-relevant

combat systems provided by the Desert Ship. As such, LC-35E was determined to be the only WSMR facility capable of meeting the mission requirement criteria.

2.3.2 Land-Based Test Ranges other than WSMR

No other test facility within the U.S. was found to have the combination of existing relevant combat systems found at the Desert Ship and the long-range test capabilities that WSMR provides. WSMR is the largest overland test facility in the U.S. and skilled personnel, unique facilities, and instrumentation required are already in place at LC-35E.

2.3.3 Continued Testing Over Ocean Environments

The DoD could continue to test the EM Railgun and HVP technologies at Wallops Flight Facility over water ranges or at other facilities that allow over-ocean firing of the EM Railgun and HVP testing. However, such testing would not allow for recovery of HVP post-test evaluation and would not meet the purpose and need of the proposed action.

CHAPTER 3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter provides a summary of the valued environmental components (VECs), a description of the environmental conditions potentially affected by the proposed actions, and analysis of potential impacts associated with the proposed action. Additionally, potential mitigation measures are identified to minimize potential impacts identified. For the purposes of this EA, project areas include the testing locations identified in Section 2.1.1. and the impact areas provided in Section 2.1.2. Alternatives 1, 2, and 3 only include impact areas within WSMR boundaries, and Alternative 4 includes those impact areas within WSMR boundaries, plus the NCA impact area and its buffer.

3.0 VALUED ENVIRONMENTAL COMPONENTS

A VEC analysis was conducted to identify environmental resource areas potentially impacted by the proposed action. This analysis considered natural and human environmental resources which are applicable to WSMR and can be impacted by combinations of past, present, and reasonably foreseeable future actions. Potentially useful federal EISs and EAs prepared for WSMR were identified and analyzed to establish regional issues, impacts, and their sources. In addition to actions and impacts, useful references and potential mitigation measures were identified for possible inclusion.

Based on this approach, the relationships between agency actions and their impacts on regionally important VECs were identified. The regionally important VECs at WSMR as characterized from the EISs and EAs were ranked as to the likelihood of impact from the proposed action. Each of the 14 VEC categories (and human health and safety, the Migratory Bird Treaty Act [MBTA], and the Bald and Golden Eagle Protection Act) described in the Army NEPA Guidance Manual will be assigned one of five impact potential categories:

- Very Low (VL) – No impact or minor impacts are anticipated;
- Low (L) – Minor impact anticipated;
- Medium (M) – Moderate impact anticipated (less than significant);
- High (H) – Significant impact potential anticipated (likely to be mitigated to less than significant); and
- Very High (VH) – Significant adverse impact anticipated (mitigation would be applied to minimize adverse effects).

VECs assigned L and VL impact potentials are not assessed further in this EA for this site-specific action. Station-wide impacts analysis for VECs assigned L and VL impact potentials can be tiered off the WSMR FEIS and the White Sands Missile Range Integrated Natural and Cultural Resources Management Plan and Environmental Assessment (WSMR 2015).

Table 3-1 provides a review of a VEC analysis conducted by WSMR Garrison, ATEC, and Navy personnel. This VEC analysis was conducted in accordance with The U.S. Army Environmental Command NEPA Analysis Guidance Manual (Army 2007). Components rated moderate to high for the proposed action include:

- Cultural resources;
- Soil erosion effects;
- Threatened and endangered species;
- Land use, traffic and transportation systems; and
- Human health and safety.

All other VECs were rated as L or VL. Although impacts to migratory birds and bald and golden eagles were determined to be low in the VEC analysis, further discussion of these components is provided due to their proximity to proposed testing locations and impact areas.

Water resources, hazardous waste and materials, and communications infrastructure are not discussed further in this EA; however, the following best management practices (BMPs) would be implemented during proposed action activities:

- All fuel operations will be conducted in accordance with Army Fuel Handling and Storage Standards;
- Drip pans and secondary containment will be required under all tactical vehicles, field equipment, fuel pods, and non-self generators;
- Used petroleum, oils, and lubricant will be collected and stored in properly labeled, approved containers;
- Used oil will be recycled through the WSMR Hazardous Management Center;
- Any asbestos-containing materials found during construction activities will be abated and disposed of by certified abatement and disposal contractors; and
- ATEC Information Management will be notified prior to any planned fiber trench or tray movement, and communication location services will be conducted prior to any planned excavation.

Table 3-1. Valued Environmental Components Review Summary

VEC	Impact Potential	Rationale/Special Considerations
Air Quality	L	Most air quality impacts would arise from construction activities, which would be limited in timescale and location. Road traffic on unpaved roads would generate fugitive dust, but this would be minor compared to levels currently generated and analyzed in the WSMR FEIS.
Airspace Resources	L	NCA airspace considerations are covered by the WSMR FEIS and an EA currently being conducted.
Cultural Resources	H	Elements at the LC-35E site are contributing factors to a historic district. However, it was determined that there would be no adverse effect to LC-35E through consultation with the State Historic Preservation Office (SHPO). Use of new impact sites may affect cultural resources.
Noise Effects	L	Powder gun blasts and EM Railgun shots would be restricted to existing WSMR test areas. As analyzed in the WSMR FEIS, there are no sensitive receptors within range of the testing locations; therefore, no noise effects would arise.
Soil Erosion Effects	M	Some recovery would be required. New road in the NCA would be limited to 500 to 700 ft long. These roads would not be regularly maintained and may lead to erosion effects.
Threatened and Endangered Species	M	Impact areas in general vicinity of the pupfish habitats are being considered. The White Sands pupfish is listed as Threatened under the New Mexico Wildlife Conservation Act and is not currently federally listed but is a species of concern by the USFWS.
Wetland Resources	L	Proposed action activities on the test areas and impact areas would not affect wetlands.
Water Resources Management	L	Water consumption anticipated to be low. Potential impacts to shallow groundwater resources in areas such as Space Harbor would be low due to implementation of BMPs
Facilities	VL	Facility impacts would be localized to construction activities, which would be minor.
Socioeconomics	VL	New staffing would include a minimum of 3 or 4 staff involved in temporary mission support and would use the same WSMR range support staff currently employed.
Energy	L	Consumption of electricity would be very minor, as it takes very little energy to charge the capacitors. However, further discussion of this VEC is provided to demonstrate the low electricity usage associated with EM Railgun operations.
Land Use	M	The proposed action would lead to new land use in the NCA as new inert impact areas would be established. All live HVP tests would utilize existing WITs.
Hazardous Materials/Hazardous Wastes	L	Standard materials and wastes localized to the launch sites. The majority of projectiles are inert. Live HVP with HE would impact in existing WITs.
Traffic and Transportation Systems	M	Closures of Highways 70 and 380 would not exceed limits provided in the WSMR EIS. Agreement for evacuations of NCA would be met. Traffic patterns on base would not change significantly. There may be increased traffic on public roads associated with the NCA.
Human Health and Safety	M	Standard mitigations would be followed.
Migratory Bird Treaty Act	L	Use of BMPs would minimize potential impacts to migratory bird species, with potential to occur on project sites. These BMPs are discussed in Section 3.3.3.
Bald and Golden Eagle Protection Act	L	Avoidance and other mitigation measures, as provided in Section 3.3.3, would be implemented.

3.1 CULTURAL RESOURCES

Cultural resources include prehistoric and historic sites, structures, artifacts, and districts that depict evidence of human activity considered important to any culture, subculture, or community. Cultural resources, as defined in the EA, consist of archaeological resources, architectural resources, and traditional cultural properties.

Archaeological resources consist of the material remains of prehistoric and/or historic human activity. The Archaeological Resources Protection Act of 1979 (ARPA) defines archaeological resources as “pottery, basketry, bottles, weapons, weapon projectiles, tools, structures or portions of structures, pit houses, rock paintings, rock carvings, intaglios, graves, human skeletal materials, or any portion or piece of any of the foregoing items” (16 USC 470bb).

Architectural resources include manmade structures including, but not limited to, standing buildings, dams, bridges, and canals. Under the National Historic Preservation Act of 1966 (NHPA) (Public Law [PL] 89-665, as amended by PL 96-515; 16 USC 470 et seq.), only architectural resources older than 50 years are considered for protection; however, younger structures can be afforded the same protection under special circumstances.

Traditional cultural properties may include archaeological resources, architectural resources, topographic features, plant and animal habitat, and any other inanimate object deemed essential to the continuance of a traditional culture by Native Americans and other groups.

The NHPA provides for establishment of the National Register of Historic Places (NRHP), an official list of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, and culture. Section 106 of the NHPA requires federal agencies with jurisdiction over a proposed federal project to take into account the undertaking’s effect on cultural resources listed or eligible for listing in the NRHP, and affords the SHPO and the Advisory Council on Historic Preservation (ACHP) opportunity to comment with regard to the undertaking.

NRHP eligibility criteria have been defined by the Secretary of the Interior’s Standards for Evaluation (36 CFR 60). Cultural resources are NRHP-eligible if they display the quality of significance in American history, architecture, archaeology, engineering, and culture present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, workmanship, feeling, and association, and meet at least one of the following criteria:

- Criterion A: The resources are associated with the events that have made a significant contribution to the broad patterns of American history;
- Criterion B: The resources are associated with the lives of persons significant in our past;
- Criterion C: The resources embody the distinctive characteristic of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant or distinguishable entity whose components may lack individual distinction;
- Criterion D: The resources have yielded or may likely yield information important in prehistory or history.

The process of agency review and assessment of the effect of an undertaking on cultural resources is set forth in the implementing regulations formulated by the ACHP (36 CFR 800, Protection of Historic Properties). Other applicable laws and guidelines include:

- Executive Order 11593, Protection and Enhancement of Cultural Environment (16 USC 470 [Supp. 1, 1971]);
- Native American Graves Protection and Repatriation Act (PL 101 – 601, USC 3001 – 3013);
- Determination of Eligibility for Inclusion in the NRHP (36 CFR 63);
- Recovery of Scientific, Prehistoric, and Archaeological Data (36 CFR 66);
- Curation of Federally Owned and Federally Administered Archaeological Collections (36 CFR 79); and
- DoD Directive 4710.1, Archeological and Historic Resources Management.

Section 101(d)(6)(B) of the NHPA requires federal agencies to consult with Indian tribes that attach religious or cultural significance to historic properties. Compliance with 36 CFR 800.2, which implements consultations with Native Americans, may be conducted by federal agencies as part of a government-to-government undertaking.

In accordance with Section 101(b)(3) of the Act, SHPOs advise and assist federal agencies in carrying out their Section 106 responsibilities and assist agencies, organizations, and individuals to ensure that historic properties are taken into consideration at all levels of planning and development. In New Mexico, the State Historic Preservation Officer is the director of the New Mexico Historic Preservation Division (HPD) of the Department of Cultural Affairs. Consultation between WSMR and SHPO is an ongoing process regarding actions taken at WSMR, and SHPO has been consulted regarding proposed construction activities at LC-35E.

3.1.1 Affected Environment

3.1.1.1 LC-35E

In September 2016, a multi-disciplinary team of archaeologists and architectural historians conducted an on-site inventory and recorded a total of 46 buildings, structures, and objects, along with 245 features at LC-35. All recorded resources related specifically to RDT&E activities in the Cold War era (1946 to 1989) and immediate post-Cold War years; no prehistoric features were recorded or evaluated. The current inventory was logged as New Mexico Cultural Resource Inventory System (NMCRIS) number 137218 with the New Mexico Archaeological Resource Management System (ARMS).

Fifteen properties at LC-35 have been previously recorded. These properties were recorded between 1995 and 1998, and due to the age of the recording, many were documented under Laboratory of Anthropology (LA) archaeological site numbers, rather than as individual Historic Cultural Properties. As such, the individual properties were not assigned Historic Cultural Properties Inventory (HCPI) numbers per current state guidelines. In 1995 and 1996, an inventory project recorded properties within the main LC-35 complex under LA 116554 (NMCRIS Number 56033). The same inventory recorded several properties along Nike Avenue at the Davy or VIP site as LA 116577. Three additional properties were evaluated in 1998, but little documentation of this effort exists, and it does not appear to have been documented under a NMCRIS number or the resources recorded as HCPIs.

Eight of the previously recorded properties were recommended for individual eligibility under NRHP Criteria A or C. Few of these recorded properties received a determination of eligibility by WSMR or concurrence by the New Mexico SHPO. Only three of the previously recorded resources received concurrence by SHPO (Properties 23226, 23227, and 23246); all three of these properties were determined ineligible by WSMR. The remaining four resources did not receive a recommendation for eligibility in the original recording. The historic landscape and district potential of the recorded resources was not fully evaluated in the previous recordings. The eligible resources recorded under NMCRIS 56033 were acknowledged as likely contributing to a potential district; however, no such district was defined or evaluated. More recently, in 2015, the Navy Blockhouse (Property 23240) was determined eligible under Criteria A and C, a determination that received SHPO concurrence. The launch pad at LC-35E (Property 23230) suffers from diminished integrity due to the removal of rocket launch towers prior to the site being recognized as a historic property. The removal of these towers is likely the most significant reduction to the overall historic integrity of the complex (Epsilon 2017).

It has been found that LC-35 represents a definable concentration of resources, most of which date to one of the identified periods of significance (1946 to 1966 and 1966 to 1989). As such, Epsilon recommended most of the recorded properties for eligibility as contributing elements to a historic district encompassing the primary concentration of Cold War-era LC-35 facilities. WSMR concurred with this recommendation (Epsilon 2017). As an active launch complex within WSMR, LC-35 has many recent additions and modifications that are unrelated to or post-date its Cold War era period(s) of significance. However, it was determined that many of the primary historic properties that have defined the complex throughout its existence remain intact and the complex overall retains sufficient historic integrity of its physical features to convey its historic significance. As such, it was concluded, through coordination with SHPO, that LC-35 is recognizable as a historic military landscape that is best managed as a historic district, per Department of the Army guidance (Loechl et al. 1994). While many of the resources at LC-35 lack distinction when considered as individual resources, they achieve greater significance when considered as a collective within the context of the Cold War historic themes (Epsilon 2017).

3.1.1.2 HVP Impact Sites within WSMR Boundaries

32-Nautical Mile Impact Area

Only one road corridor bisecting the western half of this impact area has been surveyed for cultural resources. No historic or prehistoric resources have been recorded within this area.

49-Nautical Mile Impact Area

Approximately 20 percent of this impact area has been surveyed for cultural resources, with the Denver WIT being the largest surveyed area. Approximately ten resources have been recorded within this area.

65-Nautical Mile Impact Area

Less than 10 percent of this impact area has been surveyed for cultural resources. Three archaeological resources have been recorded within this area.

70-Nautical Mile Impact Area

Less than 10 percent of this impact area has been surveyed for cultural resources, with one recorded site. Steep slopes in much of this impact area may make cultural resource surveys difficult.

77-Nautical Mile Impact Area

There have been no cultural resource surveys conducted in this impact area. High slopes over most of this area may make cultural resource surveys difficult.

Vandal Powder Gun Impact Area

Roughly one-third of this impact area has been surveyed for cultural resources, with numerous archaeological resources recorded.

Weapon Impact Targets

There is a total of 17 WITs on WSMR, and 14 have been surveyed for cultural resources. The three unsurveyed WITs: 649 WIT, Rhoads WIT, and Hayfield Target were established prior to the 1966 passage of the NHPA and are exempt. There were 3 archaeological sites identified in the 14 surveyed WITs. These sites were mitigated in the 1970s, removing all known manageable resources. As provided in the WSMR INCRMP, WITs are exempt from further NHPA Section 106 review. Designated impact areas containing unexploded, antipersonnel ordnance are off-limits to historic properties management. No access to these areas is allowed.

3.1.1.3 Vandal and Arthur Sites

No current cultural resources inventory has been conducted for the Vandal Site. However, there is a documented archaeological site immediately adjacent to the northeast corner of the site.

The Arthur Site and its vicinity have been surveyed for cultural resources, and no historic or prehistoric resources have been recorded in these surveys.

3.1.1.4 NCA Impact Area and Buffer

A cultural resources inventory survey of the 1,000-ac (405-ha) NCA buffer area was conducted in 2015. The survey resulted in documentation of five prehistoric features, one historic feature, and 28 isolates. Based on the lack of diverse artifact assemblage (i.e., recorded resources were generally small prehistoric artifact scatters), the inability of the sites to answer regional research questions, the sites' lack of integrity, and the lack of potential for subsurface deposits, none of the newly discovered sites were considered eligible for the NRHP. Fieldwork included 100 percent coverage of the 1,000-ac (405-ha) buffer area, including the 10-ac (4-ha) impact area. The fieldwork included collection of diagnostic artifacts, a review of the geological setting, and limited excavation of trowel scrapes in selected areas to determine the potential for subsurface cultural deposits. All collected artifacts have been curated in accordance with WSMR and New Mexico collection standards.

3.1.2 Environmental Consequences

The definition of effect is contained within 36 CFR Part 800: "Effect means alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register."

Per 36 CFR Part 800, an adverse effect occurs:

...when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the

integrity of the property's location, design, setting, materials, workmanship, feeling, or association.... Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative.

Examples of adverse effects may include, but are not limited to, the following:

- I. Physical destruction of or damage to all or part of the property;
- II. Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR Part 68) and applicable guidelines;
- III. Removal of property from its historic location;
- IV. Change of the character of the property's use or of physical features within the property's setting that contributes to its historic significance;
- V. Introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features;
- VI. Neglect of a property that causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- VII. Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Effects can be direct, indirect, and cumulative. Direct effects include physical destruction or damage. Indirect effects include the introduction of visual, auditory, or vibration impacts as well as neglect to a historic property. Cumulative effects are the impacts of a project taken into account with known past or present projects as well as foreseeable future projects.

3.1.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, there would be no construction activities at LC-35E and no new RDT&E activities within the WSMR boundaries or within the NCA. Therefore, there would be *no adverse effect* to cultural resources associated with the No-Action Alternative.

3.1.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

LC-35E

The proposed project represents a minimal alteration to the design, materials, and workmanship of LC-35E, this area is a relatively small portion of the larger launch complex and is spatially isolated in the northeastern corner of the main fenced complex, which serves to minimize the visual and aesthetic changes introduced by the proposed HVP and EM Railgun project. Additionally, as a current Navy RDT&E installation, the proposed EM Railgun installation represents a continuity of use of Property 23230 and the larger LC-35 installation. Per the guidance offered by the ACHP (1991), the proposed project is consistent with the historic identity and purpose of LC-35 and will help maintain the complex as a "living historic monument" to the technological innovations that have defined the history of the facility (ACHP 1991:24).

The proposed project would not significantly diminish the remaining historic integrity of Property 23230 and represents a continuity of use of the LC-35E facilities, which have historically been dedicated to research and development activities. As confirmed through consultation with SHPO, the proposed project would have a light footprint on Property 23230 and would not alter the property such that it cannot convey its historic significance as a contributing element to the LC-35 historic district. Therefore, the proposed HVP and EM Railgun project would result in *no adverse effects* to Property 23230 or to the identified LC-35 historic district.

HVP Impact Areas within WSMR Boundaries

Some RDT&E activities associated with Alternative 2 would occur in areas that have been previously surveyed and determined to contain no historic properties through NHPA Section 106 consultation, with SHPO concurrence. These activities would not impact cultural resources and would have no potential for cumulative impacts to cultural resources. The potential would exist for inadvertent discovery of cultural resources in these areas. The WSMR inadvertent discovery policy and process specified in the Integrated Natural and Cultural Resources Management Plan (INCRMP, WSMR 2015) would be followed should this occur. Areas containing known significant cultural resources would be avoided through site selection during the planning process.

Proposed RDT&E activities that would occur in areas where cultural resource surveys have not been completed or where surveys have been conducted but NHPA Section 106 consultation is not complete would be subject to site-specific cultural resource survey and evaluation as needed. The WSMR Cultural Resources Manager (CRM) would determine whether pre-test, site-specific cultural resource studies or consultation would be required prior to implementation of proposed activities in these areas. Any cultural resource identification and consultation requirements would be completed prior to implementation of these activities.

In accordance with Section 9 of the 1985 Programmatic Memorandum of Agreement with SHPO, WSMR will consult on any findings of adverse effect, to include unevaluated sites. Through implementation of standard operating procedures (SOPs) and BMPs identified in the INCRMP, there would be *no adverse effect* at the HVP impact sites due to the implementation of Alternative 2.

Vandal and Arthur Sites

Proposed activities at the Vandal and Arthur sites would be conducted within the current built environment of both sites and would not involve any new ground disturbance outside the existing concrete pads. Prior to modification or construction on the Vandal Site, the WSMR CRM would determine whether pre-test, site-specific cultural resource studies or consultation would be required. Any cultural resource identification and consultation requirements would be completed prior to implementation of proposed activities.

Through implementation of SOPs and BMPs identified in the INCRMP and Section 3.1.3, there would be *no adverse effects* to cultural resources at the Vandal and Arthur sites due to the implementation of Alternative 2.

3.1.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Implementation of Alternative 3 would include all Alternative 2 activities, plus live HVP testing, impacting existing WSMR WITs. All WSMR WITs are bladed, highly-impacted areas. As provided in the WSMR

INCRMP, safety concerns prohibit further NHPA Section 106 review in WITs. Designated impact areas containing unexploded, antipersonnel ordnance are off-limits to historic properties management. No access to these areas is allowed.

Through implementation of SOPs and BMPs identified in the INCRMP and Section 3.1.3, there would be *no adverse effect* due to the implementation of Alternative 3.

3.1.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

WSMR

Alternative 4 RDT&E activities within WSMR boundaries would be identical to those associated with Alternative 3. Therefore, through implementation of SOPs and BMPs identified in Section 3.1.3, there would be *no adverse effects* to cultural resources at WSMR due to the implementation of Alternative 4.

NCA Impact Area and Buffer

The proposed NCA 1,000-ac (405-ha) buffer area, including the 10-ac (4-ha) impact area, has been fully surveyed for cultural resources, including traditional cultural places. Identified cultural resources were deemed small, prehistoric artifact sites that lack further potential for research, and no NRHP-eligible sites were identified.

Prior to blading the 10-ac (4-ha) impact area and installation of the 700-ft (213-m) road, personnel would be briefed on procedures to be followed in the case of inadvertent discovery of cultural resources and restrictions on artifact collection. Should such an inadvertent discovery take place, program personnel would implement the appropriate SOP, as provided by the WSMR CRM. Ground disturbing activity would cease, and the WSMR CRM would be notified immediately. Therefore, through implementation of SOPs and BMPs identified in Section 3.1.3, there would be *no historic properties affected* within the NCA due to the implementation of Alternative 4.

3.1.3 Best Management Practices and Mitigation Measures

As specified in Army Regulation (AR) 200-2, *Environmental Effects of Army Actions*, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). The following BMPs would be applied to reduce impacts to cultural resources:

- All test proponents, employees, and visitors conducting activities outside the WSMR cantonment will be presented an environment and safety awareness video, which includes information regarding cultural resource management and non-disturbance;
- Support vehicles will be limited to existing roads to the fullest extent possible;
- Recovery of HVP will be conducted in accordance with the WSMR Standard Operating Procedure for Environmental Protection During Recovery Actions;
- In the event of an inadvertent discovery within WSMR boundaries, program personnel would implement the WSMR inadvertent discovery policy and process specified in the INCRMP; and
- In the event of an inadvertent discovery within the NCA, the WSMR CRM would be contacted. The WSMR CRM would then consult with SHPO regarding necessary actions to be taken.

3.2 SOIL EROSION EFFECTS

Soil erosion effects are generally dependent upon the geology, soils, and topography of a given area. The geology of an area includes its bedrock materials and mineral deposits. Soil refers to unconsolidated earthen materials overlying bedrock or other parent material. Topography is typically described with respect to the elevation, slope, aspect, and surface features found within a given area.

The RDT&E activities conducted on WSMR would be conducted in accordance with existing directives and SOPs, as provided in Section 3.2.3, minimizing the potential for soil erosion impacts. As such, the project areas within WSMR boundaries are not discussed in these sections. Descriptions of the WSMR geology and topography, seismicity and geologic hazards, geologic resources, and soils can be found in the WSMR FEIS, Section 3.6 *Earth Sciences*.

The analysis of soil erosion effects will focus on the 1,000-ac (405-ha) NCA buffer area, the 10-ac (4.05-ha) impact area and the up to 700-ft (213-m) length of unpaved road to be installed to provide access to the impact area.

3.2.1 Affected Environment

3.2.1.1 Geology

From a regional perspective, the NCA project site is located between the southeastern flanks of the Los Pinos Mountains and the eastern edge of the Chupadera Arroyo on the western edge of the Chupadera Platform. This region of New Mexico was covered by a shallow inland sea during much of the Paleozoic and Mesozoic eras prior to uplift and mountain building beginning near the end of the Cretaceous Period. The Los Pinos Mountains were formed following a stage of high-angle thrust faulting and uplift. The Chupadera Arroyo runs through the center axis of the northern-most extension of the Jornada del Muerto Basin, a major structural depression formed by a down-warped fold (Hook 1983).

The NCA Impact Area and buffer is part of the Mexican Highland Section of the Basin and Range Province and lies within a local basin landform. The Geologic Map of New Mexico shows that the primary geologic unit underlying the project site consists of unconsolidated deposits of eolian sediment from the Quaternary Period. These deposits are characterized by fine-grained sand and are widespread within the basin in which the site is located (NMBGMR 2003).

3.2.1.2 Soils

The United States Department of Agriculture (USDA) Web Soil Survey of the NCA buffer indicates that soil types of the area primarily consist of Penistaja-Clovis fine sandy loams and Pirodel fine sand, with minor amounts of the Pirodel-Harvey-Pinon complex and the San Mateo-Glenberg complex of 0 to 2-percent slopes. All of these soil groups are all well drained, with the exception of the San Mateo-Glenberg complex. The San Mateo-Glenberg complex makes up less than 2 percent of the buffer area and is comprised of sandy clay loam derived from igneous and sedimentary rock. The predominant landforms within the area are flood plains and alluvial fan remnants (NRCS 2014).

3.2.1.3 Topography

The NCA buffer area consists of low hills and valleys dominated by Juniper savannahs. Elevations range from approximately 5,680 ft in the southwest corner to approximately 5,770 ft (1,731 to 1,756 m) along the eastern boundary. In general, the landscape slopes downward to the southwest (USGS 2013).

3.2.1.4 Soil Erodibility

Soil erosion from wind, water, and road use is a concern due to its impacts on the surrounding plant communities and the resulting cost of road maintenance. The NRCS uses several factors to evaluate soil erodibility (NRCS 2014):

- The erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.
- A wind erodibility group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible.
- Road and trail erosion hazard ratings are based on soil erosion factor K, slope, and content of rock fragments.

A rating of “slight” indicates that little or no erosion is likely. “Moderate” indicates that some erosion is likely, that the roads or trails may require periodic maintenance. “Severe” indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Table 3-2 provides a summary of the soil erodibility for the soil types present within the 1,000-ac (405-ha) buffer area. The 10-ac (4-ha) impact area and the 700-ft (213-m) length of road both are comprised of Penistaja-Clovis fine sandy loams soils.

Table 3-2. Soil Erodibility by Type

Map Unit Name	Erosion Hazard (Road, Trail)	Wind Erodibility Group	K factor, Whole Soil
Penistaja-Clovis fine sandy loams, 1 to 8 percent slopes.	Moderate Moderately suited for roads	3	0.32
Pirotel-Harvey-Pinon complex	Slight Moderately suited for roads	3	0.25
San Mateo-Glenberg complex, 0 to 2 percent slopes	Slight Moderately suited for roads	4L	0.10

Source: NRCS 1988.

3.2.2 Environmental Consequences

3.2.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative there would be no new construction or RDT&E activities at WSMR or within the NCA. Therefore, there would be no soil erosion impacts associated with this alternative.

3.2.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Under Alternative 2, there would be new construction and RDT&E activities within the WSMR boundaries but not in the NCA. All WSMR activities, including test preparation and equipment emplacement, off-road recovery actions, and recontouring activities, would follow existing SOPs and BMPs, as described in Section 3.2.3, to minimize soil erosion effects. These actions would be consistent with those analyzed in the WSMR FEIS. Therefore, no significant impact would result through implementation of Alternative 2.

3.2.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Under Alternative 3, there would be new construction and RDT&E activities within the WSMR boundaries, but not in the NCA. All WSMR activities, including test preparation and equipment emplacement, off-road recovery actions, and recontouring activities, would follow existing SOPs and BMPs, as described in Section 3.2.3, to minimize soil erosion effects. These actions would be consistent with those analyzed in the WSMR FEIS. Therefore, no significant impacts would result through implementation of Alternative 3.

3.2.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Alternative 4 would involve new construction and RDT&E activities at WSMR and within the NCA. All WSMR activities, including test preparation and equipment emplacement, off-road recovery actions, and recontouring activities, would follow existing SOPs and BMPs, as described in Section 3.2.3, to minimize soil erosion effects.

The NCA Impact Area would be bladed to remove all existing juniper shrub vegetation. No juniper removal and/or blading would be performed on WSMR. The removed vegetation would be mulched and spread across the 10-ac (4-ha) area. This mulch would likely have a beneficial effect on water infiltration of the soils underneath and would reduce erosion potential for the area, as compared to bladed areas with no mulching applied (Cline et al. 2010). The Penistaja-Clovis fine sandy loams soils are moderately suited for road installation. The 700-ft (213-m) access road would be monitored for erosion and maintained or improved as needed. Road maintenance and improvements would be designed to prevent water from running down or off the road in a concentrated flow that would create ruts and erosion. Through the application of the mulched juniper and periodic road maintenance and improvements, there would be no significant impacts due to the implementation of Alternative 4.

3.2.3 Best Management Practices and Mitigation Measures

As specified in AR 200-2, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). The following BMPs would be implemented to minimize soil erosion effects:

- Support vehicles would use existing roads to the fullest extent possible;
- Appropriate surface water and erosion control measures would be implemented;
- Off-road travel would be limited to placement of test support equipment and recovery activities, using a single path in and out;
- Juniper shrub within the NCA 10-ac (4-ha) impact area removed and masticated would be scattered over the impact area as mulch;
- The access road for the NCA Impact Area would be monitored and maintained or improved as needed. Road maintenance and improvements would be designed to prevent water down or off the road in a concentrated flow that would create ruts or erosion; and
- Following HVP recovery, the excavation areas would be re-contoured to match the existing condition.

3.3 BIOLOGICAL RESOURCES

Biological resources include plants and animals and the habitats in which they occur. Biological resources discussed include vegetation communities, wildlife, and special status species.

Protected and special status species include those species that are listed, proposed for listing, or are active candidates for listing as:

- Threatened or endangered under the federal Endangered Species Act ([ESA], 16 USC § 1531 et seq.) by the U.S. Fish and Wildlife Service (USFWS);
- Threatened, or endangered wildlife species under New Mexico Wildlife Conservation Act the by the New Mexico Department of Game and Fish (NMDGF);
- Rare and endangered plants species by the New Mexico State Forestry Division’s Endangered Plant Program;
- Protected species under the Migratory Bird Treaty Act ([MBTA], 16 USC §§ 703-712); or
- Bald and golden eagles, as protected under the Bald and Golden Eagle Protection Act (16 USC § 668).

3.3.1 Affected Environment

3.3.1.1 Vegetation Communities

There is a wide diversity of vegetation types occurring on WSMR lands, ranging from desert shrublands of basin floors to ponderosa pine forests of mountaintops. A model for describing the vegetation communities of WSMR, called vegetation map units, was developed by Muldavin et al. (2000). Table 3-3 provides an overview of the predominant vegetation map units associated with the proposed action project areas, followed by a brief description (as provided by Muldavin et al. 2000) of each of the vegetation map units.

Table 3-3. Vegetation Map Units

Project Area	Vegetative Map Units
LC-35E	Mesquite Shrubland Military Disturbance
Vandal and Arthur sites	Creosotebush Shrubland
32-NM Impact Area	Pickleweed Shrubland Playa
49-NM Impact Area	Lowland Basin Grasslands Acacia Shrubland Mesquite Shrubland
65-NM Impact Area	Piedmont Desert Grassland Creosotebush Shrubland
70-NM Impact Area	Mixed Foothill – Piedmont Desert Grass Creosotebush Shrubland
77-NM Impact Area	Montane Scrub Pinyon Pine Woodland
Vandal Powder Gun Impact Area	Creosotebush Shrubland Alluvial Flats – Barren

Acacia Shrubland

This Chihuahuan Desert Scrub unit is characterized by viscid acacia-dominated communities that generally occur on foothill slopes and valley alluvial fans south of Rhodes Canyon within the San Andres Mountains. Viscid Acacia/Southwestern Needle and Viscid Acacia-Mariola Plant Associations are predominant and typically form large continuous occurrences on red sandstone uplifts within the Green and Yonder Valleys.

Alluvial Flats – Barren

This unit represents non-vegetated alluvial fan flats that occur on the piedmont leading out of the northern San Andres Mountains into the northern Jornada Basin.

Creosotebush Shrubland

This Chihuahuan Desert Scrub unit is typified by creosotebush dominated associations and occurs from low elevation basin bottoms up through the alluvial fan piedmonts, into foothills of the mountain ranges. The Creosotebush-Mariola, Ocotillo-Mariola, Creosotebush/Black Grama, and Creosotebush/Fluff Grass shrubland types generally occupy low foothill slopes and mid to upper portions of alluvial fans. In contrast to the Creosotebush/Alkali Sacaton, Creosotebush/Bush Muhly, and Creosotebush/Sparse Plant Associations are generally found on basin bottoms and on mid to low portions of alluvial fans. Honey mesquite (*Prosopis glandulosa*) and tarbush (*Flourensia cernua*) can be codominant in the stands, and at lower elevations, the unit is often adjacent to the Mesquite Shrubland, Tarbush Shrubland, or Mixed Lowland Scrub units. At the upper elevations, it is commonly intermixed with Mixed Foothill-Piedmont Desert Grasslands.

Lowland Basin Grasslands

This desert grassland is characterized by alkali sacaton dominated types and occurs on the alluvial flats of the Tularosa and Jornada del Muerto basin bottoms. In the northern Jornada, the Alkali Sacaton-Burrograss and Tobosagrass-Alkali Sacaton Plant Associations, along with Fourwing Saltbush/Alkali Sacaton shrublands are predominant. The Tularosa Basin is typified by large expanses of relatively uniform alkali sacaton and tobosagrass grasslands, intermixed with areas dominated by the shrubby Honey Mesquite/Alkali Sacaton Plant Association. Inland Saltgrass-Alkali sacaton grasslands occur adjacent to the wetlands of the Malpais Spring area and along the Salt Creek Drainage within the Tularosa Basin. Fourwing Saltbush and Mesquite Shrublands are the most common adjacent units.

Mesquite Shrubland

This Chihuahuan Desert Scrub unit is composed primarily of honey mesquite-dominated communities with inclusions of littleleaf sumac (*Rhus microphylla*) and is distributed throughout the Tularosa and Jornada del Muerto basins. The Honey Mesquite-Fourwing Saltbush and Honey Mesquite-Snakeweed Plant Associations are coppice dune types that cover large areas, particularly in the southern and central portions of the basins. The Littleleaf Sumac/Mesa Dropseed Plant Association primarily occurs in the northern portion of the northern Jornada Basin. Broom Dalea/Mesa Dropseed Plant Association also occurs as a minor inclusion. Sand Sagebrush and Fourwing Saltbush and Creosotebush Shrublands are common adjacent units on the basin floors.

Military Disturbance

This unit represents military development including WIT's, airstrips, range camps, the Main Post, and other extensive development.

Mixed Foothill – Piedmont Desert Grasslands

This map unit is an extensive complex of Plains-Mesa-Foothill Grasslands and Chihuahuan Desert Grasslands that occurs on mid- to low elevation mountain slopes, foothills, and upper alluvial fan piedmonts. These grasslands are represented by hairy grama (*Bouteloua hirsuta*), black grama (*Bouteloua eriopoda*), curlyleaf muhly (*Muhlenbergia setifolia*), blue grama (*Bouteloua gracilis*), and sideoats grama (*Bouteloua curtipendula*) types. In general, the footslopes of the San Andres Mountains support the Black Grama-Sideoats Grama Plant Association, while the upper alluvial fans are typified by the Black Grama/Mariola Plant Associations. The interior mid-elevation canyon slopes support Hairy Grama-Black Grama, Black Grama/Ocotillo Plant Associations and various grama grasses with sotol types. The Curlyleaf Muhly/Bigelow's Sage, Black Grama/Bigelow's Sage, and Curlyleaf Muhly-Grama Grass Plant Associations tend to be restricted to the valleys and basins of the eastern Oscura Mountains. At lower elevations, the unit commonly gives way to Piedmont Desert Grasslands, at higher elevations, Foothill-Montane Temperate Grasslands.

Montane Scrub

This temperate, Rocky Mountain Montane Scrub unit is characterized by mountain mahogany dominated communities with wavyleaf oak as a common associate. It occurs on slopes and ridges within the Chalk Hills and the San Andres, San Augustine, Organ, Mockingbird, Big Gyp, Fairview, and Oscura mountains. The Mountain Mahogany/Blue Grama, Sideoats or Plains Lovegrass Plant Associations occur throughout the unit, mostly on steeply sloped sites. The Mountain Mahogany/Curlyleaf Muhly Plant Association is prevalent on ridges with exposed bedrock. Stands often occur where fire has removed Pinyon or Oneseed Juniper Woodlands.

Pickleweed Shrubland

This Pickleweed Desert Shrubland occurs on alkaline flats and along the Salt Creek Drainage at the bottom of the Tularosa Basin lowlands. The Pickleweed/Sparse Plant Association typifies the unit's extremely low shrub cover and densities, approaching barren alkaline flats in some areas. The most extensive continuous occurrence is found just north of Lake Lucero.

Piedmont Desert Grasslands

This Chihuahuan Desert Grassland unit is dominated by black grama types and occurs on alluvial fan piedmonts of the Mockingbird, San Augustine, San Andres, Big Gyp, and Oscura mountains. The western Oscura Mountain piedmont is occupied by Black and Blue Grama Yucca grasslands. Granitic alluvial fans leading out from the east and west slopes of the Mockingbird Mountains are dominated by Black Grama/Longleaf Jointfir and Black and Blue Grama/Soaptree Yucca Plant Associations. Low sloped alluvial drainages leading out north from the Big Gyp and northern San Andres mountains are occupied by the Blue Grama-Alkali Sacaton Plant Associations. The San Augustine Mountain alluvial fan supports Hairy and Black Grama/Soaptree Yucca Plant Associations. At lower elevations, the unit gives way to

Lowland Basin Grasslands or various Chihuahuan Desert Scrub units. Mixed Foothill-Piedmont Grasslands or Interior Chaparral are common upslope.

Pinyon Pine Woodland

This Rocky Mountain/Great Basin Woodland unit is characterized by pinyon pine types that dominate the higher elevations of the mountainous areas, including the Chalk Hills, Chupadera Mesa, and the San Andres, San Augustine, Big Gyp, and Oscura mountains. The Pinyon Pine/Scribner's Needlegrass and Pinyon Pine/Wavyleaf Oak Plant Associations typically occur on platform summits or relatively gentle dipping slopes. In contrast, the steep escarpment and canyon sideslopes commonly support Pinyon Pine/Gambel's Oak (north-facing) and Pinyon Pine/New Mexico Muhly (south-facing). The Pinyon Pine/Mountain Mahogany is also important, particularly on sites that have been burned. These woodlands are most extensive to the north where they form dense, uniform stands on Chupadera Mesa and in the Oscura Mountains. To the south in the San Andres Mountains, the woodlands become less abundant, more fragmented, and increasingly intermixed with Montane Scrub. At lower elevations, pinyon pine (*Pinus edulis*) decreases and juniper (*Juniperus* sp.) woodlands become more prevalent.

Playa

This unit is characterized by barren playas and alkaline alluvial flats of the Tularosa Basin bottom that are periodically inundated. Lake Lucero is the largest continuous occurrence within the map unit, but occurrences are also distributed northward in the Malpais Spring area and Salt Creek drainage (Muldavin et al. 2000).

NCA Impact Area and Buffer

The Oneseed Juniper Woodland vegetation community is the dominate vegetation within the NCA 1,000-ac (405-ha) buffer area; however, the Sandsage Shrubland vegetation community sporadically mingles at lower elevations (HDR 2015). Oneseed juniper (*Juniperus monosperma*) is the prevailing tree within the NCA buffer with an occasional, isolated pinyon pine occurring as a subordinate tree primarily in the eastern portion of the NCA buffer. The observed shrub layer consists of seven species, of which the dominants were sandsage (*Artemisia filifolia*), yucca (*Yucca* sp.), broom snakeweed (*Gutierrezia sarothrae*), tree cholla (*Cylindropuntia imbricate*), and fourwing saltbush (*Atriplex canescens*). The dominate grass species observed in the NCA buffer were black grama, blue grama, bush muhly (*Muhlenbergia porteri*), alkali sacaton (*Sporobolus airoides*), and purple threeawn (*Aristida purpurea*). The common forbs observed within the project area were subjugated by spotted sandmat (*Chamaesyce maculate*), silverleaf nightshade (*Solanum elaeagnifolium*), tubular bluestar (*Amsonia longiflora*), touristplant (*Dimorphocarpa wislizeni*), trailing windmills (*Allonia incarnate*), narrowleaf stoneseed (*Lithospermum incisum*), and Indian rushpea (*Hoffmannseggia glauca*) (HDR 2015).

3.3.1.2 Wildlife

The project areas associated with the proposed action include habitats ranging from barren playa and alkali flats, grasslands, shrublands, and woodland. Complete lists of wildlife species present on WSMR can be found in the INCRMP (WSMR 2015).

Invertebrates

Invertebrate fauna of WSMR play a major role in such processes as pollination, soil aeration, decomposition, and seed dispersal. Invertebrates are also an important source of nutrition for many vertebrate species. A complete inventory of invertebrate species for WSMR has not been documented (WSMR 2015). Common orders of insects found on WSMR include Coleoptera (beetles), Hemiptera (true bugs), Hymenoptera (ants, bees, and wasps), Lepidoptera (butterflies and moths), and Diptera (flies). Other common arthropod orders include Scholopendromorpha (bark centipedes), Thelyphonida (vinegaroons), Scorpiones (scorpions), and Araneae (spiders).

One species of aquatic snail, the Tularosa springsnail (*Juturnia tularosae*), is endemic to WSMR, occurring within soft sediment areas of Salt Creek. This species also is presumed to act as an intermediate host to a trematode which parasitizes the White Sands pupfish (*Cyprinodon Tularosa*). This species overlaps with pupfish habitat; however, it has a more restricted range than the pupfish occurring in locations of Salt Creek with moderate to lower salinity levels (WSMR 2009). Salt Creek crosses the eastern third of the 49-Nautical Mile Impact Area.

Fishes

The only fish species native to WSMR is the White Sands pupfish. This small fish is endemic to the Tularosa Basin, natively occurring at Salt Creek and Malpais Spring and introduced to Mound Spring within WSMR and Lost River on Holloman Air Force Base. They occupy a variety of microhabitats, ranging from deep spring ponds to shallow pools and calm spring runs varying in salinity from freshwater (salinity of three parts per thousand) to saltier than seawater (salinity of 50 parts per thousand). Within its limited habitat, populations are often dense, but their numbers can experience wide fluctuations due to natural climatic perturbations such as flood or drought. The White Sands pupfish is omnivorous, feeding mainly on aquatic insects and larvae, algae, and organic detritus (WSMR 2009). The Malpais Spring irrigation ditch crosses the eastern third of the 49-Nautical Mile Impact Area, which may provide temporary habitat during rainy periods.

Nonnative fish species introduced to WSMR include largemouth bass (*Micropterus salmoides*), mosquitofish (*Gambusia affinis*), goldfish (*Carassius auratus*), and sunfish (*Lepomis* spp.) which have been introduced into springs and ponds and can pose a threat to native White Sands pupfish populations (WSMR 2009).

Amphibians and Reptiles

WSMR contains habitat that supports a diverse herpetofauna: seven species of amphibians and 47 species of reptiles, representing three orders and 12 families, have been documented. There are six toad species (three spadefoot toads and three true toads), one salamander species, one turtle species, 27 snake species, and 19 lizard species (WSMR 2015). Five rattlesnake species occur on WSMR, and bites from all are potentially lethal. All other snakes occurring on WSMR are either non-venomous or mildly venomous and are not dangerous to human (WSMR 2009).

Herpetofauna associated with the Oneseed Juniper Woodland vegetative community of the NCA Impact Area and buffer include glossy snake (*Arizona elegans*), gopher snake (*Pituophis melanoleucus*), great plains skink (*Eumeces obsoletus*), lesser earless lizard (*Holbrookia maculata*), long-nosed leopard lizard (*Gambelia wislizenii*), massasauga (*Sistrurus calenatus*), milk snake (*Lampropeltis triangulum*), rattlesnake

(*Crotalus* sp), spadefoot toads (*Spea* sp and *Scaphiopus couchii*), Texas horned lizard (*Phrynosoma cornutum*), western hognose (*Heterodon nasicus*), whipsnake (*Masticophis flagellum*), and whiptails (*Cnemidophorus* sp) (Dagenhardt et al. 1996).

Birds

Habitats within WSMR support some 290 documented avian species, many of which are seasonal or year-round residents (WSMR 2013). WSMR has resident populations of raptors, game birds, and songbirds. Raptor species common on WSMR include red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), and Swainson's hawk (*Buteo swainsoni*). Game birds found on WSMR include Gambel's quail (*Callipepla gambellii*), scaled quail (*Callipepla squamata*), white-winged dove (*Zenaida asiatica*), and mourning dove (*Zenaida macroura*). Songbirds common to WSMR include black-throated sparrow (*Amphispiza bilineata*), pyrrhuloxia (*Cardinalis sinuatus*), and horned larks (*Eremophila alpestris*) (WSMR 2009).

The following birds are anticipated to occur within the scattered juniper and grassland habitats of the 1,000-ac (405-ha) NCA buffer area: Bewick's wren (*Thryomanes bewickii*), common nighthawk (*Chordeiles minor*), flycatchers (*Empidonax* sp), greater roadrunner (*Geococcyx californianus*), hawks (*Buteo* sp), loggerhead shrike, meadow lark (*Sturnella neglecta*), mourning dove (*Zenaida macroura*), northern harrier, orioles (*Icterus* sp), pinyon jay (*Gymnorhinus cyanocephalus*), raven (*Corvus* sp), ruby-crowned kinglet (*Regulus calendula*), sparrows and warblers (Family Emberizidae), and western scrub-jay (*Aphelocoma woodhouseii*) (HDR 2015).

Mammals

WSMR is home to 73 documented game and non-game mammal species. Large herbivores found on WSMR include mule deer (*Odocoileus hemionus*), elk (*Cervis canadensis*), collared peccary (*Pecari tajacu*), pronghorn antelope (*Antilocapra americana*), bighorn sheep (*Ovis Canadensis*), and nonnative species including feral horse (*Equus caballus*), oryx (*Oryx gazella*), and Barbary sheep (*Ammotragus lervia*).

Predator species commonly found on WSMR include coyote (*Canis latrans*), bobcat (*Lynx rufus*), mountain lion (*Felis concolor*), and badger (*Taxidea taxus*). Small mammals occurring on WSMR include three species of rabbits, one species of shrew (*Notiosorex crawfordi*), 31 species of rodents, and 17 species of bats. Rodents make up the most diverse order of mammals occurring on WSMR, representing five different families: Sciuridae (squirrels), Geomyidae (gophers), Heteromyidae (kangaroo mice and pocket mice), Muridae (mice and rats), and Erethizontidae (porcupine). Bats are represented by two families: Vespertilionidae (common bats) and Molossidae (free-tail bats) families. Most bat species at WSMR roost in caves and buildings, and a few are tree-roosting species (WSMR 2009).

Small mammals commonly found within the 1,000-ac (405-ha) NCA buffer area include: kangaroo rats (*Dipodomys* sp), pinyon deer mouse (*Peromyscus maniculatus*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), woodrat (*Neotoma* sp) and various rodents of the Family Muridae. Larger mammals of the area include: badger, black-tailed jackrabbit (*Lepus californicus*), cottontail rabbit (*Sylvilagus* sp), coyote, foxes (Family Canidae), mule deer, and pronghorn antelope (HDR 2015).

3.3.1.3 Threatened and Endangered Species

White Sands Missile Range

Table 3-4 lists federal and state threatened or endangered listed plant and wildlife, including transient individuals, that occur or have the potential to occur within WSMR boundaries and within the project areas and their vicinity. Potential occurrence was determined based on past documentation of each species within the vicinity of the project areas and on suitability of habitat and occurrence within the region of a particular species. There are no critical habitats within the proposed project areas or within the vicinities for the project sites (NMDGF 2017, USFWS 2017).

Table 3-4. Protected Species Potentially Occurring at WSMR and within the Project Areas

Species	Status		Base Presence	Potential to Occur on Project Sites
	Federal	State		
Plants				
Todsen's pennyroyal, <i>Hedeoma Todsenii</i>	E	E	San Andres Mountains	No
Night-blooming cereus, <i>Peniocereus greggii</i> var. <i>greggii</i>	SOC	E	Oscura Mountains	No
Organ Mountains pincushion cactus, <i>Escobaria organensis</i>	SOC	E	Organ Mountains	No
Mescalero milkwort, <i>Polygala rimulicola</i>	SOC	E	Two isolated populations	No
Fishes				
White Sands pupfish <i>Cyprinodon Tularosa</i>	Under review	T	Perennial springs; Tularosa Basin.	Near 49-NM IA
Birds				
Least tern (interior population) <i>Sterna antillarum</i>	E	E	Transient	No
Northern aplomado falcon <i>Falco femoralis septentrionalis</i>	E	E	Savannas and grasslands, often with scattered trees or tall yuccas	Vandal, 65-NM, 70-NM IAs
Southwestern willow flycatcher <i>Empidonax trailii extimus</i>	E	E	One individual observed; potentially on migration	No
Bald eagle <i>Haliaeetus leucocephalus</i>	--	T	Rarely observed in winter	No
Mexican spotted owl <i>Strix occidentalis lucida</i>	T	SGCN	Species or critical habitat not on WSMR	No
American peregrine falcon <i>Falco peregrinus anatum</i>	SOC	T	Suspected breeding in Oscura and San Andres mountains	70-NM, 77-NM IAs
Baird's sparrow <i>Ammadramus bairdii</i>	SOC	T	Grasslands, Jornada Plain	49-NM, 65-NM, 70-NM, Vandal IA
Bell's vireo <i>Vireo bellii</i>	SOC	T	Early successional riparian thickets, San Andres Mountains (<5,000 ft)	No
Yellow-billed cuckoo <i>Coccyzus americanus</i>	T	SGCN	Limited riparian woodland	No
Brown pelican <i>Pelecanus occidentalis</i>	--	E	Migration/stopover only	No
Neotropic cormorant <i>Phalacrocorax brasilianus</i>	--	T	Migration/stopover only	No

Species	Status		Base Presence	Potential to Occur on Project Sites
	Federal	State		
Broad-billed hummingbird <i>Cyanthus latirostris</i>	--	T	Higher desert canyons and washes, riparian and foothill woodlands	No
Costa's hummingbird <i>Calypte costae bourcier</i>	--	T	Shrublands within dry washes and canyons	No
Gray vireo <i>Vireo vicinior</i>	Species at risk	T	Juniper and foothill woodlands	No
Varied bunting <i>Passerina versicolor</i>	--	T	Dense thorny scrub in canyons, San Andres Mountains	No
Pinyon jay <i>Gymnorhinus cyanocephalus</i>	--	SGCN	Pinyon-juniper woodlands	77-NM IA
Mammals				
Oscura Mountains Colorado chipmunk <i>Neotamias quadrivittatus oscuraensis</i>	Species at risk	T	Oscura Mountains pinyon-juniper associations	77-NM IA
Organ Mountains Colorado chipmunk <i>Neotamias quadrivittatus australis</i>	SOC	T	Texas Canyon, Organ Mountains	No
Spotted bat <i>Euderma maculatum</i>	--	T	Chihuahuan Desert to tree line; Mound Springs	No

E = endangered, T = threatened, SOC = species of concern, SGCN = species of greatest conservation need, -- = no listing, and IA = impact area.
Source = WSMR 2015.

In addition to the federally and state threatened or endangered plant species, there are 13 federal and state species of concerns and one state species of concern without federal listing. There are four federal or state bird species of concern that have potential to occur at WSMR. There are ten mammal species of concern that have potential to occur at WSMR, with eight of these being bats or myotis species. Descriptions of these species can be found in the WSMR INCRMP (WSMR 2015).

There are no federal or state threatened or endangered plant species with potential to occur within the 1,000-ac (405-ha) NCA buffer area (HDR 2015). Table 3-5 summarizes the federally and state listed wildlife species with the potential to occur within the NCA and the 1,000-ac (405-ha) buffer area, including transient individuals that do not regularly inhabit these areas.

Sprague's pipit and mountain plover occur rarely or are unlikely to occur in the project area. The Sprague's pipit is an uncommon visitor to grasslands during the winter, and the mountain plover occurs in shortgrass prairies and dry playas, only sometimes occurring in areas with juniper. The arctic peregrine falcon, gray vireo, loggerhead shrike, and western burrowing owl are all associated with juniper or pinyon-juniper woodland and may occur within the project area. The pinyon jay is a species associated with the pinyon-juniper woodland.

Northern Call-Up Area

There are two plant species of concern, one reptile species of concern, four bird species of concern, and two mammal species of concern that have potential to occur in the 1,000-ac (405-ha) NCA buffer area. Detailed descriptions of these species and their habitats can be found in the *Biological Survey Report for the Naval Launched Test Article Parcel* (HDR 2015).

Table 3-5. Protected Species Potentially Occurring at NCA and within the Project Areas

Species	Status		Habitat Associations	Potential to Occur Within the Buffer
	Federal	State		
Birds				
Mexican spotted owl <i>Strix occidentalis lucida</i>	T	SGCN	Canyons and forested habitats.	Unlikely to occur. Habitat not present.
Northern aplomado falcon <i>Falco femoralis septentrionalis</i>	E	E	Savannas and grasslands, often with mesquites.	Unlikely to occur. Habitat not present
Southwestern willow flycatcher <i>Empidonax trailii extimus</i>	E	E	Dense areas of deciduous trees.	Unlikely to occur. Habitat not present
Yellow-billed cuckoo <i>Coccyzus americanus</i>	T	SGCN	Low to moderate elevation riparian woodland	Unlikely to occur. Habitat not present
Arctic peregrine falcon <i>Falco peregrinus tundrius</i>	SOC	T	Juniper savanna, pinyon-juniper forest, deciduous woodland, grasslands	May occur
Gray vireo <i>Vireo vicinor</i>	--	T	Juniper canyon and foothill woodlands	Unlikely to occur. Habitat not present.
Sprague's pipit <i>Anthus spraguei</i>	C	SGCN	Pinyon-juniper in the Upper Sonoran Zone	Unlikely to occur. Unlikely winter visitor.
Mammals				
New Mexico meadow jumping mouse <i>Zapus hudsonius luteus</i>	E	E	Dense riparian vegetation	Unlikely to occur. Habitat not present

C = candidate, E = endangered, T = threatened, SOC = species of concern, SGCN = species of greatest conservation need, -- = no listing, and IA = impact area.

Source = HDR 2015.

3.3.1.4 Migratory Birds

Protocols and procedures for the protection of migratory birds on WSMR are discussed in the WSMR INCRMP (WSMR 2015). The project areas associated with the proposed action cover a wide range of vegetative communities and habitat associations. As such, a variety of birds protected by the MBTA are expected to occur within these sites. Chihuahuan Desert grasslands are used during migration and in winter by large numbers of birds, particularly sparrows, meadowlarks, mourning doves, and raptors. Desert grasslands in the Jornada Plain support breeding birds and provide important wintering habitat for several Partners in Flight high-priority species, such as Baird's sparrow, Sprague's pipit, McCown's longspur (*Rhynchophanes mccownii*), and Chestnut-collared longspur (*Calcarius ornatus*) (DTRA 2015).

Raptor species common on WSMR and likely to hunt over the proposed impact sites include red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk, northern harrier, and prairie falcon (*Falco mexicanus*). Because of the 70-NM and 77-NM Impact Areas' proximity to rocky outcrops and cliffs of the Mockingbird Mountains, there is potential for raptors and other resident birds to nest nearby, including red-tailed hawks, prairie falcons, golden eagles, ravens, and turkey vultures (*Cathartes aura*).

3.3.1.5 Golden Eagles

Golden eagles occur throughout WSMR and likely use all impact areas considered in this EA. However, the Vandal Site Impact Area is the only project area that contains known golden eagle nests. The nests are located within the southwest corner of this impact area. There are golden eagle nests outside the boundaries of the 65-NM, 70-NM, and 77-NM impact areas.

3.3.1.6 Other Protected Species

The White Sands are home to three endemic lizards that have lighter coloration than their common species representatives. These include the little white whiptail lizard (*Aspidoscelis gypsi*), the bleached earless lizard (*Holbrookia maculate*), and the southern plateau lizard (*Sceloporus cowlesi*). All three lizards are expected to be found in the inter-dunal vegetative cover common within the 32-NM Impact Area (Burkett 2017).

The desert massasauga (*Sistrurus catenatus edwardsii*), is listed as a Species of Greatest Conservation Need by the State of New Mexico and is a candidate species for federal ESA listing. The desert massasauga occurs on sandy soils where it is associated with a variety of habitats including woodlands, shrublands, savannahs, and grasslands. This snake is likely to be found in the 32-NM Impact Area and has limited potential to occur within the 1,000-ac (405-ha) NCA buffer area.

Conservation measures for these four species are provided in the WSMR INCRMP (WSMR 2015).

3.3.2 Environmental Consequences

3.3.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, there would be no new construction or RDT&E activities conducted at WSMR or within the NCA. Therefore, there would be no effect to sensitive species or habitats due to implementation of this alternative.

3.3.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Alternative 2 construction activities would be conducted within previously disturbed areas and would not affect nearby vegetation, wildlife, or habitat. RDT&E activities could impact biological resources during the following:

- Firing of checkout slugs immediately north of the LC-35E site;
- Emplacement and recovery of targets and instrumentation;
- Impacts of inert HVP; and
- Recovery of sabots, checkout slugs, and inert HVP.

Vegetative Communities

To minimize impacts to vegetation, the test proponent would ascertain advantageous access routes for test equipment emplacement and recovery of equipment and debris (e.g., sabots and checkout slugs), thus reducing off-road travel.

Recovery of buried HVP would require truck-mounted drilling rigs to travel off-road to the impact sites. Removed soils would be replaced following the recovery action, and the area would be re-contoured to match the pre-test conditions to the fullest extent possible. Revegetation of disturbed areas would be evaluated on a case-by-case basis. If required by the WSMR Garrison Environmental Division, reseeding would be done using species of indigenous flora approved by WSMR natural resources personnel.

To reduce the chance of invasive plants affecting project areas, the test proponent would coordinate with the WSMR Integrated Pest Management Coordinator regarding invasive weed management. Preventative

and control measures would include, but not be limited to, an Employee Environmental Awareness Program; vehicle and equipment entry and exit cleaning procedures; treatment methods including manual, mechanical, and herbicidal; and restoration and revegetation practices. These measures would prevent the infestation of invasive plant species from altering the ecological function of the WSMR lands.

Wildlife

To limit disturbance to fauna and habitat, support vehicles would use existing roads whenever possible. Off-road travel would be restricted to emplacement of testing and monitoring equipment and conducting of recovery activities, using single paths in and out. Such emplacement of equipment should avoid removal of vegetation during migratory bird nesting season. The nesting season is between March and August. A qualified biologist would determine if nests are present in project areas during nesting season.

Wildlife species would likely vacate areas temporarily when human activity level is high during instrumentation emplacement and test preparation. Small mammals, rodents, and reptiles would likely withdraw to burrows during these same activities. The likelihood that fauna would be hit directly by sabots, checkout slugs, or HVPs expended during testing is very small. These test articles would generally disperse over a relatively small surface area, and when combined with the low density of wildlife across a sizable area and the tendency for fauna to scatter during a threat, a very low probability of a direct impact is expected. Individual mortality may occur; however, no population level impacts are anticipated. Therefore, no major or long-term effects on wildlife populations are anticipated.

Threatened and Endangered Species

There are no known populations of federally-threatened or endangered species or critical habitats present at the proposed project sites; however, there is potential for the following species to occur in the WSMR project areas seasonally or as transient or foraging individuals: northern aplomado falcon, Baird's sparrow, and Oscura Mountains Colorado chipmunk. White Sands pupfish (a state-listed threatened species) is also considered, because of the site's proximity to the pupfish area of concern within the 49-NM Impact Area.

The northern aplomado falcon in New Mexico is listed under Section 10(j) of the ESA as a Nonessential Experimental Population; therefore, federal agencies are required to determine if their activities could jeopardize the continued existence of the species. The proposed Vandal Powder Gun, 65-NM, and 70-NM impact areas may provide foraging habitat for northern aplomado falcons. Pre-clearance surveys prior to target establishment would include surveying vegetation and utility poles for nests, including raptor or raven nests that could be used by northern aplomado falcons. WSMR standard procedures for range users require that projects occurring within Chihuahuan Desert grassland habitat would be coordinated with WSMR Environmental Division to ensure that appropriate surveys are conducted. If a northern aplomado falcon nest is observed, projects would be sited to avoid impacts to the falcons, their nests, eggs, or nestlings. Any northern aplomado falcon sighting would be reported to the USFWS within 24 hours.

Baird's sparrows do not breed in New Mexico, but do have potential to be present in the area in winter. Clearing of targets prior to their use would cause any birds on site to leave the area. This would also result in minor loss and fragmentation of habitat for these wintering grassland birds. Surveys would be conducted prior to target establishment, and any sightings of Baird's sparrow would be reported.

The Oscura Mountains Colorado chipmunk and pinyon jay may be present within the 77-NM Impact Area during HVP testing, within the pinyon-juniper woodlands present in the eastern mountainous areas of each of these impact areas. Neither species is expected to be affected because munitions used in this impact area would be inert and guided, and BMPs would be implemented to prevent forest fires.

The White Sands pupfish would not be affected by the proposed action through siting of the HVP impacts within the 49-NM towards the Denver and Rhodes WITs, avoiding the Malpais Springs irrigation ditch (see Figure 2-12).

Migratory Birds

Surveys for nesting migratory birds would take place seven days before test activities with the potential to disturb nesting birds occur (e.g., target installation, site preparation, instrumentation placement, and test impacts). The surveys would be conducted by a qualified biologist and use methods accepted by WSMR (e.g., point transects or time-area counts). If occupied bird nests are found during surveys, avoidance mitigation would be employed to either adjust impact locations or delay testing until the nestlings have fledged. WSMR would be consulted to determine how to best address the situation. WSMR would consult with the USFWS, if needed, to avoid MBTA violations. Through implementation of these measures, the proposed action would not likely adversely affect migratory bird populations.

Golden Eagles

Golden eagles occur throughout WSMR. However, the only impact area that contains known golden eagle nests is the Vandal Powder Gun Impact Area, which contains three nests in the southwest corner. There is also an eagle nest just west of the boundary of the 77-NM impact area, which is being used only for inert guided munitions.

While it is possible for an eagle nest to be hit by an errant munition, eagle nests are not expected to be affected because munitions are most likely to hit the center line of each impact area and are much less likely to hit the periphery of an impact area. In the case of Vandal Powder Gun Impact Area, the eagle nests are a long distance (approximately 1.25 miles [mi], 2.0 km) west of the center line of the impact area.

While it is possible for an eagle to be injured or killed by munitions while roosting or flying within an impact, the risk is low due to the low probability of a bird crossing the path of a munition. The following avoidance/minimization measures would be implemented in order to prevent take of eagles or eagle nests:

- Eagle biologists (via the WSMR Garrison Environmental Division) will monitor the eagle nests at or adjacent to each impact to determine which nests are active during a given breeding season.
- Eagle nest locations (active and inactive) will be provided to the test operators in order to avoid munition impacts to golden eagle nests, and targets will not be constructed within 0.5 mi (800 m) of any eagle nest.
- Human and vehicle activity will remain outside of the 0.5-mi (800-m) buffer area for any active eagle nest, throughout the nesting season of mid-January through July.
- Test personnel will immediately provide the locations to the Garrison Environmental Division of any munitions landing near eagle nests (active or inactive), and will immediately report any injured or dead birds (including eagles) discovered in an impact area.

Other Protected Species

The 32-NM Impact Area is occupied by three white lizard species and the desert massasauga, all of which are species with special conservation measures identified in the WSMR INCRMP for the Otero Playa and Duneland Operational Units (WSMR 2015). As such, test managers would coordinate with the WSMR Environmental Division prior to conducting HVP tests in the 32-NM Impact Area. There is a very low probability that HVP tests in these impact areas would directly impact lizards or snakes. In the unlikely event that this occurs, it would lead to fatality of individuals and would not have significant impacts to the populations.

Through implementation of BMPs and mitigation measures provided in Section 3.3.3, implementation of Alternative 2 may affect but not likely adversely affect these protected species.

3.3.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Implementation of Alternative 3 would include all Alternative 2 activities, plus live HVP testing, impacting existing WSMR WITs. Live HVP would impact existing WITs. All WSMR WITs are bladed, highly-impacted areas. As such, implementation of Alternative 3 would not adversely affect vegetative communities.

Given the disturbed nature of the WITs, there would be reduced numbers of resident wildlife species in these areas. Most wildlife observed in WITs would likely be transiting the areas. Considering this, implementation of Alternative 3 would not adversely affect wildlife species.

3.3.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Implementation of Alternative 4 would include all activities associated with Alternative 3, plus the construction and RDT&E activities identified in Section 2.1.4.1.

Vegetative Communities

The blading and mastication of juniper shrub within the 10-ac (4-ha) impact area and installation of the 700-ft (213-m) road would remove a small portion of the local Oneseed Juniper Woodland and would not be represent a significant impact to the local flora. Further, implementation of soil erosion BMPs provided in Section 3.2.3 and implementation of noxious and invasive weed control measures provided in Section 3.3.3 would ensure impacts to vegetation are localized to these construction areas.

Recovery of buried HVP would require truck-mounted drilling rigs travel off-road to the impact sites. Removed soils would be replaced following the recovery action, and the area would be re-contoured to match the pre-test conditions to the fullest extent possible. Revegetation of disturbed areas would be evaluated on a case-by-case basis. If required by WSMR or SLO, reseeding would be undertaken, using species of indigenous flora approved by the SLO land manager.

Wildlife/Migratory Birds/Golden Eagles/Other Protected Species

Potential impacts to wildlife, migratory birds, golden eagles, and other protected species would be very similar to those described in the analysis of Alternative 2 above. As such, the same BMPs and mitigation

measures would be applied, and no takes of sensitive wildlife, migratory birds or golden eagles are anticipated.

Threatened and Endangered Species

There are no known populations of federally- or state-listed threatened or endangered species or critical habitats present at the proposed project sites. However, there is potential for the arctic peregrine falcon to occur in the NCA buffer area seasonally or as transient or foraging individuals. Peregrine falcons hunt over a wide variety of habitats to include very open, featureless habitat so long as there is ample prey. During their migration, arctic peregrine falcons prefer hunting in wetlands or open water habitats occupied by shorebirds, waterfowl, or wading birds (Juergens 2017). Blading and mastication of juniper shrub within the 10-ac (4-ha) impact area would not affect arctic peregrine falcon populations, as it would not lead to greater concentration of these bird species within the project area.

Through implementation of BMPs and mitigation measures provided in Section 3.3.3, implementation of Alternative 4 would not adversely affect threatened and endangered species.

3.3.3 Best Management Practices and Mitigation Measures

As specified in AR 200-2, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). The following BMPs and mitigation measures would be applied to minimize impacts to biological resources:

BMPs:

- Support vehicles would use existing roads to the fullest extent possible;
- Off-road travel would be limited to placement of test support equipment and recovery activities, using a single path in and out;
- Off-road travel would be limited and use of chainsaws would not be allowed to prevent forest fires in the Oscura Mountains;
- Surveys for migratory birds would be conducted seven days before construction and RDT&E activities;
- All openings inside and out of buildings and structures that allow wildlife (e.g., rodents, birds, snakes, etc.) entry would be blocked;
- Do not harass, collect, possess, harm, disturb, or destroy wildlife or their parts to include but not limited to snakes, bats, birds, nests, eggs, or nestlings;
- Report to WSMR Environmental any injured or dead birds or active nests with eggs or nestlings discovered at the project sites;
- Removal or modification of vegetation, including the blading of the NCA 10-ac (4-ha) impact area, would be conducted outside bird nesting season (March through September);
- When vegetation removal or modification must be conducted during bird nesting season, surveys would be conducted by qualified biologists and coordinated with the WSMR Garrison Environmental Division; and
- The WSMR Environmental Division would be contacted regarding any issues regarding migratory birds, raptors, lizards, snakes, or other wildlife species of concern.

Mitigation Measures

- Following HVP recovery, disturbed areas would be restored to the fullest extent feasible, and native vegetation would be allowed to reseed naturally as approved by the WSMR Environmental Division;
- If bird nests are found during surveys, the WSMR Environmental Division would be consulted to determine actions to be taken;
- WSMR Environmental Division would consult with the USFWS regarding MBTA and ESA issues;
- Eagle biologists (via the WSMR Garrison Environmental Division) would monitor the eagle nests at or adjacent to each impact to determine which nests are active during a given breeding season;
- Eagle nest locations (active and inactive) would be provided to the test operators in order to avoid munition impacts to golden eagle nests, and targets would not be constructed within 0.5 mi (800 m) of any eagle nest;
- Human and vehicle activity would remain outside of the 0.5-mi (800-m) buffer area for any active eagle nest, throughout the nesting season of mid-January through July; and
- Test personnel would immediately provide the locations to the Garrison Environmental Division of any munitions landing near eagle nests (active or inactive), and would immediately report any injured or dead birds (including eagles) discovered in an impact area.

3.4 ELECTRIC UTILITIES

Electric utilities are necessary to the mission at WSMR, providing energy sources for operational and support facilities and residences within the installation. An extensive utility network supplies electricity and natural gas to facilities situated throughout WSMR, with the highest concentration located within the Main Post.

3.4.1 Affected Environment

Electricity at WSMR is generated off-range and is supplied by local commercial utilities with several locations linked directly to distribution lines on the local power grid. El Paso Electric Company (EPEC) supplies approximately 93 percent of the electricity used at WSMR, with additional supply provided by Otero Electric and Socorro Electric Cooperative. Primary electrical service is provided by EPEC in the southern and central parts of WSMR and by Socorro Electric Cooperative to the northern part of WSMR.

Mobile and remote operations use portable generators for power supply where no ground-based source is accessible. WSMR currently has over 300 portable diesel generators, with outputs ranging from 10 to 700 kilovolt-amperes (kVA) to remote sites (WSMR 2009).

Electricity at the LC-35E site is provided by EPEC through the WSMR distribution lines. Remote sites including Vandal, Arthur, and the NCA Impact Area would use portable diesel generators as needed.

3.4.2 Environmental Consequences

Potential impacts to electrical utilities were evaluated to assess whether construction and operational activities would result in changes in electricity demand over WSMR. Significance criteria for the analysis of direct and indirect to electric utilities include:

- Negligible (less than significant) – Activities that have barely perceptible impacts on local and regional energy demand;
- Minor to Moderate (less than significant) – Activities that would have noticeable impacts on local and regional energy service demand;
- Severe (significant) – Activities that would create energy service demand in excess of existing supply or capacity; and
- Beneficial – Activities that would result in a reduction of demand for energy services.

3.4.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, there would be no new construction or RDT&E activities conducted at WSMR. Therefore, there would be no impacts to local and regional energy demand.

3.4.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Under Alternative 2, construction activities at LC-35E would have a short-term draw on the electrical utilities at WSMR. This electricity usage is expected to be minor in comparison to routine operations at WSMR as a whole. RDT&E activities at the Vandal and Arthur sites would utilize mobile diesel generators and would not use local electrical utilities.

At LC-35E, electrical and communications cables would be extended from existing service lines and installed in underground conduits to serve the personnel/command shelters, storage shelters, a radar instrumental power van, a mobile radar, the pulsed power system for the EM Railgun, and pole lighting around the site. The pulsed power system would store energy in capacitors, and would precisely switch and manage the energy over a few milliseconds in order to fire the EM Railgun. The use of this system would ensure that the electrical distribution system at WSMR would not be adversely affected by surges or sudden increased demand resulting from the firing of the EM Railgun.

The EM Railgun pulsed power system draws electricity only when charging the capacitors. For a single EM Railgun firing at the highest energy level, the capacitor charge time is about 67 seconds. This 67-second charging would draw approximately 120 megajoules (33.4 kilowatt-hours [kWh]). As of March 2017, the average commercial rate of electricity utilities was 9.99 cents per kWh (EIA 2017). At this rate, each EM Railgun firing would cost \$3.33. The maximum expected number of EM Railgun firings for a one-year period is expected to be 100, representing a maximum annual electricity bill of \$333.

Considering the short-term nature of LC-35E construction activities and the barely perceptible electricity usage due to EM Railgun firings, implementation of Alternative 2 would yield no significant impacts to local and regional energy demand or electric utilities infrastructure.

3.4.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Alternative 3 would have identical construction activities as Alternative 2 and would not exceed the 100 EM Railgun firings annually. Considering the short-term nature of LC-35E construction activities and the barely perceptible electricity usage due to EM Railgun firings, implementation of Alternative 3 would yield no significant impacts to local and regional energy demand or electric utilities infrastructure.

3.4.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Use of local electric utilities under Alternative 4 would be identical to Alternatives 2 and 3. Any instrumentation set up in the NCA would use mobile electric generators and would not draw on local electric utilities. The maximum number of annual EM Railgun firings would remain 100 under this alternative. Considering the short-term nature of LC-35E construction activities and the barely perceptible electricity usage due to EM Railgun firings, implementation of Alternative 4 would yield no significant impacts to local and regional energy demand or electric utilities infrastructure.

3.4.3 Best Management Practices and Mitigation Measures

There would be no anticipated impacts to electric utilities; therefore, there are no BMPs or mitigation measures proposed.

3.5 LAND USE

The attributes of land use addressed in this EA include general land use patterns, land ownership, land management plans, and special use areas. Land ownership is defined according to major categories of land owner, including private, federal, Native American, and state. Federal lands are further described by their managing agency (e.g., USFWS, U.S. Forest Service, Bureau of Land Management [BLM], or DoD). Several agencies identify special use areas, which are managed differently than other lands due to their sensitivity.

3.5.1 Affected Environment

3.5.1.1 WSMR On-Station Land Use

Military Land Use

WSMR developed a Land Use Classification system to assist in planning range use. The classifications primarily reflect the administrative status of land areas and overlying airspace and the associated limitations on use. The WSMR FEIS lists 17 discrete Land Use Classifications involving combinations of land status and airspace designation at WSMR.

Figure 2.3-1 of the FEIS (WSMR 2009) provides an overview of the Land Use Classifications for the WSMR lands. The project areas associated with the proposed action fall under Land Use Classification C, *Augmented Test Zone*, with the exception of portions of the Denver and Rhodes WITs that are within the 49-Nautical Mile Impact Area, which are Land Use Classification D, *Impact Area*. All proposed activities would be consistent with WSMR's Land Use and Airspace Strategy Plan ([LUASP] Appendix B, WSMR 2009) and would follow the siting and review process provided in Section 6. Sensitive species and specialized areas would be avoided to the fullest extent feasible.

Land Use Classification C, *Augmented Test Zone*, supports a wide variety of test and management activities, including airborne and surface-based weapons firing, impact zones, and danger zones, directed energy systems, aircraft operations, dismounted operations, communications and instrumentation, field operations, and off-road travel using all types of vehicles (heavy/light, tracked/wheeled). Activities in this Land Use Classification can be constrained by a variety of environmental or operational factors. For example, certain safety buffers, such as around munitions storage facilities, are in effect continuously and preclude siting or occupation of other facilities. The large safety buffers associated with many testing activities at WSMR are temporary, lasting only for the duration of the test, allowing multiple uses at other times (WSMR 2009).

Land Use Classification D (*Impact Area*) lands are known to contain dud high-explosives rounds and are not compatible with any ground activity other than explosive ordnance disposal (EOD) and data recovery. Adjacent areas are subjected to noise, smoke, dust, and an increased potential for wildfires (WSMR 2009).

Recreational Land Use

Hunting on WSMR is conducted for recreation and wildlife population management. Since the 1950s, WSMR and NMDGF have cooperated to conduct hunts for big- and small-game animals on WSMR. Big game available for hunting on WSMR include oryx, pronghorn, desert bighorn sheep, and mountain lion. Small-game species include furbearers, upland game birds, waterfowl, and non-protected species. WSMR

is closed to fishing, sport trapping, and hunting for black bear, Barbary sheep, mule deer, elk, javelina, and turkey. The collection and/or killing of reptiles and amphibians are prohibited (WSMR 2015).

Hunting on WSMR occurs in compliance with state and federal laws, NMDGF regulations, and WSMR regulations. *The White Sands Missile Range Installation Hunting Program Guidance, Policies, and Procedures* (WSMR 2012) addresses responsibilities, policies and procedures, safety and security issues, and methods, means, and access for hunting on WSMR. Hunting on WSMR is authorized and regulated in accordance with WSMR (2012); state, federal, and Army and Range regulations; and Army and Range policies. Hunting seasons, dates, areas, closures, species, licensing, weapons restrictions, and bag limits are primarily established by and in compliance with state regulations.

Restricted Access Hunts are available only to WSMR personnel who have long-term up-range access authority and have a Range Hunting Permit, and to guests who are escorted by volunteers that are properly permitted. Hunting opportunities include lottery draw oryx hunts, cougar, and small game hunting. Restricted access oryx hunts are conducted to reduce animal numbers in remote areas of the range (WSMR 2012).

Public tours of the Trinity Site are offered biannually. The Trinity Site, which was the site of the first atomic bomb detonation in 1945, is a National Historic Landmark. In addition, White Sands National Monument provides guided tours of Lake Lucero approximately once per month (WSMR 2009).

Athletic events held on WSMR include biking, running, and swimming races and the Bataan Memorial Death March. Several races are run per year and include duathlons and triathlons. The annual Bataan Memorial Death March, first held in 1989, consists of a 26.2-mi (42.2-km) trek through rugged terrain within WSMR. This event can host thousands of participants (WSMR 2009).

3.5.1.2 NCA Land Use

Land ownership in the NCA is summarized in Table 3-6. The majority of privately-owned lands in the vicinity of the 1,000-ac (405-ha) buffer area are used for livestock rangeland. Many livestock operations in the area make use of several tracts of land including privately owned land and land leased from BLM or other government agencies.

Table 3-6. Land Ownership within the NCA

Surface Administrator	Acreage	Percent of NCA
Bureau of Land Management	328,600	38
State of New Mexico	258,786	30
Private Owners	205,111	24
US Fish and Wildlife Service	64,027	7
Department of Defense	10,806	1
TOTAL	867,330	100

Source: WSMR 2009.

The New Mexico SLO is the management agency for state lands, and is tasked with generating funds through leases to support education within the state. Of the combined 629,980 total ac (254,944 ha) administered by the SLO in the WSMR NCA and WCA, 607,500 ac (245,848 ha) are leased for agricultural purposes, 35,090 ac (14,200 ha) are leased for oil and gas extraction, 75,510 ac (30,558 ha) are leased for commercial purposes, and 2,910 ac (1,178 ha) are leased for mineral extraction (WSMR 2009).

The proposed 1,000-ac (405-ha) buffer area is located approximately 16 mi (26 km) north of the town of Bingham in Socorro County, New Mexico. The buffer area is entirely on state-owned ranch land and is surrounded in all directions by undeveloped ranch land with several two-track and bladed unpaved roads. No known structures exist within the site boundaries.

There are no facility-based recreational activities within the 1,000-ac (450-ha) buffer area; only dispersed recreational opportunities occur within the vicinity of the site. Recreational opportunities may include bird watching, day hiking, geocaching, horseback riding, hunting, off-highway vehicle use, mountain-biking, primitive camping, scenic driving, and sightseeing.

Hunting is a popular activity in the NCA on both public and privately-owned lands. Under the authority of 36 CFR Part 53 (e) and 36 CFR Part 261.54 (e), Call-up areas may be closed to scheduled and unscheduled hunting to protect public safety. During these closures all persons, including hunters, are evacuated from the areas and roadblocks are established along roads to prevent access (WSMR 2015).

3.5.2 Environmental Consequences

Actions that would lead to significant land impacts include those that would: 1) be inconsistent or in non-compliance with applicable use plans or policies; 2) preclude the viability of an existing use activity; 3) preclude continued use or occupation of an area; 4) be incompatible with adjacent or vicinity use to the extent that public health or safety is threatened; or 5) conflict with range planning criteria established to ensure the safety and protection of human life and property.

3.5.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, there would be no new construction or RDT&E activities conducted. Therefore, implementation of the No-Action Alternative would yield no land use impacts.

3.5.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Under Alternative 2, all construction and RDT&E activities would be conducted on WSMR lands. These activities would be consistent with current Army and WSMR land use management plans and guidance and would not preclude the viability of existing use activity within the project areas or other adjacent areas. Through coordination with involved groups, recreational activities would not be significantly impacted. By following existing SOPs and BMPs, there would be no increased risk to public health and safety.

Inert debris (containing no HE or chemical residues) including sabots, checkout slugs, and HVP from failed tests, will be dispersed following tests, generating areas that would be technically considered to fall under Land Use Classification D, *Impact Area*. This debris would be removed immediately following each test, reverting the affected area to Land Use Classification C, *Augmented Test Zone*. Such changes in land use classification would not be permanent. Considering this, there would be no significant land use impacts associated with the implementation of Alternative 2.

3.5.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Alternative 3 would have the same construction and RDT&E activities associated with Alternative 2, plus the testing of live (containing HE) HVPs. The live HVP tests would impact existing WITs and would not be recovered, consistent with land use plans for Land Use Classification D, *Impact Area*. Implementation of Alternative 3 would result in no significant land use impacts.

3.5.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Alternative 4 would involve all Alternative 3 construction and RDT&E activities, plus the installation of a 700-ft (213-m) length of unpaved road, blading and mulching of a 10-ac (4-ha) impact area, and impacts of inert HVP within the bladed and mulched impact area. The NCA activities would be consistent with SLO guidance as stipulated in a lease agreement for the 1,000-ac (405-ha) buffer area. HVP testing would be scheduled to avoid hunting seasons; however, testing during hunting seasons would be coordinated with the NMDGF to properly communicate the testing activities to area residents and hunters.

Residents of the NCA would be contacted 30 days prior to any HVP tests impacting within this area, with notification of any modification within 48 hours of operations. Mandatory evacuation of the NCA would be conducted in accordance with an existing memorandum of understanding. Road signs would be posted on all access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of the evacuation orders.

Considering the measures described above, implementation of Alternative 4 would yield no significant land use impacts.

3.5.3 Best Management Practices and Mitigation Measures

As specified in AR 200-2, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). The following BMPs and mitigation measures would be applied to reduce land use impacts:

BMPs:

- All construction and RDT&E activities would be consistent with the WSMR LUASP;
- RDT&E activities would be planned with WSMR to minimize impacts to other WSMR mission requirements and other land uses of the station; and
- Residents of the NCA would be contacted 30 days prior to any HVP tests impacting within the 10-ac (4-ha) impact area, with notification of any modification within 48 hours of operations.

Mitigation Measures:

- Testing activities in the NCA would be scheduled outside hunting seasons. When testing must be performed during hunting seasons, WSMR will coordinate with NMDGF to properly communicate the testing activities to area residents and hunters;
- The NCA would be evacuated during HVP tests, in accordance with an existing memorandum of understanding; and
- Road signs will be posted on all NCA access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of any evacuation orders.

3.6 TRAFFIC AND TRANSPORTATION SYSTEMS

This section discusses the network of roads, highways, and railroads that serve southern New Mexico and the WSMR region. This section also briefly discusses the occurrences of roadblocks as a result of proposed action activities.

3.6.1 Affected Environment

3.6.1.1 Regional Road Network

Interstate Highways 10 (I-10) and 25 (I-25) are the primary interstate highways in the vicinity of WSMR. I-10 generally traverses in an east-west direction and passes approximately 50 mi (80.5 km) south of the Main Post, with exits to WSMR at El Paso, Texas and Las Cruces, New Mexico. I-25 provides a north-south interstate connection to WSMR, with local exits at San Antonio (17 mi [27.4 km] from the Stallion Gate), and Las Cruces (22 mi [35.4 km] from the Las Cruces Gate).

Other major highways serving WSMR include US 380, US 70, and US 54. US 70 crosses the southern portion of WSMR between Las Cruces and Alamogordo and connects the City of Las Cruces to the Main Post, with an exit located 5 mi (8 km) north of the Main Post on Range Road 1. US 54 runs a parallel course along the entire eastern boundary of WSMR between Carrizozo and El Paso. US 380 travels along the northern boundary of WSMR between San Antonio and Carrizozo and connects with I-25 in San Antonio. No major access points exist along the western boundary of WSMR.

Throughout the NCA is a network of Socorro County- and WSMR-maintained unpaved roads, which can be accessed from US 380 at the southern end and US 60 from the north. Private roads branch off county and WSMR roads to provide access to other remote locations. A two-track road approaching the proposed buffer area branches off the WSMR S Route 3704.

WSMR sets safety roadblocks on US 70 and other local roads to protect motorists from debris during a test mission. A memorandum of agreement with the State of New Mexico grants WSMR the authority to establish roadblocks on public roadways US 70, US 54, and US 380 as a safety precaution during missile tests. Under the agreement, roadblocks on US 54 and US 70 may last approximately 60 minutes and, in cases of emergency, no longer than 80 minutes. On US 380, roadblocks may last approximately two hours. Per requirements stated in the agreement, WSMR must notify the State Highway Engineer at the New Mexico State Highway Department 48 hours prior to implementation of any such public roadblocks. The US 70 roadblocks are set at various points between White Sands National Monument and San Augustin Pass. The US 380 roadblocks are set east of the Rio Grande and west of Carrizozo. The US 54 roadblocks are set south of Orogrande and north of the New Mexico/Texas state line. During FY 2007, 32 highway closures occurred (22 for US 70 and ten for US 380). Under the WSMR FEIS Record of Decision, the number of annual closures increased to 44 occurring on US 70 and 25 occurring on US 380 (WSMR 2009). In FY 2016 there were 62 highway closures (42 for US 70 and 20 for US 380). WSMR also establishes an average of two internal roadblocks per day. These roadblocks can occur anywhere on the main range and are from two-and-a-half to three hours in length (Parsons 2017).

3.6.1.2 WSMR Range Roads

WSMR maintains access to much of the range via a widespread network of primary and secondary range roads. Most areas within WSMR are connected via an extensive road network, with the exception of less

accessible areas in the San Andres and Oscura mountains. A road system within WSMR is of limited access and is maintained, as funding permits, by WSMR. The roadway system within the installation comprises 1,338 mi of major range roads, 596 mi of secondary roads, 1,490 mi of bladed trails, and an undetermined length of remote two-track four-wheeled-vehicle trails. The size, surface, and condition of these roads vary. Major range roads are two-lane roads with either paved or graded surfaces; all secondary roads are unpaved (WSMR 2009).

3.6.2 Environmental Consequences

Impacts to transportation were primarily assessed by reviewing the anticipated increase of vehicle traffic on roads accessing project areas (i.e., regional highways, WSMR roads, and unpaved roads within the NCA) and determining how the increased traffic would impact the existing transportation infrastructure.

3.6.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, there would be no construction at LC-35E or increased RDT&E activities at WSMR. As such, there would be no transportation impacts under this alternative.

3.6.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

Under Alternative 2, there would be an increase of vehicle traffic on WSMR roads during the construction activities at LC-35E and during EM Railgun and HVP RDT&E activities. The present road network is sufficient to handle this increase, and degradation of the road network is not a concern. Powder gun tests from the Vandal and Arthur sites would not require highway closures but would require closure of WSMR roads for approximately ten test events per year. EM Railgun tests from LC-35E would require closure of US 70 and internal WSMR roads for approximately five events per year. These closures would be minimized to the least restrictive duration, approximately 75 minutes each. No closures of US 380 would be required under Alternative 2. Considering these factors, there would be no significant transportation impacts due to the implementation of Alternative 2.

3.6.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

The construction activities under Alternative 3 would be identical to Alternative 2, and the operational tempo of the two alternatives would be very similar. Considering this, there would be no significant transportation impacts due to the implementation of Alternative 3.

3.6.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Vehicle traffic associated with Alternative 4 would be identical to Alternative 3, plus the transportation activities within the NCA, including the installation of the new 700-ft (213-m) unpaved road, blading and mulching of the 10-ac (4-ha) impact area, and the RDT&E activities. The existing road network within the NCA is suitable for the anticipated increase in traffic, and degradation is not a concern. There would be an additional five closures of internal WSMR roads, US 70, and US 380 due to EM Railgun and HVP testing utilizing the NCA Impact Area. These closures would be minimized to the least restrictive duration, approximately 75 minutes each. Through use of this BMP, there would be no significant transportation impacts due to the implementation of Alternative 4.

3.6.3 Best Management Practices and Mitigation Measures

As specified in AR 200-2, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). To minimize impacts to area transportation networks, the following BMP would be applied:

- Roadblocks of US 70, US 380, and internal WSMR roads would be minimized to the least duration possible, generally 75 minutes or less.

3.7 HUMAN HEALTH AND SAFETY

Safety is defined as the protection of workers and the public from hazards. The total accident spectrum encompasses not only injury to personnel, but also damage or destruction of property or products. For worker safety, the boundary of the immediate work area defines the region of influence. For public safety, the region of influence varies depending on the nature of the operation; this area may extend for miles beyond the source of the hazard.

The Army's policies, responsibilities, and procedures to protect Army personnel and property are contained in AR 385-10, *Army Safety Program*. The regulation provides for operational safety and safe and healthy work places, and assures compliance with applicable laws and regulations. Department of the Army Pamphlet (DA PAM) 385-24 establishes Army radiation safety guidance and direction, and DA PAM 385-64 provides guidance for the safe storage, handling, and transportation of ammunition and explosives. These pamphlets provide guidance and direction to implement the requirements of AR 385-10. Regulations and guidance pertaining to the safe use of ranges on Army installations is contained in AR 385-63, *Range Safety*. This regulation covers range usage from live firing of small arms to rockets, guided missiles, and lasers, and provides guidance for minimizing the risk of using these weapons.

3.7.1 Affected Environment

Both hazardous and non-hazardous activities occur daily at WSMR. Hazardous activities are activities that can pose a safety hazard to personnel and include weapons firing, bomb drops, hazardous lasers, and similar operations. Most activities are non-hazardous, involving installation management, test setup, calibration of equipment and communication systems, and "dry runs." All hazardous activities performed on WSMR are subject to applicable regulations, review, and approval. WSMR plans test events carefully to meet requisite ground and flight safety criteria. Radio frequency operations are coordinated, and applicable frequency assignments and limitations are established prior to use.

The primary safety issues associated with the proposed action include those inherent to EM Railgun and conventional powder gun RDT&E activities. These safety concerns include, but are not limited to:

- Work-related risks associated with heavy equipment and machinery;
- Vehicle accidents;
- Exposure to venomous animals;
- Exposure to EM radiation;
- Exposure to explosive devices and UXO; and
- Impact with the HVP or checkout slugs.

The safety policy of WSMR is to take every reasonable precaution in the planning and execution of all operations that occur at WSMR and the NCA to prevent injury to people and damage to property. This involves implementing extensive measures for risk mitigation, as well as increased range control in the areas determined to have the highest risk to public safety.

3.7.2 Environmental Consequences

3.7.2.1 Alternative 1 – The No-Action Alternative

Under the No-Action Alternative, no EM Railgun operations or conventional powder gun tests over the current tempo and type would be conducted at WSMR. RDT&E operations at WSMR would continue as previously conducted and would therefore yield no new health and safety impacts.

3.7.2.2 Alternative 2 – EM Railgun/HVP Testing on WSMR with Inert Munitions

General Operational Safety

RDT&E activities would comply with all Army and WSMR policies and procedures to minimize potential health and safety hazards. Hazardous material spills, fires, and other accidents would be reported immediately to WSMR Directorate of Public Works. Accident reports would be submitted documenting measures taken or proposed to minimize impacts and/or to prevent recurrences of incidents.

All personnel would receive UXO training, would remain in approved areas, and would not handle unfamiliar objects. Additionally, all personnel would be trained on how to avoid venomous snakes and how to reduce the risks of heat exposure and dehydration.

Electromagnetic Radiation

To estimate permissible hazards of EM radiation to personnel, the rate at which energy is absorbed in body tissues, called the specific absorption rate, is generally used. The specific absorption rate varies based on distance from the source. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has guidelines for limiting exposure to time-varying electric, magnetic, and EM fields up to 300 gigahertz (GHz). Exposure restrictions to EM energy are based on short-term, immediate health effects, including stimulation of peripheral nerves and muscles, shocks and burns caused by touching conducting objects, and elevated tissue temperatures resulting from absorption of energy during exposure to EM fields (ICNIRP 1998). For electromagnetic fields, the energy level falls rapidly as the distance from the source increases (proportional to the square of the distance). For example, a doubling of the distance from the source results in exposure to one-fourth of the original field.

For the EM Railgun testing at the Wallops Flight Facility, a minimum separation distance of 80 ft (24 m) from the EM Railgun was calculated for personnel present during EM Railgun operation, based on the ICNIRP guidelines and the strength of the radiated field from a EM Railgun shot (Navy 2014). Testing of EM Railgun technology at WSMR would involve the same energy levels and EM fields, and would therefore maintain this distance for all operations. At this distance, EM energy exposure levels would be below exposure limits and would be insufficient to cause adverse effects on health, even under repeated or long-term exposure conditions. In addition, personnel in the immediate vicinity of the EM Railgun during testing would be in trailers, vans, or shelters to provide additional protection.

Kinetic Weapons Safety

Storage and handling of powder gun rounds would be undertaken to minimize risk of endangerment to personnel from explosion and chemical exposure in accordance with the *DoD Ammunition and Explosives Safety Standards: General Explosives Safety Information and Requirements Manual*, DoD 6605.09-M. This

manual and other applicable Army and WSMR policies and procedures set separation distances between explosive ordnance and buildings, vehicles, and other inhabited areas.

Public access to WSMR lands is generally restricted and would not allow members of the public to be present in the HVP and checkout slug impact areas. For HVP tests associated with Alternative 2, WSMR would enact closure of US 70, generally for a period of 75 minutes or less.

WSMR manages restricted airspace on and off the installation's land boundaries. The WSMR Flight Safety Office has the authority to terminate flight tests to protect personnel and equipment and is required to approve all flight tests, based on a comprehensive review of safety factors, risk analysis, and relevant SOPs. Flight safety analysis is actively performed for both catastrophic failure and flight control failures for trajectories over populated areas. Test support includes monitoring missiles and targets trajectories during tests to ensure that flight termination systems (FTS) are activated if needed. The HVP and checkout slugs associated with the proposed action do not have FTS capabilities. However, the projectiles associated with this alternative would be fired on trajectories that would not impact areas outside the WSMR boundaries.

Based on the SOPs and BMPs, provided in Section 3.7.3, that would be followed to ensure safe operation of the powder guns, EM Railgun, and associated HVPs, there would be no significant impacts on human health and safety under Alternative 2.

3.7.2.3 Alternative 3 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions

Implementation of Alternative 3 would involve the same human health and safety as Alternative 2 with the addition of the transportation, storage and use of live HVP. All live HVP would be fired in a manner to impact only within existing WSMR WITs. No recovery of live HVP would be conducted under Alternative 3.

Based on the SOPs and BMPs, provided in Section 3.7.3, that would be followed to ensure safe operation of the powder guns, EM Railgun, and associated HVPs, there would be no significant impacts on human health and safety under Alternative 3.

3.7.2.4 Alternative 4 – EM Railgun/HVP Testing on WSMR with Inert and Live Munitions and an Inert Impact Area within the Northern Call-Up Area

Alternative 4 RDT&E operations would include those associated with Alternative 3, plus testing of inert HVP impacting within the 10-ac (4-ha) NCA impact area. Residents of the NCA would be contacted 30 days prior to any HVP tests impacting within this area, with notification of any modification within 48 hours of operations. Mandatory evacuation of the NCA would be conducted in accordance an existing memorandum of understanding. Road signs would be posted on all access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of the evacuation orders.

Based on the SOPs and BMPs, provided in Section 3.7.3, that would be followed to ensure safe operation of the powder guns, EM Railgun, and associated HVPs, there would be no significant impacts on human health and safety under Alternative 4.

3.7.3 Best Management Practices and Mitigation Measures

As specified in AR 200-2, the project proponent has the responsibility of ensuring that all BMPs or mitigation measures are implemented (Army 1988). To minimize human health and safety impacts, the following BMPs would be applied:

- All personnel would receive UXO training;
- Test proponents will coordinate with WSMR regarding quantity-distance (QD) requirements prior to commencing testing activities;
- Test proponents, through coordination with WSMR, will ensure all Hazard of Electromagnetic Radiation to Ordnance (HERO) safety distances are identified and maintained;
- All personnel would be trained on how to avoid venomous snakes and how to reduce the risks of heat exposure and dehydration;
- Personnel in the vicinity of the EM Railgun would be housed in trailers, vans, or shelters to provide protection from EM radiation;
- All HVP and checkout slugs would be fired on trajectories that would impact only within WSMR impact areas or within the NCA 10-ac (4-ha) impact area;
- Residents of the NCA would be evacuated during HVP tests, in accordance with an existing memorandum of understanding; and
- Road signs will be posted on all NCA access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of any evacuation orders.

3.8 SUMMARY OF POTENTIAL IMPACTS AND MITIGATIONS

BMPs are standard practices that are implemented as part of the proposed action to minimize or avoid adverse impacts. Additional mitigation measures are proposed to rectify or compensate for unavoidable adverse environmental effects that could be significant without mitigation. Table 3-7 provides a summary of the potential impacts associated with the proposed action alternatives, as well as the proposed BMPs and mitigation measures.

The No-Action Alternative would represent no change in the current operational environment of WSMR and the NCA. Therefore, no impacts to the resource areas analyzed would be expected.

1

Table 3-7. WSMR Advanced Gunfire Environmental Effects Summary

Impacts of the Proposed Action Alternatives	Proposed Best Management Practices and Mitigation Measures
Cultural Resources	
<p>No effect/No adverse effect</p> <ul style="list-style-type: none"> • Property 23240 no longer maintains the key physical elements relevant to its historic associations with the Aerobee program; • The proposed project represents a minimal alteration to the design, materials, and workmanship of LC-35E; • Some of the RDT&E activities would occur in areas where cultural resource surveys have not been completed or where NHPA Section 106 consultation is not complete; and • Site-specific cultural resource studies or consultation would be required for some project sites, prior to implementation of proposed activities. 	<p>BMPs</p> <ul style="list-style-type: none"> • All test proponents, employees, and visitors conducting activities outside the WSMR cantonment will be presented an environment and safety awareness video which includes information regarding project personnel will be briefed on cultural resource management and non-disturbance; • Support vehicles will be limited to existing roads, to the fullest extent possible; • Recovery of HVP will be conducted in accordance with the WSMR Standard Operating Procedure for Environmental Protection During Recovery Actions; • In the event of an inadvertent discovery, within WSMR boundaries, program personnel would implement the WSMR inadvertent discovery policy and process specified in the INCRMP; and • In the event of an inadvertent discovery within the NCA, the WSMR CRM would be contacted. The WSMR CRM would then consult with SHPO regarding necessary actions to be taken.
Soil Erosion Effects	
<p>No significant impact</p> <ul style="list-style-type: none"> • The NCA 10-ac (4-ha) would be bladed and mulched; • 700 ft (213 m) of new unpaved roads would be installed; • Mulching would have a beneficial impact with regards to soil erosion; and • Road maintenance would minimize erosion effects. 	<p>BMPs</p> <ul style="list-style-type: none"> • Support vehicles would use existing roads to the fullest extent possible; • Appropriate surface water and erosion control measures would be implemented; • Off-road travel would be limited to placement of test support equipment and recovery activities, using a single path in and out; • Juniper shrub within the NCA 10-ac (4-ha) impact area removed and masticated would be scattered over the impact area as mulch; • The access road for the NCA Impact Area would be monitored and maintained or improved as needed. Road maintenance and improvements would be designed to prevent water down or off the road in a concentrated flow that would create ruts or erosion; and • Following HVP recovery, the excavation areas would be re-contoured to match the existing condition.

Impacts of the Proposed Action Alternatives	Proposed Best Management Practices and Mitigation Measures
<p>Biological Resources</p> <p>No significant impact</p> <ul style="list-style-type: none"> • Reduction in habitat may occur on a small scale but would not impact the ability to maintain plant populations; • Some risk of spreading invasive plant species; • Test articles would impact small surface area over a sizable test area; • Testing operations would avoid known sensitive wildlife species populations; • Individual mortality may occur; however, no population level impacts are anticipated; and • No critical habitat located within the project areas. 	<p>BMPs</p> <ul style="list-style-type: none"> • Support vehicles would use existing roads to the fullest extent possible; • Off-road travel would be limited to placement of test support equipment and recovery activities, using a single path in and out; • Off-road travel would be limited and use of chainsaws would not be allowed to prevent forest fires in the Oscura Mountains; • Surveys for migratory birds would be conducted seven days before construction and RDT&E activities; • All openings inside and out of buildings and structures that allow wildlife (e.g., rodents, birds, snakes, etc.) entry would be blocked; • Do not harass, collect, possess, harm, disturb, or destroy wildlife or their parts to include but not limited to snakes, bats, birds, nests, eggs, or nestlings; • Report to WSMR Environmental any injured or dead birds or active nests with eggs or nestlings discovered at the project sites; • Removal or modification of vegetation, including the blading of the NCA 10-ac (4-ha) impact area, would be conducted outside bird nesting season (March through September); • When vegetation removal or modification must be conducted during bird nesting season, surveys would be conducted by qualified biologists and coordinated with the WSMR Garrison Environmental Division; and • The WSMR Environmental Division would be contacted regarding any issues regarding migratory birds, raptors, lizards, snakes, or other wildlife species of concern. <p>Mitigation Measures</p> <ul style="list-style-type: none"> • Following HVP recovery, disturbed areas would be restored to the fullest extent feasible, and native vegetation would be allowed to reseed naturally as approved by the WSMR Environmental Division; • If bird nests are found during surveys, the WSMR Environmental Division would be consulted to determine actions to be taken;

Impacts of the Proposed Action Alternatives	Proposed Best Management Practices and Mitigation Measures
	<ul style="list-style-type: none"> • WSMR Environmental Division would consult with the USFWS regarding MBTA and ESA issues; • Eagle biologists (via the WSMR Garrison Environmental Division) would monitor the eagle nests at or adjacent to each impact to determine which nests are active during a given breeding season; • Eagle nest locations (active and inactive) would be provided to the test operators in order to avoid munition impacts to golden eagle nests, and targets would not be constructed within 0.5 mi (800 m) of any eagle nest; • Human and vehicle activity would remain outside of the 0.5-mi (800-m) buffer area for any active eagle nest, throughout the nesting season of mid-January through July; and • Test personnel would immediately provide the locations to the Garrison Environmental Division of any munitions landing near eagle nests (active or inactive), and would immediately report any injured or dead birds (including eagles) discovered in an impact area.
Electric Utilities	
<p>No effect</p> <ul style="list-style-type: none"> • RDT&E activities consistent with current WSMR operations; • LC-35E activities would be served by existing WSMR electrical distribution system; • Remote WSMR and NCA sites would receive electricity via portable generators; and • EM Railgun tests would require relatively small draw on utilities. 	<p>No BMPs or Mitigation Measures Proposed</p>
Land Use	
<p>No significant impact</p> <ul style="list-style-type: none"> • All construction and RDT&E activities would be consistent with current land use management plans; • Recreational land use changes would be short-term and temporary on WSMR and the NCA; and • Closures on NCA would be publicized 30 days prior to RDT&E activities. 	<p>BMPs</p> <ul style="list-style-type: none"> • All construction and RDT&E activities would be consistent with the WSMR LUASP; • RDT&E activities would be planned with WSMR to minimize impacts to other WSMR mission requirements and other land uses of the station; and • Residents of the NCA would be contacted 30 days prior to any HVP tests impacting within the 10-ac (4-ha) impact area, with notification of any modification within 48 hours of operations. <p>Mitigation Measures</p>

Impacts of the Proposed Action Alternatives	Proposed Best Management Practices and Mitigation Measures
	<ul style="list-style-type: none"> • Testing activities in the NCA would be scheduled outside hunting seasons. When testing must be performed during hunting seasons, WSMR will coordinate with NMDGF to properly communicate the testing activities to area residents and hunters; • The NCA would be evacuated during HVP tests, in accordance with an existing memorandum of understanding; and • Road signs will be posted on all NCA access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of any evacuation orders.
Traffic and Transportation Systems	
<p>No significant impact</p> <ul style="list-style-type: none"> • Short-term increase on internal WSMR roads during LC-35E construction activities; • Current WSMR infrastructure is adequate to handle proposed action transportation needs; • 700-ft (213-m) unpaved road would be installed to provide access to NCA impact area; and • Up to ten closures of US 70 and five closures of US 380 would be required annually. 	<p>BMP</p> <ul style="list-style-type: none"> • Roadblocks of US 70, US 380, and internal WSMR roads would be minimized to the least duration possible, generally 75 minutes or less.
Human Health and Safety	
<p>No significant impact</p> <ul style="list-style-type: none"> • All RDT&E activities would comply with Army and WSMR policies and procedures; • Public access to WSMR is generally restricted; • All checkout slug and HVP tests would be subject to flight safety analysis; and • HVP currently do not have FTS capabilities. 	<p>BMPs</p> <ul style="list-style-type: none"> • All personnel would receive UXO training; • Test proponents will coordinate with WSMR regarding quantity-distance (QD) requirements prior to commencing testing activities; • Test proponents, through coordination with WSMR, will ensure all HERO safety distances are identified and maintained; • All personnel would be trained on how to avoid venomous snakes and how to reduce the risks of heat exposure and dehydration; • Personnel in the vicinity of the EM Railgun would be housed in trailers, vans, or shelters to provide protection from EM radiation; • All HVP and checkout slugs would be fired on trajectories that would impact only within WSMR impact areas or within the NCA 10-ac (4-ha) impact area; • Residents of the NCA would be evacuated during HVP tests, in accordance with an existing memorandum of understanding; and • Road signs will be posted on all NCA access roads to ensure that recreational land users (e.g., hunters and hikers) are aware of any evacuation orders.

CHAPTER 4 CUMULATIVE IMPACTS

Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA define cumulative impacts as:

...the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7)

Each resource, ecosystem, and human community must be analyzed in terms of its ability to accommodate additional effects, based on its own time and space parameters. Therefore, cumulative effects analysis will typically encompass a Region of Influence (ROI) or geographic boundaries beyond the immediate area of the proposed action and a time frame including past actions and foreseeable future actions, to capture these additional effects.

For the proposed action to have a cumulatively significant impact on an environmental resource, two conditions must be met. First, the combined effects of all identified past, present, and reasonably foreseeable projects, activities, and processes on a resource, including the effects of the proposed action, must be significant. Second, the proposed action must make a substantial contribution to that significant cumulative impact. In order to analyze cumulative effects, a cumulative effects region must be identified for which effects of the proposed action and other past, present, and reasonably foreseeable actions would occur. The Army uses a process for cumulative effects analysis that follows 11 steps identified by the CEQ:

- Step 1 identifies the significant, or potentially significant, cumulative impacts issues associated with the proposed action and define the assessment goals.
- Step 2 establishes the geographic scope, or ROI, for the analysis.
- Step 3 establishes the time frame for the analysis.
- Step 4 identifies other actions affecting the VECs (see Section 3.0).
- Step 5 characterizes the VECs identified in scoping in terms of their response to change and capacity to withstand adverse impacts.
- Step 6 characterizes the natural and human factors that adversely affect these VECs and their relation to safety or security thresholds established through regulations.
- Step 7 defines a baseline condition for the VECs.
- Step 8 identifies the important cause-and-effect relationships between VECs.
- Step 9 determines the magnitude and significance of cumulative impacts.
- Step 10 modifies or adds alternatives to avoid, minimize, or mitigate adverse significant cumulative impacts arising from federal activities, and identifies opportunities to work with others to avoid, minimize, or mitigate adverse effects caused by non-federal activities.
- Step 11 monitors cumulative impacts of the selected alternative and applies adaptive management.

For purposes of this cumulative effects analysis, the ROI includes the project sites within WSMR boundaries and the NCA. This analysis depends on the availability of data and the relevance of effects of

past, present, and future actions. Although certain data (e.g., extent of forest cover) may be available for extensive periods in the past (i.e., decades), other data (e.g., water quality) may be available for much shorter periods. Because specific information and data on past projects and action are usually scarce, the analysis of past effects is often qualitative (CEQ 1997).

Table 4-1 lists the past, present, and reasonably foreseeable future actions within the ROI that have had, continue to have, or would be expected to have some impact on the natural and human environment. The projects in this table are limited to those implemented in the last five years or those with ongoing contributions to environmental effects. Projects with measurable contributions to impacts within the ROI for a resource area were included in the cumulative analysis.

Table 4.1. Reasonably Foreseeable Actions within the Region of Influence

Project Title	Project Description	Project Timeframe		
		Past	Present	Future
Jornada Sand Sagebrush Treatment	This BLM activity includes treatment of approximately 14,000 ac with tebuthiuron herbicide to reduce the density and restrict expansion of sand sagebrush in the southern portion of the NCA. The northernmost extent of the approved treatment area lies approximately 18 mi (29 km) southwest of the proposed 1,000-ac (405-ha) buffer area (BLM 2007).	✓	✓	✓
SunZia Southwest Transmission Project	The project would include the construction and operation of two adjacent 500 kilovolt transmission lines within one right-of-way from central New Mexico to central Arizona. The proposed transmission lines would originate at a new substation in Lincoln County, New Mexico and travel west through the NCA toward the Interstate 25 corridor. Up to eight alternative transmission courses pass through the NCA, with the closest routes located approximately 6 mi (9.7 km) to the north, 6.5 mi (10.5 km) to the south, and 4 mi (6.4 km) to the west of the proposed 1,000-ac (405-ha) buffer area (BLM 2013).			✓
Launch Test Article Testing on a New Extended Range Area	WSMR proposed to continue to test Extended Range launch test articles at WSMR while operating new airspace corridors in and north of WSMR's restricted airspace over the NCA, as well as utilizing a newly designated 1,000-ac debris impact area in the NCA, which would lengthen testing distances.	✓	✓	✓

4.1.1 Cultural Resources

Implementation of the proposed action would have no adverse effects on the cultural resources of WSMR and the NCA. Launch test article testing would utilize the same 1,000-ac (405-ha) buffer area. The increased use of this area could lead to a higher probability of inadvertent discoveries, which would lead to implementation of the appropriate SOPs as directed by the WSMR CRM. The Jornada SunSage Treatment Project and SunZia Southwest Transmission Project are outside the area of potential effect for the WSMR projects and would be managed in accordance with their respective agencies' cultural resource management

protocols. Therefore, the proposed action, in conjunction with other past, present, and foreseeable activities, would not result in cumulative impacts to cultural resources.

4.1.2 Soil Erosion Effects

The proposed action would have only localized effects on area soil erosion effects. Such effects are limited to ground disturbance during the installation of a 700-ft (213-m) segment of road in the NCA and occasional maintenance activities. As described in the draft Launch Test Article Testing EA and the BLM NEPA documents for their two projects, previous, ongoing, and proposed future actions in support of regional activities are not expected to significantly affect geology and soils. Due to the limited scope of potential impacts associated with the proposed action of this EA, the action would have only minor effects and would not measurably add to effects from other activities. Hence, there would be no cumulative impact on soil erosion effects.

4.1.3 Biological Resources

Implementation of the proposed action would have small-scale impacts to vegetation communities, but would not impact the ability to maintain plant populations. There are chances of individual mortalities during RDT&E activities; however, no population-level impacts are anticipated. The proposed project areas do not contain critical habitat. When combined with the effects of other past, present, and foreseeable project activities, implementation of the proposed action is unlikely to have any additional cumulative effect on regional plant and animal populations, including threatened and endangered species.

4.1.4 Electric Utilities

Implementation of the proposed action would be consistent with current WSMR operations and would require a relatively small draw on local utilities. When combined with the effects of other past, present, and foreseeable project activities, implementation of the proposed action is unlikely to have any additional cumulative effect on regional electric utilities.

4.1.5 Land Use

Existing land use designations would not change as a result of the proposed action, and the existing land uses within the project areas would continue for the same purposes. Operations associated with the proposed action and the launch test article testing would lead to increased evacuations of the NCA. These evacuations would be conducted in accordance with existing agreements and would be coordinated in a manner to minimize impacts to local residents and recreational land users. Crews working on the SunZia Southwest Transmission Project would be required to evacuate the NCA during RDT&E activities within the 1,000-ac (405-ha) buffer area. WSMR would communicate planned evacuations with the SunZia Southwest Transmission Project to minimize lost work days. Therefore, implementation of the proposed action in conjunction with other past, present, and foreseeable actions would not result in cumulative impacts to land use.

4.1.6 Traffic and Transportation Systems

Operations associated with the proposed action and launch test article testing would lead to increased roadblocks of US 70 and US 380. These roadblocks and closures would be conducted in accordance with existing agreements and would be coordinated in a manner to minimize impacts to local residents and motorists on the area highways.

4.1.7 Human Health and Safety

All proposed action alternatives would comply with Army and WSMR health and safety policies and procedures. Public access to WSMR is restricted, and the NCA would be evacuated during testing on the 1,000-ac (405-ha) buffer area. All checkout slug and HVP tests would be subject to flight safety analysis, and all projectiles would be fired on trajectories that would impact only within WSMR impact areas or within the NCA 10-ac (4-ha) impact area. Any personnel involved with the SunZia Southwest Transmission project and the Launch Test Article testing, along with area residents and recreational users, would be evacuated from the NCA prior to HVP testing impacting the 10-ac (4-ac) site. Therefore, implementation of the proposed action in conjunction with other past, present, and foreseeable actions would not result in cumulative impacts to human health and safety.

1 **CHAPTER 5 LIST OF PREPARERS AND CONTRIBUTORS**

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CHAPTER 6 AGENCIES AND CONSULTATION

Reviewing agencies encompass federal, state, and local government agencies and tribes which have a vested interest in the planning area and wish to collaborate with WSMR to implement the requirements of NEPA. Federal and state agencies and local and tribal governments have qualified as reviewing agencies because of proximity or estate ownership within the planning area or by legal jurisdiction or special expertise.

Collaboration can be used to describe a wide range of external and internal working relationships, including the relationship between reviewing agencies. WSMR strongly supports the engagement of reviewing agencies in developing EAs.

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APPENDIX A PUBLIC PARTICIPATION

This appendix provides a summary of the public participation activities associated with this EA.

A public meeting was held on October 5, 2017, at the Macey Center on the Campus of New Mexico Institute of Mining and Technology in Socorro, New Mexico to solicit public comments on the preliminary draft EA. Notice of this meeting will be published in area newspapers including the El Defensor Chieftain, the Las Cruces News-Sun, and the Alamogordo Daily News, the Valencia County News-Bulletin, and the Albuquerque Journal. Public input was taken in the form of written comments. The preliminary draft EA was posted on a DoD public website and hardcopies were placed in area libraries. The libraries included the Socorro Public Library and the Thomas Branigan Memorial library in Las Cruces.

Once the final EA is complete, a FONSI for the document will be published in the same newspapers listed above, with the final draft EA placed in local libraries and on the same DoD public website for a 30-calendar-day public comment period.

Two comments received in the public meeting and are provided in the table below, and no comments were received via the project email or by U.S. mail.

Table A-1 Comments Received During the Public Meeting

Name	Comment	Response
Darrell Case	Please define "limited recovery" of HVP	In the meeting the phrase "limited recovery" was used to indicate that under uncommon situations, HVP would be recovered. Section 2.1.5 describes the limited number of HVP and situations where they would not be recovered.
Darrell Case	Please define "limited access" to the impact site	The Northern Call-Up Impact Area would be evacuated prior to testing operations. Following test close-out, the NCA would be open to public access. The NCA impact area would be open to public access as well.

The pages below provide the Affidavits of Publication for the public notice published in area newspapers.

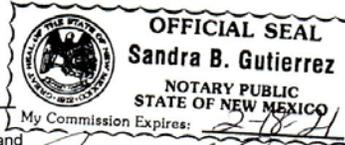
AFFIDAVIT OF PUBLICATION

STATE OF NEW MEXICO

County of Bernalillo SS

Bernadette Gonzales, the undersigned, on oath states that she is an authorized Representative of The Albuquerque Journal, and that this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Section 3, Chapter 167, Session Laws of 1937, and that payment therefore has been made of assessed as court cost; that the notice, copy of which hereto attached, was published in said paper in the regular daily edition, for 1 time(s) on the following date(s):

10/01/2017



[Signature]

Sworn and subscribed before me, a Notary Public, in and for the County of Bernalillo and State of New Mexico this
1 day of October of 2017

PRICE \$68.40

Statement to come at the end of month.

ACCOUNT NUMBER 1085179

The White Sands Missile Range (WSMR) Environmental Division invites the public to identify concerns and provide comments on an Environmental Assessment (EA) that examines the environmental effects of proposed hypervelocity projectile (HVP) and Electromagnetic (EM) Railgun testing at WSMR, New Mexico and the Northern Call-Up Area (NCA) in Socorro County, New Mexico. In addition, this EA considers potential ground disturbance associated with test operations on a restricted parcel of land in the NCA.

This EA identifies, documents, and evaluates relevant impacts, conditions, and issues associated with the proposed action and its alternatives. A public meeting will be held on Thursday, October 5, 2017, at the Macey Center, 801 Leroy Place, Socorro, New Mexico, from 7 to 9 p.m. Discussion with the public about the proposed action will be used to determine the scope of issues to be addressed and identified in the analysis process.

The Draft EA is available to the public at the following information repositories: 1) Thomas Branigan Memorial Library, 200 E. Picacho Avenue, Las Cruces, New Mexico 88001; 2) WSMR Post Library, Building 465, WSMR, New Mexico 88002; 3) Socorro Public Library, 401 Park St, Socorro, NM 87801; and 4) US Army Corp of Engineers <http://www.spa.usace.army.mil/Missions/Environmental/Environmental-Compliance-Documents/Environmental-Assessments-FO/NSI/>

The EA is being prepared in accordance with the National Environmental Policy Act (42 U.S.C. 4321 et seq.), Council on Environmental Quality (40 CFR Parts 1500-1518), and other federal, state, and Army rules that require the environmental impacts of proposed actions and reasonable alternatives to those actions be analyzed. The EA shall determine whether or not this federal undertaking would significantly affect the environment as a result of the proposed testing and will be available for public review. The WSMR Environmental Division estimates the EA will be finalized within six months of the public meeting.

Questions concerning the Draft Advanced Gunfire Environmental Assessment should be directed to Ms. Deborah Nethers (US Army, Directorate of Public Works-Environmental Division) at WSMR, or by e-mail mdimsha@wsmmepa.com or faxed to (575) 678-4028. Written Comments must be signed. Comments regarding the Draft EA will be received in writing for 30-days from publication. Comments must be postmarked or received by 30 October 2017. Comments can be sent to the following address:

Department of Army
U.S. Garrison White Sands
Environmental Division
(Bldg. 163/DPW)
Advanced Gunfire EA Comments
BLDG 163
White Sands Missile Range, NM
88002

Journal: October 1, 2017

LEGAL NOTICE

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Department of Army
U.S. Garrison White Sands
Environmental Division (Bldg. 16
3/DPW)
Advanced Gunfire EA Comments
BLDG 163
White Sands Missile Range, NM
88002

Published in the Valencia County News-Bulletin on September 28, 2017.

AFFIDAVIT of PUBLICATION

Clara Garcia, being first duly sworn, deposes and says that she is Editor of the **Valencia County New-Bulletin**, printed and published each week in the County of Valencia, State of New Mexico, and of general circulation in the city of Belen, County of Valencia, State of New Mexico and elsewhere, and the hereto attached

NEW MEXICO)

:SS

VALENCIA)

was printed and published correctly in the regular and entire issue of said **VALENCIA COUNTY NEWS-BULLETIN** for 1 issue(s), that the first was made on the 28 day of September 2017, and subsequent publications being:

Request of **VALENCIA COUNTY NEWS-BULLETIN**

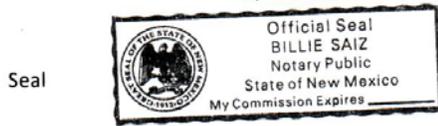
By:

Affiant Clara Garcia

Subscribed and sworn to me this 28 day of September 2017 in the County of VALENCIA, State of New Mexico.

Billie Saiz
Notary Public

Notary Public in and for the County of Valencia, State of New Mexico
My Commission Expires: 9.17.18



Account Number: 1081225/1372421
Price: \$92.94 (Statement to come at end of month)

LEGAL NOTICE

The White Sands Missile Range (WSMR) Environmental Division invites the public to identify concerns and provide comments on an Environmental Assessment (EA) that examines the environmental effects of proposed hypervelocity projectile (HVP) and Electromagnetic (EM) Railgun testing at WSMR, New Mexico and the Northern Call-Up Area (NCA) in Socorro County, New Mexico. In addition, this EA considers potential ground disturbance associated with test operations on a restricted parcel of land in the NCA.

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Department of Army
U.S. Garrison White Sands
Environmental Division (Bldg. 16
3/DPW)
Advanced Gunfire EA Comments
BLDG 163
White Sands Missile Range, NM
88002

Published in the El Defensor Chieftain on September 28, 2017.

AFFIDAVIT of PUBLICATION

Scott Turner, being first duly sworn, deposes and says that he is Editor/Publisher of the **El Defensor Chieftain**, printed and published each week in the County of Socorro, State of New Mexico, and of general circulation in the city of Socorro, County of Socorro, State of New Mexico and elsewhere, and the hereto attached

NEW MEXICO)
:SS
OF SOCORRO)

was printed and published correctly in the regular and entire issue of said **EL DEFENSOR CHIEFTAIN** for 1 issue(s), that the first was made on the 28 day of September 2017, and subsequent publications being:

Request of **EL DEFENSOR CHIEFTAIN**

By:
Affiant Scott Turner

Subscribed and sworn to me this 28 day of September 2017 in the County of Socorro, State of New Mexico.

Julianna Vase
Notary Public

Notary Public in and for the County of Socorro, State of New Mexico
My Commission Expires: 2-14-2021



Seal
Account Number/Ad Number: 1081225/0001372424

Price: \$ 88.68
(Statement to come at end of month)

AFFIDAVIT OF PUBLICATION

ALAMOGORDO,
STATE OF NEW MEXICO **SS.**
COUNTY OF OTERO.

I, KIM HERRERA, being duly sworn, on my oath say that I am the Legal Coordinator of the Alamogordo Daily News, a newspaper of daily circulation, published and printed in the English language at the City of Alamogordo, Otero County, and State of New Mexico. That the Alamogordo Daily News has been regularly published and issued for more than nine months prior to the date of the first publication hereinafter mentioned.

That the attached notice was published for Epsilon System Solutions, 1 time in 1 issue of said newspaper, and not in any supplement thereof, the publication being October 1, 2017, with the laws of the State of New Mexico.

Legal # 1213454.

Kim Herrera
Legal Coordinator

Subscribed in my presence and sworn before me this the 1st day of October, 2017.

Edith J. Seleme
Notary Public

My commission expires 12.15.20



OFFICIAL SEAL
EDITH J. SELEME
NOTARY PUBLIC-State of New Mexico
My Commission Expires 12.15.20

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Legal # 1213454

Run Date: 10/1/2017

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