RECORD OF DECISION
FOR THE BARRY M. GOLDWATER RANGE EAST RANGE ENHANCEMENTS FINAL ENVIRONMENTAL IMPACT STATEMENT DATED NOVEMBER 26, 2010

INTRODUCTION

This Record of Decision (ROD) documents the decisions of the U.S. Air Force regarding 6 of 10 proposed enhancements to the eastern portion of the Barry M. Goldwater Range (BMGR), also known as BMGR East. The 10 proposals include: (1) developing a sensor training area, (2) establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground target complexes on the tactical ranges, (3) installing a moving-vehicle target system to support air-to-ground attack training, (4) developing a new target to support training in live air-to-ground missile employment within the East tactical range (East TAC), (5) lowering the regular flight altitude floor over a portion of the Cabeza Prieta National Wildlife Refuge, (6) converting a portion of Manned Range 3 into a helicopter gunnery range, (7) allowing additional training in combat search and rescue and similar ground-based and combined air-ground operations, (8) constructing a new taxiway and air traffic control tower at Gila Bend Air Force Auxiliary Field (AFAF), (9) paving approximately 7 miles of an existing graded road within the BMGR East, and (10) excavating, stockpiling, and using sand and gravel resources on the BMGR East. The Air Force has reached a decision regarding six of these proposals.

Proposal 1. Developing a sensor training area.

Proposal 4. Developing a new target for live air-to-ground missiles within East TAC.

Proposal 6. Converting a portion of Manned Range 3 into a helicopter gunnery range.

Proposal 8. Constructing a new taxiway and air traffic control tower at Gila Bend AFAF.

Proposal 9. Paving approximately 7 miles of an existing graded road within BMGR East.

Proposal 10. Excavating, stockpiling, and using sand and gravel resources on the BMGR East.

This ROD is based on the information, analysis, and public and agency comments contained in the *Final Environmental Impact Statement for Proposed Barry M. Goldwater Range East Range*

Report Documentation Page

Form Approved
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
20 MAY 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Record of Decision for the Barry M. Goldwater Range East Range Enhancements Final Environmental Impact Statement Dated November 26, 2010	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Deputy Assistant Secretary of the Air Force (Installations),1670 Air Force Pentagon,Washington,DC,20330-1670**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**738**	

Enhancements (Federal Register Vol 75, No 227, Nov 26, 2010, p 72824), as well as other relevant factors. The Final Environmental Impact Statement (EIS) proposes 10 separate actions that would enhance military training and operations at BMGR East. This ROD has been prepared in accordance with the regulations implementing the National Environmental Policy Act (NEPA), specifically Title 40 Code of Federal Regulations (CFR), Part 1505.2, *Record of decision in cases requiring environmental impact statements* (40 CFR § 1505.2). This ROD:

- States the Air Force's decision (p. 14);
- Identifies alternatives considered by the Air Force in reaching the decision and specifies the alternative considered to be environmentally preferable ;
- Identifies and discusses relevant factors in reaching the decision, including technical considerations and public input;
- States the mitigations adopted and states whether all practical means to avoid, minimize, or mitigate environmental harm from the alternatives selected have been adopted.

BACKGROUND

Since its inception in 1941, the BMGR has been indispensible for producing and maintaining the combat-ready aircrews needed to defend the United States and its interests. The BMGR is currently used to train aircrews from the Air Force, Air Force Reserve, Air National Guard, Army National Guard, Marine Corps, Marine Corps Reserve, and Navy. The BMGR routinely supports the training of both student and combat-ready aircrews in the region. An aggregate total of more than 800 combat aircraft are typically stationed at military air bases in southern Arizona (AZ) and California (CA). The BMGR is also one of the most heavily used ranges in the United States for training deployments by air units from bases located in other regions of the country, U.S. bases located overseas, and allied foreign militaries. Training deployments typically result in an additional 950 to 1,200 aircraft annually using the BMGR. Approximately 55,000 training sorties, or flights by individual aircraft, are flown annually at BMGR East.

Since the BMGR was established, technology and tactics of military aviation have substantially evolved. In response to these changes, the infrastructure at BMGR East has been modified, improved, and upgraded periodically to keep aircrew training relevant to real-world air combat missions and threats. Although some modernization has occurred during the last decade, much of the current training infrastructure (including physical and electronic simulations of targets and air defense systems) was installed or last upgraded during the Cold War era, which ended in the

early 1990s. Since that time, many of the tactics of modern air combat have been dramatically altered by rapid advancements in aircraft-delivered air-to-ground weapons (including precision-guidance systems and stand-off [i.e., long-range] capabilities), electronic sensing and surveillance of the battle space, and air defense systems. Furthermore, as recent events in Iraq and Afghanistan have demonstrated, increased warfare in urban settings has placed new demands on airpower to counter threats and support friendly forces in an exceedingly complex environment.

The Air Force has determined that the training and range support infrastructure currently in place at BMGR East is in need of key additions, modifications, improvements, and upgrades to ensure that aircrew training remains realistic and relevant and so that training produces the air combat capabilities needed by the nation today and in the future. These training features are not available at other training ranges within the BMGR operating region. Similarly, there is need to upgrade Gila Bend AFAF, located within the northeastern portion of BMGR East, to support flying operations. Certain new ground-based training activities that are components of the overall air power mission are also needed at BMGR East. Finally, improvements in some range maintenance facilities are needed to help the Air Force keep BMGR East fully functional.

The Cabeza Prieta National Wildlife Refuge (NWR), located directly south of BMGR East, would be directly affected by one of the proposed actions and is therefore serving as a cooperating agency. In addition, the Cabeza Prieta NWR leads the Recovery Team for the endangered Sonoran pronghorn (which occurs within BMGR East) and has contributed to the understanding of how the proposed actions may affect Sonoran pronghorn. No decision has been made regarding Proposal 5, which would lower the regular flight altitude floor over a portion of the Cabeza Prieta NWR; that proposal is not addressed in this ROD.

An EIS was prepared to aid in the decision-making process of the Air Force to implement 10 proposed enhancements within BMGR East. All of the actions being proposed for BMGR East and Gila Bend AFAF are independent of each other and have stand-alone value for improving training operations. While the Air Force prefers to implement all the proposed actions because this would result in the greatest training benefit for aircrew and ground troop training, each of the proposals, if implemented alone, would have a positive effect on the use and/or management of BMGR East and/or Gila Bend AFAF. This ROD identifies the Air Force's decisions regarding six of the proposed enhancements; the other proposed enhancements may be addressed in one or more separate RODs at a later date.

SELECTED ALTERNATIVES

The proposed actions selected by the Air Force thus far to meet the enhanced mission requirements at BMGR East are described below.

Proposal 1: Developing a Sensor Training Area (STA) within the San Cristobal Valley underlying the air-to-air range airspace.

The STA will provide regular and deployed users of the BMGR with realistic training in air-to-ground combat in urban settings, including training for simulated precise guided munitions (also known as smart bombs). This urban target complex will employ the latest technology to: (1) meet the detection and targeting capabilities resident in today's advanced airborne weapons systems, as well as next generation weapon systems; (2) provide the most realistic target environment for these weapon systems to include infrared targets and a variety of urban lighting conditions; (3) simulate 21st century surface-to-air threats and aircrew reaction through advanced airborne sensor systems, and (4) electronically score pilot performance and record it for post-mission replay.

The STA will consist of 640 acres, of which up to 400 acres will be developed over time. Key features will include electronic unmanned threat emitters and a large-scale target sensor system. Related features beyond the 640 acres will include a ground-based forward air controller site on approximately 0.25 acre; roadway improvements for construction, operations, and maintenance access; and limited Explosive Ordnance Disposal (EOD) clearance activities.

Proposal 4: Developing a new target for live air-to-ground missiles within East TAC.

BMGR East currently has two targets for training with live air-to-ground missiles, but the one in East TAC is positioned in a way that limits the ability of aircrews to attack the target from a variety of directions and altitudes. A second live missile target will be developed in East TAC in a centrally positioned location that will support attacks with air-to-ground missiles, including Maverick missiles, from multiple directions and optimal altitudes.

Proposal 6: Converting a portion of Manned Range 3 into a helicopter gunnery range.

The targets in each of the four manned ranges within BMGR East were developed for fixed-wing aircraft and are less relevant for training aircrews of rotary-wing aircraft (helicopters). Consequently, the Air Force will convert the southern portion of Manned Range 3, including the left conventional target south of the tower, into a helicopter gunnery range with fixed, moving, and pop-up targets to provide more appropriate training for the Army National Guard and other rotary-wing units that train at BMGR East. The targets, which will be strafed with small caliber (up to 50 cal) munitions, will be used for daytime and nighttime training missions.

Proposal 8: Constructing a new taxiway and air traffic control tower at Gila Bend AFAF.

The runway at Gila Bend AFAF is not serviced by a separate parallel taxiway, which forces aircraft to taxi on the runway and limits the tempo at which the airfield can support take-off and landing operations. The air traffic control tower at Gila Bend AFAF, designed and built in 1964, is inadequately sized and no longer meets the minimally acceptable visual surveillance or depth perception standards to fully manage current flight operations. Two key improvements will be made to support airfield operations at the Gila Bend AFAF. One improvement will be to construct a taxiway parallel to and west of the airfield runway to increase the safety and capacity of the airfield by eliminating the need for aircraft to taxi on the runway; total ground disturbance will be about 42 acres. The second improvement will be to replace the existing air traffic control tower with a new one located approximately 1,100 feet west of the existing tower with the height needed to provide adequate observation of aircraft movements on the runway and taxiways and sufficient interior space to house the needed equipment.

Proposal 9: Paving approximately 7 miles of an existing graded road within BMGR East.

Approximately 7 miles of the road will be paved from the main tower within Manned Range 1 to the water well and adjacent Range Munitions Consolidation Point (RMCP) 1 located near the boundary of the North and South TAC ranges to the west of Manned Range 1. Paving this road will (1) decrease dust levels and improve air quality and driver visibility and safety; (2) decrease road maintenance requirements by providing a cost-effective, durable, and long-lasting maintenance solution; and (3) reduce vehicle maintenance costs resulting from the disproportionate wear and tear on Air Force vehicles that frequently travel on this road. The current roadbed and drainage way is approximately 30 feet wide; however, only the center 16 feet will be paved. The total

area to be paved will cover approximately 13.5 acres. The current speed limit of 35 mph established by the Air Force for this road will not be changed, and speed limit signs will be posted along the road.

Proposal 10: Excavating, stockpiling, and using sand and gravel resources at BMGR East.

Sand and gravel supplies are needed within BMGR East to (1) simulate certain target features, such as aircraft revetments; (2) repair and maintain some facilities, such as berms used to protect scoring instruments at the strafe pits on the manned ranges; (3) fill road ruts resulting from frequent grading and soil erosion; and (4) repair at-grade crossings of washes. Instead of continuing to purchase and haul sand and gravel from off-range sources, the Air Force will excavate sand and gravel from ten sites within BMGR East to be used for on-range road maintenance, target reconstruction, and target maintenance. The excavated material will be transported to four new stockpile sites on BMGR East and to one existing site on the Gila Bend AFAF, where the materials can be accessed as needed. The material source sites are all located adjacent to existing roads and in areas open enough to provide reasonable access for a loader and where trees along the banks of the washes can be avoided. The source sites are highly ephemeral washes that are normally dry and flow only in response to local rainfall runoff. The proposed sites have material of sufficient quantity and quality for the intended uses. The materials excavated from the source sites will be removed using existing equipment such as a front-end loader mounted on a rubber-tired tractor. The quantities excavated at each site will be small enough that natural replenishment is expected following major rainfall events. Stockpile sites will be outside of washes so that runoff from storms will result in minimal movement of the stockpiled sand and gravel.

ALTERNATIVES CONSIDERED

For each of the 10 actions proposed, the EIS analyzed (1) the proposed action and (2) no action, in which no changes to existing operations would be made. Action alternatives were considered in detail for four of the proposals (STA, moving vehicle target system, lowered flight floor over a portion of the Cabeza Prieta NWR, and the air traffic control tower at Gila Bend AFAF). Of the proposals with action alternatives, only Proposal 1 regarding the STA and Proposal 8 regarding the air traffic control tower at Gila Bend AFAF are addressed in this ROD. These action alternatives addressed other locations or modified areas in which the proposed action could

occur. No other reasonable alternatives meeting the purpose and need were identified for the other proposed actions.

Three alternative locations were evaluated in detail for the STA. The preferred and selected location underlies the air-to-air range airspace where it offers the fewest operational conflicts with other simultaneous military operations. Another location analyzed was Target 220 on South TAC, which offers an area of previous and ongoing military disturbance, but would disrupt other training operations within South TAC. The third location was within North TAC outside of the current range of the endangered Sonoran pronghorn and in an area that has not been previously used for air-to-ground training; flight maneuvers associated with a STA in this location would interfere with the simultaneous use of both Manned Range 4 and Manned Range 2 and reduce the training capacity of those ranges.

Two alternative locations were considered for the proposed replacement air traffic control tower at Gila Bend AFAF. The preferred and selected location is approximately 3,100 feet north of the Runway 35 threshold (the beginning of the portion of the runway that is usable for landing) and 1,600 feet west of the Runway 17/35 centerline. This location is approximately 1,100 feet west of the existing tower. The second location considered is approximately 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline. However, this location would result in a field of view that is impacted by power lines and other base structures.

ENVIRONMENTAL CONSEQUENCES AND MITIGATION/MANAGEMENT ACTIONS

The effects of each alternative are discussed in the Final EIS with regard to earth resources, water resources, air quality, biological resources, land use, outdoor recreation, health and safety, cultural resources, hazardous materials, socioeconomics, and noise. The analysis in the Final EIS indicates that, with mitigation and management actions, none of the selected actions will result in a significant environmental impact.

Earth Resources

Environmental Consequences: Effects on earth resources will predominantly consist of short-term localized ground disturbance associated with construction and EOD operations associated with range enhancements. Long-term localized ground disturbance will occur with ongoing use of the STA, new air-to-ground target, and sand and gravel extraction and stockpile sites. The paving of the frequently used road in Manned Range 1 will stabilize soils and reduce erosion potential in this area in the long term.

Mitigation/Management Actions: Construction-related effects will be minimized through adherence to the Arizona Pollutant Discharge Elimination System Construction General Permit requirements. Ongoing impacts will be minimized through best management practices to limit erosion and adherence to the Arizona Pollutant Discharge Elimination System Multi-Sector General Permit for the proposed sand and gravel operations.

Water Resources

Environmental Consequences: Effects on water resources are mostly associated with the potential for increased sedimentation in washes associated with runoff from areas with increased ground disturbance. The short- and long-term potential for impacts correlate to those noted for Earth Resources. The Air Force has consulted with the Department of the Army, Corps of Engineers who has determined that none of the proposals will involve discharge of dredged or fill material into jurisdictional waters of the United States and therefore, would not be regulated under Section 404 of the Clean Water Act.

Mitigation/Management Actions: Adherence to construction permits and natural revegetation will minimize the effects in the short and long terms, respectively.

Air Quality

Environmental Consequences: The construction emissions associated with the proposed actions will generate low to moderate emissions, with the bulk of emissions associated with land disturbance activities and the resultant production of dust (PM_{10}). Generator emissions associated with the STA and equipment used for sand and gravel extraction will result in minor ongoing and/or recurring air emissions. Individually and collectively, none of the proposed actions is expected to result in an exceedance of the National Ambient Air Quality Standards.

Mitigation/Management Actions: None required.

Biological Resources

Environmental Consequences: Biological effects are associated with loss of vegetation from ground disturbing activities; and potential disturbance to wildlife and special status species associated with human presence in new areas for construction, operations, and maintenance of the Range enhancements. Activities are, in general, not expected to impact the distribution or abundance of any species.

Mitigation/Management Actions: Plant salvage and revegetation efforts will be conducted in accordance with the Arizona Native Plant Law. Where required, surveys will be conducted for

western burrowing owls and desert tortoise prior to ground disturbing or construction activities. The Air Force has consulted with the U.S. Fish and Wildlife Service to comply with Section 7 of the Endangered Species Act and will adhere to the terms and conditions issued as part of the Biological Opinion.

Land Use

Environmental Consequences: The selected actions are generally compatible with existing land uses because the purpose of BMGR East is to support Department of Defense training. With regard to the STA in particular, the preferred and selected action of developing the STA underlying the air-to-air range airspace is more compatible with existing military operations than the alternative locations in North and South TAC ranges, which would be more likely to interfere with training in other subranges within BMGR East.

Mitigation/Management Actions: None required.

Outdoor Recreation

Environmental Consequences: The actions addressed in this ROD are proposed in areas that are closed to public use for safety reasons and will not affect outdoor recreation. Establishing the STA within the San Cristobal Valley could result in certain limitations on bighorn sheep hunting within the Mohawk Mountains to the west of the site due to potential laser hazards.

Mitigation/Management Actions: The number of potential bighorn sheep hunters that could be affected by limited hunting opportunities within the Mohawk Mountains is very small. If there is a period of time during the hunting season when the STA will not be activated for laser use, bighorn sheep hunting may be allowed with a special use permit.

Health and Safety

Environmental Consequences: Because the actions addressed in this ROD are in areas where public access is not allowed, there will be minimal effects on public health and safety. Personnel involved in construction activities associated with the proposed actions may be exposed to increased health and safety risks associated with heavy equipment operations or EOD clearance operations, but such risks would be comparable to those associated with periodic range maintenance.

Mitigation/Management Actions: Adherence to standard construction and ongoing health and safety protocols will be requirements for BMGR East operations and maintenance personnel, contractors, military users, and visitors.

Cultural Resources

Environmental Consequences: Surface disturbance associated with five of the six independent proposals included in this ROD (4, 6, 8, 9, and 10) will be limited to areas that have been surveyed for cultural resources, where no resources eligible for inclusion on the National Register of Historic Places (National Register) were identified. As documented in the Final EIS, the Arizona State Historic Preservation Officer (SHPO) has concurred with the Air Force's determinations that implementation of Proposals 4, 6, 8, 9, and 10 will not affect historic properties.

Proposal 1, developing the STA in the San Cristobal Valley underlying the air-to-air range airspace, will adversely affect properties eligible for inclusion on the National Register. The Air Force and SHPO, in consultation with tribes that attach cultural importance to places in the affected area, have executed a programmatic agreement which takes into account the effects of the proposal on historic properties and demonstrates compliance with Section 106 of the National Historic Preservation Act.

Mitigation/Management Actions: No mitigation actions are required in connection with Proposals 4, 6, 8, 9, and 10. The programmatic agreement governing implementation of Proposal 1 stipulates that the Air Force, in consultation with SHPO and tribes, will develop and implement a treatment plan which includes measures to avoid, minimize, or mitigate adverse effects on historic properties.

Hazardous Materials and Waste Management

Environmental Consequences: Construction-related activities could result in temporary increases in petroleum, oil, and lubricant use and the need to dispose of solid and/or hazardous wastes. Actions that will result in a change in aircraft operations, such as increased use of the air-to-air range airspace associated with locating the STA within the San Cristobal Valley, could result in an increased risk of aircraft mishaps or mishaps in a different area of BMGR East. No increased potential for unacceptable risk to human and/or ecological receptors or transport of munitions constituents off-range is expected with the new air-to-ground missile target given the source-interaction-receptor analysis conducted to date.

Mitigation/Management Actions: Spills will be addressed and cleaned up in accordance with applicable regulations and Air Force policies and procedures. The potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years as specified in the

Operational Range Assessment Program, or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.

Socioeconomics and Environmental Justice

Environmental Consequences: Socioeconomic effects are expected to be minor. Construction-related activities will result in short term regional economic gains from the purchase of equipment, goods, and services. The use of sand and gravel from within BMGR East will have little effect on the local community as the current off-site sand and gravel source is located roughly 70 miles from the range. No adverse off-range effects have been identified that would affect a minority or low-income population so there are no environmental justice concerns.

Mitigation/Management Actions: None required.

Noise

Environmental Consequences: New sources of noise will include generators used to power STA equipment; equipment used to construct the new air-to-ground target; pave the existing dirt road within Manned Range 1; and construct a parallel taxiway and air traffic control tower at Gila Bend AFAF; and equipment and activities associated with excavating, loading, and unloading sand and gravel. These noise sources will generally be short in duration and infrequent. Establishing both the STA under the air-to-air range airspace and a new air-to-ground missile target are expected to result in the redistribution of aircraft noise and ordnance noise within BMGR East, but are not expected to change the number of sorties flown or the number of air-to-ground missiles used in training. Persons and wildlife in proximity to these new features will, however, notice a change in noise and may be disturbed by it.

Mitigation/Management Actions: None required.

In consideration of the mitigation and management actions identified for each resource, all practical means to avoid, minimize, or mitigate environmental harm from the alternatives selected have been adopted.

PUBLIC INVOLVEMENT

The public involvement process began with the publication of the Notice of Intent to prepare an EIS in the *Federal Register* on December 28, 2007. The Notice of Intent included dates and locations for scoping meetings. Three scoping meetings were held January 15 through January 17, 2008 in the Arizona communities of Glendale, Tucson, and Gila Bend to actively solicit input from the public, local governments, federal and state agencies, American Indians, and environmental groups. A total of 25 people attended the scoping meetings. During the official scoping period, the Air Force received a total of nine written comment forms or letters.

Publication of the Notice of Availability of the Draft EIS was published on July 10, 2009 in the *Federal Register* and in local newspapers in the affected area in mid-July, 2009. A total of 135 copies of the Draft EIS were sent to federal, state, and local agencies, Native American tribes and organizations, special interest groups, and those members of the public who requested a copy; an additional 15 copies of the Draft EIS were sent to local libraries to provide a location where the public could review the document. On July 27 through July 29, 2009, public hearings were held in Glendale, Tucson, and Gila Bend to provide an opportunity for the public to evaluate the proposed actions and alternatives as well as the analysis contained within the Draft EIS. Six people attended the hearings with two people providing oral comments. The 45-day public review and comment period for the Draft EIS closed on August 24, 2009. The Air Force received a total of nine written comments during the 45-day public comment period.

All comments received during the public review and comment period were reviewed by the Air Force and considered in the preparation of the Final EIS, which was issued on November 26, 2010. No substantive modifications were made to the Draft EIS based upon the input received during the public review and comment period. No comments changed the substantial elements or conclusions presented in the Draft EIS. The Final EIS contains the public and agency comments and responses to comments.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

In accordance with 40 CFR § 1505.2(b), the ROD must specify the alternative, or alternatives, considered to be environmentally preferable. Ordinarily, the environmentally preferable alternative is considered to be the alternative that causes the least damage to the biological and physical environment and that also best protects, preserves, and enhances historic, cultural, and natural resources (see 46 *Federal Register* 18026-18038, 23 March 1981).

Most of the proposed actions as well as the action alternatives involve some ground disturbance, and ground disturbance can contribute to environmental damage such as loss of vegetative cover and wildlife habitat, soil erosion, greater potential for sedimentation of running water, and greater potential for disturbance of cultural resources. While most of these effects can be avoided or minimized with implementation of management actions or mitigation, avoiding ground disturbance is typically environmentally preferred.

Proposal 1: Developing a STA

Developing a sensor training area will result in some level of ground disturbance within an area of up to 1200 acres. In addition to increased potential for soil erosion, increase sediment in stormwater runoff, and damage or destruction of vegetation, construction and maintenance may frighten animals away from the area, although other suitable habitat occurs in the vicinity. Not developing the STA would eliminate these effects and is, therefore, the environmentally preferred alternative.

Proposal 4: Developing a new air-to-ground missile target

Developing a new air-to-ground missile target will result in ground disturbance within an estimated 75-acre area. In addition to increased potential for soil erosion, increase sediment in stormwater runoff, and damage or destruction of vegetation, the practice of firing missiles at a newly established target will frighten animals away from the area, although other suitable habitat occurs in the vicinity. Not developing the target would eliminate these effects and is therefore the environmentally preferred alternative.

Proposal 6: Converting a portion of Manned Range 3 into a helicopter gunnery range

Developing new targets for a helicopter gunnery range will result in dispersed ground disturbance within a 400-acre area. Because the no-action alternative would not require a change in ground disturbance, the no-action alternative would be environmentally preferred even though it would not support the operational purpose and need.

Proposal 8: Constructing a new taxiway and air traffic control tower at Gila Bend AFAF.

While constructing a new taxiway and air traffic control tower at Gila Bend AFAF will result in approximately 43 acres of ground disturbance, the construction will occur within areas that have been previously disturbed. The no-action alternative would not require a change from current ground disturbance so it would be the environmentally preferred alternative. However, the

safety improvements resulting from the temporary disturbance will help to minimize the potential for an aircraft crash, which would also be harmful to the environment.

Proposal 9: Paving approximately 7 miles of an existing graded road within BMGR East.

Paving approximately 7 miles of the existing graded road within Manned Range 1 is the environmentally preferred alternative because the proposed paved surface will reduce susceptibility of soils to erosion, control dust, and reduce the potential for dust-related vehicle accidents over the long term, which will offset short-term physical disturbance construction impacts.

Proposal 10: Excavating, stockpiling, and using sand and gravel resources on the BMGR East.

Excavating, stockpiling, and using sand and gravel resources within BMGR East will also result in ongoing ground disturbance, but the same types of ground disturbance would occur off-range at commercial facilities. In addition, there are environmental costs associated with hauling materials to BMGR East including increases in vehicle emissions and a greater potential to transport seeds from non-native species onto BMGR East. Therefore, excavating and stockpiling sand and gravel resources within BMGR East is the environmentally preferred alternative.

DECISION

After consideration of the potential environmental consequences of the proposed action and alternatives as analyzed in the EIS, input from agencies and the public, and other factors relative to national defense, including current military operational needs, it is our decision to proceed with the proposed actions to:

- Develop a sensor training area in the San Cristobal Valley underlying the air-to-air range airspace (Proposal 1).
- Develop a new target for live air-to-ground missiles within East TAC (Proposal 4).
- Convert a portion of Manned Range 3 into a helicopter gunnery range (Proposal 6).
- Construct a new taxiway parallel to and west of the existing runway and a new air traffic control tower approximately 3,100 feet north of the Runway 35 threshold and 1,600 feet west of the Runway 17/35 centerline at Gila Bend AFAF (Proposal 8).

- Pave approximately 7 miles of the existing graded road from the main tower within Manned Range 1 to the water well and adjacent RMCP 1 located near the boundary of the North and South TAC ranges to the west of Manned Range 1 (Proposal 9).

- Excavate, stockpile, and use sand and gravel resources within BMGR East (Proposal 10).

While no decision has been made for Proposals 2, 3, 5, and 7 at this time, the Air Force anticipates issuing one or more RODs for these independent proposals at a future date.

Kathleen I. Ferguson

20 May 11

KATHLEEN I. FERGUSON, P.E.
Deputy Assistant Secretary of the Air Force
(Installations)

Date

SECOND RECORD OF DECISION
FOR THE BARRY M. GOLDWATER RANGE EAST RANGE ENHANCEMENTS FINAL ENVIRONMENTAL IMPACT STATEMENT DATED NOVEMBER 26, 2010

INTRODUCTION

This Record of Decision (ROD) is the second for this Environmental Impact Statement and documents the decisions of the U.S. Air Force regarding three of ten proposed enhancements to the eastern portion of the Barry M. Goldwater Range (BMGR), also known as BMGR East. The ten proposals include: (1) developing a sensor training area, (2) establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground target complexes on the tactical ranges, (3) installing a moving-vehicle target system to support air-to-ground attack training, (4) developing a new target to support training in live air-to-ground missile employment within the East Tactical Range (ETAC), (5) lowering the regular flight altitude floor over a portion of the Cabeza Prieta National Wildlife Refuge, (6) converting a portion of Manned Range 3 into a helicopter gunnery range, (7) allowing additional training in combat search and rescue and similar ground-based and combined air-ground operations, (8) constructing a new taxiway and air traffic control tower at Gila Bend Air Force Auxiliary Field (AFAF), (9) paving approximately 7 miles of an existing graded road within the BMGR East, and (10) excavating, stockpiling, and using sand and gravel resources on the BMGR East. The Air Force documented decisions regarding six of these proposals (Proposals 1, 4, 6, 8, 9, and 10) in the first ROD signed on 20 May 2011. The Air Force now has reached a decision regarding three additional proposals (Proposals 2, 5 and 7).

Proposal 2. Establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground target complexes on the tactical ranges.

Proposal 5. Lowering the regular flight altitude floor over a portion of the Cabeza Prieta National Wildlife Refuge.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based and combined air-ground operations.

This ROD is based on the information, analysis, and public and agency comments contained in the *Final Environmental Impact Statement for Proposed Barry M. Goldwater Range East Range Enhancements* (Federal Register Vol 75, no 227, Nov 26, 2010, p. 72824), as well as other relevant factors. The Final Environmental Impact Statement (EIS) proposed 10 separate actions

that would enhance military training and operations at BMGR East. This ROD has been prepared in accordance with the regulations implementing the National Environmental Policy Act (NEPA), specifically Title 40 Code of Federal Regulations (CFR), Part 1505.2, *Record of decision in cases requiring environmental impact statements* (40 CFR § 1505.2). This ROD:

- States the Air Force's decision (p. 15);
- Identifies alternatives considered by the Air Force in reaching the decision and specifies the alternative considered to be environmentally preferable (pp. 5-6 and p. 14);
- Identifies and discusses relevant factors in reaching the decision, including technical considerations and public input (pp. 6-14);
- States whether all practical means to avoid, minimize, or mitigate environmental harm from the alternatives selected have been adopted (p. 6); and
- Summarizes mitigation and management actions (pp. 6-13).

BACKGROUND

Since its inception in 1941, the BMGR has been indispensable for producing and maintaining the combat-ready aircrews needed to defend the United States and its interests. The BMGR is currently used to train aircrews from the Air Force, Air Force Reserve, Air National Guard, Army National Guard, Marine Corps, Marine Corps Reserve, and Navy. The BMGR routinely supports the training of both student and combat-ready aircrews in the region. An aggregate total of more than 800 combat aircraft are typically stationed at military air bases in southern Arizona and California. The BMGR is also one of the most heavily used ranges in the United States for training deployments by air units from bases located in other regions of the country, U.S. bases located overseas, and allied foreign militaries. Training deployments typically result in an additional 950 to 1,200 aircraft annually using the BMGR. Approximately 55,000 training sorties, or flights by individual aircraft, are flown annually at BMGR East.

Since the BMGR was established, technology and tactics of military aviation have substantially evolved. In response to these changes, the infrastructure at BMGR East has been modified, improved, and upgraded periodically to keep aircrew training relevant to real-world air combat missions and threats. Although some modernization has occurred during the last decade, much of the current training infrastructure (including physical and electronic simulations of targets and air defense systems) was installed or last upgraded during the Cold War era, which ended in the

early 1990s. Since that time, many of the tactics of modern air combat have been dramatically altered by rapid advancements in aircraft-delivered air-to-ground weapons (including precision-guidance systems and stand-off [i.e., long-range] capabilities), electronic sensing and surveillance of the battle space, and air defense systems. Furthermore, as recent events in Iraq and Afghanistan have demonstrated, increased warfare in urban settings has placed new demands on airpower to counter threats and support friendly forces in an exceedingly complex environment.

The Air Force has determined that the training and range support infrastructure currently in place at BMGR East is in need of key additions, modifications, improvements, and upgrades to ensure that aircrew training remains realistic and relevant and so that training produces the air combat capabilities needed by the nation today and in the future. Similarly, there is need to upgrade Gila Bend AFAF, located within the northeastern portion of BMGR East, to support flying operations. Certain new ground-based training activities that are components of the overall air power mission are also needed at BMGR East. Finally, improvements in some range maintenance facilities are needed to help the Air Force keep BMGR East fully functional.

The Cabeza Prieta National Wildlife Refuge (NWR), located directly south of BMGR East, would be directly affected by one of the proposed actions and therefore the Department of Interior is serving as a cooperating agency. Proposal 5 would lower the regular flight altitude floor over a portion of the Cabeza Prieta NWR. In addition, the Cabeza Prieta NWR leads the Recovery Team for the endangered Sonoran pronghorn (which occurs within BMGR East) and has contributed to the understanding of how the proposed actions may affect Sonoran pronghorn.

An EIS was prepared to aid in the decision-making process of the Air Force to implement 10 proposed enhancements within BMGR East. All of the actions being proposed for BMGR East and Gila Bend AFAF are independent of each other and have stand-alone value for improving training operations. While the Air Force prefers to implement all the proposed actions because this would result in the greatest training benefit for aircrew and ground troop training, each of the proposals, if implemented alone, would have a positive effect on the use and/or management of BMGR East and/or Gila Bend AFAF. This ROD identifies the Air Force's decisions regarding three of the proposed enhancements; the remaining proposed enhancement will be addressed in a separate ROD at a later date.

SELECTED ALTERNATIVES

The proposed actions selected by the Air Force in this document to meet the enhanced mission requirements at BMGR East are described below.

Proposal 2: Establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground tactical range target complexes.

Several targets within the tactical ranges must be reconfigured to accurately simulate the types of targets being engaged in today's air-to-ground battlefield and afford full use of front-line targeting and/or weapons systems, including precision guided munitions. This action is a programmatic action designed to provide a more efficient way to process future requests for target reconfigurations. This action will enable aircrew training planners and environmental managers to be more effective in selecting locations for target reconfiguration and in determining an appropriate level of NEPA review for new target proposals.

Proposal 5: Lowering the regular flight altitude floor over a portion of the Cabeza Prieta NWR.

Surface attack tactics require pilots to be proficient at low altitude ingress and target attacks to evade detection by enemy radars and avoid surface-to-air missiles, anti-aircraft artillery and small arms fire. Peace-time training for low-level attacks must often be performed at altitudes of about 500 feet above ground level (AGL) to allow the aircrew sufficient opportunity to effectively ingress, engage the target, and egress in a realistic manner. Currently, pilots are forced to ingress at 1,500 feet AGL, then drop to 500 feet AGL upon reaching the border during a critical portion of the attack, often creating a safety hazard due to task loading, or resulting in poor execution. The proposal to lower the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL will enable more realistic and safer attack approaches to targets on the South Tactical Range (STAC) and low-altitude intercepts in the air-to-air range. Implementation will require the renegotiation of a 1994 Memorandum of Understanding among the Departments of the Air Force, Navy, and Interior in which the Department of Defense has self-imposed a flight floor, even though the restricted airspace overlying the Cabeza Prieta NWR authorizes military flights to the surface of the earth. The area that will be affected by the lowered flight floor will be entirely within restricted airspace R-2301E and will extend from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary, and south of the STAC boundary to a distance of 15 nautical miles. The R-2301E airspace from 500 feet AGL up to 1,500 feet AGL over the Cabeza Prieta NWR will be available to be

scheduled for either day or night military missions in association with R-2301E airspace above 1,500 feet AGL. Use of this low-level airspace block will be restricted to missions that require this airspace for realistic training. This action is consistent with the Military Lands Withdrawal Act of 1999, which authorizes the BMGR for military use.

Proposal 7: Allowing additional training in combat search and rescue and similar ground-based missions.

Military teams involved in insertion operations, combat search and rescue (CSAR) and special tactics have the difficult missions of airfield or urban target assault, security, and/or finding and rescuing downed aircrews, hostages, or other high-value persons. These hazardous missions must often be performed in stealth in unfamiliar territory held by hostile forces. Therefore, the Air Force will allow CSAR teams, and potentially other small special tactics teams of approximately 10 or fewer troops, to use BMGR East for ground-based training activities. Training for CSAR or similar small team missions will involve clandestine insertions and extractions from helicopters or vehicles driven on existing range roads, and performance of cross-country land navigation and other on-the-ground exercises, such as shooting at targets. The teams will conduct long-range, cross-country reconnaissance patrols on foot with the intent of remaining undetected.

Certain events, including the Weapons Tactics Instructor course, may include up to 100 troops. These events will be infrequent (typically no more than two or three events per year) and will generally occur within the tactical ranges in areas of previous military ground disturbance. These larger-scale events will be less likely to involve land maneuvers that exceed about 3 miles.

ALTERNATIVES CONSIDERED

For each of the actions proposed in the EIS and addressed in this ROD, the EIS analyzed (1) the proposed action and (2) no action, in which no changes to existing operations would be made. Only one proposal addressed in this ROD included an action alternative. Proposal 5 regarding the lowering of the regular flight altitude floor over a portion of the Cabeza Prieta NWR addressed an action alternative of a modified area in which the proposed action could occur. No other reasonable alternatives meeting the purpose and need were identified for the two other proposed actions.

In addition to the preferred and selected action to lower the flight floor overlying the Cabeza Prieta NWR south of the STAC boundary to a distance of 15 nautical miles, an alternative was considered to extend the lowered flight floor area only 8 nautical miles. Reducing the size of the area with a lowered flight floor is less beneficial for military operations as the aircraft often are approaching the targets at high speeds and can travel 8 nautical miles in a minute. While the types of environmental effects would be the same with both action alternatives, the area of potential effects would be about half the size as with the preferred and selected alternative that extends the proposed lower flight floor 15 nautical miles south of the BMGR East.

ENVIRONMENTAL CONSEQUENCES AND MITIGATION/MANAGEMENT ACTIONS

The effects of each alternative are discussed in the Final EIS with regard to earth resources, water resources, air quality, biological resources, land use, outdoor recreation, health and safety, cultural resources, hazardous materials, socioeconomics, and noise. The analysis in the Final EIS indicates that, with management actions, none of the selected actions will result in a significant environmental impact. All practical means to avoid, minimize, or mitigate environmental harm from the alternatives selected have been adopted.

Earth Resources

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not result in changes in levels of potential impact to earth resources. Effects of target reconfigurations on earth resources will consist of short- and long-term localized ground disturbance associated with construction and/or demolition and Explosive Ordnance Disposal (EOD) operations in the immediate vicinity of reconfigured targets.

Proposal 5. Lowering the flight altitude over a portion of the Cabeza Prieta NWR will not affect earth resources.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based missions would result in minor increased erosion rates in dispersed areas of BMGR East used for small team exercises and short-term, infrequent, more intense increased erosion in localized areas used for large team exercises; however, these impacts will not be significant.

Mitigation/Management Actions: Construction-related and ongoing impacts will be minimized through best management practices to limit erosion and stipulations in Arizona Pollutant Discharge Elimination System Construction General Permit. There are no mitigation measures.

Water Resources

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not result in changes in levels of potential impacts to water resources. Effects on water resources of proposed target reconfigurations may result from the potential for increased sedimentation in washes associated with runoff from areas of new or increased ground disturbance. The short- and long-term potential for impacts correlate to those noted for Earth Resources.

Proposal 5. Lowering the flight altitude over a portion of the Cabeza Prieta NWR will not affect water resources.

Proposal 7. Effects of allowing additional training in combat search and rescue and similar ground-based missions would be localized, not affecting overall functionality of the drainage system watershed quality, and there will be no significant impacts on water resources.

Mitigation/Management Actions: Adherence to construction permit stipulations and the natural revegetation of disturbed areas will minimize the effects in the short and long terms, respectively. There are no mitigation measures.

Air Quality

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not result in any changes in air emissions produced at BMGR East. Demolition and reconstruction of reconfigured targets will generate low emissions, with the bulk of emissions being associated with land disturbance activities and the resultant production of dust (PM_{10}).

Proposal 5. The lowered flight altitude of aircraft over Cabeza Prieta NWR will not generate additional emissions; however, emissions will impact a more localized area due to the reduced altitude.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based missions would have negligible air emission impacts as a result of increased dust in localized areas associated with helicopter operations for insertion and extraction.

Individually and collectively, none of the proposed actions are expected to exceed any National Ambient Air Quality Standard.

Mitigation/Management Actions: None required.

Biological Resources

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not result in impacts to biological resources. These procedures, as described in the EIS, include specific conditions that must be met; if not, consultation with USFWS regarding a proposed reconfiguration would be required (p. 4-67).

Proposal 5. Lowering the flight altitude over a portion of the Cabeza Prieta NWR will not result in ground disturbance and the increased noise level is not expected to be biologically significant. Therefore this proposal will not affect the distribution or abundance of any species.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based missions may minimally disturb wildlife or vegetation, but will not result in lasting impacts. It was determined, through formal consultation with the USFWS, that allowing additional ground-based missions may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn.

Mitigation/Management Actions: The Air Force has consulted with the U.S. Fish and Wildlife Service to comply with Section 7 of the Endangered Species Act and will adhere to the terms and conditions issued as part of the Biological Opinion, dated 4 May 2010.

Land Use

Environmental Consequences: The selected actions are compatible with existing land uses because the purpose of BMGR East is to support Department of Defense training.

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect land use, and target reconfigurations will take place within areas already designated for air-to-ground ordnance delivery.

Proposal 5. The proposal to lower the flight altitude over portions of the Cabeza Prieta NWR will not have a direct effect on land use, but could result in minor inconveniences for those authorized to fly in the airspace from 500 feet AGL to 1,500 feet AGL because such use will have to be scheduled more carefully and will not be available as frequently.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based missions will not affect land use on the BMGR East and vicinity.

Mitigation/Management Actions:

Proposal 5. The Air Force will work with non-military users of the restricted airspace (R-2301E) overlying the Cabeza Prieta NWR to schedule flights using this airspace for border surveillance, wildlife monitoring, and other authorized uses. In the event of a bona fide, time-sensitive apprehension or rescue mission, per standard procedure, the Air Force will temporarily raise the flight floor for military operations so that law enforcement can safely operate in the airspace below 1,500 feet AGL.

Proposals 2 and 7. None required.

Outdoor Recreation

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect outdoor recreation, and target reconfigurations will take place in areas that are closed to public use for safety reasons.

Proposal 5. Persons visiting the Cabeza Prieta NWR and Wilderness and Organ Pipe Cactus National Monument and Wilderness may experience greater noise associated with a lowered flight floor over portions of the Cabeza Prieta NWR; the areas most affected are extremely remote and rarely visited.

Proposal 7. Recreational users of Area B may be similarly affected by allowing additional training in combat search and rescue and similar ground-based missions. Although CSAR or other small teams of approximately ten troops would be inserted into (or extracted from) Area B and move into the military target areas of ETAC, the Air Force would not close Area B to public access during these activities. Signage describing the potential for the public to observe these training activities would be posted, and some recreationists may determine that they do not wish to engage in an outdoor experience that may expose them to military training missions. Impacts to recreationists that use Area B as a result of this proposal would be expected to be minimal, and no impacts are anticipated within the recreation areas adjacent to BMGR East.

Mitigation/Management Actions: None required.

Health and Safety

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect public health and safety, and target reconfigurations will take place in areas where public access is not allowed. Personnel involved in construction activities associated with target reconfiguration will be exposed to health and safety risks associated with heavy equipment operations or EOD clearance operations comparable to those associated with ongoing, periodic range maintenance.

Proposal 5. Lowering the flight altitude over a portion of the Cabeza Prieta NWR will minimally increase health and safety risks to the visiting public; however, the areas most affected are extremely remote and rarely visited.

Proposal 7. Potential health and safety implications associated with allowing additional training in combat search and rescue and similar ground-based missions would include exposure of ground troops training in both small and large groups to environmental hazards and considerations for public safety with respect to small ground troop training exercises within Area B, which is generally open to public access. Training activities conducted in Area B would occur in a manner that ensures no danger or potential harm to the public. Any target practice conducted during these exercises would occur only in areas where public access is prohibited.

Mitigation/Management Actions: Adherence to standard construction and ongoing health and safety protocols will be requirements for BMGR East operations and maintenance personnel, contractors, military users, and visitors.

Cultural Resources

Environmental Consequences:

During preparation of the FEIS and as each independent proposal was reviewed under Section 106 of the National Historic Preservation Act (NHPA), the Air Force consulted with tribes that attach cultural importance to places on the BMGR East and the Arizona State Historic Preservation Officer (SHPO).

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect cultural resources including properties listed or eligible for inclusion on the National Register of Historic Places (National Register). Most proposed target reconfigurations will take place in areas that have been surveyed for cultural resources where no historic properties were identified; however, some target reconfigurations

may adversely affect properties eligible for inclusion on the National Register if any are located in the immediate vicinity of proposed target locations. The Air Force and SHPO, in consultation with tribes that attach cultural importance to places in the affected area, have executed a programmatic agreement, dated 26 September 2011, which takes into account the effects of the proposal (and other activities on the BMGR East) on historic properties and demonstrates compliance with Section 106.

Proposal 5. No surface disturbance will occur with lowering the flight altitude over a portion of the Cabeza Prieta NWR and no historic properties will be affected. Consultation with tribes resulted in requests for additional information on the effects of overflights, and some tribal representatives expressed general concern over potential impacts to both natural and cultural resources; however, no potential effects to places of traditional cultural value or historic properties were identified through this process. The SHPO concurred with the Air Force's finding of *no historic properties affected* by this proposal on 5 July 2011.

Proposal 7. Limited surface disturbance will be associated with small teams ground movement; however, most proposed activities will take place in previously surveyed areas and recorded cultural resources will be avoided.

Cultural resources could be minimally impacted by roadside vehicle parking, foot traffic, and helicopter rotor wash that would occur with allowing additional training in combat search and rescue and similar ground-based missions . Most such effects would occur in previously disturbed and surveyed areas in tactical ranges and along roads in Area B. Ground-based training will be planned to avoid the locations of previously recorded sites, and impacts associated with small teams operating vehicles only on approved roads and traveling on foot are expected to be similar to the effects of public recreational use of Area B. Review under Section 106 of the NHPA was completed in consultation with the SHPO and concerned tribes. Concerns expressed by representatives of the Pueblo of Zuni were successfully addressed through consultation. The SHPO concurred with the Air Force's finding of *no historic properties affected* on 19 August 2011.

Mitigation/Management Actions:

Proposal 2. The programmatic agreement covering implementation of establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations establishes procedures the Air Force will follow, in consultation with SHPO and tribes, to avoid, minimize, or mitigate adverse effects on historic properties.

Proposal 5 and 7. None required.

Hazardous Materials and Waste Management

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect levels of hazardous materials and waste on range. Target reconfiguration activities could result in temporary increases in petroleum, oil, and lubricant use and the need to dispose of solid and/or hazardous wastes. Actions that will result in a change in aircraft operations, such as lowering the flight altitude could result in an increased risk of aircraft mishaps or mishaps in a different area of BMGR East. No increased potential for unacceptable risk to human and/or ecological receptors or transport of munitions constituents off-range is expected with the target reconfigurations given the source-interaction-receptor analysis conducted to date.

Proposal 5. Lowering the flight altitude over a portion of the Cabeza Prieta NWR, will have no effect on hazardous materials and waste management.

Proposal 7. Allowing additional training in combat search and rescue and similar ground-based missions would involve use of minor amounts of fuels and coolants in vehicles used for ground access and aircraft used for troop insertion and extraction, but would not result in a discernible change in the types, amounts, or handling of hazardous materials or wastes at BMGR East. Small-arms munitions used in training would be similar to those used by hunters in Area B and would be widely dispersed and non-hazardous. Consequently, potential impacts associated with hazardous materials and wastes would be negligible or nonexistent.

Mitigation/Management Actions: Spills will be addressed and cleaned up in accordance with applicable regulations and Air Force policies and procedures. The potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years as specified in the Operational Range Assessment Program, or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.

Socioeconomics and Environmental Justice

Environmental Consequences: No socioeconomic effects are expected as a result of these proposals. No adverse off-range effects have been identified that would affect a minority or low-income population so there are no environmental justice concerns.

Mitigation/Management Actions: None required.

Noise

Environmental Consequences:

Proposal 2. Establishing efficient and timely environmental review and approval procedures of proposed target reconfigurations will not affect noise levels on range.

Proposal 5. The lowering of the flight floor over portions of the Cabeza Prieta NWR to 500 feet AGL is projected to increase "A-weighted" Onset Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) noise exposure levels by approximately 5 decibels (dB) to an L_{dnmr} ranging from less than 45 dB to 48 dB; these noise levels are significantly below community noise impact levels.

Proposal 7.Supporting ground-based training for small teams, including use of Area B, would not affect cumulative noise exposure levels associated with BMGR East baseline operations. New sources of noise will include generators used to power equipment used to construct or improve targets and troop insertion by helicopter in Area B. These noise sources are short in duration and infrequent, and will be similar to noise associated with ongoing target maintenance and training elsewhere on the BMGR East. Persons and wildlife in proximity to these new sources will, however, notice a change in noise and may be disturbed by it.

Mitigation/Management Actions: None required.

PUBLIC INVOLVEMENT

The public involvement process began with the Notice of Intent to prepare an EIS in the *Federal Register* on December 28, 2007. The Notice of Intent included dates and locations for scoping meetings. Three scoping meetings were held January 15 through January 17, 2008 in the Arizona communities of Glendale, Tucson, and Gila Bend to actively solicit input from the public, local governments, federal and state agencies, American Indians, and environmental groups. A total of 25 people attended the scoping meetings. During the official scoping period, the Air Force received a total of nine written comment forms or letters.

Publication of the Notice of Availability of the Draft EIS occurred on July 10, 2009 in the *Federal Register* and in local newspapers in the affected area in mid-July, 2009. A total of 135 copies of the Draft EIS were sent to federal, state, and local agencies, Native American tribes and organizations, special interest groups, and those members of the public who requested a copy; an additional 15 copies of the Draft EIS were sent to local libraries to provide a location where the public could review the document. On July 27 through July 29, 2009, public hearings were held in Glendale, Tucson, and Gila Bend to provide an opportunity for the public to

evaluate the proposed actions and alternatives as well as the analysis contained within the Draft EIS. Six people attended the hearings with two people providing oral comments. The 45-day public review and comment period for the Draft EIS closed on August 24, 2009. The Air Force received a total of nine written comments during the 45-day public comment period.

All comments received during the public review and comment period were reviewed by the Air Force and considered in the preparation of the Final EIS, which was issued on November 26, 2010. No substantive modifications were made to the Draft EIS based upon the input received during the public review and comment period. No comments changed the substantive elements or conclusions presented in the Draft EIS. The Final EIS contains the public and agency comments and responses to comments.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

In accordance with 40 CFR § 1505.2(b), the ROD must specify the alternative, or alternatives, considered to be environmentally preferable. Ordinarily, the environmentally preferable alternative is considered to be the alternative that causes the least impact to the biological and physical environment and that also best protects, preserves, and enhances historic, cultural, and natural resources (see 46 *Federal Register* 18026-18038, 23 March 1981). The environmentally preferred alternative may or may not satisfy the purpose and need (to keep BMGR East fully functional by meeting the operational needs and implementing the range enhancements that will ensure that aircrew training remains realistic and relevant and so that training produces the air combat capabilities needed by the nation today and in the future).

Proposal 2. Establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground target complexes will not result in changes in levels of potential environmental impact regardless of the alternative selected.

Proposal 5. Lowering the flight floor over a portion of the Cabeza Prieta NWR will not result in ground disturbance, but will result in a greater potential for noise disturbance for wildlife and visitors to the Cabeza Prieta and Organ Pipe Cactus designated wilderness areas. Consequently, the no-action alternative is environmentally preferable.

Proposal 7. Providing small tactical teams with on-the-ground training will not contribute to ground disturbanee, but the human presence could disturb wildlife in the area. Therefore, the no-action alternative is environmentally preferable.

DECISION

After consideration of the potential environmental consequences of the proposed action and alternatives as analyzed in the EIS, input from agencies and the public, and other factors related to national defense, including current military operational needs, it is our decision to proceed with the proposed actions to:

- Establish efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground tactical range target complexes (Proposal 2 Alternative 2.A).

- Renegotiate the 1994 Memorandum of Understanding with the Department of the Navy and the Department of the Interior to lower the flight altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL, extending from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary and south of the STAC boundary for a distance of 15 nautical miles (Proposal 5 Alternative 5.A).

- Conduct additional ground-based training for CSAR and other small tactical teams with ground-based missions (Proposal 7 Alternative 7.A).

No decision has been made regarding Proposal 3 at this time. The Air Force anticipates issuing a third ROD for this independent proposal at a future date.



15 May 2013

GERALD F. PEASE, JR.
Deputy Assistant Secretary of the Air Force
(Environment, Safety & Occupational Health)

Date

Final Environmental Impact Statement for Proposed Barry M. Goldwater Range East Range Enhancements











Prepared by 56th Fighter Wing
Range Management Office
Luke Air Force Base

Cooperating Agency:
U.S. Fish and Wildlife Service

October 2010

Final Environmental Impact Statement for Proposed
Barry M. Goldwater Range East Range Enhancements

Lead Agency:	U.S. Air Force
Cooperating Agency:	Department of the Interior
Title of the Proposed Action:	Proposed Barry M. Goldwater Range East Range Enhancements
Affected Jurisdictions:	Yuma, Pima, and Maricopa Counties
Prepared by:	56th Fighter Wing, Range Management Office Luke Air Force Base
Contact Person:	Ms. Lisa McCarrick 7224 N 139th Dr, Luke Air Force Base, Arizona 85309-1420 (623) 856-9475
Waiting Period:	A 30-day waiting period will commence hen the notice of availability is published in the Federal Register. The Record of Decision will not be signed until after the waiting period.

ABSTRACT

The U.S. Air Force proposes to take ten different actions that would enhance range operations and training at the Barry M. Goldwater Range (BMGR) East, including the Gila Bend Air Force Auxiliary Field (AFAF). These proposals include (1) developing a Sensor Training Area for precision-guided munitions training, (2) establishing procedures for environmental clearance of target reconfigurations, (3) developing a track for a moving vehicle target system and conducting associated attack training, (4) establishing a new target for air-to-ground missiles, (5) lowing the flight training altitude over a portion of the Cabeza Prieta National Wildlife Refuge, (6) reconfiguring Manned Range 3 for helicopter training, (7) allowing on-the-ground training exercises for small and large teams, (8) building a taxiway and a new air traffic control tower at the Gila Bend AFAF, (9) paving the road from Manned Range 1 to Range Munitions Consolidation Point 1, and (10) extracting and stockpiling sand and gravel for use on BMGR East. The purpose of and need for these actions is to modernize BMGR East to provide the training resources needed to prepare air and ground forces to meet current and future defense missions.

This final environmental impact statement analyzes the proposed actions and alternatives, including the no-action alternative. Each action could be implemented independently of the others and contribute to the training value of the range, although the most military value would be obtained by implementing all of the proposed actions. The effects of each alternative are discussed in regard to earth resources, water resources, air quality, biological resources, land use, outdoor recreation, health and safety, cultural resources, hazardous materials, socioeconomics, and noise. Comments received on the draft environmental impact statement have been addressed with clarifications and supplemental information as well as written responses to comments.

TABLE OF CONTENTS

Executive Summary **S-1**

1.0 Purpose of and Need for the Proposed Actions **1-1**
1.1 Purpose and Need Overview 1-1
1.2 BMGR and Gila Bend AFAF Overview 1-3
1.2.1 BMGR Significance as a Military Training Asset 1-3
1.2.2 BMGR Management 1-7
1.2.3 Current BMGR East and Gila Bend AFAF Operations 1-8
1.3 Purpose of and Need for the Proposed Actions 1-11
1.3.1 Proposed Sensor Training Area 1-13
1.3.2 Proposed Target Reconfiguration and Reconfiguration Management 1-15
1.3.3 Proposed Moving Vehicle Target System 1-16
1.3.4 Proposed New Target for Air-to-Ground Missiles 1-16
1.3.5 Proposed Lower Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge 1-17
1.3.6 Proposed Conversion of Manned Range 3 for Helicopter Training 1-17
1.3.7 Proposed On-the-Ground Training Exercises 1-18
1.3.8 Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field 1-19
1.3.9 Proposed Paving of Road from Manned Range 1 to RMCP 1 1-20
1.3.10 Proposed Excavation and Use of Sand and Gravel on BMGR East 1-20
1.4 National Environmental Policy Act Compliance 1-21
1.5 Required Permits, Licenses, and Entitlements 1-21
1.6 Public Involvement 1-22
1.6.1 Scoping Process 1-22
1.6.2 Draft EIS Public Comment Process 1-24
1.7 Scope and Organization of this Analysis 1-25

2.0 Description of the Proposed Action and Alternatives **2-1**
2.1 Introduction 2-1
2.2 Proposal 1 – Sensor Training Area 2-2
2.2.1 Elements Common to Each of the STA Action Alternatives 2-3
2.2.2 Alternative 1.A – Proposed Action – Air-to-Air Range Site 2-15
2.2.3 Alternative 1.B – South Tactical Range Site 2-18
2.2.4 Alternative 1.C – North Tactical Range Site 2-20
2.2.5 Alternative 1.D – No-Action Alternative 2-22
2.2.6 Alternatives Eliminated from Detailed Consideration 2-22
2.3 Proposal 2 – Target Reconfiguration 2-24
2.3.1 Alternative 2.A – Proposed Action 2-24
2.3.2 Alternative 2.B – No-Action Alternative 2-38
2.3.3 Alternatives Eliminated from Detailed Consideration 2-38
2.4 Proposal 3 – Moving Vehicle Target System 2-38
2.4.1 Proposed Action Alternatives 2-38
2.4.2 Alternative 3.A – Proposed Action 2-41
2.4.3 Alternative 3.B 2-41
2.4.4 Alternative 3.C 2-41
2.4.5 Alternative 3.D – No-Action Alternative 2-42
2.4.6 Alternatives Eliminated from Detailed Consideration 2-42
2.5 Proposal 4 – New Target for Air-to-Ground Missiles 2-42
2.5.1 Alternative 4.A – Proposed Action 2-42
2.5.2 Alternative 4.B – No-Action Alternative 2-43

2.6 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....2-45
2.6.1 Alternative 5.A – Proposed Action....2-45
2.6.2 Alternative 5.B – No-Action Alternative....2-47
2.6.3 Alternatives Eliminated from Detailed Considerations....2-47
2.6.4 Alternatives Eliminated from Detailed Consideration....2-47
2.7 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....2-49
2.7.1 Alternative 6.A – Proposed Action....2-49
2.7.2 Alternative 6.B – No-Action Alternative....2-51
2.7.3 Alternatives Eliminated from Detailed Consideration....2-51
2.8 Proposal 7 – On-the-Ground Training Exercises....2-52
2.8.1 Alternative 7.A – Proposed Action....2-52
2.8.2 Alternative 7.B – No-Action Alternative....2-53
2.9 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....2-53
2.9.1 Alternative 8.A – Proposed Action....2-53
2.9.2 Alternative 8.B – Alternative Tower Site B....2-57
2.9.3 Alternative 8.C – No-Action Alternative....2-57
2.9.4 Alternatives Eliminated from Detailed Consideration....2-57
2.10 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement....2-58
2.10.1 Alternative 9.A – Proposed Action....2-58
2.10.2 Alternative 9.B – No-Action Alternative....2-60
2.10.3 Alternatives Eliminated from Detailed Consideration....2-60
2.11 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....2-60
2.11.1 Alternative 10.A – Proposed Action....2-60
2.11.2 Alternative 10.B – No-Action Alternative....2-64
2.12 Alternatives Eliminated from Detailed Consideration....2-64
2.13 Comparison of the Alternatives....2-65

3.0 Affected Environment....3-1
3.1 Introduction....3-1
3.2 Earth Resources....3-1
3.2.1 Definition of Resource....3-1
3.2.2 Study Area....3-2
3.2.3 Geology, Seismicity, and Mineral Resources....3-2
3.2.4 Topography....3-3
3.2.5 Soils....3-3
3.2.6 Soil Sampling and Evaluations for Munitions Constituents....3-8
3.3 Water Resources....3-9
3.3.1 Definition of Resource....3-9
3.3.2 Study Area....3-9
3.3.3 Drainage, Watershed, and Surface Waters....3-9
3.3.4 Major Drainages within the ROI....3-11
3.3.4.1 San Cristobal/Growler Wash System....3-12
3.3.4.2 Daniels Arroyo....3-12
3.3.4.3 Tenmile Wash....3-12
3.3.4.4 Midway Wash....3-13
3.3.4.5 Sauceda and Quilotosa Washes....3-13
3.3.5 Floodplains and Jurisdictional Waters of the United States....3-13
3.3.6 Groundwater....3-13
3.3.7 Potential for Contaminated Water....3-14
3.3.8 Stormwater and Stormwater Permit Requirements....3-14

3.4 Air Quality 3-15
3.4.1 Definition of Resource 3-15
3.4.2 Study Area 3-16
3.4.3 Introduction 3-17
3.4.4 New Source Review and Prevention of Significant Deterioration 3-17
3.4.5 Attainment Status 3-17
3.5 Biological Resources 3-18
3.5.1 Sonoran Desertscrub Biotic Community 3-18
3.5.1.1 Lower Colorado River Valley Subdivision of the Sonoran Desert 3-21
3.5.1.2 Arizona Upland Subdivision of the Sonoran Desert 3-21
3.5.1.3 Desert Wash Habitats 3-22
3.5.1.4 Sand Dune Habitat 3-23
3.5.1.5 Desert Playa 3-24
3.5.1.6 Water Sites and Associated Habitats 3-24
3.5.2 Wildlife 3-25
3.5.2.1 Mule Deer 3-26
3.5.2.2 White-tailed Deer 3-26
3.5.2.3 Desert Bighorn Sheep 3-26
3.5.2.4 Javelina 3-27
3.5.2.5 Carnivores 3-27
3.5.2.6 Small Mammals 3-28
3.5.2.7 Birds 3-28
3.5.2.8 Reptiles and Amphibians 3-29
3.5.2.9 Wildlife Movement Corridors 3-30
3.5.3 Wildlife Management and Protected Species 3-31
3.5.3.1 Federally Protected Species and State Listed Species that May Occur within the Study Area 3-35
3.6 Land Use 3-54
3.6.1 Definition of Resource 3-54
3.6.2 Introduction 3-54
3.6.3 Land Status 3-55
3.6.4 Land Use and Management 3-55
3.6.4.1 Military Land Use 3-55
3.6.4.2 Arizona Game and Fish Department 3-61
3.6.4.3 U.S. Department of Homeland Security, Border Patrol 3-62
3.6.4.4 Other Land Uses 3-64
3.6.4.5 U.S. Fish and Wildlife Service 3-65
3.7 Outdoor Recreation 3-66
3.7.1 Definition of Resource 3-66
3.7.2 Introduction and Study Area 3-66
3.7.3 Outdoor Recreation within BMGR East 3-67
3.7.3.1 Access Permits 3-67
3.7.3.2 Recreational Opportunities 3-69
3.7.3.3 Hunting 3-72
3.7.3.4 BMGR Recreation Use Statistics 3-73
3.7.4 Outdoor Recreation in the BMGR Vicinity 3-73
3.7.4.1 Cabeza Prieta National Wildlife Refuge and Wilderness 3-74
3.7.4.2 Organ Pipe Cactus National Monument and Wilderness 3-76
3.7.4.3 Sonoran Desert National Monument 3-76
3.7.4.4 Barry M. Goldwater Range West 3-77
3.7.4.5 Imperial Sand Dunes Recreation Area and North Algodones Dunes Wilderness 3-78
3.7.4.6 Kofa National Wildlife Refuge and Wilderness 3-78

3.8 Health and Safety 3-79
3.8.1 Definition of Resource 3-79
3.8.2 Study Area 3-79
3.8.3 Introduction 3-79
3.8.4 Aviation Safety 3-80
3.8.5 Ground Safety 3-82
3.8.5.1 Manned Ranges 3-83
3.8.5.2 Tactical Ranges 3-84
3.8.5.3 Air-to-Air Range 3-84
3.8.5.4 Gila Bend AFAF 3-85
3.8.6 Non-military Hazards and Other Safety Issues 3-85
3.8.6.1 Environmental Hazards 3-85
3.8.6.2 Road Hazards 3-87
3.8.6.3 International Border Issues 3-88
3.8.6.4 Environmental Health and Safety Risks to Children 3-88
3.9 Cultural Resources 3-89
3.9.1 Definition of Resource 3-89
3.9.2 Study Area 3-91
3.9.3 Historic Setting 3-91
3.9.4 Native American Consultation 3-93
3.9.5 Inventoried Cultural Resources 3-95
3.9.5.1 Proposal 1 – Sensor Training Area 3-98
3.9.5.2 Proposal 2 – Target Reconfiguration 3-103
3.9.5.3 Proposal 3 – Moving Vehicle Target System 3-105
3.9.5.4 Proposal 4 – New Target for Air-To-Ground Missiles 3-107
3.9.5.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge 3-107
3.9.5.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training 3-108
3.9.5.7 Proposal 7 – On-the-Ground Training Exercises 3-108
3.9.5.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field 3-109
3.9.5.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement 3-110
3.9.5.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East 3-110
3.10 Hazardous Materials and Waste 3-111
3.10.1 Definition of Resource 3-111
3.10.2 Study Area 3-111
3.10.3 Air Force Policy Overview 3-112
3.10.4 Hazardous Materials 3-113
3.10.5 Hazardous and Munitions Constituents 3-113
3.10.6 Installation Restoration Program 3-116
3.10.7 Solid Waste 3-117
3.11 Socioeconomics and Environmental Justice 3-118
3.11.1 Definition of Resources 3-118
3.11.2 Study Area 3-118
3.11.3 Demographics 3-118
3.11.3.1 Population and Population Growth 3-118
3.11.3.2 Race and Ethnicity 3-123
3.11.3.3 Other Notable Demographic Characteristics 3-125
3.11.4 Economic Characteristics 3-125
3.11.5 Environmental Justice 3-128

3.12 Noise 3-131
3.12.1 Definition of Resource 3-131
3.12.2 Study Area 3-132
3.12.3 Primary Noise Metrics 3-133
3.12.4 Methodologies for Predicting Noise 3-134
3.12.5 Baseline Noise Exposure Levels from Aircraft Operations at Gila Bend AFAF 3-135
3.12.6 Baseline Cumulative Noise Exposure Levels for Non-Gila Bend AFAF Aircraft Operations 3-136
3.12.6.1 Subsonic Aircraft Operations 3-139
3.12.6.2 Weapons Tactics Instructor Flight Corridor and Military Training Route Operations 3-140
3.12.6.3 Supersonic Operations 3-140
3.12.6.4 Explosive Ordnance Operations 3-140

4.0 Environmental Consequences 4-1
4.1 Introduction 4-1
4.2 Earth Resources 4-2
4.2.1 Proposal 1 - Sensor Training Area 4-2
4.2.1.1 Alternative 1.A – Air to Air Range Site 4-2
4.2.1.2 Alternative 1.B – South Tactical Range Site 4-3
4.2.1.3 Alternative 1.C – North Tactical Range Site 4-4
4.2.1.4 Alternative 1.D – No-Action Alternative 4-4
4.2.2 Proposal 2 – Target Reconfiguration 4-5
4.2.2.1 Alternative 2.A – Proposed Action 4-5
4.2.2.2 Alternative 2.B – No-Action Alternative 4-6
4.2.3 Proposal 3 – Moving Vehicle Target System 4-6
4.2.3.1 Alternative 3.A – Proposed Action 4-6
4.2.3.2 Alternative 3.B 4-7
4.2.3.3 Alternative 3.C 4-7
4.2.3.4 Alternative 3.D – No-Action Alternative 4-8
4.2.4 Proposal 4 – New Target for Air-to-Ground Missiles 4-8
4.2.4.1 Alternative 4.A – Proposed Action 4-8
4.2.4.2 Alternative 4.B – No-Action Alternative 4-9
4.2.5 Proposal 5 – Lowering Flight Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge 4- 9
4.2.5.1 Alternative 5.A – Proposed Alternative 4-9
4.2.5.2 Alternative 5.B – Alternative Action
4.2.5.3 Alternative 5.C – No-Action Alternative 4-9
4.2.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training 4-9
4.2.6.1 Alternative 6.A – Proposed Action 4-9
4.2.6.2 Alternative 6.B – No-Action Alternative 4-11
4.2.7 Proposal 7 - On-the-Ground Training Exercises 4-11
4.2.7.1 Alternative 7.A – Proposed Action 4-11
4.2.7.2 Alternative 7.B – No-Action Alternative 4-12
4.2.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field 4-12
4.2.8.1 Alternative 8.A - Proposed Action 4-12
4.2.8.2 Alternative 8.B – Alternative Tower Site B 4-13
4.2.8.3 Alternative 8.C – No-Action Alternative 4-13
4.2.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement 4-13
4.2.9.1 Alternative 9.A – Proposed Action 4-13
4.2.9.2 Alternative 9.B – No-Action Alternative 4-14
4.2.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling and Use on BMGR East 4-14
4.2.10.1 .Alternative 10.A – Proposed Action 4-14

4.2.10.2 .Alternative 10.B – No-Action Alternative....4-15
4.2.11 Aggregate Impacts to Earth Resources....4-15
4.3 Water Resources....4-16
4.3.1 Proposal 1 - Sensor Training Area....4-17
4.3.1.1 Alternative 1.A – Air to Air Range Site....4-17
4.3.1.2 Alternative 1.B – South Tactical Range Site....4-18
4.3.1.3 Alternative 1.C – North Tactical Range Site....4-18
4.3.1.4 Alternative 1.D – No-Action Alternative....4-19
4.3.2 Proposal 2 – Target Reconfiguration....4-19
4.3.2.1 Alternative 2.A - Proposed Action....4-19
4.3.2.2 Alternative 2.B – No-Action Alternative....4-20
4.3.3 Proposal 3 – Moving Vehicle Target System....4-20
4.3.3.1 Alternative 3.A – Proposed Action....4-20
4.3.3.2 Alternative 3.B....4-21
4.3.3.3 Alternative 3.C....4-21
4.3.3.4 Alternative 3.D – No-Action Alternative....4-22
4.3.4 Proposal 4 – New Target for Air-to-Ground Missiles....4-22
4.3.4.1 Alternative 4.A – Proposed Action....4-22
4.3.4.2 Alternative 4.B - No-Action Alternative....4-23
4.3.5 Proposal 5 – Lowering Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge....4-23
4.3.5.1 Alternative 5.A – Proposed Action....4-23
4.3.5.2 Alternative 5.B – Alternative Action....4-23
4.3.5.3 Alternative 5.C – No-Action Alternative....4-23
4.3.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-23
4.3.6.1 Alternative 6.A – Proposed Action....4-23
4.3.6.2 Alternative 6.B – No-Action Alternative....4-24
4.3.7 Proposal 7 – On-the-Ground Training Exercises....4-24
4.3.7.1 Alternative 7.A – Proposed Action....4-24
4.3.7.2 Alternative 7.B – No-Action Alternative....4-24
4.3.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field....4-24
4.3.8.1 Alternative 8.A – Proposed Action....4-24
4.3.8.2 Alternative 8.B....4-26
4.3.8.3 Alternative 8.C – No-Action Alternative....4-26
4.3.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement....4-26
4.3.9.1 Alternative 9.A – Proposed Action....4-26
4.3.9.2 Alternative 9.B – No-Action Alternative....4-27
4.3.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....4-27
4.3.10.1 Alternative 10.A – Proposed Action....4-27
4.3.10.2 Alternative 10.B – No-Action Alternative....4-29
4.3.11 Aggregate Impacts....4-29
4.4 Air Quality....4-30
4.4.1 Proposal 1 – Sensor Training Area....4-31
4.4.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site....4-31
4.4.1.2 Alternative 1.D – No-Action Alternative....4-33
4.4.2 Proposal 2 – Target Reconfiguration....4-33
4.4.2.1 Alternative 2.A – Proposed Action....4-33
4.4.2.2 Alternative 2.B – No-Action Alternative....4-33
4.4.3 Proposal 3 – Moving Vehicle Target System....4-33
4.4.3.1 Alternative 3.A – Proposed Action....4-33
4.4.3.2 Alternative 3.D – No-Action Alternative....4-35
4.4.4 Proposal 4 – New Target for Air-To-Ground Missiles....4-35
4.4.4.1 Alternative 4.A – Proposed Action....4-35
4.4.4.2 Alternative 4.AB– No-Action Alternative....4-35

4.4.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge 4-35
4.4.5.1 Alternative 5.A – Proposed Action....4-35
4.4.5.2 Alternative 5.B – Alternative Action....4-36
4.4.5.3 Alternative 5.C – No-Action Alternative....4-36
4.4.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-36
4.4.6.1 Alternative 6.A – Proposed Action....4-36
4.4.6.2 Alternative 6.B – No-Action Alternative....4-36
4.4.7 Proposal 7 – On-the-Ground Training Exercises....4-37
4.4.7.1 Alternative 7.A – Proposed Action....4-37
4.4.7.2 Alternative 7.B – No-Action Alternative....4-37
4.4.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-37
4.4.8.1 Alternative 8.A – Proposed Action....4-37
4.4.8.2 Alternative 8.B – No-Action Alternative....4-38
4.4.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement....4-38
4.4.9.1 Alternative 9.A – Proposed Action....4-38
4.4.9.2 Alternative 9.B – No-Action Alternative....4-39
4.4.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....4-39
4.4.10.1 Alternative 10.A – Proposed Action....4-39
4.4.10.2 Alternative 10.B – No-Action Alternative....4-40
4.4.11 Aggregate Impacts....4-41
4.5 Biological Resources....4-44
4.5.1 Proposal 1 – Sensor Training Area....4-51
4.5.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site....4-51
4.5.1.2 Alternative 1.B – South Tactical Range Site....4-57
4.5.1.3 Alternative 1.C – North Tactical Range Site....4-61
4.5.1.4 Alternative 1.D – No-Action Alternative....4-65
4.5.2 Proposal 2 – Target Reconfiguration....4-66
4.5.2.1 Alternative 2.A – Proposed Action....4-66
4.5.2.2 Alternative 2.B – No-Action Alternative....4-67
4.5.3 Proposal 3 – Moving Vehicle Target System....4-67
4.5.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C....4-67
4.5.3.2 Alternative 3.D – No-Action Alternative....4-74
4.5.4 Proposal 4 – New Target for Air-To-Ground Missiles....4-75
4.5.4.1 Alternative 4.A – Proposed Action....4-75
4.5.4.2 Alternative 4.B – No-Action Alternative....4-78
4.5.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....4-79
4.5.5.1 Alternative 5.A – Proposed Action....4-79
4.5.5.2 Alternative 5.B – Alternative Action....4-84
4.5.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-84
4.5.6.1 Alternative 6.A – Proposed Action....4-84
4.5.6.2 Alternative 6.B – No-Action Alternative....4-88
4.5.7 Proposal 7 – On-the-Ground Training Exercises....4-88
4.5.7.1 Alternative 7.A – Proposed Action....4-88
4.5.7.2 Alternative 7.B – No-Action Alternative....4-93
4.5.8 Proposal 8 – New Taxiway and Air Traffic control Tower at the Gila Bend Air Force Auxiliary Field....4-93
4.5.8.1 Alternative 8.A – Proposed Action and Alternative 8.B – Alternative Tower Site B....4-93
4.5.8.2 Alternative 8.C – No-Action Alternative....4-95
4.5.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement....4-95
4.5.9.1 Alternative 9.A – Proposed Action....4-95
4.5.9.2 Alternative 9.B – No-Action Alternative....4-99

4.5.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East 4-99
4.5.10.1 Alternative 10.A – Proposed Action.....4-99
4.5.10.2 Alternative 10.B – No-Action Alternative.....4-102
4.5.11 Aggregate Impacts.....4-102
4.6 Land Use.....4-103
4.6.1 Proposal 1 - Sensor Training Area 4-104
4.6.1.1 Alternative 1.A – Air-to-Air Range Site.....4-104
4.6.1.2 Alternative 1.B - South Tactical Range Site.....4-105
4.6.1.3 Alternative 1.C – North Tactical Range Site 4-105
4.6.1.4 Alternative 1.D – No-Action Alternative 4-106
4.6.2 Proposal 2 – Target Reconfiguration 4-106
4.6.2.1 Alternative 2.A – Proposed Action.....4-106
4.6.2.2 Alternative 2.B – No-Action Alternative.....4-107
4.6.3 Proposal 3 – Moving Vehicle Target System 4-107
4.6.3.1 Alternative 3.A – Proposed Action.....4-107
4.6.3.2 Alternative 3.B 4-108
4.6.3.3 Alternative 3.C 4-108
4.6.3.4 Alternative 3.D – No-Action Alternative 4-108
4.6.4 Proposal 4 – New Target for Air-to-Ground Missiles 4-108
4.6.4.1 Alternative 4.A – Proposed Action.....4-108
4.6.4.2 Alternative 4.B – No-Action Alternative.....4-109
4.6.5 Proposal 5 – Lowering Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge 4-109
4.6.5.1 Alternative 5.A – Proposed Action.....4-109
4.6.5.2 Alternative 5.B – Alternative Action.....4-111
4.6.5.3 Alternative 5.C – No-Action Alternative.....4-111
4.6.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training.....4-111
4.6.6.1 Alternative 6.A – Proposed Action.....4-111
4.6.6.2 Alternative 6.B – No-Action Alternative.....4-111
4.6.7 Proposal 7 – On-the-Ground Training Exercises 4-112
4.6.7.1 Alternative 7.A – Proposed Action.....4-112
4.6.7.2 Alternative 7.B – No-Action Alternative.....4-112
4.6.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field 4-112
4.6.8.1 Alternative 8.A – Proposed Action.....4-112
4.6.8.2 Alternative 8.B 4-113
4.6.8.3 Alternative 8.C – No-Action Alternative.....4-113
4.6.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement 4-114
4.6.9.1 Alternative 9.A – Proposed Action.....4-114
4.6.9.2 Alternative 9.B – No-Action Alternative.....4-114
4.6.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East ...4-114
4.6.10.1 Alternative 10.A – Proposed Action.....4-114
4.6.10.2 Alternative 10.B – No-Action Alternative.....4-115
4.6.11 Aggregate Impacts.....4-115
4.7 Outdoor Recreation.....4-115
4.7.1 Proposal 1 – Sensor Training Area 4-116
4.7.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site 4-116
4.7.1.2 Alternative 1.B – South Tactical Range Site 4-117
4.7.1.3 Alternative 1.C – North Tactical Range Site 4-118
4.7.1.4 Alternative 1.D – No-Action Alternative 4-118
4.7.2 Proposal 2 – Target Reconfiguration 4-118
4.7.2.1 Alternative 2.A – Proposed Action.....4-118
4.7.2.2 Alternative 2.B – No-Action Alternative.....4-118
4.7.3 Proposal 3 – Moving Vehicle Target System 4-118
4.7.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C 4-118
4.7.3.2 Alternative 3.D – No-Action Alternative 4-118

4.7.4 Proposal 4 – New Target for Air-To-Ground Missiles 4-118
4.7.4.1 Alternative 4.A – Proposed Action....4-118
4.7.4.2 Alternative 4.B – No-Action Alternative....4-119
4.7.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge 4-119
4.7.5.1 Alternative 5.A – Proposed Action....4-119
4.7.5.2 Alternative 5.B – Alternative Action....4-120
4.7.5.3 Alternative 5.C – No-Action Alternative....4-120
4.7.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-120
4.7.6.1 Alternative 6.A – Proposed Action....4-120
4.7.6.2 Alternative 6.B – No-Action Alternative....4-121
4.7.7 Proposal 7 – On-the-Ground Training Exercises....4-121
4.7.7.1 Alternative 7.A – Proposed Action....4-121
4.7.7.2 Alternative 7.B – No-Action Alternative....4-121
4.7.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-121
4.7.8.1 Alternative 8.A – Proposed Action and Alternative 8.B....4-121
4.7.8.2 Alternative 8.C – No-Action Alternative....4-122
4.7.9 Proposal 9 – Proposed Paving of Road from Manned Range 1 to RMCP 1....4-122
4.7.9.1 Alternative 9.A – Proposed Action....4-122
4.7.9.2 Alternative 9.B – No-Action Alternative....4-122
4.7.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....4-122
4.7.10.1 Alternative 10.A – Proposed Action....4-122
4.7.10.2 Alternative 10.B – No-Action Alternative....4-122
4.7.11 Aggregate Impacts....4-122
4.8 Health and Safety....4-123
4.8.1 Proposal 1 – Sensor Training Area....4-124
4.8.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site....4-124
4.8.1.2 Alternative 1.B – South Tactical Range Site....4-126
4.8.1.3 Alternative 1.C – North Tactical Range Site....4-127
4.8.1.4 Alternative 1.D – No-Action Alternative....1-127
4.8.2 Proposal 2 – Target Reconfiguration....4-127
4.8.2.1 Alternative 2.A - Proposed Action....4-127
4.8.2.2 Alternative 2.B – No-Action Alternative....4-127
4.8.3 Proposal 3 – Moving Vehicle Target System....4-127
4.8.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C....4-127
4.8.3.2 Alternative 3.D – No-Action Alternative....4-128
4.8.4 Proposal 4 – New Target for Air-To-Ground Missiles....4-128
4.8.4.1 Alternative 4.A – Proposed Action....4-128
4.8.4.2 Alternative 4.B – No-Action Alternative....4-128
4.8.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....4-129
4.8.5.1 Alternative 5.A – Proposed Action....4-129
4.8.5.2 Alternative 5.B – Alternative Action....4-129
4.8.5.3 Alternative 5.C – No-Action Alternative....4-130
4.8.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-130
4.8.6.1 Alternative 6.A – Proposed Action....4-130
4.8.6.2 Alternative 6.B – No-Action Alternative....4-130
4.8.7 Proposal 7 – On-the-Ground Training Exercises....4-131
4.8.7.1 Alternative 7.A – Proposed Action....4-131
4.8.7.2 Alternative 7.B – No-Action Alternative....4-131
4.8.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-132
4.8.8.1 Alternative 8.A – Proposed Action....4-132
4.8.8.2 Alternative 8.B – Alternative Tower Site B....4-132
4.8.8.3 Alternative 8.C – No-Action Alternative....4-132

4.8.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement 4-133
4.8.9.1 Alternative 9.A – Proposed Action 4-133
4.8.9.2 Alternative 9.B – No-Action Alternative 4-133
4.8.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East 4-133
4.8.10.1 Alternative 10.A – Proposed Action 4-133
4.8.10.2 Alternative 10.B – No-Action Alternative 4-133
4.8.11 Aggregate Impacts 4-134
4.9 Cultural Resources 4-134
4.9.1 Proposal 1 – Sensor Training Area 4-136
4.9.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site 4-136
4.9.1.2 Alternative 1.B – South Tactical Range Site 4-138
4.9.1.3 Alternative 1.C – North Tactical Range Site 4-138
4.9.1.4 Alternative 1.D – No-Action Alternative 4-139
4.9.2 Proposal 2 – Target Reconfiguration 4-139
4.9.2.1 Alternative 2.A - Proposed Action 4-139
4.9.2.2 Alternative 2.B – No-Action Alternative 4-140
4.9.3 Proposal 3 – Moving Vehicle Target System 4-140
4.9.3.1 Alternative 3.A 4-140
4.9.3.2 Alternative 3.B 4-141
4.9.3.3 Alternative 3.C 4-141
4.9.3.4 Alternative 3.D – No-Action Alternative 4-141
4.9.4 Proposal 4 – New Target for Air-To-Ground Missiles 4-141
4.9.4.1 Alternative 4.A – Proposed Action 4-141
4.9.4.2 Alternative 4.B – No-Action Alternative 4-142
4.9.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge 4-142
4.9.5.1 Alternative 5.A – Proposed Action 4-142
4.9.5.2 Alternative 5.B – Alternative Action 4-142
4.9.5.3 Alternative 5.C – No-Action Alternative 4-142
4.9.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training 4-143
4.9.6.1 Alternative 6.A– Proposed Action 4-143
4.9.6.2 Alternative 6.B – No-Action Alternative 4-143
4.9.7 Proposal 7 – On-the-Ground Training Exercises 4-143
4.9.7.1 Alternative 7.A – Proposed Action 4-143
4.9.7.2 Alternative 7.B – No-Action Alternative 4-143
4.9.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field 4-144
4.9.8.1 Alternative 8.A – Proposed Action 4-144
4.9.8.2 Alternative 8.B – Alternative Tower Site B 4-144
4.9.8.3 Alternative 8.C – No-Action Alternative 4-144
4.9.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement 4-144
4.9.9.1 Alternative 9.A – Proposed Action 4-144
4.9.9.2 Alternative 9.B – No-Action Alternative 4-144
4.9.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East 4-145
4.9.10.1 Alternative 10.A – Proposed Action 4-145
4.9.10.2 Alternative 10.B – No-Action Alternative 4-145
4.9.11 Aggregate Impacts 4-145
4.10 Hazardous Materials and Waste 4-145
4.10.1 Proposal 1 – Sensor Training Area 4-146
4.10.1.1 Alternative 1.A –Proposed Action, Alternative 1.B, and Alternative 1.C 4-146
4.10.1.2 Alternative 1.D – No-Action Alternative 4-148
4.10.2 Proposal 2 – Target Reconfiguration 4-148
4.10.2.1 Alternative 2.A – Proposed Action 4-148
4.10.2.2 Alternative 2.B – No-Action Alternative 4-148

4.10.3 Proposal 3 – Moving Vehicle Target System 4-148
4.10.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C ..4-148
4.10.3.2 Alternative 3.D – No-Action Alternative....4-148
4.10.4 Proposal 4 – New Target for Air-To-Ground Missiles 4-149
4.10.4.1 Alternative 4.A – Proposed Action....4-149
4.10.4.2 Alternative 4.B – No-Action Alternative....4-149
4.10.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....4-149
4.10.5.1 Alternative 5.A –Proposed Action....4-149
4.10.5.2 Alternative 5.B – Alternative Action....4-149
4.10.5.3 Alternative 5.C – No-Action Alternative....4-150
4.10.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-150
4.10.6.1 Alternative 6.A – Proposed Action....4-150
4.10.6.2 Alternative 6.B – No-Action Alternative....4-150
4.10.7 Proposal 7 – On-the-Ground Training Exercises....4-150
4.10.7.1 Alternative 7.A – Proposed Action....4-150
4.10.7.2 Alternative 7.B – No-Action Alternative....4-150
4.10.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-151
4.10.8.1 Alternative 8.A –Proposed Action, and Alternative 8.B....4-150
4.10.8.2 Alternative 8.B – No-Action Alternative....4-151
4.10.9 Proposal 9 – Manned Range 1 to RCMP 1 Road Pavement....4-151
4.10.9.1 Alternative 9.A –Proposed Action....4-151
4.10.9.2 Alternative 9.B – No-Action Alternative....4-152
4.10.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East 4-152
4.10.10.1 Alternative 10.A – Proposed Action....4-152
4.10.10.2 Alternative 10.B – No-Action Alternative....4-152
4.10.11 Aggregate Impacts....4-152
4.11 Socioeconomics and Environmental Justice 4-152
4.11.1 Proposal 1 – Sensor Training Area 4-154
4.11.1.1 Alternative 1.A –Proposed Action, Alternative 1.B, and Alternative 1.C ...4-154
4.11.1.2 Alternative 1.D – No-Action Alternative....4-154
4.11.2 Proposal 2 – Target Reconfiguration 4-154
4.11.2.1 Alternative 2.A –Proposed Action....4-154
4.11.2.2 Alternative 2.B – No-Action Alternative....4-154
4.11.3 Proposal 3 – Moving Vehicle Target System 4-154
4.11.3.1 Alternative 3.A –Proposed Action, Alternative 3.B, and Alternative 3.C ...4-154
4.11.3.2 Alternative 3.D – No-Action Alternative....4-155
4.11.4 Proposal 4 – New Target for Air-To-Ground Missiles 4-155
4.11.4.1 Alternative 4.A – Proposed Action....4-155
4.11.4.2 Alternative 4.B – No-Action Alternative....4-155
4.11.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....4-155
4.11.5.1 Alternative 5.A –Proposed Action....4-155
4.11.5.2 Alternative 5.B – Alternative Action....4-155
4.11.5.3 Alternative 5.C – No-Action Alternative....4-155
4.11.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-155
4.11.6.1 Alternative 6.A – Proposed Action....4-155
4.11.6.2 Alternative 6.B – No-Action Alternative....4-156
4.11.7 Proposal 7 – On-the-Ground Training Exercises....4-156
4.11.7.1 Alternative 7.A – Proposed Action....4-156
4.11.7.2 Alternative 7.B – No-Action Alternative....4-156

4.11.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-156
4.11.8.1 Alternative 8.A – Proposed Action and Alternative 8.B....4-156
4.11.8.2 Alternative 8.C – No-Action Alternative....4-156
4.11.9 Proposal 9 – Manned Range 1 to RCMP 1 Road Pavement....4-157
4.11.9.1 Alternative 9.A –Proposed Action....4-157
4.11.9.2 Alternative 9.B – No-Action Alternative....4-157
4.11.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....4-157
4.11.10.1 Alternative 10.A – Proposed Action....4-157
4.11.10.2 Alternative 10.B – No-Action Alternative....4-157
4.11.11 Aggregate Impacts....4-157
4.12 Noise....4-158
4.12.1 Proposal 1 – Sensor Training Area....4-158
4.12.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site....4-158
4.12.1.2 Alternative 1.B – South Tactical Range Site....4-161
4.12.1.3 Alternative 1.C – North Tactical Range Site....4-162
4.12.1.4 Alternative 1.D – No-Action Alternative....4-162
4.12.2 Proposal 2 – Target Reconfiguration....4-162
4.12.2.1 Alternative 2.A – Proposed Action....4-162
4.12.2.2 Alternative 2.B – No-Action Alternative....4-162
4.12.3 Proposal 3 – Moving Vehicle Target System....4-162
4.12.3.1 Alternative 3.A – Proposed Action....4-162
4.12.3.2 Alternative 3.B....4-163
4.12.3.3 Alternative 3.C....4-163
4.12.3.4 Alternative 3.D – No-Action Alternative....4-163
4.12.4 Proposal 4 – New Target for Air-To-Ground Missiles....4-163
4.12.4.1 Alternative 4.A – Proposed Action....4-163
4.12.4.2 Alternative 4.B – No-Action Alternative....4-163
4.12.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge....4-164
4.12.5.1 Alternative 5.A – Proposed Action....4-164
4.12.5.2 Alternative 5.B – Alternative Action....4-165
4.12.5.3 Alternative 5.C – No-Action Alternative....4-165
4.12.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training....4-165
4.12.6.1 Alternative 6.A – Proposed Action....4-165
4.12.6.2 Alternative 6.B – No-Action Alternative....4-165
4.12.7 Proposal 7 – On-the-Ground Training Exercises....4-166
4.12.7.1 Alternative 7.A – Proposed Action....4-166
4.12.7.2 Alternative 7.B – No-Action Alternative....4-166
4.12.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field....4-166
4.12.8.1 Alternative 8.A – Proposed Action....4-166
4.12.8.2 Alternative 8.B – Alternative Tower Site B....4-166
4.12.8.3 Alternative 8.C – No-Action Alternative....4-167
4.12.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement....4-167
4.12.9.1 Alternative 9.A – Proposed Action....4-167
4.12.9.2 Alternative 9.B – No-Action Alternative....4-167
4.12.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East....4-167
4.12.10.1 Alternative 10.A – Proposed Action....4-167
4.12.10.2 Alternative 10.B – No-Action Alternative....4-167
4.12.11 Aggregate Impacts....4-168
4.13 Unavoidable Adverse Environmental Effects....4-168
4.14 Relationship Between Short-Term Uses and Long-Term Productivity....4-169

4.15 Irreversible and Irretrievable Commitment of Resources 4-170
4.15.1 Earth Resources 4-170
4.15.2 Water Resources 4-171
4.15.3 Air Quality 4-171
4.15.4 Biological Resources 4-171
4.15.5 Land Use 4-172
4.15.6 Outdoor Recreation 4-173
4.15.7 Health and Safety 4-174
4.15.8 Cultural Resources 4-174
4.15.9 Hazardous Materials and Waste 4-175
4.15.10 Socioeconomics 4-175
4.15.11 Noise 4-175

5.0 Cumulative Effects 5-1
5.1 Cumulative Effects Background 5-1
5.2 Cumulative Effects Methodology 5-5
5.3 Effects of Past, Present, and Reasonably Foreseeable Future Actions 5-17
5.3.1 Introduction 5-17
5.3.2 Earth Resources 5-17
5.3.3 Water Resources 5-18
5.3.4 Air Quality 5-19
5.3.5 Biological Resources 5-20
5.3.6 Land Use 5-21
5.3.7 Outdoor Recreation 5-22
5.3.8 Health and Safety 5-22
5.3.9 Cultural Resources 5-23
5.3.10 Hazardous Materials and Waste 5-23
5.3.11 Socioeconomics and Environmental Justice 5-24
5.3.12 Noise 5-25

6.0 Persons Consulted 6-1

7.0 Draft EIS Distribution 7-1

8.0 List of Preparers 8-1

9.0 References 9-1

APPENDICES

Appendix A Notice of Intent
Appendix B Air Quality Calculations
Appendix C Noise
Appendix D Common and Scientific Names of Wildlife and Plant Species Referenced in this EIS
Appendix E Cumulative Effects
Appendix F Comments and Responses to Comments on the Draft EIS

LIST OF TABLES

1-1 Community Representation at Scoping Meetings 1-23
1-2 Issues Identified During Public Scoping 1-24
2-1 Summary of Key Sensor Training Area Action Alternative Features 2-5
2-2 Estimated Disturbance Area and Annual Volume of Excavated Materials by Source Site 2-64
2-3 Proposed Sensor Training Area Comparison of the Alternatives 2-67
2-4 Proposed Target Reconfiguration Comparison of the Alternatives 2-75
2-5 Proposed Moving Vehicle Target System Comparison of the Alternatives 2-78
2-6 Proposed New Target for Air-to-Ground Missiles Comparison of the Alternatives 2-84
2-7 Proposed Lower Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge Comparison of the Alternatives 2-87
2-8 Proposed Reconfiguration of Manned Range 3 for Helicopter Training Comparison of the Alternatives 2-91
2-9 Proposed On-the-Ground Training Exercises Comparison of the Alternatives 2-93
2-10 Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field Comparison of the Alternatives 2-96
2-11 Proposed Manned Range 1 to Range Munitions Consolidation Point 1 Road Pavement Comparison of the Alternatives 2-102
2-12 Proposed Excavation and Use of Sand and Gravel on BMGR East Comparison of the Alternatives 2-104
3-1 BMGR East Soil Units and K-Values 3-7
3-2 National and Arizona Ambient Air Quality Standards 3-16
3-3 Protected Species in the Region and their Potential to Occur within BMGR East 3-36
3-4 Recreation Opportunities in BMGR Management Units within the Area of Potential Effect 3-71
3-5 Class A Mishap Rates for F-16 and A-10s per 100,000 Flying Hours 3-81
3-6 Western Papaguería Cultural History 3-91
3-7 Cultural Resources in/near the Proposal 1 Action Areas 3-103
3-8 Cultural Resources in/near the Proposal 2 Action Areas, Active Intensive Use Category 3-105
3-9 Cultural Resources in/near the Proposal 3 Action Area 3-107
3-10 Cultural Resources in Proposal 5 Action Area 3-108
3-11 Cultural Resources in/near the Proposal 10 Action Areas 3-110
3-12 Munitions Elements and Respective Hazardous Constituents 3-113
3-13 Population Trends within the Tri-County Area 3-120
3-14 Population and Population Projections within the Tri-County Area 3-121
3-15 2000 U.S. Census Population for Census Tracts within the ROI 3-122
3-16 Population Trends and Projections for Major Communities within the ROI 3-122
3-17 Race and Ethnicity (2000) 3-124
3-18 Median Household Income and Unemployment Rates 3-127
3-19 Minority and Low-Income Populations 3-130
3-20 Noise Study Area 3-133
3-21 Maximum L_{dnmr} Levels for Aircraft Operations in Study Area 3-139
4-1 Summary of Areas of Disturbance Associated with All BMGR East Enhancement Proposals 4-16
4-2 Sand and Gravel Excavation Sites, Wash Bed and Disturbed Area 4-27
4-3 Construction Emission Estimates for Development of Sensor Target Area, Air-to-Air Range Site 4-32
4-4 Operational Emission Estimates for Sensor Target Area, Any Action Alternative 4-33
4-5 Maximum Construction Emission Estimates for Moving Vehicle Target System, Alternative 3.A 4-34
4-6 Operational Emission Estimates for Moving Vehicle Target System, Any Action Alternative 4-34
4-7 Operational Emission Estimates for 500 Feet AGL Flights over Cabeza Prieta NWR 4-36
4-8 Emission Estimates for Construction of Taxiway and Control Tower, Gila Bend AFAF 4-38
4-9 Construction Emission Estimates for Paving Road from Manned Range 1 to RMCP 1 4-39
4-10 Projected Annual Reduction in Fugitive Dust Emissions Due to Proposed Paving of Road from Manned Range 1 to RMCP 1 4-39
4-11 Annual Operational Emission Estimates for Onsite Sand and Gravel Extraction and Storage 4-40
4-12 Annual Operational Emission Estimates for Onsite Sand and Gravel Deliveries from Phoenix-based Supplier 4-41
4-13 Total Aggregate Construction Emissions (STA Site, Moving Vehicle Target System, Taxiway and Control Tower, Road Paving from Manned Range 1 to RMCP1) 4-41

LIST OF TABLES (Continued)

4-14 Total Aggregate Operational Emission Estimates (STA Site, Moving Vehicle Target System, Lowered Flight Training Altitude Over Cabeza Prieta NWR, Paved Road from Manned Range 1 to RMCP 1, and Sand and Gravel Extraction and Stockpiling) 4-42
4-15 Total Aggregate GHG Emissions 4-43
4-16 Target Closure Distance Based on Ordnance Delivery or Military Activity 4-46
5-1 Past, Present, and Reasonably Foreseeable Future Actions 5-9

LIST OF FIGURES

1-1 Barry M. Goldwater Range and Vicinity 1-2
1-2 Current Military Airspace and Major Land Use Features of BMGR East 1-9
2-1 Sensor Training Area Site Alternatives 2-4
2-2 Sensor Training Area Site Concept Design 2-6
2-3 Typical Remote Emitter Site 2-9
2-4 Alternative 1.A, Air-to-Air Range Sensor Training Area Site 2-16
2-5 Alternative 1.B, South TAC Sensor Training Area Site 2-21
2-6 Alternative 1.C, North TAC Sensor Training Area Site 2-22
2-7 Former Explosive Ordnance Disposal Areas in which Target Reconfigurations May be Proposed 2-27
2-8 Example of Review Procedure Areas at a Representative Inert Target Area 2-28
2-9 Alternative Locations for Moving Vehicle Target System 2-40
2-10 Existing and Proposed Air-to-Ground Missile Target Locations 2-43
2-11 Lowering Flight Training Area over Cabeza Prieta National Wildlife Refuge 2-48
2-12 Proposed Reconfiguration of the Manned Range 3 Left Conventional Target for Helicopter Gun Training 2-50
2-13 Proposed Taxiway and Air Traffic Control Tower at Gila Bend AFAF 2-55
2-14 Proposed Manned Range 1 to RMCP 1 Road Pavement 2-59
2-15 Sand and Gravel Excavation and Stockpile Sites 2-61
3-1 Soil Associations in the BMGR East 3-5
3-2 Surface Water Resources in the BMGR East Vicinity 3-10
3-3 Natural Communities in the BMGR East Vicinity 3-20
3-4 U.S. Sonoran Pronghorn Distribution 3-51
3-5 Compatible Land Use Plan Zones at the Gila Bend AFAF 3-60
3-6 BMGR East Recreation 3-70
3-7 BMGR East Regional Recreation 3-75
3-8 APZs at the Gila Bend AFAF 3-86
3-9 Munitions Constituent Sampling Locations 3-115
3-10 Socioeconomic Study Area 3-119
3-11 Typical Maximum A-Weighted Common Sounds 3-131
3-12 Noise Contour Levels at the Gila Bend AFAF 3-137
3-13 Noise Contour Levels within BMGR East and Vicinity 3-138
4-1 Common Construction Noise Levels 4-161
5-1 Locations of Selected Past, Present, and Reasonably Foreseeable Future Actions from Table 5-1 5-8

LIST OF ACRONYMS AND ABBREVIATIONS

AAA	Anti-Aircraft Artillery
ACHP	Advisory Council on Historic Preservation
ADEQ	Arizona Department of Environmental Quality
AFAF	Air Force Auxiliary Field
AFB	Air Force Base
AFI	Air Force Instruction
AGL	above ground level
AGFD	Arizona Game and Fish Department
AGM	Air-to-Ground Missile
APZ	accident potential zone
ARS	Arizona Revised Statutes
AUX	Auxiliary
AZ	Arizona
AZPDES	Arizona Pollutant Discharge Elimination System
BASH	Bird/Wildlife Aircraft Strike Hazard
BDU	Bomb Dummy Unit
BLM	Bureau of Land Management
BMGR	Barry M. Goldwater Range
BMP	best management practice
BO	biological opinion
CA	California
CAA	Clean Air Act
cal	caliber
CDNL	C-Weighted" Day-Night Average Sound Level
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGP	Construction General Permit
CO	carbon monoxide
CO_2	carbon dioxide
CSAR	Combat Search and Rescue
CWA	Clean Water Act
CWCS	Comprehensive Wildlife Conservation Strategy
DART	Deployable Aerial Rigged Target
dB	Decibel
dBA	A-weighted Decibel
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESQD	Explosive Safety Quantity Distance
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FW	Fighter Wing
GIS	Geographic Information System

GHG	Green House Gas
HAPs	hazardous air pollutants
HE	high explosive
IAM	Inertially Aided Munitions
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
JLUS	Joint Land Use Study
kV	kilovolt
kW	kilowatt
L_{dn}	"A-weighted" Day-Night Average Sound Level
L_{dnmr}	"A-weighted" Onset Rate Adjusted Monthly Day-Night Average Sound Level
LSTSS	Large Scale Target Sensor System
MBTA	Migratory Bird Treaty Act
MCAS	Marine Corps Air Station
MLWA	Military Lands Withdrawal Act
mm	millimeter
MOA	Military Operations Area
MOU	Memorandum of Understanding
MOUT	Military Operations in Urban Terrain
mph	miles per hour
MSL	Mean Sea Level
MTR	Military Training Route
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NM	nautical mile
NO_x	oxides of nitrogen
NO_2	nitrogen dioxide
NOI	Notice of Intent
NRHP	National Register of Historic Places
NWR	National Wildlife Refuge
O_3	ozone
OHV	off-highway vehicle
P5CTS	P5 Combat Training System
Pb	lead
PGM	Precision Guided Munitions
P.L.	Public Law
$PM_{2.5}$	particulate matter less than 2.5 microns
PM_{10}	particulate matter less than 10 microns
POL	petroleum, oils, and lubricants
ppm	parts per million
PTC	Pilot Training Center
RF	Radio Frequency
RMCP	Range Munitions Consolidation Point
RMO	Range Management Office
ROD	Record of Decision
ROI	Region of Influence

SAM	Surface-to-Air Missile
SEAL	Sea, Air, and Land Commando
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SO_x	oxides of sulfur
STA	Sensor Training Area
SWPPP	Storm Water Pollution Prevention Plan
TAC	tactical
TACP	Tactical Air Control Party
TCP	traditional cultural places
TCTS	Tactical Combat Training System
TOSS	Television Ordnance Scoring System
UAV	Unmanned Aerial Vehicle
UDI	undocumented immigrant
UFC	Unified Facilities Criteria
UMTE	Unmanned Threat Emitter
USAF	U.S. Air Force (used only in quotations from the Biological Opinion)
U.S.C.	U.S. Code
USFWS	United States Fish and Wildlife Service
UXO	unexploded ordnance
VOC	volatile organic compound
WAATS	Western Army National Guard Aviation Training Site
WTI	Weapons Tactics Instructor

EXECUTIVE SUMMARY

INTRODUCTION

Since its inception in 1941, the Barry M. Goldwater Range (BMGR) has been indispensable for producing and maintaining the combat-ready aircrews needed to defend the United States and its interests. From the perspective of land and airspace management and military operations, the BMGR is divided into eastern and western portions. The eastern portion of the BMGR, known as BMGR East, is assigned to the Secretary of the Air Force and is locally operated by Luke Air Force Base (AFB). The western portion of the range, known as BMGR West, is assigned to the Secretary of the Navy and is locally operated by Marine Corps Air Station (MCAS) Yuma. Although the Air Force and Marine Corps are the primary users of their respective portions of the BMGR, all aviation branches of the Armed Services use both portions of the range.

With technological advances in air defense systems, the tactics of modern combat continue to evolve. Therefore, the training features within the BMGR also must evolve to support training activities and operations that are relevant to the real-world air combat missions and threats.

This Environmental Impact Statement (EIS) focuses on actions proposed by the U.S. Air Force to upgrade and improve training assets and opportunities at BMGR East, including the Gila Bend Air Force Auxiliary Field (AFAF), which is located within BMGR East and directly supports the training and maintenance functions performed on the range. The 56th Fighter Wing (FW) Range Management Office (RMO) at Luke AFB, which executes the management and operational support functions for BMGR East, is the local command proponent of the proposed actions. The U.S. Fish and Wildlife Service (USFWS) is serving as a cooperating agency.

PURPOSE OF AND NEED FOR ACTION

Much of the training infrastructure currently in place at BMGR East (including physical and electronic simulations of targets and air defense systems) was installed or last upgraded during the Cold War era, which ended early in the 1990s. Since that time, many of the tactics of modern air combat have been altered by advancements in aircraft delivered air-to-ground weapons (including precision-guidance systems), electronic sensing and surveillance of the battle space, and air defense systems. Furthermore, as recent events in Iraq and Afghanistan have demonstrated, increased warfare in urban settings has placed new demands on airpower to counter threats and support friendly forces in an exceedingly complex environment.

The Air Force has determined that the training and range support infrastructure currently in place at BMGR East is in need of key additions, modifications, improvements, and upgrades to ensure

that aircrew training remains realistic and relevant. Similarly, there is need to upgrade Gila Bend AFAF to support flying operations. Certain new ground-based training activities that are components of the overall air power mission are also needed at BMGR East. Finally, improvements in some range maintenance facilities are needed to help the Air Force keep BMGR East fully functional.

This EIS includes ten proposed actions that would meet the general training and support needs at BMGR East and Gila Bend AFAF. While each action is supported by an individual purpose and need, the shared purpose and need for these actions is to:

- **Support air combat power.** The Air Force, Air Force Reserve, and Air National Guard air combat training that occurs at BMGR East is essential to U.S. combat readiness. More than 90 percent of the A-10 and F-16 pilots who participated in recent and/or ongoing conflicts in Bosnia, Iraq, and Afghanistan trained at BMGR East. Many Army National Guard, Marine Corps, Marine Corps Reserve, and Navy aircrews flying most types of U.S. tactical aircraft also train at BMGR East prior to engaging in military conflicts and peacekeeping missions.
- **Expand training value, flexibility, and capacity.** Implementation of the proposed actions would expand the overall training value, flexibility, and capacity of BMGR East to prepare aircrews qualified to fight in today's battlefield and to support readiness. Each of the proposed actions is synergistic with existing and future operations at the BMGR. The more training requirements that can be met at BMGR East, the less local Air Force F-16 and A-10 and other local users would need to deploy to other ranges in order to meet training requirements.
- **Invest in one of the nation's most capable and productive ranges.** BMGR East has long been one of the nation's most capable and productive ranges because of its (1) extensive size, (2) year-round-flying weather, (3) few operational limitations, and (4) close operational proximity to many military air bases. Investment to keep BMGR existing extensive training capabilities in line with the ever-advancing evolution of air combat technology and tactics is worthwhile and sound.

A summary of the purpose and need for each of the ten proposed actions follows. Proposals 1 through 7 address upgrades to training at BMGR East and Proposals 8 through 10 address the improvement of range management functions at Gila Bend AFAF and BMGR East.

1. Developing a Sensor Training Area (STA), which is a new target complex that would be used to train aircrews for air-to-ground combat in the modern urban environment through the use of laser sensors rather than by firing munitions at the targets.

Purpose and need: to provide regular and deployed users of the BMGR with realistic training in air-to-ground combat in urban settings. By investing in appropriate training facilities and technologies, the Air Force can enhance the safety of friendly forces and generate substantial advantages over enemies in urban terrain while avoiding civilian loss of life, damage to humanitarian missions (e.g., medical and aid facilities), and destruction of non-combatant property. The STA is needed within BMGR East to train regular and deployed users of the BMGR so that they are prepared to successfully execute military operations in urban terrain as assigned by combat commanders.

2. Establishing new procedures to guide environmental reviews and approvals for reconfiguration of existing air-to-ground tactical range target complexes to create more realistic simulations of today's battlefield.

   Purpose and need: to reconfigure targets to accurately simulate the types of targets encountered in today's air-to-ground battlefield that will provide a more realistic view of modern and futuristic combat conditions, and to support the training syllabus requirement that F-16 aircrew know about inertially aided munitions mission planning and deliveries.

3. Installing a moving vehicle target for air-to-ground attack training.

   Purpose and need: to provide aircrews with realistic training in attacking moving vehicles.

4. Developing a new target for attack training with live (i.e., explosive) air-to-ground missiles.

   Purpose and need: to enhance training with air-to-ground missiles by providing a target that could support missile attacks from multiple, realistic directions and altitudes without compromising range safety.

5. Lowering the altitude floor for regular flight training over a portion of the Cabeza Prieta National Wildlife Refuge (NWR).

   Purpose and need: to enable realistic low-level approaches to targets located in South tactical range (South TAC) and low-level air-to-air intercepts.

6. Converting the southern portion of Manned Range 3 into a helicopter gunnery range.

   Purpose and need: to provide more appropriate training for the Army National Guard and other rotary-wing units that train at BMGR East.

7. Allowing additional ground-based training on BMGR East in Air Force combat search and rescue (CSAR) and other land navigation and reconnaissance missions.

   Purpose and need: to provide training to CSAR teams, Special Operation teams, Marine Corps units, and potentially other small squads of troops in conducting clandestine insertions and extractions from helicopters or vehicles, and performing cross-country land navigation and other on-the-ground exercises while traveling in stealth on foot.

8. Constructing a new taxiway and air traffic control tower at Gila Bend AFAF.

   Purpose and need: to provide tactical aviation units with a simulation of the higher tempo airfield operations often required in actual war fighting theaters of action, to enhance the utility of Gila Bend AFAF for emergency aircraft recoveries, and to have an air traffic control tower that meets the minimally acceptable visual surveillance or depth perception standards specified by the Unified Facilities Criteria for military airfields.

9. Paving approximately 7 miles of an existing graded road within BMGR East.

   Purpose and need: to eliminate much of the dust generated by the ongoing heavy use of the existing improved dirt road; to decrease road maintenance requirements by providing a cost-effective, durable, and long-lasting maintenance solution; and to reduce the vehicle maintenance burden resulting from disproportionate wear and tear on Air Force vehicles that frequently travel on this road.

10. Excavating, stockpiling, and using sand and gravel resources at BMGR East.

    Purpose and need: to provide a more cost effective and ready source of sand and gravel for conducting on-range road maintenance, target reconfiguration, and target maintenance.

PUBLIC INVOLVEMENT AND ISSUES

The Air Force initiated public involvement on the proposed project by publishing a Notice of Intent to prepare an EIS in the *Federal Register* on December 28, 2007. The notice included an announcement of the dates and locations for public scoping meetings to determine the scope of issues that should be addressed through the environmental impact assessment process. In addition, notification letters were mailed to 570 parties and announcements for the scoping meetings were advertised in newspapers serving the Arizona communities of Glendale, Gila Bend, Yuma, and Tucson. Scoping meetings were held in Glendale, Tucson, and Gila Bend on January 15, 16, and 17, 2008, respectively.

A total of 25 individuals attended the public scoping meetings. Six written comments were submitted during the scoping meetings and three additional comment letters were received via postal mail before the scoping period concluded on January 28, 2008. The issues raised during the public scoping period included:

- Support for the military training value of the BMGR and the proposed improvements
- Opposition to the proposal for lowered flight training over the Cabeza Prieta NWR or consideration for alternative locations for such training in BMGR West or at other ranges
- Suggestion to implement a Leave No Trace ethic with search and rescue ground training
- Concern for potential impacts to soil erosion, reptiles and wildlife, and archaeological sites from the sand and gravel extraction and use proposal
- Concern that the moving vehicle target proposal may potentially impact Sonoran pronghorn
- Support for management that allows harvesting of bighorn sheep
- Concern about cumulative impacts to the Cabeza Prieta Wilderness associated with noise impacts from lowered flight training over the Cabeza Prieta NWR
- Concern that the proposed helicopter gunnery range at Manned Range 3 could potentially impact the Sonoran Desert National Monument
- Questions about the cost effectiveness of the sand and gravel extraction and use proposal, and the costs for Sonoran pronghorn monitoring for the moving vehicle target proposal

A Notice of Availability for the Draft EIS was published in the *Federal Register* on July 10, 2009 and copies of the Draft EIS were mailed to 15 libraries for public review as well as to a total of 135 agencies, Tribal representatives, organizations, and individuals. Public hearings were held in the Arizona communities of Gila Bend, Glendale, and Tucson on July 27, 28, and 29, 2009, respectively. Oral comments were made by two parties and nine written comment letters were submitted. Responses to those comments are included in this Final EIS.

DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

As noted, 10 different actions are proposed at BMGR East and Gila Bend AFAF to help ensure that the Air Force, Air Force Reserve, Air National Guard, Army National Guard, and other military units training at BMGR East can develop and maintain the state of readiness required to accomplish their assigned defense missions. All of the actions being proposed for BMGR East and Gila Bend AFAF are independent of each other and have stand-alone value for improving

training operations. While full implementation of all the proposed actions is desired and would result in the greatest training benefit for aircrew and ground troop training, each of the proposals, if implemented alone, would have a positive effect on the use and/or management of BMGR East and/or Gila Bend AFAF.

Proposal 1 – Sensor Training Area

Three action alternatives are being considered for the proposed STA. Features that all three action alternatives have in common include:

- 640-acre site with approximately 400 acres developed over time and 240 acres left undeveloped. The developed areas would support two laser scoring systems; one unmanned threat emitter; one Smokey Surface-to-Air Missile (SAM) launcher system; and an urban complex of simulated homes, buildings, industrial areas, roads, a sports field, and other types of urban features
- An approximately 0.25-acre ground-based forward air controller observation point that is external to the STA
- Access roads to the STA and ground forward air controller point

Alternative 1.A, Air-to-Air Range Site (preferred) – The proposed location for Alternative 1.A is within the San Cristobal Valley and underlying the Air-to-Air Range. This location offers optimum airspace for target ingress and egress as well as defensive maneuvering without interference with existing tactical or manned ranges, and acceptable communication with the existing microwave telemetry system. Alternative 1.A would require improvements to approximately 17 miles of existing road for access.

Alternative 1.B, South TAC Site – The proposed location for Alternative 1.B is within the former Target 220 site within South TAC. Advantages of this alternative include that it within an area of former military disturbance with existing access and would not require new Explosive Ordnance Disposal (EOD) clearance. Disadvantages include that South TAC would be less available for other operations when the STA is activated for training.

Alternative 1.C, North TAC Site – The proposed location for Alternative 1.C is within North TAC, but outside of the existing North TAC target complexes. This location would reduce the availability of North TAC for other simultaneous training missions, but may be less disruptive to other tactical range missions than Alternative1.B. This location could, however, interfere with concurrent airspace operations involving Manned Ranges 2 and 4. An advantage of Alternative 1.C is that it is outside of the current established range of the endangered Sonoran

pronghorn, although individual pronghorn raised in captivity recently wandered into this area of BMGR East.

Alternative 1.D, No-Action Alternative – The STA would not be constructed or operated within BMGR East at this time with Alternative 1.D.

Proposal 2 – Target Reconfiguration

Alternative 2.A, Proposed Action (preferred) – would establish environmental review and approval parameters that would allow most of the target reconfigurations needed to update BMGR East tactical ranges in a timely and efficient manner. The overall goal of proposed target reconfigurations at BMGR East is to bring the tactical ranges up-to-date in a comprehensive manner by partially or completely modifying a target simulation in its existing location, expanding the size or complexity of an existing target, eliminating an existing target that is no longer relevant to training, developing a target in a new location, or a combination of these actions. This proposed action is programmatic in nature and no specific individual target reconfigurations are proposed in this EIS. However, the environmental review and approval parameters would establish an efficient process for implementing target reconfigurations as needs are identified.

Alternative 2.B, No-Action Alternative – would result in continued use of the existing targets within BMGR East. No process would be established to streamline the review and approval process for future proposals to change target scenarios.

Proposal 3 – Moving Vehicle Target System

Three action alternatives are being considered for the proposed moving vehicle target system and differ primarily in their location. Each action alternative features the use of an existing road within North TAC to serve as part of a track that would be developed for towing a target pulled by a remotely operated, unoccupied vehicle. In each action alternative, the track would be relatively flat, approximately 50 feet wide, and routinely maintained to remove munitions impact scars. Approximately 85 percent of the time, the vehicle towing the target would be driven at speeds up to 45 miles per hour (mph) and 15 percent of the time, the vehicle would travel at speeds between 45 mph and 60 mph.

Alternative 3.A, Proposed Action (preferred) – the approximately 7.3-mile-long track would be co-located with Target 104/106 (the old main airfield) complex.

Alternative 3.B – the approximately 7.3-mile-long track would be located west of and adjacent to the road that provides primary ground access to interior locations in North TAC, including the Target 104 complex.

Alternative 3.C – the approximately 5.4-mile-long track would be located southeast of the North TAC simulated rail yard and west of the double-bladed road that forms the eastern boundary of North TAC.

Alternative 3.D, No-Action Alternative – With Alternative 3.D, no moving vehicle target system would be introduced at BMGR East. Existing roads within North TAC would not be modified to form tracks for moving vehicle operations, but these existing roads would continue to be used for other military operations and support functions.

Proposal 4 – New Target for Air-to-Ground Missiles

Alternative 4.A, Proposed Action (preferred) – would establish a second target within East TAC for live (exploding) air-to-ground missiles. The proposed live missile target would be more centrally positioned to allow attacks with Maverick missiles from a wider variety of headings and optimal altitudes. The proposed target location is within prior EOD clearance areas.

Alternative 4.B, No-Action Alternative – With the no-action alternative, the existing live air-to-ground missile target in East TAC would continue to be used for both Hellfire and Maverick missiles and an additional air-to-ground missile target for Maverick missile use would not be developed.

Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

Alternative 5.A, Proposed Action (preferred) – would result in the renegotiation of a 1994 Memorandum of Understanding among the Departments of the Air Force, Navy, and the Interior to provide for lowering the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet above ground level (AGL) to 500 feet AGL to enable more realistic attack approaches to targets in South TAC and low-altitude intercepts in the air-to-air range. The area that would be affected by Alternative 5.A would be entirely within R-2301E and would extend from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary, and south of the South TAC boundary to a distance of 15 nautical miles. The R-2301E airspace from 500 feet AGL up to 1,500 feet AGL over the Cabeza Prieta NWR would be available to be scheduled for either day or night missions in association with R-2301E airspace above 1,500 feet AGL.

It is estimated that on an annual basis, between 4,200 and 6,200 sorties would use the airspace from 500 feet to 1,500 feet AGL over the Cabeza Prieta NWR with implementation of this alternative.

Alternative 5.B – would be similar to Alternative 5.A except that the lowered flight floor area would extend 8 NM south of South TAC rather than 15 NM to the south as proposed in Alternative 5.A.

Alternative 5.C, No-Action Alternative – With the no-action alternative, the 1994 Memorandum of Understanding would not be renegotiated and military aircraft would continue to fly at altitudes of 1,500 feet AGL or higher when in the airspace overlying the Cabeza Prieta NWR except for those currently authorized flights along mutually designated low-level corridors.

Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

Alternative 6.A, Proposed Action (preferred) – would convert the southern portion of Manned Range 3, including the left conventional target south of the tower, into a helicopter gunnery range with fixed, moving, and pop-up targets to provide more appropriate training for the Army National Guard and other rotary-wing units that train at BMGR East. Helicopter crews would then strafe these targets with small munitions (such as .50-caliber).

Alternative 6.B, No-Action Alternative – With the no-action alternative, Manned Range 3 would not be reconfigured. Targets would not be added or removed and the range would continue to be used by fixed and rotary-wing aircraft.

Proposal 7 – On-the-Ground Training Exercises

Alternative 7.A, Proposed Action (preferred) – would provide for CSAR and other small teams with the opportunity to use BMGR East for ground-based training activities, such as clandestine insertions and extractions from helicopters or vehicles driven on existing range roads, cross-country land navigation, or shooting at targets while traveling on foot. Teams could also travel by vehicle on existing, open roads.

Alternative 7.B, No-Action Alternative – Only previously authorized on-the-ground training would occur with Alternative 7.B; no new ground training exercises by CSAR or other units would be introduced within BMGR East.

Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

Alternative 8.A, Proposed Action (preferred) – would result in the construction of a taxiway parallel to the airfield runway to increase the safety and capacity of the airfield, and construction of a new air traffic control tower designed to provide adequate views of the areas to be controlled. The taxiway would be approximately 8,500 feet long by 75 feet wide and include a 50-foot shoulder on each side of the main taxiway. The existing runway would be tied to the

proposed taxiway by expanding the runway arming areas at each end of the runway to a dimension of about 1,075 feet by 200 feet. The proposed action may require the relocation of the existing helicopter landing pads.

The proposed location for the new air traffic control tower is approximately 3,100 feet north of the Runway 35 threshold and 1,600 feet west of the Runway 17/35 centerline. The proposed tower would consist of five floors and the control tower cab, with the tower cab floor approximately 55 feet above ground level.

Alternative 8.B, Alternative Tower Site B – would include the taxiway construction as described for Alternative 8.A, but the air traffic control tower would be located approximately 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline. Views from the tower would be somewhat obstructed by power lines and other base structures, but less obstructed than with the current tower.

Alternative 8.C, No-Action Alternative – With the no-action alternative, no taxiway would be constructed parallel to the runway and the existing control tower would continue to be used. Aircraft would continue to use the runway for taxiing.

Proposal 9 – Manned Range 1 to Range Munitions Consolidation Point 1 Road Pavement

Alternative 9.A, Proposed Action (preferred) – would pave approximately 7 miles of the road from the main tower within Manned Range 1 to the water well and adjacent Range Munitions Consolidation Point (RMCP) 1 located near the boundary of the North and South TAC ranges to the west of Manned Range 1. The central 16 feet of the road would be paved, for a total paved area of approximately 13.5 acres.

Alternative 9.B, No-Action Alternative – would leave the existing road unpaved.

Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

Alternative 10.A, Proposed Action (preferred) – would allow the Air Force to excavate sand and gravel from ten sites within BMGR East; stockpile the materials in five alternative sites located near roads; and use the materials for on-range road maintenance, target reconstruction, and target maintenance.

Alternative 10.B, No-Action Alternative – would continue the ongoing practice of using funds, when available, to purchase sand and gravel from approved, outside, commercial sources that have the desired material composition and have them delivered to BMGR East for needed maintenance.

ENVIRONMENTAL ANALYSIS

The effects of the proposed and alternative actions were assessed for earth resources, water resources, air quality, biological resources, land use, outdoor recreation, health and safety, cultural resources, hazardous materials and waste management, socioeconomics and environmental justice, and noise. The following tables (Tables S-1 through S-10) present the key findings of the EIS in a comparative format.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Earth Resources	• Short-term ground disturbance with establishment of the STA. • Most disturbance expected to be within 400 acres of the 640-acre site. • Activities would be subject to conditions of the AZPDES CGP, which would minimize construction-related impacts.	Same as Alternative 1.A.	Similar to Alternative 1.A, except: • Approximately 2.5 acres of additional land would be disturbed for development of new road. • Upgrades to 4 miles of existing road would improve the long-term erosion potential.	• Ongoing accelerated erosion associated with use of existing roads would continue.
Water Resources	• Potential sedimentation of San Cristobal Wash and minor tributaries down gradient from vegetation removal, grading, and construction activities. • Construction BMPs, storm water control features, and adherence to AZPDES CGP requirements would protect surface waters from sedimentation and minimize the potential impacts.	Similar to Alternative 1.A, except: • Slightly higher potential risk of erosion since the site is previously disturbed. • Potential sedimentation of Growler Wash from vegetation removal, grading, and construction activities.	Similar to Alternative 1.A, except: • Potential sedimentation of Tenmile Wash from vegetation removal, grading, and construction activities.	• No impact to water resources within the study area.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				

Air Quality	• Short term, localized increase in emissions, particularly dust, during construction activities over portions of 2010 and 2011:
	  • Volatile organic compounds (VOC): 1.46 tons
	  • Carbon monoxide (CO): 10.26 tons
	  • Oxides of nitrogen (NO_x): 10.95 tons
	  • Sulfur dioxide (SO_2): 1.12 tons
	  • Particulate matter less then 10 microns in size (PM_{10}): 126.05 tons
	  • Particulate matter less the 2.5 microns in size ($PM_{2.5}$): 13.10 tons
	• Construction activities would require an earthmoving permit from Maricopa County and would use construction BMPs to reduce emissions.
	• Estimated emissions from operation of the STA site:
	  • VOC: 2.59 tons
	  • CO: 0.32 tons
	  • NO_x: 0.07 tons
	  • SO_2: 0.18 tons
	  • PM_{10}: 0.86 tons
	  • $PM_{2.5}$: <0.86 tons
		Same as Alternative 1.A.	Same as Alternative 1.A.	• No impact to air quality within the study area.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Biological Resources	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the San Cristobal Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 1.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the Growler Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 1.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 1.B were implemented, consultation with the USFWS was not completed for Alternative 1.B and so no alternative-specific terms and conditions were developed.	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the Sentinel Plain. • Not considered to result in adverse affects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS. Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 1.C were implemented; because Alternative 1.C is not the preferred alternative and only the preferred action (Alternative 1.A) is consulted on with the USFWS, a request for concurrence by the USFWS with the not likely to adversely affect determination was not initiated.	• No impact to biological resources either within or adjacent to BMGR East.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Land Use	• May result in reconfiguration of air-to-air low and air-to-air high ranges when STA activated. • Creates military training ground features within a currently natural area affecting 1 square mile. • Requires widening of 17 miles of existing road for access. • Requires new ground forward air controller point and access to this point. • Increases existing EOD clearance requirements • Minimally increases vehicular travel in the San Cristobal Valley.	• Reduces availability of South TAC when STA activated. • Uses area of prior military disturbance (Target 220). • Requires no access road improvements. • No change in existing EOD clearance requirements. • Minimally increases vehicular travel in South TAC.	• Reduces availability of North TAC when STA activated. • Creates military training ground features within a currently natural area affecting 1 square mile. • Requires upgrading of 4 miles of existing road for access. • Requires new ground forward air controller point and access to this point. • Reduces training capacity at Manned Ranges 2 and 4 due to airspace requirements. • Increases existing EOD clearance requirements.	• Limits BMGR East to existing training opportunities. • No change to land use.
Outdoor Recreation	• Minimal, localized impacts from recreation access closures within the laser safety footprint while STA is in use. • Land available for big horn sheep hunts may be reduced from recreational access closures; however, sheep occur within other game management units and mountains in the vicinity.	• No impact to recreation within the study area.	Same as Alternative 1.B.	• No impact to recreation within the study area.

Table S-1 Proposed Sensor Training Area Comparison of the Alternatives				
	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Health and Safety	• Increased potential for contact with health and safety hazards during construction, maintenance, and training activities. • Positive impacts to traffic safety through widening and improving the roads. • Safety protocols needed to address hazard of potential damage to eyesight from lasers during firing operations and radar emissions produced by the threat emitter. • Slight potential for a wildfire to ignite from use of illuminating rockets and flares at the STA; however, limited vegetative fuel minimizes this risk. • Luke AFB Supplement to AFI 13-212 would be updated to address procedures, protocols, and logistics for the safe operation of the STA.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No health and safety impacts within the study area.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Cultural Resources	• Intensive cultural resource survey of 100 percent of the access road and vicinity, and the STA/EOD footprint identified 11 prehistoric and historical-period cultural resource sites. Of these, 10 have been determined eligible for inclusion on the NRHP; one historic site is not eligible. • Nine of the 10 historic properties are located within 50 m (about 150 ft) of Stoval Road and have been disturbed to some extent.. Road improvements along the existing alignment would introduce new potential impacts to sites; however, impacts to some sites may be avoided. Maintenance of a passable road would have a beneficial effect on sites immediately adjacent to the existing road. • Places that may be eligible for inclusion on the NRHP for their traditional cultural value may be identified through ongoing consultation with tribes that attach cultural importance to places on BMGR East. • Assessment and resolution of adverse effects, and if needed, implementation of mitigation measures, would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of 100 percent of the project area identified no historic properties that might be affected by this alternative. • Places that may be eligible for inclusion on the NRHP for their traditional cultural value may be identified through ongoing consultation with tribes that attach cultural importance to places on BMGR East. • Assessment and resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Intensive cultural resource survey of 65 of the roughly 1,200 acres potentially affected has been completed. A single prehistoric site was recorded along a road about 2 miles from this alternative STA location; it has been determined eligible for inclusion on the NRHP. That site will not be affected by construction and maintenance of the STA in this location, but might be affected if this road is used in connection with training at this location. Based on findings of surveys in similar environmental settings near the project area, it is likely that one or more small sites may be located in the area Disturbance from construction, maintenance, and ongoing operation and use of the STA, including accelerated erosion, would potentially impact cultural resources, if identified, within this project area. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Baseline conditions for cultural resources would continue.

Table S-1
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Hazardous Materials and Waste Management	• Temporary increase in use of petroleum, oils, and lubricants (POL) and waste disposal from construction. • Minor long term increase in POL use to power equipment. • No change in overall levels of munitions delivered to BMGR East or increase potential for munitions constituents to be transported off-range.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain during construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No socioeconomic impact or environmental justice concerns within the study area.
Noise	• Low to moderate increase in "A-weighted" Onset Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) noise exposure level within the STA aircraft operating area. • Moderate temporary increases in noise levels ranging from 70 to 90 dBA from construction of the STA would occur during daytime working hours. • There may be slight increases in noise exposure levels within the Cabeza Prieta NWR, but no other off-range noise impacts.	Same as Alternative 1.A, except: • Greater concentration of aircraft operations in South TAC could increase cumulative L_{dnmr} noise exposure at or above the 65 dB DNL threshold, but would be at interior locations to BMGR East and would not result in incompatible community noise levels. • Noise level increase would be less noticeable as compared to Alternative 1.A because there are more existing operations in the tactical ranges.	Same as Alternative 1.B, except: • Noise exposure levels as described for Alternative 1.B would occur within North TAC as opposed to South TAC and potentially result in less noise exposure within Cabeza Prieta NWR as compared to Alternative 1.A.	• No noise impacts within the study area.

Table S-2
Proposed Target Reconfiguration
Comparison of the Alternatives

	Alternative 2.A, Target Reconfiguration (Proposed Action)	**Alternative 2.B, No-Action Alternative**
Resources		
Earth Resources	• Localized increased rates of erosion with land disturbance activities associated with target reconfiguration. • Activities would be subject to AZPDES CGP, which would minimize construction-related impacts.	• Potential for localized increased rates of erosion with land disturbance activities that may occur with ongoing routine target maintenance.
Water Resources	• Potential for increased sedimentation in runoff from target reconfiguration in Tenmile Wash, Growler Wash/Daniels Arroyo Wash, Quilotosa Wash, and Sauceda Wash systems. • Adherence to AZPDES CGP requirements would minimize potential impacts.	• Potential for localized increased rates of sedimentation in runoff from land disturbance that may occur with ongoing routine target maintenance.
Air Quality	• Construction activities at specific target locations may create short term, localized air emissions.	• Ongoing routine target maintenance activities would continue to result in some minor, short-term, localized air emissions.
Biological Resources	• No impacts to vegetation, wildlife, or special status species for reconfiguration in areas with moderate to high prior military use. Actions in less disturbed areas would be reviewed for potential biological impacts on a site-specific basis.	• No impact to biological resources either within or adjacent to BMGR East.
Land Use	• Establishes opportunities for modern, more realistic training. • Focuses on reconfiguring targets within areas of prior military use, thereby minimizing changes to land use.	• Continues training with outdated target scenarios. • No change to existing land use.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• No health and safety impacts within the study area. • Luke AFB Supplement to AFI 13-212 would be updated with procedures for safe operation of reconfigured targets.	• No impact to health and safety.

Table S-2
Proposed Target Reconfiguration
Comparison of the Alternatives

	Alternative 2.A, Target Reconfiguration (Proposed Action)	**Alternative 2.B, No-Action Alternative**
Resources		
Cultural Resources	• Review under NEPA would be limited for target reconfigurations that meet certain criteria; however, with few exceptions, all target reconfigurations will require review under Section 106 of the NHPA. • Most target reconfigurations (Types 1, 2, and 3) would occur in the Active Intensive Use category (the current 2-year EOD clearance area). Intensive cultural resource surveys of 100 percent of these areas have identified 22 prehistoric and historic period resources which might be affected by target reconfiguration and use. All but two sites have been recommended eligible for inclusion on the NRHP; none has been determined eligible to date. • Most target reconfigurations away from existing target locations are likely to fall within previously surveyed areas that have been disturbed to some extent by past military training and support activities including the Active Moderate Use, Infrequent Moderate Use, and Reserve Light Use categories. Intensive archaeological surveys of from 90 to 100 percent of these areas have been completed. Impacts from renewed ground disturbance might occur to cultural resources located in the vicinity of targets reconfigured outside of the existing biennial but within areas previously cleared by EOD. • Target reconfigurations in the Active Moderate Use category (about 26,000 acres), 100 percent of which has been intensively surveyed, might affect 62 unevaluated sites, most of which have been recommended eligible for inclusion on the NRHP. • Target reconfigurations in the Infrequent Moderate Use category (the 2001-2006 5-year EOD clearance zone; roughly 42,000 acres) might impact as many as 250 unevaluated cultural resource sites. • Target reconfigurations in the Reserve Light Use category (about 50,000 acres) might affect over 400 recorded but unevaluated sites. • New ground disturbance might impact cultural resources in currently undisturbed areas outside the pre-2001 5-year EOD footprint on tactical ranges (Negligible Use category). Very little survey has been completed in this area. • Identification and evaluation of historic properties, assessment	• Baseline cultural resource conditions would continue.

Table S-2 Proposed Target Reconfiguration Comparison of the Alternatives		
	Alternative 2.A, Target Reconfiguration (Proposed Action)	**Alternative 2.B, No-Action Alternative**
Resources		
	and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA for target reconfigurations outside existing target complexes.	
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction occurring in increments over 10 or more years. • Changes in munitions constituents to be addressed through ongoing program to periodically review the potential for munitions constituents to be transported off-range.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• Long-term minor economic gains from sporadic construction activities associated with reconfiguring targets as needs are identified. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concerns within the study area.
Noise	• Equipment used for reconfiguration activities would create noise at the sites in the range of 70 to 90 dBA; sites are well within interior locations of BMGR East.	• No noise impacts within the study area.

Table S-3
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Earth Resources	• Disturbance of approximately 44 acres of previously disturbed soils for construction of track. • Long term soil degradation from operation of the 4x4 vehicle that pulls the moving target. • Adherence to AZPDES CGP requirements would minimize construction-related erosion potential.	Same as Alternative 3.A, except: • There is less previous disturbance at this site.	Similar to Alternative 3.A, except: • Disturbance of approximately 33 acres of relatively undisturbed soils for construction of track. • Site location at base of Crater Range would experience higher erosion rates than Alternative 3.A and 3.B sites due to runoff and flash flooding following heavy rain events.	• No impact to earth resources within the study area.
Water Resources	• Potential for increased sedimentation in tributary of Tenmile Wash from construction and ongoing operation of moving vehicle target system. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• Potential for increased sedimentation in tributaries of Tenmile Wash and San Cristobal Wash from cultural surveys, construction, munitions delivery, and EOD clearance activities. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• Similar to Alternative 3.A. and 3.B, but with the highest potential for increased sedimentation of Tenmile Wash since site drains directly into the main channel of the system instead of a tributary. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• No impact to water resources within the study area.

Air Quality	• Short term, localized increase in emissions from road construction:
	  • VOC: 0.02 tons
	  • CO: 0.25 tons
	  • NO_x: 0.13 tons
	  • SO_2: 0.01 tons
	  • PM_{10}: 5.15 tons
	  • $PM_{2.5}$: 0.52 tons
	• An earth moving permit would be required from Maricopa
		Same as Alternative 3.A.	Same as Alternative 3.A.	No air quality impacts within the study area.

Table S-3
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
	County for construction activities. • Short term localized increase in dust (PM_{10}) emission would occur from operation of the moving vehicle target system on unpaved roads during training exercises.			
Biological Resources	• Project activities could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 3.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn.	• Project activities could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 3.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 3.B were implemented, consultation with the USFWS was	• Project activities adjacent to Tenmile Wash could disrupt the ability of wildlife to effectively use this important habitat area to safely move across the landscape. • Potential to impact individual crested saguaro. • Could contribute to degradation of desert tortoise habitat and impact individual animals. • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Could result in disturbance to individual peregrine falcons possibly associated with the cliffs of the Crater Range. • Could result in disturbance to California leaf-nosed bats through modification of suitable foraging habitat. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran	• No biological resources impacts either within or adjacent to BMGR East.

Table S-3
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
	Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	not completed for Alternative 3.B and so no alternative-specific terms and conditions were developed.	pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 3.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 3.C were implemented, consultation with the USFWS was not completed for Alternative 3.C and so no alternative-specific terms and conditions were developed.	
Land Use	• Creates a loop road using some existing roadway, affecting 44 acres. • Limits access to this area of North TAC during moving target training exercises.	• Creates a loop road using some existing roadway, affecting 44 acres. • Limits access to this area of North TAC during moving target training exercises.	• Creates a loop road using some existing roadway, affecting 33 acres. • Limits access to this area of North TAC during moving target training exercises.	• Limits training within BMGR East to static targets. • No change to land use or range accessibility.
Outdoor Recreation	• No impact to recreation within the study area.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No impact to recreation within the study area.
Health and Safety	• Hazards associated with heavy equipment operation and vehicle use for construction activities would not differ substantially from those already encountered during periodic maintenance. • Luke AFB Supplement to AFI 13-212 would be updated to address safe operation and training at the moving vehicle target system.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No health and safety impacts within the study area.

Table S-3
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area identified one prehistoric site recommended eligible for inclusion on the NRHP. • Ground disturbance and soil erosion at the project site associated with the proposed action would potentially result in impacts to this site, unless avoidance is possible. • Evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of approximately 70 percent of the project area has identified no sites recommended eligible for inclusion on the NRHP. One site excavated in 1979 has since been determined not eligible. • Surface disturbance and associated erosion could impact cultural resources, if present in unsurveyed areas. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan, would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of 100 percent of the project area identified two archaeological sites recommended eligible for inclusion on the NRHP. • Ground disturbance and soil erosion at the project site associated with the proposed action would potentially result in impacts to this site, unless avoidance is possible. • Evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction. • Minor long term increase in POL use to power equipment.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.

Table S-3
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Moderate temporary increases in noise levels in the range of 70 to 90 dBA from construction of the moving vehicle target system. • Intermittent noise-generating activity associated with operation of the moving vehicle target system. Site is well within the interior of BMGR East.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No noise impacts within the study area.

Table S-4 Proposed New Target for Air-To-Ground Missiles Comparison of the Alternatives		
	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Earth Resources	• Live air-to-ground missiles result in larger surface disturbance footprints as compared to inert munitions. • Estimated to be 75-acre disturbance area in area of some prior disturbance associated with inert munitions delivery. • Ongoing target maintenance and construction would have localized impacts to soils. • Shift of munitions delivery from existing air-to-ground missile target to the proposed target site (approximately 2.5 miles closer to the BMGR East boundary) would shift associated munitions constituent content in soils localized to the proposed target site, with no change in potential for munitions constituents in soils to migrate off-Range.	• No impacts to earth resources within the study area.
Water Resources	• New target would be located in close proximity to Quilotosa Wash. • Delivery of live missiles at new target would destabilize soils in the area, increasing sedimentation in the wash during rain events which could alter flow of the channel. • Low increased probability that future delivery of munitions to the proposed air-to-ground missile target would increase the potential for munitions constituents to migrate off-range and cause an unacceptable risk to human and/or ecological receptors due to the comparative proximity of the proposed site and Quilotosa Wash pathway to the existing air-to-ground target site and Sauceda Wash pathway. Ongoing assessment requirements are noted under Hazardous Material s and Waste Management. • No federal or state water quality standards would be exceeded and impacts would be localized.	• No impacts to water resources within the study area.
Air Quality	• Although emissions from missile delivery would shift from one localized site to another, there would be no impact to air quality within the study area.	• No impact to air quality within the study area.

Table S-4
Proposed New Target for Air-To-Ground Missiles
Comparison of the Alternatives

	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Biological Resources	• Live fire activity could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife safely across the landscape. • Potential to impact individual crested saguaro and the wildlife that rely on saguaros for food and/ or shelter. • Potential for disturbance to individual Le Conte's thrashers, but would not be expected to impact the distribution or overall abundance of the species. • Potential to impact individual California leaf-nosed bats but would not be expected to alter the local distribution or abundance of the bat. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 4.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 4.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats.	• No impact to biological resources within or adjacent to BMGR East.
Land Use	• Provides air-to-ground missile training opportunity with improved angles of attack. • Establishes new target for live ordnance, precluding approximately 75 acres from other land uses for the life of the target. • Compatible with other land uses in East TAC.	• Limits training to two live air-to-ground missile targets, one of which is constrained by its location in providing a full range of attack angles and altitudes of approach. • No change to land use, thereby retaining the area for other future compatible land uses.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Potential health and safety impacts associated with construction and ongoing operation would not differ from those that typically occur for periodic range clearance and maintenance. • Luke AFB Supplement to AFI 13-212 would be updated to include safe procedures for this activity.	• No impact to health and safety within the study area.

Table S-4 Proposed New Target for Air-To-Ground Missiles Comparison of the Alternatives		
	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area did not identify historic properties. • Section 106 review of this proposal resulted in a finding of *no historic properties affected*..	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction. • Although the proposed air-to-ground missile site/Quilotosa Wash pathway is approximately 2.5 miles closer to the range boundary than the existing air-to-ground missile site/Sauceda Wash pathway no increased potential for unacceptable risk to human and/or ecological receptors would be expected given the source-interaction-receptor analysis conducted to date. Potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years; or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concerns within the study area.
Noise	• Minor temporary increases in noise levels ranging from 70 to 90 dBA from construction of the target. • Minor changes to noise exposure levels in the immediate vicinity of the new target, which is well within the interior of BMGR East.	• No noise impacts within the study area.

Table S-5
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
Earth Resources	• No impacts to earth resources within the study area.	Same as Alternative 5.A.	• No impacts to earth resources within the study area.
Water Resources	• No impact to water resources within the study area.	Same as Alternative 5.A.	• No impact to water resources within the study area.
Air Quality	• Operation of aircraft at a lower altitude would not generate additional emissions, but rather impact a more localized area of the Cabeza Prieta NWR. • Oxides of nitrogen estimated at highest quantity, in excess of 6 tons per year; actual impact would be a fraction of this estimate since aircraft operations already produce these emissions. • All pollutant emissions would be considered negligible.	• Same as Alternative 5.A except that the area of potential effect would be about half the size of Alternative 5.A	• No impact to air quality within the study area.
Biological Resources	• Though some individuals of various species may be disturbed by the low level overflights, these activities are not expected to result in impacts to the distribution or abundance of wildlife. • Potential impacts to individual cactus ferruginous pygmy-owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual Le Conte's thrashers, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual peregrine falcons but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual California leaf-nosed bats but would not be expected to alter the local distribution or abundance of the bat. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the	• Same as Alternative 5.A except that the area of potential effect would be about half the size of Alternative 5.A • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 5.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 5.B were implemented, consultation with the USFWS was not completed for Alternative 5.B and so no alternative-specific terms and conditions were developed.	• No impact to biological resources within or adjacent to BMGR East.

Table S-5
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
	local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 5.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 5.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 5.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.		
Land Use	• No impact to land surface (ground disturbance) either within BMGR East or Cabeza Prieta NWR. • Requires new scheduling procedures so that authorized military and non-military users do not simultaneously use the affected airspace between 500 feet AGL and 1,500 feet AGL. • Creates minor inconvenience in scheduling airspace for authorized non-military surveillance flights, such as those made by wildlife agencies or the Border Patrol.	• Same as Alternative 5.A except that only about half as much airspace would be affected by the change in scheduling procedures.	• No impact to land use either within or adjacent to BMGR East. • Reduces realism in altitude of attack training for certain targets located near the southern boundary of BMGR East.
Outdoor Recreation	• Minor overflight disturbance to recreation within the remote areas of Cabeza Prieta NWR and Wilderness and Organ Pipe Cactus National Monument and Wilderness. • No impact to recreation within BMGR East.	• Same as Alternative 5.A except that overflight effects would be more concentrated on an area about half the size of Alternative 5.A in the northern portion of the Cabeza Prieta NWR and Wilderness.	• No impact to recreation within the study area.

Table S-5
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
Health and Safety	• Negligible increased risk of an aircraft mishap could occur with lower flight training altitude. • Luke AFB Supplement AFI 13-212 would be updated to address safety procedures for lower flight training altitude.	Same as Alternative 5.A.	• No impact to health and safety within the study area.
Cultural Resources	• Less than 1 percent of the land area underlying this airspace area has been surveyed for cultural resources. Seven prehistoric and historical-period cultural resources have been recorded. • Auditory and visual intrusions, and possibly vibratory impacts, to cultural resources on these lands from aircraft overflights would potentially increase. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Less than 1 percent of the land area underlying this airspace area has been surveyed for cultural resources. One prehistoric cultural resource has been recorded. • Auditory and visual intrusions, and possibly vibratory impacts to cultural resources on these lands from aircraft overflights would potentially increase. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Auditory and visual intrusions to cultural resources from overflights of Cabeza Prieta NWR would continue at current levels. Impacts from vibrations caused by overflights are possible; however, none have been documented to date.
Hazardous Materials and Waste Management	• Minor increase in potential for aircraft crashes, which would be addressed with crash response protocols already in place.	Same as Alternative 5.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• No socioeconomic impact. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 5.A.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• L_{dnmr} noise exposure levels in areas underlying the Air-to-Air range, including the Cabeza Prieta NWR would increase approximately 5 dB, but would remain significantly below community noise impact levels, ranging from 48 dB to below 45 dB.	Noise exposure levels under Alternative 5.B would increase at the same magnitude as described for Alternative 5.A; however, the area exposed to the approximately 5dB increase would be reduced due to the reduced size of the lowered flight training area.	• No noise impacts within the study area.

Table S-6
Proposed Reconfiguration of Manned Range 3 for Helicopter Training
Comparison of the Alternatives

	Alternative 6.A, Reconfigure Manned Range 3 for Helicopter Training (Proposed Action)	**Alternative 6.B, No-Action Alternative**
Resources		
Earth Resources	• Localized disturbance from EOD clearance activities prior to establishing targets. • Disturbance at sites for the establishment of 15 to 25 pop-up systems to be dispersed within a 400-acre area. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impacts. • Training activities and helicopter use would increase localized soil disturbance and erosion potential at the target area.	• No impact to earth resources within the study area.
Water Resources	• Localized soil disturbance throughout 400-acre site from establishment of 15-25 pop-up systems could increase potential for sedimentation during heavy rain events in tributaries of Sauceda Wash. • Adherence to AZPDES CGP requirements would minimize the construction-related impact.	• No impact to water resources within the study area.
Air Quality	• Emissions associated with the minor construction of pop-up systems would be short term, negligible, and preclude quantification.	• No impact to air quality within the study area.
Biological Resources	• Potential impacts to small areas of desert lowland vegetation. • Live fire activity could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife across the landscape. • Potential impacts to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 6.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 6.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats.	• No impact to biological resources within or adjacent to BMGR East.

Table S-6
Proposed Reconfiguration of Manned Range 3 for Helicopter Training
Comparison of the Alternatives

	Alternative 6.A, Reconfigure Manned Range 3 for Helicopter Training (Proposed Action)	**Alternative 6.B, No-Action Alternative**
Resources		
Land Use	• Establishes new training opportunity for helicopter gunnery training that includes pop-up target systems • Establishes targets in a new area within Manned Range 3, introducing new small munitions impacts and resulting in minor increase in EOD clearance area	• Limits helicopter gunnery training to existing opportunities. • No change in land use.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Health and safety conditions would not differ appreciably from those already present at the range. • Luke AFB Supplement AFI 13-212 would be updated to include safety procedures for the reconfigured range.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area identified no historic properties. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction and, in the long-term, with target maintenance. • No increased potential for transport of munitions constituents off-range.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain would result from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• During construction, there would be minor temporary increases in noise levels ranging from 70 to 90 dBA in this interior location within BMGR East. • Minor changes to noise exposure levels in the immediate vicinity of the new targets associated with change in aerial gunnery and aircraft operations at the reconfigured target.	• No noise impacts within the study area.

Table S-7 Proposed On-the-Ground Training Exercises Comparison of the Alternatives		
	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
Earth Resources	• Minimal and localized erosion from foot traffic and vehicular use. • Wind erosion from helicopter blade wash down at previously disturbed points of insertion/extraction.	• No impact to earth resources within the study area.
Water Resources	• Minor, localized potential for increased erosion which could result in sedimentation from increased vehicular use on roads and parking on unpaved roadside shoulders. • Ground-based training activities could slightly increase erosion potential, specifically when training occurs during or following a rain event in areas where there are semi-erodible and highly erodible soils.	• No impact to water resources within the study area.
Air Quality	• Localized dust (PM_{10}) from helicopter blade wash down in insertion/extraction exercise, but no impact to air quality within the study area.	• No impact to air quality within the study area.
Biological Resources	• Clandestine activities by troops on foot would not be expected to generally disturb wildlife or vegetation; however there is potential for minimal impacts to vegetation associated with vehicle parking for troop insertion or extraction. • Troops camping in a fixed location may temporarily impact individual wildlife movements, but no lasting impacts are anticipated; no long-term change in movement patterns or habitat use is anticipated. • There is potential for minimal impacts to xeroriparian habitats by vehicle traffic in the area and maintenance activities at the targets, as well as minimal impacts to vegetation adjacent to wash channels in the vicinity of the new targets. • Potential impacts to individual desert tortoise but would not be expected to alter the local distribution or abundance of the tortoise. • Potential impacts to individual Le Conte's thrashers and individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to the California leaf-nosed bat, if roost sites are entered or disturbed by troops moving through. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 7.A, as part of a programmatic consultation on Air	• No impact to biological resources within or adjacent to BMGR East.

Table S-7
Proposed On-the-Ground Training Exercises
Comparison of the Alternatives

	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
	Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 7.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 7.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	
Land Use	• Provides for land navigation and other on-the-ground training opportunities for CSAR and other small teams of troops. • Negligible effects on land use from dispersed cross-country travel on foot.	• Limits CSAR ground training to locations outside of BMGR East. • No change in land use.
Outdoor Recreation	• Minor impacts to recreationists within Area B from the possibility of observing a military training exercise.	• No impact to recreation within the study area.
Health and Safety	• Military personnel involved in training exercises would be exposed to various environmental health and safety issues; however, updates to Luke AFB Supplement to AFI 13-212 would establish safe training procedures to protect personnel.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource survey in of 2,341 acres in sample survey blocks and along 80 miles of roads in Area B has identified 75 prehistoric and historical-period cultural resources. • Cultural resources could be impacted by minimal ground disturbance from roadside vehicle parking, foot traffic, and helicopter rotor wash in previously disturbed and surveyed areas in tactical ranges and Area B, a portion of BMGR East that is open to the public. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Baseline conditions for cultural resources would continue.

Table S-7
Proposed On-the-Ground Training Exercises
Comparison of the Alternatives

	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
Hazardous Materials and Waste Management	• Minor amount of use of fuels and coolants in equipment used for troop insertion and extraction. • No impacts from small arms munitions use. • Troops to carry out solid waste and bury human waste.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• Potential minor economic gain if deployed units seek services or supplies in the communities around BMGR East. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Minor, intermittent noise impacts associated with aircraft operations and activity from ground troops.	• No noise impacts within the study area.

Table S-8
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Earth Resources	• Construction-related disturbance of 42 acres of previously disturbed soil for development of new taxiway. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impact. • Long term stabilization of soil with addition of tarmac and asphalt surfaces for taxiway and design of drains and culverts to manage runoff from increased impervious surface.	• Short term soil disturbance of less than 1 acre at previously disturbed site for air traffic control tower. • Existing storm water controls would minimize erosion impacts. • Activities may be subject to AZPDES CGP requirements if final design exceeds1 acre, which would minimize construction-related impact.	Same as Alternative 8.A air traffic control tower impacts.	• Proposed site would continue to be subject to wind and water erosion, but controlled through existing storm water culverts and controls at the airfield.
Water Resources	• The taxiway would result in 42 acres of impervious surface that would eliminate natural infiltration and alter the flow and velocity of storm water. • Utilizing Low Impact Development would minimize the potential long-term impacts from increased impervious surface and storm water runoff. • Adherence to AZPDES CGP requirements would minimize potential construction-related impacts.	• New control tower would be constructed at a confined and disturbed site on disturbed land where existing storm water controls are present. • Existing storm water controls and adherence to AZPDES CGP requirements during construction would minimize the potential impacts. • Integration with existing Gila Bend AFAF wastewater and potable water service with no discernible impact to function or capacity nor any change to the regulatory status of the systems.	Same as Alternative 8.A air traffic control tower impacts.	• No impact to water resources within the study area.

Table S-8
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				

Air Quality	• Short term, localized increase in air emissions would occur during construction of taxiway and control tower:
	  • VOC: 2.60 tons
	  • CO: 2.09 tons
	  • NO_x: 4.26 tons
	  • SO_2: 0.48 tons
	  • PM_{10}: 15.60 tons
	  • $PM_{2.5}$: 1.77 tons
	• A dust control permit would be required from Maricopa County for construction activities.
		Same as Alternative 8.A (emissions calculations included tower construction).	Same as Alternative 8.A.	• No impact to air quality within the study area.

Biological Resources	• The project area does not provide any substantial wildlife habitat. • To accommodate the new taxiway configuration, Bird/ wildlife-Aircraft Strike Hazard (BASH) survey protocols would be modified to minimize risk to pilots, aircraft, and wildlife. • Potential impacts to individual burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• The project area does not provide any substantial wildlife habitat. • Potential impacts to individual western burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• The project area does not provide any substantial wildlife habitat. • Potential impacts to individual western burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• No impact to biological resources within or adjacent to BMGR East, including Gila Bend AFAF.

Table S-8
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Land Use	• Benefits military operations by enhancing airfield capacity. • Requires replacement of existing air traffic control tower, which is also an element of proposal. • Potential adverse effect on existing land use if helicopter pads must be relocated (depends on final design). • Precludes other land uses within the approximately 42-acre area, although uses are already limited based on runway use and safety requirements.	• Provides for an air traffic control tower that meets UFC requirements, which improves safe military land use and operations.	• Provides for an improved air traffic control tower compared to existing conditions, improving safe military land use and operations but failing to meet all UFC requirements.	• Potential for adverse effects on military operations during flight emergencies if the runway cannot be rapidly cleared of aircraft. • Continues use of existing air traffic control tower that does not provide adequate space or field of vision to meet UFC requirements.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Positive impact on flight safety by separating aircraft movement at the airfield through development of the taxiway. • Luke AFB Supplement to AFI 13-212 would be updated to address safety procedures associated with operations of the new taxiway.	• Luke AFB Supplement to AFI 13-212 would be updated to address safety procedures associated with operation of new air traffic control tower.	• The location for the control tower would not be optimal for safety improvements as the field of view from the tower would be impacted by power lines and other structures.	• The existing runway would continue to function as the taxiway, maintaining the suboptimal airfield situation. • Existing air traffic control tower would continue to be inadequate for observing the entire unobstructed airfield.

Table S-8
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Cultural Resources	• An intensive cultural resource survey has been completed for 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• An intensive cultural resource survey of 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Same as Alternative 8.A air traffic control tower impacts. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Ongoing operations at the existing Gila Bend AFAF taxiways and air traffic control tower would continue with no impact to cultural resources.
Hazardous Materials and Waste Management	• Temporary increase in POL use, including use of an asphalt batching plant, and waste generation during construction.	• Increase in POL use and waste generation during construction. • Potential for asbestos containing materials and lead-based paint to be present in facilities to be demolished. • Long-term demands on fuels for heating and power of the new air traffic control tower would likely be slightly less.	• Same as Alternative 8.A air traffic control tower impacts.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 8.A air traffic control tower impacts.	• No socioeconomic impact or environmental justice concern within the study area.

Table S-8
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Noise	• Minor temporary increases in noise levels ranging from 70 to 100 dBA from construction, which would be confined to the construction site within Gila Bend AFAF.	• Minor temporary increases in noise levels ranging from 70 to 100 dBA from construction, which would be confined to the construction site within Gila Bend AFAF.	Same as Alternative 8.A air traffic control tower impacts.	• No noise impacts within the study area.

Table S-9
Proposed Paving of Road from Manned Range 1 to RMCP 1
Comparison of the Alternatives

	Alternative 9.A, Pave Approximately 7 Miles of Road (Proposed Action)	**Alternative 9.B, No-Action Alternative**
Resources		
Earth Resources	• Disturbance of 23 acres of soils for road development. • Paving would stabilize soils and reduce erosion potential in the long term. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impacts. • Over the long term, minimal impact from roadside runoff would occur; any problem spots would be addressed through engineering controls.	• Erosion from frequent use and grading of the 7-mile unpaved road would continue.
Water Resources	• Improvement of current erosion and sedimentation problems associated with frequent use and maintenance of the 7-mile unpaved road. • Creation of additional impervious surface that could increase storm water runoff during heavy rain events creating erosion concerns along the roadside shoulders; however, these impacts could be minimized with the construction of culverts to manage the flow.	• Erosion and subsequent sedimentation of natural surface water drainages would continue with frequent use and maintenance of the unpaved road.

Air Quality	• Construction activities would result in short term, minor, and localized increase in air emissions:
	  • VOC: 0.46 tons
	  • CO: 1.20 tons
	  • NO_x: 1.17 tons
	  • SO_2: 0.11 tons
	  • PM_{10}: 6.87 tons
	  • $PM_{2.5}$: 0.74 tons
	• A dust control permit would be required from Maricopa County for construction activities.
	• Over the long-term, reduction in fugitive dust emissions from frequent travel over a paved versus unpaved surface and frequent grading and maintenance activity.
		• Uncontrolled fugitive dust emissions would continue from the frequent use of the unpaved road.

Table S-9
Proposed Paving of Road from Manned Range 1 to RMCP 1
Comparison of the Alternatives

	Alternative 9.A, Pave Approximately 7 Miles of Road (Proposed Action)	**Alternative 9.B, No-Action Alternative**
Resources		
Biological Resources	• The construction and potentially the use of a paved road could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential impacts to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 9.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• The existing road usage could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.
Land Use	• Could result in minor inconveniences and delays for personnel needing to use the road during road preparation and paving. • No change in the way the road is used.	• No change in land use or road and vehicle maintenance requirements.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Positive impact to safety from reducing dust-impaired visibility along the road.	• Continued dust-impaired visibility would occur from frequent use of unpaved road.
Cultural Resources	• An intensive cultural resource survey has been completed for 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and use of an asphalt batching plant during construction.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Minor temporary increases in noise levels in interior locations of BMGR East ranging from 70 to 90 dBA from construction. • Periodic road grading would no longer be required, reducing noise exposure associated with this activity.	• Long-term intermittent noise associated with grading the unpaved road for maintenance would continue.

Table S-10
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		
Earth Resources	• Excavation of 12,990 cubic yards of sand and gravel annually would reduce the sand and gravel material at each excavation site. • Stockpiling the excavated material would have localized soil disturbance and minor increased erosion from runoff of the fine silts and sands integrated with the excavated material. • Using excavated material to reinforce surfaces susceptible to erosion would reduce erosion within BMGR East. • Effects from use of and transport of materials from off-range sand and gravel supply sites would discontinue.	• Continued use of off-range sources for sand and gravel would create impacts at those excavation sites. • Using off-range sources would result in higher heavy vehicle traffic on range and other roads resulting in minimally greater levels of erosion.
Water Resources	• A combined area of 2.68 acres would be disturbed with excavation of sand and gravel from wash beds affecting Tenmile Wash, Quilotosa Wash, Daniels Arroyo, Sauceda Wash, and Midway Wash. • Excavation of the wash beds would alter the natural hydrology of each wash to a depth of 3 feet over an area ranging from 0.12 to 0.69 acres (depending on the wash). • The change in depth would be a localized impact and normal conditions would return to the wash beds over time as the excavation sites are filled with sediment from rain events. • The 56 FW/RMO would obtain an AZPDES Multi-Sector General Permit under the industrial sector of sand and gravel operations for BMGR East. Since the floodplains at BMGR East have not been delineated, they are exempt from permitting requirements of the Regulatory Division of the Flood Control District. No Clean Water Act Section 404 or Section 401 State Water Quality Certification would be required.	• Continued use of off-range sources for sand and gravel would potentially contribute to the water resource impacts at these source sites.

Table S-10
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		

Air Quality	• Annual operation emissions would be negligible with the exception of PM_{10} (5.36 tons per year) generated by the movement of dump trucks on unpaved roads to and from stockpile locations:
	  • VOC: 0.04 tons
	  • CO: 0.15 tons
	  • NO_x: 0.42 tons
	  • SO_2: 0.04 tons
	  • PM_{10}: 6.04 tons
	  • $PM_{2.5}$: 0.62 tons
	• Fugitive dust generation would be short term and localized.
	• A Maricopa County dust control permit and would be required.
		• No impact to air quality within the study area.

Biological Resources	• The excavation of sand and gravel in washes and the use of roads by heavy equipment could temporarily frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential for disturbance to xeroriparian vegetation at the excavation site and downstream of the site, as well as to associated floral and faunal communities. • Potential impacts to individual Le Conte's thrashers and individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Not considered to result in adverse affects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS. The result of consultation with the USFWS determined that Alternative 10.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• The use of commercial sand and gravel sources may potentially introduce noxious weed seeds that are not native to BMGR East if such seeds are in the sand and gravel materials.

Table S-10
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		
Land Use	• Excavation and stockpile sites would be along existing roadways so no new access would be required. • Could result in minor inconveniences and delays for personnel needing to use the roads near excavation and stockpile site when materials are being loaded or unloaded. • May benefit military maintenance operations through more readily available sources of sand and gravel	• Continues to require that sand and gravel be hauled from off-site sources to BMGR East over public roadways, resulting in a negligible adverse effect to some BMGR East and off-range roads.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• No impact to health and safety within the study area.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource surveys of 100 percent of the project area have been completed. No cultural resource sites were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of no historic properties affected.	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary, intermittent increase in use of POLs during operation of the excavation and transport equipment.	• Continued increased fuel consumption associated with the longer distance transport of sand and gravel resources.
Socioeconomics and Environmental Justice	• Slight reduction in military spending in the local economy if sand and gravel are no longer purchased from outside sources. • Slight increase in military expense from using equipment to excavate, stockpile, and use sand and gravel on BMGR East; however, this would be less than what is currently spent using outside sources. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Periodic and intermittent, short-term daytime noise ranging from 70 to 95 dBA from heavy equipment used to excavate, stockpile, and use material at dispersed locations within BMGR East.	• Short term intermittent noise associated with transporting sand and gravel from off-range sources would continue.

1 PURPOSE OF AND NEED FOR THE PROPOSED ACTIONS

1.1 PURPOSE AND NEED OVERVIEW

The Air Force proposes ten individual actions to upgrade and enhance training, enhance auxiliary airfield operations, and improve range management functions at the Barry M. Goldwater Range (BMGR) East and Gila Bend Air Force Auxiliary Field[1] (AFAF) in southwestern Arizona (Figure 1-1). The purpose shared by the ten proposed actions is either to correct deficiencies in the capabilities of the BMGR East and Gila Bend AFAF to support Air Force training requirements, or to improve the ability of the Air Force to maintain BMGR East functional capabilities. Although some modernization of BMGR East has occurred during the last decade, much of the training infrastructure currently in place was installed or last upgraded by the early 1990s, and meanwhile the tactics of modern combat have changed drastically with technological advances in air defense systems. The ten proposed actions are part of a program to modernize BMGR East to provide the training resources needed to prepare air and ground forces to meet current and future defense missions. The following seven actions are proposed for the BMGR East to upgrade and enhance training:

1. developing a Sensor Training Area (STA), which is a new target complex that would be used to train aircrews for air-to-ground combat in the modern urban environment through the use of laser sensors, threat emitters, infrared targets, concealed and camouflaged targets, and lit targets rather than by dropping on or firing at targets;
2. establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground tactical range target complexes to create more realistic simulations of today's battlefield;
3. installing a moving vehicle target system for air-to-ground attack training;
4. developing a new target for attack training with live (i.e., explosive) air-to-ground missiles;
5. lowering the altitude floor for regular flight training over a portion of the Cabeza Prieta National Wildlife Refuge (NWR);
6. converting the southern portion of Manned Range 3 into a helicopter gunnery range; and

[1] Gila Bend AFAF is located within BMGR East and directly supports the training and maintenance functions performed on the range.

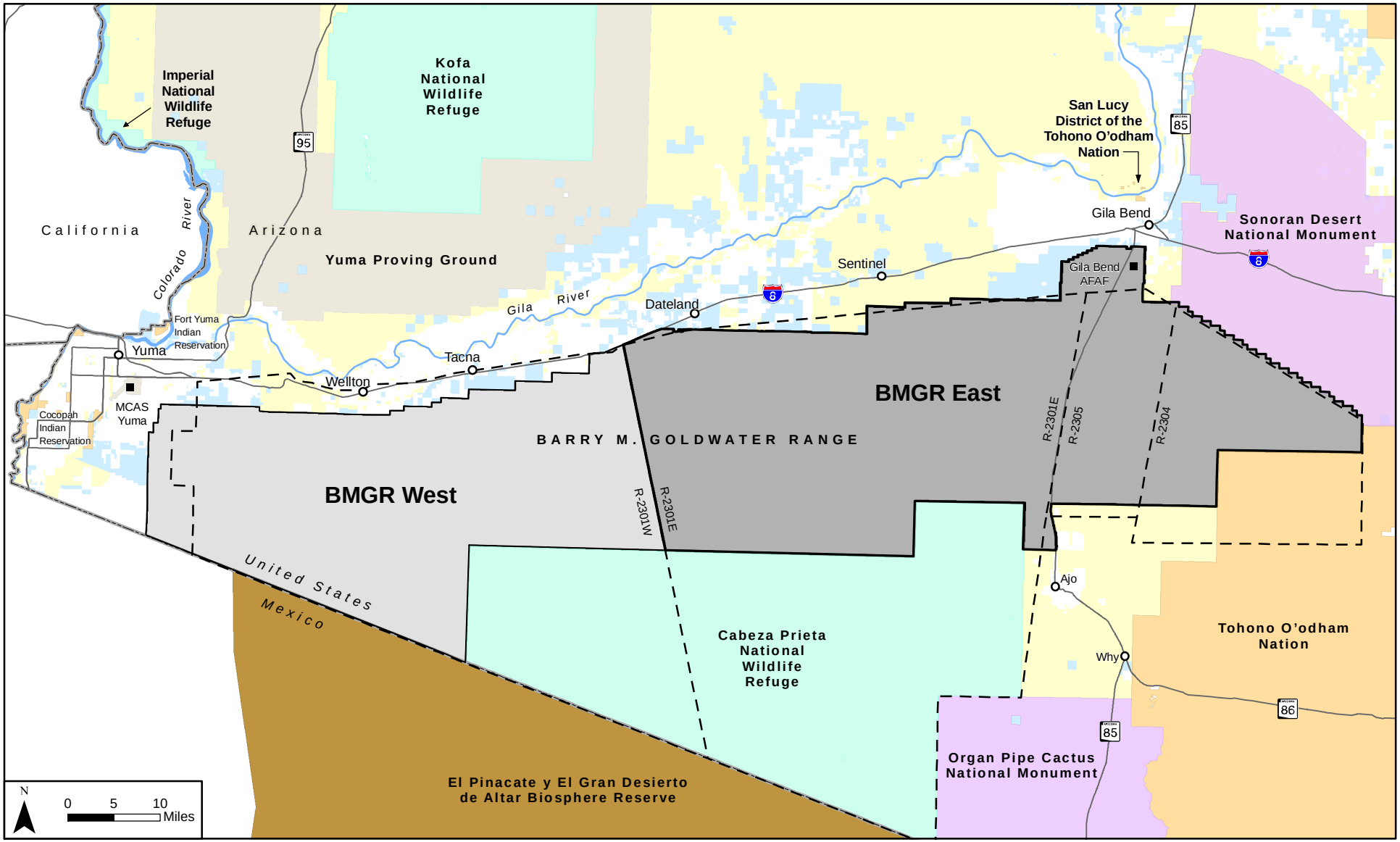


Figure 1-1

BARRY M. GOLDWATER RANGE AND VICINITY

7. allowing additional ground-based training on the BMGR[2] in combat search and rescue and other land navigation and reconnaissance missions.

Three actions are proposed to improve range management functions at Gila Bend AFAF and BMGR East:

1. constructing a new taxiway and air traffic control tower at Gila Bend AFAF;
2. paving approximately 7 miles of a graded road that serves as a primary daily access route for range maintenance, training and training support functions, natural and cultural resource management, and range security; and
3. excavating, stockpiling, and using sand and gravel resources within BMGR East for range maintenance projects.

Details on the purposes of and needs for each of the aforementioned proposed actions are provided in Section 1.3. First, an overview of the BMGR, Gila Bend AFAF, and associated training and support operations is presented to provide background for the discussion of purposes of and needs for the proposed actions.

1.2 BMGR AND GILA BEND AFAF OVERVIEW

1.2.1 BMGR Significance as a Military Training Asset

Since its inception in 1941, the BMGR has been indispensible for producing and maintaining the combat-ready aircrews needed to defend the United States and its interests. The BMGR is currently used to train aircrews from the Air Force, Air Force Reserve, Air National Guard, Army National Guard, Marine Corps, Marine Corps Reserve, and Navy. An aggregate total of more than 800 combat aircraft are typically stationed at military air bases in southern Arizona (AZ) and California (CA) to support the training of both student and combat-ready aircrews. Among these air bases are:

- Luke Air Force Base (AFB) in Glendale, AZ; which supports all introductory training for the Air Force and Air Force Reserve in the F-16 aircraft;
- Davis-Monthan AFB in Tucson, AZ; which supports introductory, advanced, and/or readiness training in the A-10, OA-10, HH-60, HC-130, and EC-130 aircraft;
- Tucson Air National Guard Base in Tucson, AZ; which supports most introductory training for the Air National Guard in the F-16 aircraft;

[2] References to the BMGR in this EIS regard the entire range inclusive of BMGR East and BMGR West. References to BMGR East regard the portion of the range assigned to the Secretary of the Air Force.

- Western Army National Guard Aviation Training Site (WAATS) and 1-128th Attack Helicopter Battalion at Silverbell Army Heliport, Marana, AZ; which support introductory, advanced, and readiness training in the AH-1, AH-64, OH-58, and UH-60 aircraft;
- Marine Corps Air Station (MCAS) Yuma, AZ; which supports advanced and readiness training in the F/A-18, AV-8, F-5, and other aircraft;
- MCAS Miramar near San Diego, CA; which supports introductory, advanced, and readiness training in the F/A-18, CH-46, CH-53, and KC-130 aircraft; and
- MCAS Camp Pendleton near San Diego, CA; which supports introductory, advanced, and/or readiness training in the CH-46, CH-53, and AH-1 aircraft.

In addition to serving the above listed regionally based users, the BMGR is one of the United States' most heavily used ranges for training deployments by air units from bases located in other regions of the country and U.S. bases located overseas. The BMGR is also used to train aircrews from allied foreign militaries. Training deployments typically result in an additional 950 to 1,200 aircraft annually using the BMGR (U.S. Air Force 1999). The seven above listed bases provide local support for training deployments.

Although a number of factors have influenced the placement of air bases, aircraft, and aircrews in southern Arizona and California, everyday access to the training opportunities afforded by the BMGR has been and continues to be decisive for locating many of these national defense assets in this region. The value of the BMGR for high-quality training stems from many attributes including the following.

- An extensive restricted land area with about 1.7 million acres available to directly support training, including areas designated for weapons impacts[3]. In addition, about 820,000 additional contiguous acres within the Cabeza Prieta NWR[4] may be incorporated in surface safety zones[5] for live-fire weapons training on the BMGR, but may not be used as

[3] A designated impact area is the area in the near vicinity of a designated target in which most air-to-ground or ground-to-ground ordnance, employed in accordance with authorized training activities, is expected to impact.

[4] Congressional authorization and provisions for military use of the BMGR and Cabeza Prieta NWR is provided in the Military Lands Withdrawal Act of 1999 (Public Law 106-65).

[5] Live-fire use of all military weapons in training is strictly governed by regulation designed to ensure the safety of personnel, structures, and the public from expended ordnance or target debris. In accordance with Air Force Instruction (AFI) 13-212, before any type of ordnance may be authorized for training use on a range, a weapon safety footprint must be determined. The safety footprint defines the minimum land area needed to contain all potential hazards associated with the use of a selected type of ordnance and includes the weapon release/firing point, designated target and impact area, and all other land areas that may be subject to ordnance impact, target debris, or

designated impact areas. Due to its size, the BMGR was subdivided into 14 fully functional subranges. These subranges are typically used to allow many independent flight training operations to be conducted simultaneously, which provides the BMGR with a training capacity that exceeds nearly all other Department of Defense ranges. Additionally, multiple contiguous subranges or the entire range can be scheduled to support training exercises that realistically simulate large and complex battle scenarios. The BMGR is the third largest range in the nation and the largest dedicated principally to training[6].

- A contiguous block of about 57,000 cubic miles of restricted airspace[7] overlies the BMGR and adjacent Cabeza Prieta NWR. Other contiguous and nearby special use airspace can support flight training at the BMGR by providing either airborne staging or lead-in areas for BMGR training missions. Nearby special use airspace also relieves the BMGR of the need to support training that does not require its live-fire or other special subranges.
- The capacity to support training in nearly every aspect of tactical air combat including, but not limited to, air-to-air and air-to-ground warfare, anti-air warfare, electronic air warfare, aerial reconnaissance, close air support, tactical airlift, and combat search and rescue. This diverse training capacity, which is available to users on a full-time-everyday basis, is made possible by the wide variety of subranges available at the BMGR.

---

other safety hazards. The area inside the safety footprint but outside of the designated target and impact area is not ordinarily expected to be subject to ordnance impacts but could be, given the degree of variability that is inherent in the use of tactical war fighting weapons.

6 The Nevada Test and Training Range is the nation's largest military range with almost 2,920,000 acres followed by the White Sands Missile Range in New Mexico, which encompasses about 2,050,000 acres. Tactical aviation training occurs at both of these ranges, but must compete with various test missions for range time and test missions can receive priority over tactical aviation training.

7 A block of regulated special use airspace with a defined altitude floor and ceiling and lateral boundaries designed by the Federal Aviation Administration (FAA). The purpose of a restricted airspace is to contain or segregate activities that would be hazardous to nonparticipating aircraft. Examples of hazardous activities include firing of aircraft cannons, rockets, or missiles; aircraft delivery of aerial bombs; firing artillery; or training aircrews at night in the use of night vision goggles with the external lights of the participating aircraft extinguished. All of these activities occur within the BMGR.

- Extensive arrays of electronic training instrumentation used to observe, measure, record, and replay the simultaneous actions of multiple aircraft participating in training activities by simulating aircraft weapons and enemy missile threats.
- Year-round flying weather, which maximizes the availability of the BMGR for training operations and allows most training missions to be efficiently performed as scheduled without delays or cancellations due to inclement weather.
- Highly varied terrain, which adds realism to target simulations and tactical air combat training.
- A regional land use setting that is relatively free of urban or other development that would potentially conflict with flight or range operations. Except along its northern borders, BMGR East is bordered by federal or tribal lands that either will not be or are unlikely to be developed in the future.
- A location that is readily accessible to aircraft from the aforementioned nearby military air bases. The relationship between the BMGR and these bases is mutually supporting and well integrated. The BMGR provides critical training resources and opportunities needed to justify the positioning of bases, aircraft, personnel, and other defense assets in the region. In turn, the surrounding bases provide launching points for everyday access to the BMGR and other nearby training airspace as well as the technical, academic, material, command and control, maintenance, personnel, and community support needed to keep aircraft and aircrews flying.

1.2.2 BMGR Management

From the perspective of land and airspace management and military operations, the BMGR is divided into eastern and western portions. The eastern portion of the BMGR, known as BMGR East, is assigned to the Secretary of the Air Force and is locally operated by Luke AFB. The western portion of the range, known as BMGR West, is assigned to the Secretary of the Navy and is locally operated by MCAS Yuma. Although the Air Force and Marine Corps are the primary users of their respective portions of the BMGR, all aviation branches of the Armed Services use both portions of the range. The entire range is periodically scheduled to support large training exercises. Approximately 55,000 training sorties, or flights by individual aircraft, are flown annually at BMGR East. An additional 18,000 training sorties are flown annually at BMGR West.

This Environmental Impact Statement (EIS) focuses on actions proposed by the U.S. Air Force to upgrade and improve training assets and opportunities at BMGR East. The 56th Fighter Wing (FW) Range Management Office (RMO) at Luke AFB, which executes the management and operational support functions for BMGR East, is the local command proponent of the proposed actions. U.S. Fish and Wildlife Service (USFWS) is serving as a cooperating agency, in accordance with Title 40 Code of Federal Regulations (CFR) 1501.6.

From a regional perspective, enhancing BMGR East supports and benefits other military users in southwestern Arizona. The Marine Corps and Navy are the primary users of BMGR West and conduct training that is comparable to that done within BMGR East. The Marine Corps occasionally schedules the entire BMGR; target enhancements within BMGR East could provide additional training opportunities for these Marine Corps users and potentially minimize the need to develop similar types of targets and associated facilities within BMGR West. Likewise, while the mission of the Army's Yuma Proving Ground focuses more on ground training and testing of weapons compared to the air training focus of the BMGR, the nearby proximity of BMGR East in relationship to the Yuma Proving Ground provides an opportunity to the Army and Army National Guard to have diverse training facilities within the region.

1.2.3 Current BMGR East and Gila Bend AFAF Operations

To support training activities and operations, the land areas and restricted airspace of BMGR East are partitioned into a number of smaller subranges or operations areas in order to provide locations where multiple, simultaneous training activities or other operations may effectively and safely occur. Infrastructure and equipment at each subrange support the training. Air Force Instruction (AFI) 13-212, Weapons Ranges, Luke AFB Supplement 1 provides official information and procedures for all units and users operating in BMGR East. In accordance with this instruction, and as illustrated in Figure 1-2, the BMGR East land area is currently subdivided to support:

- nine aircrew training subranges, including the P5 Combat Training System/Tactical Combat Training System (P5CTS/TCTS); seven aircraft weapons ranges known as Manned Ranges[8] 1, 2, 3, and 4 and North, South, and East Tactical (TAC) ranges[9]; and the Air-to-Air Range[10];

[8] The four manned ranges are live-fire ranges designed for training pilots or other aircrew members in the basic procedures and tactics of delivering ordnance—including bombs, rockets, and gunfire—from aircraft against ground targets. The first live-fire air-to-ground ordnance delivery training a pilot receives ordinarily occurs on a manned range. The term "manned range" refers to the fact that personnel are present in two observation towers to control the movement of aircraft and the delivery of munitions within the range and to score the accuracy of those deliveries. The weapons used on manned ranges are restricted to training ordnance that may be equipped with a small flash/smoke producing charge used to mark the location of hits relative to the designated target. The delivery of ordnance equipped with explosive incendiary, or pyrotechnic warheads designed for war fighting is prohibited.

[9] The three tactical ranges are live-fire ranges designed for training pilots or other aircrew members how to deliver air-to-ground ordnance against targets that are tactically realistic in their appearance. Some target complexes are equipped with electronic or other devices that actively simulate surface-to-air missile or artillery defenses. Aircrews learn to attack well-defended targets on tactical ranges and they acquire the skill sets needed to survive in combat. The targets currently on the tactical ranges simulate features such as airfields, railroad yards, missile emplacements, truck convoys, and battlefield tank formations. None of these features are currently presented in an urban setting. Most of the ordnance delivered on the tactical ranges consists of practice munitions that are either fully inert or equipped with marking charges.

[10] An airspace and underlying land area designated to support live-fire training in air-to-air gunnery. Pilots fire aircraft guns at a target towed by another aircraft. The underlying land area is closed to entry by all personnel during gunnery training because of dangers imposed by expended bullets and target debris that fall to the ground in this area.

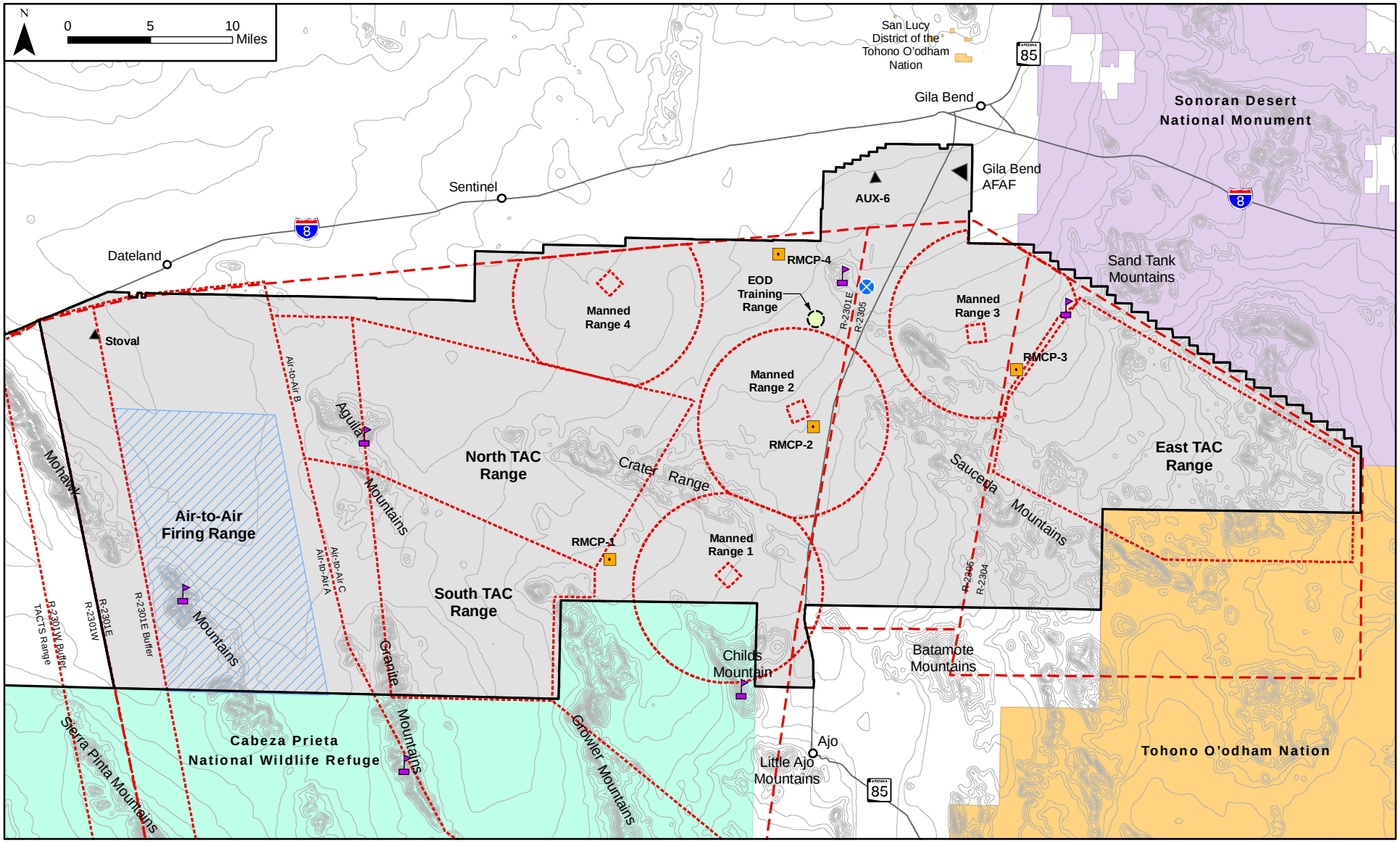


Figure 1-2

CURRENT MILITARY AIRSPACE AND MAJOR LAND USE FEATURES OF BMGR EAST

- two outlying auxiliary airfields[11]: Auxiliary Airfield 6 (AUX-6) and Stoval Auxiliary Airfield;
- one Explosive Ordnance Disposal (EOD) training range[12];
- one small arms range[13]; and
- four support areas for maintaining subranges and storing and processing spent ordnance and target debris (Range Munitions Consolidation Points, or RMCPs).

Gila Bend AFAF, located just inside the northern boundary of BMGR East (Figure 1-1), is a unique support and training asset integral to the daily operations of the range. Although the airfield is manned, no permanently based aircraft or personnel are assigned to Gila Bend AFAF.

Gila Bend AFAF provides onsite command and control for daily training and support operations within BMGR East and serves as a logistical and support center for range security, maintenance, communications, and administrative functions. The runway at Gila Bend AFAF is used for emergency recoveries of aircraft that experience mechanical difficulties while training at BMGR East. Firefighting and other emergency response services are located on the airfield. Gila Bend AFAF also serves as a critical forward base of support for AH-1, AH-64, OH-58, and UH-60 aircraft operating from WAATS and 1-128th Attack Helicopter Battalion, which lack the fuel capacity to optimize training time on BMGR East when operating directly from the Silverbell Army Heliport.

In addition, Gila Bend AFAF provides an important training site for simulating the operating conditions of a forward operating base. Forward operating bases are established to launch tactical operations in strategic locations often in combat zones, such as those encountered in Iraq or Afghanistan. The focus of a forward operating base is specific to mission-oriented logistics and does not offer the services of typical military airfields. Air Force aviation and other units are deployed to Gila Bend AFAF to familiarize them with forward operating base conditions prior to overseas deployments for war fighting or peace keeping missions. Fighter squadrons or other tactical aviation units deployed to Gila Bend AFAF for forward operating base training use the

[11] These are primitive airfields that are periodically used for certain forward deployed training missions, including some aircraft operations requiring bare-bones conditions. These airfields are manned only when personnel participating in training are present, provide no airfield support service or features, and are suitable only for certain types of aircraft capable of operating from primitive runways.

[12] EOD is the highly specialized practice of rendering hazardous munitions safe. The EOD training range, located within BMGR East, is where personnel receive training in EOD procedures.

[13] A rifle and pistol firing range where Air Force security personnel train in the use of firearms.

airfield to generate training sorties on BMGR East in a manner consistent with those encountered when deployed overseas.

The ongoing need for the land and airspace of the BMGR was reaffirmed by Congress with the passage of the Military Lands Withdrawal Act (MLWA) of 1999 (Public Law [P.L.] 106-65). This Act reconfirmed that national defense activities continue to be the primary land use purpose of the BMGR.

1.3 PURPOSE OF AND NEED FOR THE PROPOSED ACTIONS

Since the BMGR was established, technology and tactics of military aviation have radically evolved. In response to these changes, the infrastructure at BMGR East has been modified, improved, and upgraded periodically to keep aircrew training relevant to real-world air combat missions and threats. Although some modernization has occurred during the last decade, much of the current training infrastructure (including physical and electronic simulations of targets and air defense systems) was installed or last upgraded during the Cold War era, which ended early in the 1990s. Since that time, many of the tactics of modern air combat have been dramatically altered by advancements in aircraft-delivered air-to-ground weapons (including precision-guidance systems and stand-off [i.e., long-range] capabilities), electronic sensing and surveillance of the battle space, and air defense systems. Furthermore, as recent events in Iraq and Afghanistan have demonstrated, increased warfare in urban settings has placed new demands on airpower to counter threats and support friendly forces in an exceedingly complex environment.

The Air Force has determined that the training and range support infrastructure currently in place at BMGR East is in need of key additions, modifications, improvements, and upgrades to ensure that aircrew training remains realistic and relevant and so that training produces the air combat capabilities needed by the nation today and in the future. Similarly, there is need to upgrade Gila Bend AFAF to support flying operations. Certain new ground-based training activities that are components of the overall air power mission are also needed at BMGR East. Finally, improvements in some range maintenance facilities are needed to help the Air Force keep BMGR East fully functional.

This EIS includes ten proposed actions that would meet the aforementioned general training and support needs at BMGR East and Gila Bend AFAF. These actions are listed below.

1. Developing a STA.
2. Establishing efficient and timely environmental review and approval procedures to address reconfiguration of existing air-to-ground TAC range target complexes.

3. Installing a moving vehicle target system for air-to-ground attack training.
4. Developing a new target for live air-to-ground missiles.
5. Lowering the regular flight altitude floor over a portion of the Cabeza Prieta NWR.
6. Converting a portion of Manned Range 3 into a helicopter gunnery range.
7. Allowing additional training in combat search and rescue and similar ground-based missions.
8. Constructing a new taxiway and air traffic control tower at Gila Bend AFAF.
9. Paving approximately 7 miles of an existing graded road within BMGR East.
10. Excavating, stockpiling, and using sand and gravel resources at BMGR East.

The shared purpose and need for these actions is supported by the following factors.

- **Air Combat Power.** The training that occurs at BMGR East provides a substantial proportion of the air combat power of the Air Force, Air Force Reserve, and Air National Guard. Well more than 90 percent of the A-10 and F-16 pilots who participated in recent and/or ongoing conflicts trained at BMGR East as regular or deployed users. These recent and/or ongoing conflicts include the Gulf War of 1991; Operation Allied Force in Bosnia in 1999; Operations Southern Watch, Provide Comfort, and Northern Watch (to enforce no-fly zones) over Iraq from 1991 to 2003; and the ongoing conflicts in Iraq and Afghanistan. Substantial proportions of other Air Force, Air Force Reserve, Air National Guard, Army National Guard, Marine Corps, Marine Corps Reserve, and Navy aircrews flying most types of U.S. tactical aircraft also received training at BMGR East prior to these conflicts and peacekeeping missions.
- **Expanded Training Value, Flexibility, and Capacity.** Implementation of these proposals would expand the overall training value, flexibility, and capacity of BMGR East to prepare aircrews qualified to fight in today's battlefield and to support readiness. Each of the proposed actions is synergistic with existing and future operations at the BMGR. The more training requirements that can be met at BMGR East, the less local Air Force F-16 and A-10 and other local users will need to deploy to other ranges in order to meet training requirements. Benefits of fewer training deployments are realized in terms of training quality and quality of life for personnel (i.e., less time away from home) as well as reduced cost and time associated with deployments.
- **Worthwhile Investment.** The existing extensive training resources of BMGR East add value to the investment in range modernization. BMGR East has long been one of the nation's most capable and productive ranges largely due to its (1) extensive size, (2) year-round-flying weather, (3) few operational limitations, and (4) close operational proximity

to many military air bases. Since its inception in 1941, investments in the training capabilities of the BMGR to keep it abreast of the ever advancing evolution of air combat technology and tactics have been sound because of these four underlying, fundamental characteristics of the range.

The specific purpose of and need for each of these ten proposed actions is provided in the following subsections, 1.3.1 through 1.3.10.

1.3.1 Proposed Sensor Training Area

The purpose of and need for the proposed STA is to provide regular and deployed users of the BMGR with realistic training in air-to-ground combat in urban settings. Air Force air-to-ground combat missions include suppression of enemy air defense systems; disruption of enemy lines of communications, supply, logistics, and reinforcement; interdiction of enemy ground forces; and close-fire support of friendly forces in close contact with enemy forces. These responsibilities are always challenging; however, when warfare occurs in the urban setting, the complexity of the Air Force mission and the risks of collateral casualties and damages are often elevated. This is particularly relevant when the adversary is composed of irregular or guerilla forces interspersed among a civilian population. High quality, realistic training is needed for all Air Force aircrews with air-to-ground combat missions if these aircrews are to successfully meet the particular set of operational challenges posed by Military Operations in Urban Terrain (MOUT)[14]. By investing in appropriate training facilities and technologies, the Air Force can enhance the safety of friendly forces and generate substantial advantages over enemies in urban terrain while avoiding civilian loss of life, damage to humanitarian missions (e.g., medical and aid facilities and religious centers), and destruction of non-combatant property.

The STA is needed within BMGR East to train regular and deployed users of the BMGR so that they are prepared to successfully execute MOUT as assigned by combat commanders. The STA would meet Air Force F-16 and A-10 training requirements for air-to-ground attack or support missions in complex urban environments, including the training requirement that aircrews be able to fly low- and medium-altitude day Visual Flight Rule attacks on preplanned targets and deliver ordnance using system or visual deliveries.

The STA would simulate an urban setting and would include a street/road system, and simulations of residential areas, commercial districts, industrial areas, and community buildings, with lighting appropriate for an urban setting at night. Rather than training with ordnance

[14] MOUT represents the air-to-ground battlefield that is anticipated on an increasing basis in the 21st century.

expenditures, the performance of aircrews in attacking targets within an STA is electronically simulated, scored, and recorded for post-mission replay and evaluation.

The need to develop a STA at BMGR East is supported by several factors. First, there are no suitable MOUT training facilities within the BMGR operating region. Existing Air Force MOUT facilities in the United States are located at the Juniper Butte Range in Idaho and the Nevada Test and Training Range in Nevada. These facilities are both too distant to support the routine MOUT training needed by regular BMGR East users. Access to either of these facilities would require multi-day deployments of aircraft, aircrews, and may require support personnel such as aircraft maintainers, armorers, and mission planners. As previously noted, the large number of regular and deployed users of BMGR East generate about 55,000 training sorties annually. Most of these users would likely schedule a STA at BMGR East if this MOUT training facility is built. Deploying the aircraft and personnel that train regularly at BMGR East on an annual basis to either the Juniper Butte Range or the Nevada Test and Training Range would add considerable cost and time as compared to having the MOUT capability at BMGR East. The establishment of the STA at BMGR East would provide the capability to fully qualify F-16 and A-10 aircrews in tactical air-to-ground combat at one range. Additionally, similar cost and time savings would be provided to other BMGR users that would use the STA.

Second, there is no suitable comprehensive MOUT training area within BMGR East that:

- simulates an urban environment by providing tactical targets within civilian structures such as industrial facilities, residences, and office buildings;
- offers the realistic appearance and complexity of actual urban settings;
- requires aircrews to achieve the accuracy needed to avoid both collateral casualties and damages; and
- simulates the reality of air defense threats.

Third, while no weapons would be dropped on the proposed STA, the facilities would support training through the simulation of the delivery of conventional air-to-ground ordnance and precision guided munitions (PGMs). PGMs are the weapon of choice for obtaining quick, high probability destruction of intended targets with a minimum of collateral casualties or damage in urban environments. Training in the use of PGMs is needed for aircrews that employ the F-16, A-10, and all other aircraft in tactical attacks in the urban environment. In the case of the proposed STA, no PGMs or other ordnance would be dropped because of the cost of the equipment proposed for the STA.

Fourth, the large size and extensive training resources of BMGR East would add value to the STA and underscore the value of investment in MOUT training. BMGR East has sufficient land and airspace available to support an STA with maneuvering space for multiple axes of attack, initial point to target distances that vary from short to long, high altitude attack tactics, and dispersion of threats. The STA could be interlinked with the existing P5CTS/TCTS instrumentation to allow the STA to be integrated in complex training scenarios that incorporate training resources located in other subranges, but also battle space environments of up to the size of the entire BMGR.

1.3.2 Proposed Target Reconfiguration and Reconfiguration Management

As noted in Sections 1.2.1 and 1.2.2, approximately 55,000 training sorties are flown annually at BMGR East by multi-service aircrews. In addition to being the principal training range used by regional installations, the BMGR also serves as a national and international training asset. Consequently, modern facilities and up-to-date training scenarios are critical for national defense readiness.

Several targets within the BMGR East tactical ranges (see Figure 1-2) must be reconfigured to accurately simulate the types of targets being engaged in today's air-to-ground battlefield and afford full use of front-line targeting and/or weapons systems, including PGMs. Some existing targets have not been comprehensively updated since the Vietnam and Cold War eras, and existing targets lack the characteristics needed for MOUT training. By reconfiguring targets, training scenarios provide a more realistic view of modern and futuristic combat conditions and support the training syllabus requirement of an F-16 aircrew with inertially aided munitions (IAMs), mission planning, and deliveries.

In the past, periodic but infrequent target reconfigurations on BMGR East were generally viewed as isolated events; however, this obsolete approach, propagated in part by the enormous scale and expense of force modernization and long-standing geopolitical tensions of the Cold War (which kept potential opposing forces in a relative stasis with one another), must be adjusted to accommodate the current military environment.

The end of the Cold War changed national defense realities due to quickly emerging and changing asymmetric warfare threats from a number of real and potential enemies; however modern day technological advancements worldwide necessitate restructured target and threat scenarios on a frequent and consistent basis to provide aircrews with realistic, cutting-edge training. The Air Force proposes to manage target reconfigurations at BMGR East tactical ranges by addressing these actions on an annual or bi-annual basis.

1.3.3 Proposed Moving Vehicle Target System

Real world contingency operations have identified a training shortfall with respect to employing weapons against moving targets. In today's dynamic battlefield, aircrews are often required to attack moving targets as an objective, but have not been exposed to the tactics, techniques, and procedures to effectively employ against moving targets. Training capability must be addressed in order to provide aircrew exposure to a dynamic environment prior to being subject to real world employment.

All current targets within BMGR East are static and cannot prepare aircrews for the greater challenge of engaging a moving vehicle. Employing moving targets on designated tactical range tracks would provide aircrews with realistic training in attacking moving vehicles. Presently, many A-10 pilots' initial experience with employing ordnance on a moving target occurs in a live combat environment, thereby compromising safety and success rates. This lack of readiness training could mean the difference in killing a high-value target or missing an opportunity that cannot be reestablished. A moving target capability is long overdue to give aircrews the ability to train using 20 millimeter (mm) and 30 mm munitions, laser guided bombs, and Maverick missiles against the types of targets seen in combat. The F-16 and A-10 communities propose to add moving target employment as a familiarization training requirement for qualified pilots, and to incorporate exposure to moving targets for upgrading new F-16/A-10 pilots into respective syllabi.

1.3.4 Proposed New Target for Air-to-Ground Missiles

BMGR East currently has two targets for training with live air-to-ground missiles. One is located in North TAC and the other is located in East TAC. The existing target location for live, air-to-ground missiles in East TAC limits the ability of aircrews to attack the target from a variety of directions and altitudes. As a result, training in this important surface attack tactic is unduly constrained, repetitious, and incomplete. A new target for live air-to-ground missiles is proposed in a new location within East TAC. The purpose of this proposed action would be to enhance training with air-to-ground missiles by providing a target that could support missile attacks from multiple, realistic directions and altitudes, without compromising range safety. In addition, this proposed action would support the F-16 training syllabus requirement that aircrews be able to fly low- and medium-altitude day Visual Flight Rule attacks on preplanned targets and deliver ordnance using system or visual deliveries.

1.3.5 Proposed Lower Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge

The R-2301E restricted airspace that overlies the Cabeza Prieta NWR is authorized by the Federal Aviation Administration (FAA) for use from the surface to 80,000 feet above mean sea level. However, a 1994 Memorandum of Understanding (MOU) among the Department of the Interior and the Secretaries of the Navy and the Air Force limits training flight operations over the NWR to altitudes of no lower than 1,500 feet above ground level (AGL), with the exception of certain low-level flights authorized along mutually designated corridors. The MLWA of 1999 left this MOU in effect but also provided that the MOU may be renegotiated "…in order to revise existing or establish new low-level training routes or to otherwise accommodate low-level overflight…" The 1,500 foot AGL floor artificially restricts aircrews from performing realistic, low-level approaches to attack targets in South TAC. Low-level attacks on enemy targets in actual combat must often be performed at an altitude of 500 feet AGL to allow the aircrew sufficient opportunity to effectively engage the target and evade ground-to-air anti-aircraft fire. The importance of low-level attack is reflected in the F-16 training syllabus with a requirement that aircrews be qualified in low altitude step-down training. Lowering the floor for regular flight training to 500 feet AGL over a portion of the Cabeza Prieta NWR from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary, and south of the South TAC boundary to a distance of up to 15 nautical miles (NM) would enable realistic low-level approaches to targets located in South TAC and low-level air-to-air intercepts.

1.3.6 Proposed Conversion of Manned Range 3 for Helicopter Training

Each of the four manned ranges at BMGR East has (1) two bull's-eye targets for scorable training in conventional bombing and rocketry, (2) one bull's-eye target for scorable training in simulated nuclear weapons delivery or conventional bombing, (3) one applied tactics target (a single target vehicle without a cleared area or bull's-eye) for unscored conventional bombing or rocketry training, (4) one scorable target for training in low-angle strafe, and (5) one unscorable tactical strafe target for low-angle strafe. Manned ranges are restricted to training ordnance only; thus, the surface danger zone does not need to account for blast effects.

These targets were developed for fixed-wing aircraft and are less relevant for training aircrews of rotary-wing aircraft (helicopters); therefore, the Air Force proposes conversion of the southern portion of Manned Range 3 into a helicopter gunnery range with fixed, moving, and pop-up targets to provide more appropriate training for the Army National Guard and other rotary-wing units that train at BMGR East. This modification is needed to provide the aircrews of AH-1, AH-64, OH-58, and UH-60 aircraft with training that is more realistic relative to the types of conditions that aircrews encounter in combat in Iraq and Afghanistan.

Manned Range 3 is the least frequently used of the manned ranges at BMGR East for fixed-wing aircrew training because certain attack tactics when performed on Manned Range 3 conflict with the full simultaneous use of East TAC, which is contiguous to Manned Range 3. Thus the helicopter gunnery range would not adversely impact the fixed-wing aircrew training schedule at Manned Range 3 and would provide helicopter aircrews with a quality training alternative to East TAC (which is the most heavily used tactical range for helicopter training), when that tactical range is unavailable. This would in turn increase the availability of East TAC for training fixed-wing aircrews.

1.3.7 Proposed On-the-Ground Training Exercises

Troops involved in insertion options, and combat search and rescue (CSAR) and special tactics teams have the difficult and frequently dangerous missions of airfield or urban target assault/security, and/or finding and rescuing downed aircrews, hostages, or other high-value persons. This hazardous mission must often be performed in stealth in unfamiliar territory held by hostile forces. Among the regular users of BMGR East are Marine Corps Weapons Tactics Instructor (WTI) course units and the recently activated 563rd Rescue Group at Davis-Monthan AFB. The 563rd Rescue Group is responsible for training, readiness, and maintenance of the HC-130 squadron, two HH-60 squadrons, two para-rescue squadrons, and support squadrons that comprise the Air Force's active duty CSAR capability.

Needed on-the-ground training activities on BMGR East may include land navigation, surveillance, clandestine movements, bivouac, firing at established targets with infantry weapons, and other similar activities conducted by troops on foot. On-the-ground troop access and allowance can be categorized by size. Large troop insertions could be up to approximately 100 individuals, whereas CSAR and special tactics teams are typically small, with fewer than ten persons to a team. The need for large troop operations (greater than 10 troops) generally would be limited to specific areas with limited overland movement (approximately 5 kilometers) on foot. More extensive and variable on-the-ground training within BMGR East is needed for small team activities, although some specifications would be provided to the teams regarding access and routing.

For example, the Marine Corps typically conducts ground-based operations within North, South, and East TAC during their semi-annual WTI course. During portions of this advanced training exercise, Marine Corps Tactical Air Control Parties (TACPs), composed of three or four troops, provide forward air control of aircraft delivering ordnance on targets selected for attack. TACPs operate from observation posts and use lasers or 81 mm mortars that fire phosphorus illumination rounds to mark targets for air attack. In addition, ground-based personnel providing battlefield realism enhancement support for the WTI course employ mobile electronic threat emitters,

which simulate air defense radars, and Smokey Surface-to-Air Missile (SAM) rockets[15]. During the WTI-course training evolutions, up to 33 ground personnel are present at the observation posts and mobile threat emitter sites in the active TAC range for about 6 to 8 hours. The observation posts within North TAC are located in the Crater Range vertically and geographically outside of current Sonoran pronghorn habitat. The observation posts within South TAC Range are located on outlying foothills of the Growler Mountains vertically outside of current Sonoran pronghorn habitat (MCAS Yuma and Southwest Division Naval Facilities Engineering Command 2003).

The purpose of the proposed action is to expand the ongoing use of ground troops during WTI to include other ground troop use of BMGR East by CSAR teams, Special Operations/tactics teams, Marine Corps units, and potentially other small squads of troops, for land navigation and surveillance. CSAR teams and similar squads of special operations troops need training opportunities in desert environments that can realistically simulate the conditions that would be encountered on a CSAR, special tactics, or similar type of mission. The proposed action would allow small teams (generally up to approximately 10 persons) to conduct clandestine insertions and extractions from helicopters or vehicles (from existing range roads) and perform cross-country land navigation and other on-the-ground exercises while traveling in stealth on foot. With the proposed action, larger troop movement would be limited to target specific insertion and limited on-ground maneuvering, typically within 5 kilometers of the insertion. Much of the proposed training would occur as an integrated component of training exercises of greater scope involving other types of flying units and war fighting missions in order to provide the most realistic possible simulations of the complexity and challenges of combat.

1.3.8 Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field

The runway at Gila Bend AFAF is not serviced by a separate parallel taxiway. This forces aircraft to taxi on the runway and limits the tempo at which the airfield can support take-off and landing operations. The parallel taxiway is needed, in part, to provide tactical aviation units with a simulation of the higher tempo airfield operations often required in actual war fighting theaters of action. The parallel taxiway is also needed to enhance the utility of Gila Bend AFAF to allow rapid recovery of multiple emergency or diverted aircraft without having to suspend landing

[15] Smokey SAMs are a small (4-by-12 inch), lightweight disposable rocket composed of cardboard, foam, and solid fuel that is used to simulate the launch boost phase of an air defense surface-to-air missile by producing a column of rising smoke to approximately 1,500 feet AGL.

operations to back taxi aircraft from the runway to the parking ramp.

The air traffic control tower at Gila Bend AFAF, designed and built in 1964, lacks adequate space for the personnel and equipment needed to control air traffic. Furthermore, the floor of the tower cab, which is 35 feet above ground level, is not high enough, nor is the tower location appropriate to meet the minimally acceptable visual surveillance or depth perception standards specified by the Unified Facilities Criteria for military airfields for current flight operations. These standards include:

- providing a clear, unobstructed, and direct view to all operating positions of the airport traffic area; the approach end of the runway; and all other active runways, taxiways, parking aprons, test pads, and similar areas;
- providing sufficient depth perception of all surface areas to be controlled to allow the controllers the ability to differentiate the number and type of grouped aircraft and ground vehicles and to observe their movement and position relative to the airfield surface areas; and
- providing an area relatively free of jet exhaust fumes and other visibility impairments such as industrial smoke, dust, and fire training areas.

Construction of a new parallel taxiway and a new air traffic control tower in an appropriate location at Gila Bend AFAF are proposed to correct these operational deficiencies.

1.3.9 Proposed Paving of Road from Manned Range 1 to RMCP 1

The approximately 7-mile long road that extends from the Main Tower at Manned Range 1 west to the water well and adjacent RMCP 1, located near the boundaries of North and South TAC, is currently unpaved. Paving this road serves three purposes. First, the proposed action would eliminate much of the dust generated by the ongoing heavy use of the existing improved dirt road. Decreased dust levels would minimize airborne particulates and improve air quality and driver visibility and safety. Dust has been identified as a critical factor in several vehicular collisions at BMGR East. Second, the proposed improvements would decrease road maintenance requirements by providing a cost-effective, durable, and long-lasting maintenance solution. Third, frequent travel on this road causes disproportionate wear and tear on Air Force vehicles, resulting in a vehicle maintenance burden. Due to frequent use of the road by heavy vehicles, paving the road may reduce vehicle maintenance labor and equipment costs.

1.3.10 Proposed Excavation and Use of Sand and Gravel on BMGR East

Targets within BMGR East require maintenance on an annual or possibly more frequent schedule. Sand and gravel supplies are needed to (1) simulate certain target features, such as

aircraft revetments (fortification in the form of earthen barriers constructed to protect against damage or injury from explosives), and (2) repair and maintain some facilities, such as berms used to protect scoring instruments at the strafe pits on the manned ranges. In addition, most of the roads within BMGR East are unpaved and require annual maintenance such as grading. Frequent grading can leave the road depressed from the surrounding terrain and subject to prolonged periodic flooding as well as accelerated erosion and fugitive dust generation. Roads located within areas where soils erode easily also require more frequent maintenance, which exacerbates the roadbed entrenchment problem. Sand and gravel supplies are needed to fill road ruts and entrenched roadways, and to repair at-grade crossings of washes.

The Air Force proposes to excavate, transport, and stockpile sand and gravel within BMGR East for the purpose of conducting on-range road maintenance, target reconfiguration, and target maintenance. Limited use of on-range sand and gravel resources for military purposes is authorized by the MLWA of 1999.

1.4 NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

This EIS has been prepared to comply with regulations that implement the National Environmental Policy Act of 1969 (NEPA, Title 40 CFR Parts 1500-1508), and the AFI 32-7061, *Environmental Impact Analysis Process* (EIAP), promulgated in Title 32, CFR Part 989. The regulations and directives of other agencies with jurisdiction and environmental responsibilities within BMGR East have provided additional guidance.

The use of the term "significant" (and derivations thereof) in this EIS is consistent with the definition and guidelines provided in the Council on Environmental Quality (CEQ) regulations that implement NEPA (40 CFR 1508.27), which require consideration of both the context and intensity of impacts.

1.5 REQUIRED PERMITS, LICENSES, AND ENTITLEMENTS

The following permits have been identified as required with one or more of the proposed actions:

- For any earthmoving operation disturbing more than 0.1 acre in Maricopa County, an earthmoving permit is required before construction activities can begin (required under Air Pollution Control Regulations Rule 200, Section 305). Additionally, Rule 310, Fugitive Dust from Dust Generating Operations, requires that prior to commencing construction of, operating or modifying a dust-generating operation, a dust control permit be obtained.

- The asphalt batch plant under certain proposals may require a permit from either Maricopa County or Arizona Department of Environmental Quality (ADEQ).
- The Arizona Pollutant Discharge Elimination System (AZPDES) Multi-Sector General Permits for water resource protection and storm water control and management that address base activities may need to be modified.
- AZPDES Construction General Permits (CGPs) would be required for any construction activity (includes clearing, grading, excavating, stockpiling of fill material and other similar activities) resulting in a land disturbance of at least 1 acre.

1.6 PUBLIC INVOLVEMENT

1.6.1 Scoping Process

NEPA regulations require an early and open process for determining the scope of issues that should be addressed prior to implementation of a proposed action. The Air Force initiated the public scoping process on December 28, 2007, by publishing a Notice of Intent (NOI) to prepare an EIS in the Federal Register (Appendix A). Notification letters were mailed to 570 parties, including 42 federal elected officials or agencies, 11 state elected officials or agencies, 35 local elected officials or agencies, 105 tribal representatives, 68 organizations, 28 military representatives, 258 individuals, 17 libraries, 5 media organizations, and 1 church.

Advertisements of the NOI and public scoping meetings were placed in the following newspapers:

- West Valley View, Glendale, AZ
- Gila Bend Sun, Gila Bend, AZ
- The Sun, Yuma, AZ
- Arizona Daily Star/Tucson Citizen, Tucson, AZ

Three public scoping meetings were held:

- Tuesday, January 15, 2008, 6-8 p.m., Glendale High School, Media Center, 6216 W. Glendale Avenue, Glendale, AZ
- Wednesday, January 16, 2008, 6-8 p.m., El Rio Center, 1390 W. Speedway Boulevard, Tucson, AZ
- Thursday, January 17, 2008, 6-8 p.m., Gila Bend Union High School, 308 N. Martin Avenue, Gila Bend, AZ

A total of 25 individuals attended the public scoping meetings with no one person attending more than one meeting. Table 1-1 provides a breakdown of the attendance at the scoping meetings including the community that attendees noted as their address when signing in at the meeting.

Table 1-1
Community Representation at Scoping Meetings

Meeting Location	**Total Attendance**	**Community (all in Arizona)**							
		Phoenix	**Tucson**	**Yuma**	**Luke AFB**	**Gila Bend**	**Tacna**	**Litchfield Park**	**Ajo**
Glendale	4	4							
Tucson	10		7	2	1				
Gila Bend	11					7	1	1	2
Totals	**25**	**4**	**7**	**2**	**1**	**7**	**1**	**1**	**2**

At the meeting, written comments were received by individuals via the comment form provided. Three were received at the Tucson meeting and three were received at the Gila Bend Meeting. In addition, three comment letters were received via postal mail during the comment period that ended on January 28, 2008. One of these letters was received from an individual, one from the Ak-Chin Indian Community, and another from the Friends of Cabeza Prieta. The issues raised during the public scoping period are categorized by issue and summarized in Table 1-2.

Table 1-2
Issues Identified During Public Scoping

Topic	Issue identified in Comment
General	• Support for the military training value of the BMGR • Support for the military's efforts towards environmental protection • Appreciation for scoping meeting • Request for copy of Draft EIS
Project Description	• Appreciation for value of information provided at the scoping meeting • Support for proposed improvements • Questions or clarification regarding the moving vehicle target system proposal (including means for control of the vehicle, ordnance clearance, potential for use of electronic scoring) • Opposition to the proposal for lowered flight training over the Cabeza Prieta NWR/consideration for alternative locations for such training in BMGR West or at other ranges • Questions or clarifications regarding the proposal for sand and gravel extraction and use • Potential for implementation of Leave No Trace ethic with search and rescue ground training
Earth Resources	• Potential erosion from sand and gravel extraction and use proposal
Air Quality	• Potential dust from sand and gravel extraction and use proposal
Biological Resources	• Concern for potential impacts to Sonoran pronghorn with regard to moving vehicle target system proposal • Concerns for impacts to reptiles and wildlife associated with the sand and gravel extraction and use proposal
Recreation	• Support for management that allows harvesting of bighorn sheep • Concern about cumulative impacts to Cabeza Prieta Wilderness associated with noise impacts from lowered flight training over the Cabeza Prieta NWR
Land Use	• Potential impacts of helicopter gunnery range to Sonoran Desert National Monument
Socioeconomics	• Questions about cost effectiveness of sand and gravel extraction and use proposal, and costs for Sonoran pronghorn monitoring for the moving vehicle target system proposal
Cultural Resources	• Potential impacts to archeological sites associated with the sand and gravel extraction and use proposal

1.6.2 Draft EIS Public Comment Process

A notice of availability was published in the *Federal* Register to announce the availability of the Draft EIS for public review. Persons and organizations on the BMGR East mailing list who have a regulatory responsibility associated with this EIS, who may be directly or indirectly affected by the proposed actions, or who have requested a copy of the Draft EIS were sent a copy of the document (see Chapter 7.0). Concurrent with the publication of the DEIS, advertisements were placed in the *Gila Bend Sun*, *Arizona Daily Star* (Tucson), and *West Valley View* (Glendale, AZ)

to announce the availability of the Draft EIS as well as the locations and times for public hearings.

Public hearings were held in Gila Bend on July 27, 2009; in Glendale, Arizona on July 28, 2009; and in Tucson, Arizona on July 29, 2009. Two persons attended the Gila Bend hearing, four persons attending the Glendale hearing, and there was no public participation at the Tucson hearing. A court reporter transcribed the proceedings and oral comments were offered by two attendees at the Gila Bend Hearing.

All formal comments received on the Draft EIS during the public review period are provided in Appendix F of this Final EIS along with responses to the comments.

1.7 SCOPE AND ORGANIZATION OF THIS ANALYSIS

The resource categories determined relevant to the proposed action and no-action alternatives include airspace and range operations, land use, utilities, transportation, recreation, hazardous materials and waste, public and occupational health and safety, air quality, noise, biological resources, earth resources, water resources, cultural resources, socioeconomic resources, and environmental justice. Chapter 2.0 of this EIS provides a description of the proposed actions, alternative actions (when applicable), no-action alternatives, alternatives eliminated from detailed consideration, and a comparison of the alternatives. The existing conditions of the relevant resources are described in Chapter 3.0. An evaluation of the possible environmental consequences on each environmental resource that would result from implementing the proposed actions or alternatives is presented in Chapter 4.0 along with the unavoidable adverse environmental effects; relationship between short-term uses and long-term productivity; and irreversible and irretrievable commitment of resources. Chapter 5.0 provides an analysis of cumulative effects. The remaining sections of the document consist of lists of preparers, persons and agencies consulted in the preparation of the EIS, persons and organizations receiving the Draft EIS, and references.

2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the proposed actions and alternatives at BMGR East for developing, reconfiguring, or otherwise enhancing training infrastructure and opportunities; enhancing the availability of restricted airspace to support aircrew training; and improving range support infrastructure and operations. Proposals for improving the capacity of Gila Bend AFAF to support flying operations are also described. The proposed actions and alternatives to these proposals, including the no-action alternative, are described in sufficient detail to assess the foreseeable environmental consequences from implementing either the proposed actions or the alternatives. This chapter also identifies alternatives that were evaluated but eliminated from detailed consideration after it was determined that they would not meet Air Force requirements for training support.

The proposed actions reflect important operational and support enhancements at BMGR East and Gila Bend AFAF that are needed to help ensure that the Air Force, Air Force Reserve, Air National Guard, Army National Guard, and other military units training at BMGR East can develop and maintain the state of readiness required to accomplish their assigned defense missions. The proposed actions represent necessary improvements to BMGR East and Gila Bend AFAF that would provide far-reaching training benefits; however, the proposed upgrades would result in only small changes to the land surface, subrange arrangement and configurations, range infrastructure, range airspace, and the overall layout of the Gila Bend AFAF airfield. By far, the bulk of the facilities, operations, airspace, and training capacities at BMGR East and Gila Bend AFAF would remain unchanged.

All of the actions being proposed for BMGR East and Gila Bend AFAF are independent of each other and have stand-alone value for improving training operations. While full implementation of all the proposed actions is desired and would result in the greatest training benefit for aircrew and ground troop training, each of the proposals, if implemented alone, would have a positive effect on the use and/or management of BMGR East and/or Gila Bend AFAF. Depending on decisions made and the availability of funding, it is possible that some of the actions being proposed could be implemented soon after a Record of Decision (ROD) is issued, some actions could be implemented quite some time after the ROD is issued, and some proposed actions may not be implemented.

2.2 PROPOSAL 1 – SENSOR TRAINING AREA

The proposed STA would support comprehensive training at BMGR East for aircrews with air-to-ground attack or support missions in complex urban environments. In order to fully support MOUT training, enhance the overall training capabilities of BMGR East, and facilitate construction and maintenance of the STA, the proposed facility would accomplish the following.

- Provide a sensor-target complex (i.e., an electronically scored target complex) for aircrews that realistically simulates a highly developed urban environment composed of residential, commercial, industrial, public service, and other types of buildings; roads, an airfield, and other types of transportation infrastructure; public utilities; and urban open space.
- Furnish training opportunities for air-to-ground attack through the simulated employment of precision-guided weapons or conventional munitions (such training involves visual acquisition of the target by aircrews and/or airborne or ground-based forward air controllers).
- Provide the electronic and laser sensors needed to realistically simulate and accurately score air-to-ground attacks using diverse types of aircraft weapons and tactics, which would eliminate the need for the release of either training ordnance or explosive munitions from aircraft with the exceptions of illumination rockets and flares.
- Support air-to-ground attacks from any direction by either single aircraft or large formations of aircraft.
- Underlie restricted airspace that provides at least 15 nautical miles (NM)[1] of attack ingress and egress in multiple directions.
- Have both electronic and visible air-defense threat emitters.
- Be located on relatively flat land in a location near existing range roads so that the site is accessible for both construction and maintenance of the facility; ideally, the STA site would be in a location where construction and maintenance access would neither require disruption of training at other BMGR East subranges nor be dependent on otherwise scheduled down periods at other subranges.
- Be geographically separated from existing target areas to avoid potential exposure to unexploded ordnance (UXO) and constituents thereof during construction, and to minimize the need for EOD clearance prior to construction.

[1] One NM = 1.15 statute miles.

- Reduce the constraints in the training schedule that are generated by the annual maintenance and EOD closures of each of the existing three tactical ranges by providing an additional tactical training area within BMGR East.
- Meet the increasing demands for night air-to-ground training by providing an additional tactical training area within BMGR East with enhanced capabilities for night training operations.
- Be able to readily accommodate future upgrades or modifications as necessary to support improved training technology, training with new aircraft weapons systems, or training in new attack or support aviation tactics.

Six alternative locations within BMGR East, shown in Figure 2-1, were initially considered for the proposed STA. Three of these locations were not carried forward for analysis as alternatives because they were not found to be viable for meeting the operational requirements of the STA (see Section 2.2.6 for an explanation of the relevant operational deficiencies). The three locations that were retained for full analysis as alternatives each meet or exceed the minimal requirements for supporting an operationally viable STA, although some of the alternatives do not fully satisfy the ideal characteristics of a STA site. Some elements of the proposed action differ depending on the location selected; for example, some support requirements may already exist or may be functionally superior at one location compared to another. Therefore, the common elements of the action alternatives are described first, followed by the site-specific elements associated with each of the viable alternatives. This is followed by a description of the no-action alternative and the alternatives eliminated from detailed consideration.

2.2.1 Elements Common to Each of the STA Action Alternatives

The proposed STA would consist primarily of an array of high-technology scoring systems, one or more threat emitter sites, and infrastructure that simulates the urban area. Two laser scoring systems and associated equipment would require approximately 1 acre per site for a total of 2 acres allocated for Large Scale Target Sensor System (LSTSS) sites. At least one unmanned threat emitter (UMTE) would be installed; BMGR East is scheduled to receive up to four of the next generation Joint Threat Emitters (JTEs) and some of these additional electronic warfare assets could be apportioned to the STA. With fencing, each UMTE site would cover approximately 1.5 acres. The urban complex would involve the construction of simulated homes, buildings, industrial areas, roads, a sports field, and other types of urban features. The laser scoring system, UMTE, and urban complex would all be located within a one-square-mile (640-acre) site. The location and density of development within the 640-acre site would vary with some areas being intensely developed and others being left open and unaltered from the existing

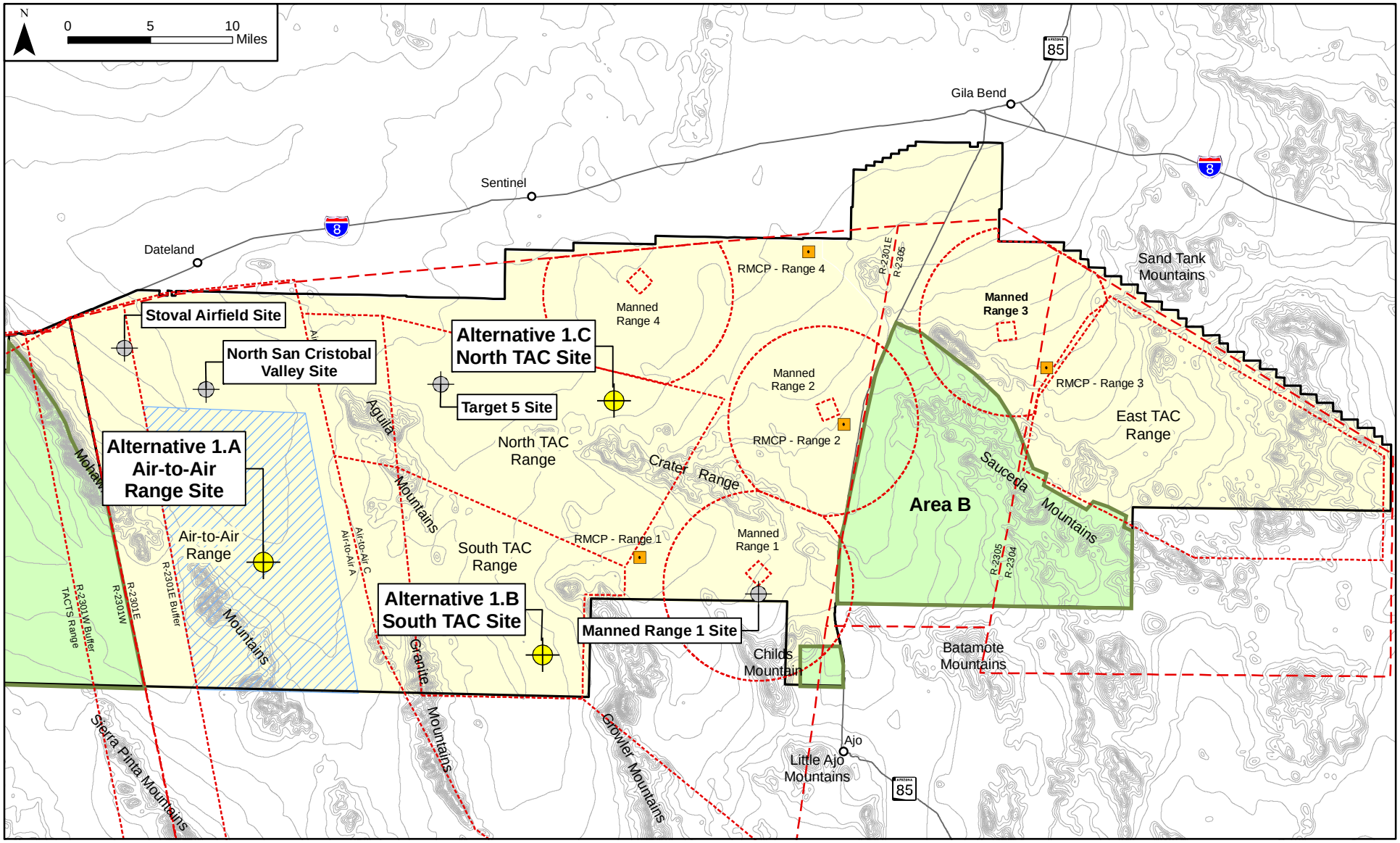


Figure 2-1

SENSOR TRAINING AREA SITE ALTERNATIVES

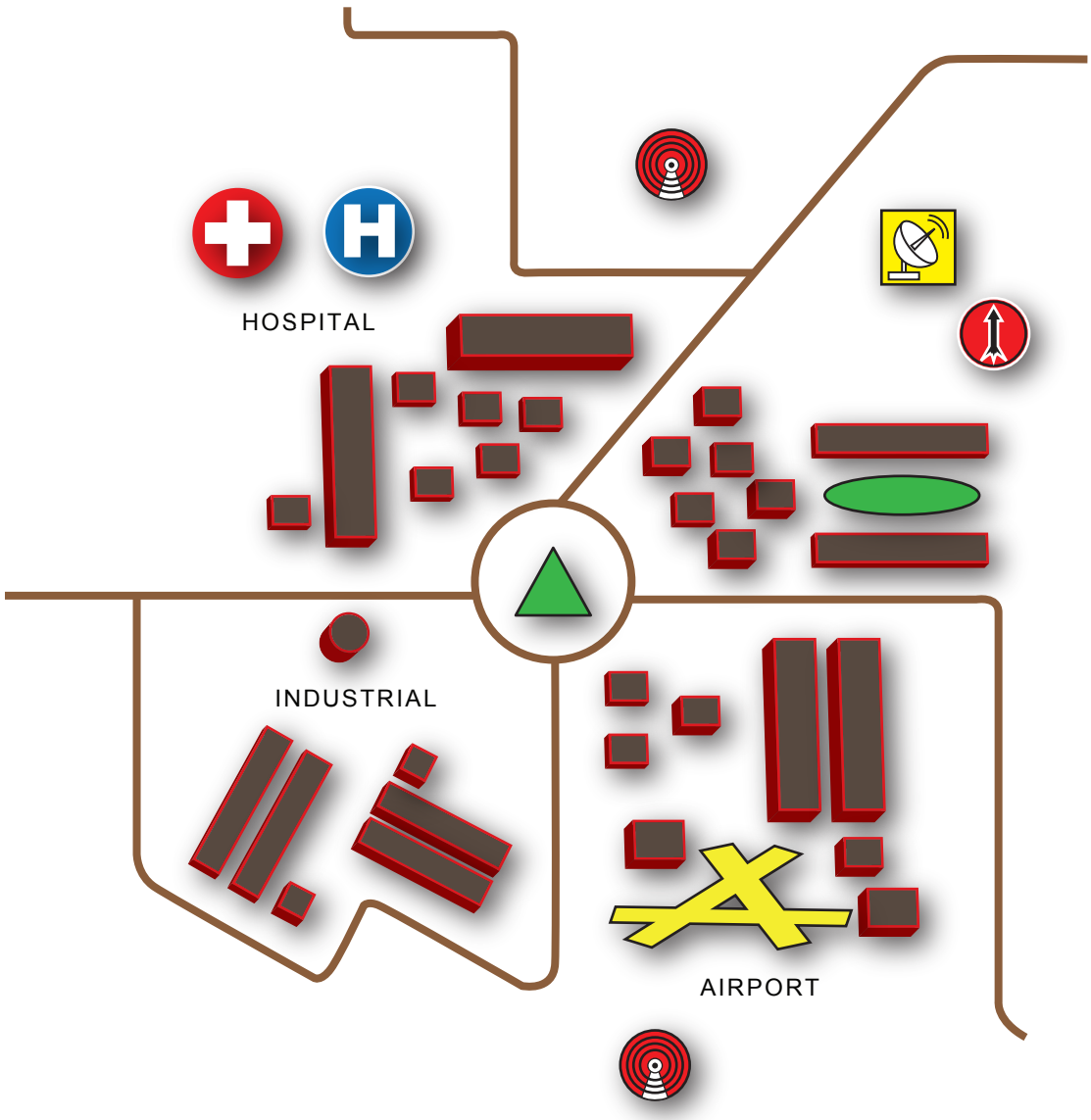
site conditions. Full development of the facility would likely occur in several phases. Ultimately, up to 400 acres of the 640-acre site could be developed over time. Depending on the location selected, the action may also include the use of 8-foot by 20-foot containers that could be stacked within 0.25 acre or less outside of the 640-acre STA. These stacked containers would serve as a vantage point outside of the proposed urban complex site to be used by ground-based forward air controllers who would direct simulated aircraft attacks on the STA. Disturbance associated with the establishment and maintenance of such a ground-based forward air controller site would not be expected to exceed 0.25 acre.

Figure 2-2 shows a conceptual design of the STA. Table 2-1 lists the key features both within and beyond the 640-acre proposed STA target array along with the anticipated acres needed for these features for each of the alternatives being considered in detail.

Table 2-1
Summary of Key Sensor Training Area Action Alternative Features

Feature	*Estimated Area of Disturbance*
STA Features within 640-acre Target Array	
One to three threat emitter sites with fencing	1.5 acres to 4.5 acres
Two LSTSS sites[1]	1 acre per site (2 acres total)
Smokey SAM Launcher System[2]	0.5 acre
Maintenance and storage area	1 acre
Estimated total area covered by simulated targets (buildings, graded areas, etc.)	up to 400 acres
STA Features beyond 640-acre Target Array	
Ground-Based Forward Air Controller Site	Up to 0.25 acre
Microwave repeater station	Varies by alternative
Access and Maintenance	
Road widening or other improvements	Varies by alternative
Initial EOD clearance of STA target array	640 acres
Initial EOD clearance area beyond STA target array	577 acres (1,000 feet from edge of 640-acre site)
Biennial EOD clearance area	300-foot radius from each target[3]
10-year EOD clearance area	1,000-foot radius from each target[3]

Notes:
[1] LSTSS = Large Scale Target Sensor System – A system to support realistic attack training and to provide feedback (accurate targeting assessment) for laser targeting systems.
[2] SAM = Surface-to-Air Missile; Smokey SAMs are small solid fuel rockets that may be launched in conjunction with threat emitter transmissions to give aircrews visual (smoke column) as well as electronic cues that they have been engaged by a surface-to-air missile and that evasive action is in order.
[3] Acreage cannot be calculated until specific target locations are established. It is generally anticipated that biennial EOD clearance would be within the 640-acre STA, but if targets are positioned near the edge of the STA, biennial and 10-year EOD clearance area could potentially extend beyond the 640-acre site.



Helipad
Streets
City Center
Ball/Field/Recreation Area
Simulated Urban Building
Large Scale Target Sensor System (LSTSS) Site
Smokey Surface-to-Air Missile (SAM) Launcher
Unmanned Threat Emitter (UMTE)

Figure 2-2

SENSOR TRAINING AREA CONCEPTUAL SITE DESIGN

Aircraft Operations

The volume of training at BMGR East has varied considerably over the years, which is typical for a major military training range. Military deployments, the introduction of different aircraft types, base realignments and closures, specific training needs, weather, and other factors may influence the number of sorties flown. While most military aircraft types in the U.S. inventory are flown at least occasionally within the BMGR East airspace, the fixed-wing aircraft types most typically flown include the F-16, A-10, F/A-18, and AV-8B. Rotary-wing aircraft (helicopters) most commonly flown in BMGR East airspace include the AH-1, AH-64, OH-58, UH-60, CH-46, and CH-53.

There is no action currently proposed that would appreciably change the number of sorties or the types of aircraft that would train at the proposed STA compared to those operations normally conducted at BMGR East. If the STA were built, it is anticipated that some existing operations would be conducted at the STA rather than at other locations on the range and future missions could include use of the STA. Typically, the STA would be scheduled in 40-minute blocks within the normal hours of operation from 7 a.m. though 11 p.m., with generally four aircraft using the airspace associated with the STA in a given block of time. This would typically equate to a daily maximum of 96 sorties, although it is not likely that the STA would be fully scheduled every day and periodic large-force exercises may impose somewhat higher sortie rates on some days.

It is estimated that fixed-wing aircraft would fly 85 percent of the sorties. Although the flight profile for fixed-wing aircraft would differ depending on the aircraft type, it is anticipated that approximately 60 to 70 percent of the fixed-wing operations would typically be conducted at a medium-level altitude (6,000 feet AGL [approximately 6,800 to 7,500 feet above mean sea level or MSL] to 30,000 feet MSL [approximately 30,800 to 31,500 feet AGL]). A small percentage of the fixed-wing operations would occur above 30,000 feet MSL and the balance would occur at less than 6,000 feet AGL. It is also anticipated that concurrent low-level and medium-altitude sorties would be flown during training operations. Each case above is consistent with how BMGR East airspace is currently used.

Helicopter usage would be highest during the Marine Corps' semi-annual WTI course, and during CSAR training. During WTI exercises (which may last up to 6 weeks), helicopters may land at the STA on an average of twice per week to support on-the-ground troop training. Such training would typically be limited to foot traffic associated with ground-based forward air controller or search and rescue training. However, most helicopter training at the STA would not include landings and would normally be conducted at low levels (50 feet AGL or less).

While the use of Unmanned Aerial Vehicles (UAVs) is currently limited primarily to the WTI courses, other users have expressed interest in using UAVs within BMGR East and an increase in UAV training is anticipated, particularly if the STA were built since it would provide value for UAV mission training.

For aircraft operations conducted after dark, 2.75-inch rockets with infrared illumination warheads and/or illuminating flares (LUU-1, -2, and -19 type flares) would be used for target illumination during training with night vision devices. The quantity of rockets and flares would fluctuate depending on the amount of STA night use. On nights that the STA is used at full capacity, an estimated 24 rockets and 24 flares may be used during the course of the night training.

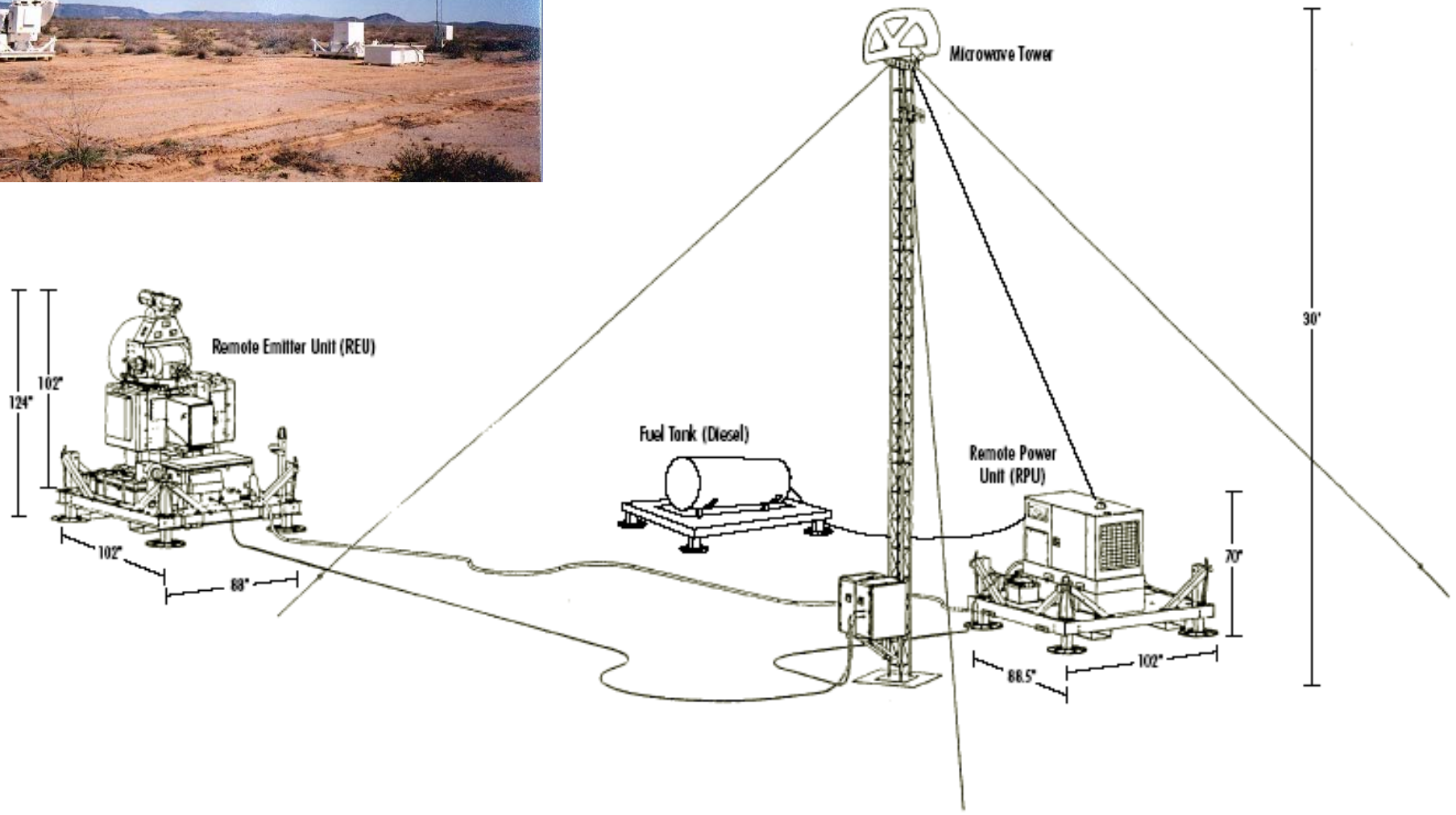
Sensor Training Area Features

Unmanned Threat Emitter – An UMTE is an electronic instrument that transmits radar signals to simulate the radars used to operate either Surface-to-Air Missile (SAM) or Anti-Aircraft Artillery (AAA) air defense systems. The UMTE would be used to simulate SAM and AAA air defenses against which U.S. aircrews have recently flown and will likely continue to encounter. One threat emitter would be installed within the boundaries of the STA.

An UMTE incorporates five separate but interlinked remotely operated components including: (1) an emitter unit, (2) a video-tracking camera, (3) a power unit, (4) a fuel source, and (5) a microwave antenna and tower (Figure 2-3). The emitter unit is the electronic instrument that produces threat radar transmissions. The emitter would be attached to a support platform that is 8 feet 6 inches long and 7 feet 4 inches wide and has a maximum loaded weight of 4,500 pounds. When the emitter unit is mounted on the support platform, the combined assembly stands 10 feet 4 inches high. Broad, flat footpads on the support platform allow the combined assembly to be placed and supported directly on the ground without the need to excavate or pour concrete footings.

Threat emitters produce radio frequency (RF) energy that is potentially harmful to people or wildlife (including large or small mammals, reptiles, or birds) if exposure to the radar emissions occurs close to the transmitting source where the emissions are at peak strength for an extended duration. An effective way to minimize the risk of human and some terrestrial mammalian wildlife exposure to hazardous RF emissions at an UMTE is to install perimeter fences and warning signs. For the type of threat emitter proposed for installation within the STA, the radiation safety distance is 308 feet from the transmitting antenna. Perimeter fencing, such as a chain-link fence, would be placed around the UMTE at a radius of 308 feet as a safety measure





Note: Tower and Remote Power Unit may be situated together during final construction.

Figure 2-3

TYPICAL REMOTE EMITTER SITE

and would preclude the endangered Sonoran pronghorn from exposure to RF emissions at the UMTE. In addition, the fences would be marked with RF hazard warning signs as well as other safety warnings such as no-smoking signs in English and Spanish. When determined appropriate, warnings on signs may also be illustrated pictorially.

Small mammals and reptiles would be able to penetrate the fence perimeter, but would suffer little risk of hazardous RF exposure because the transmitting antenna is elevated above the ground and is inclined to an angle above the horizon when transmitting. Bird-repellent devices, such as spikes, would be installed on appropriate features within the RF field to discourage birds from perching in areas where they may be exposed to radiation.

A remotely operated video-tracking camera attaches to the top of the emitter unit. The camera can be used to visually observe, track, and record the actions taken by an aircrew when their aircraft is challenged by a radar threat. The video signal would be fed to the 56 FW for recording and later playback at aircrew debriefings via a microwave transmission link.

If determined economically and operationally feasible, the electrical power for the proposed emitter unit, video camera, and microwave link would be provided onsite by solar panels to minimize environmental effects. However, to ensure this EIS conservatively addresses potential impacts, it is assumed that electrical power would be provided by an onsite diesel-powered, 20-kilowatt (kW) generator mounted on a free-standing support platform and a 500-gallon capacity aboveground diesel fuel tank. The support platform would be 8 feet 6 inches long and 7 feet 4.5 inches wide. The height of the generator and support platform combined would be 5 feet 10 inches and the combined unit would weigh up to 4,000 pounds. At maximum load, the generator would produce a sound intensity level of 74 decibels, A-weighted (dBA[2]) at 23 feet from the unit and an estimated 40 dBA at 153 feet (Luke AFB, 56 FW/RMO 2001a). A sound intensity of 74 dBA is equivalent to a bedside alarm clock or noisy office setting; 45 dBA is the sound intensity needed to awaken most sleeping people and 40 dBA is the sound intensity within a private office.

The typical fuel consumption rate for the generator would be 1 gallon per hour. At this rate, the planned 500-gallon-capacity double-walled storage tank would hold enough fuel for 500 hours of operation. It is estimated that refueling could be required about once every 3 months based on operation of the UMTE for the equivalent of 8 hours a day for 5 days per week (although it is likely that the UMTE also would be operated on some weekends in addition to weekdays).

[2] A dBA is a measurement that emphasizes certain frequencies to approximate how the sound is perceived by the human ear. Noise levels are measured in decibels (dB) on a logarithmic scale, which means an increase in sound level of about 10 dB is usually perceived as doubling the sound's loudness. Most conversations would measure between 50 and 60 dB, depending on how close the people are standing to one another.

The microwave antenna and tower would be needed to establish a two-way communications link between the UMTE and its operators at the Luke AFB. The antenna and tower assembly would typically stand about 30 feet high and would either attach to the emitter unit platform or would stand free on a broad, flat base plate directly on the soil. Four guy wires attached to the top of the tower would be required to support the tower in either configuration.

Large Scale Target Sensor System Sites – The LSTSS is designed to support realistic attack training and to provide feedback (accurate targeting assessment) for laser targeting systems. The system essentially has two parts: (1) the main tower, which collects data from the sensors or "nodes," and (2) the actual laser sensors (nodes), which are laser receiver plates that are placed on buildings or other targets. When an aircrew activates an aircraft laser targeting system to attack a target within the STA complex, the sensor nodes would provide a measure of the probable accuracy of the intended attack without any release of an air-to-ground weapon. The nodes placed on multiple targets would be interconnected by an ultra-high frequency radio link, allowing a microwave signal to be sent to the base and providing the ability to monitor and score the simulated delivery of ordnance on a large-scale and realistic urban target environment. The system provides real-time synthetic video displays of the target area, along with animated symbology indicating the status and performance of various sensors. The system is also capable of providing a complete replay of the mission at a remote location to debrief participants, assessing aircrew performance and enhancing the training experience.

Two LSTSS sites are proposed and would be located within the boundaries of the STA. Up to 63 nodes per LSTSS may be installed on targets within the STA. The nodes perform as sensor or device controllers and provide signals that interface with other equipment, such as laser, electronic warfare, infrared, Smokey SAM, or other devices.

The targeting lasers on the aircraft, which would be employed both day and night as aircrews attempt to hit selected targets in the STA and activate the LSTSS sensor nodes on targets, are not eye-safe systems. The area affected by laser use would be included in laser hazard areas. All three action alternative sites are within areas that are closed to the public because of the hazardous nature of military operations conducted there.

The actual laser hazard area cannot be calculated until targets are in place, but for the aircraft mounted system, the laser hazard area conservatively would be approximately 1 km around the intended target. For ground employed lasers, the laser hazard area can be as long as 20 km, but would be very directional, much like a camper shining a flashlight ahead of where he intends to walk. The graze angle, the slope of terrain, and having a mountain or hill as a backstop can all influence the size of the area affected.

Signs would be posted to warn military and other authorized personnel to stay out of the area in which the lasers may be used. These signs would also warn unauthorized people of the hazards in the area and would be in both English and Spanish. When determined appropriate, warnings on signs may also be illustrated pictorially.

Like the UMTE proposed for the STA, the LSTSS would be remotely operated by microwave transmission and would require a power source. Solar power would be preferred, but may not be feasible if the solar panels cannot be treated or equipped in a way that prevent the laser light from reflecting off the panels. Consequently, it is assumed that the LSTSS sites would include a diesel generator with specifications comparable to those described in the discussion of the UMTE (that is, a diesel-powered, 20 kW generator mounted on a free-standing support platform and a 500-gallon capacity aboveground diesel fuel tank). Routine maintenance on the LSTSS sites would be conducted weekly at the same time as other maintenance on STA equipment.

Remotely Controlled Smokey SAM Launcher System – Smokey SAMs enhance the visual realism of the air-ground training environment. Smokey SAMs are small (less than 2 feet long), solid fuel rockets made out of cardboard tubing and plastic foam. Most Smokey SAM motors include perchlorate, a stable and reliable propellant oxidizer that is valued for its safe storage, handling, and performance, but may also be a contaminant if it enters water sources. Smokey SAMs can generate a visible smoke column to about 1,000 feet AGL when launched. These rockets are used to simulate the initial boost phase of a surface-to-air missile launch. Smokey SAMs are launched in conjunction with threat emitter transmissions to give aircrews visual as well as electronic cues that they have been engaged by a surface-to-air missile and that evasive action is in order. Smokey SAMs have no tracking capability and are unlikely to hit an aircraft. Nevertheless, the soft construction of these decoys is designed to prevent damage to an aircraft.

A Smokey SAM launcher unit is approximately 1 square foot in size, but 16 units would be grouped together in either a single- or double-line configuration. The footprint for the entire launcher system is expected to be approximately 30 feet by 40 feet in size.

While the cardboard tubing will biodegrade over time, debris from launched Smokey SAMs would typically be collected and removed from the range by the range operations and maintenance contractor during scheduled maintenance in the area. The Smokey SAM system would be remotely controlled through microwave link and powered by batteries (using a solar panel re-charging energy source). The launcher unit would be restocked with Smokey SAMs during the weekly routine maintenance for the STA.

Utilities – Incandescent lights would be used within the STA at night to simulate the lighting within an urban environment. Some features would include infrared lights. Some lights could be

attached to standard-height poles comparable to those used to light streets in cities. These poles would be topped with spikes to prevent birds from perching on the poles, thus decreasing the bird/wildlife aircraft strike hazard potential. The lights could potentially be solar powered, but if this is not feasible, a diesel-powered 20 kW generator mounted on a free-standing platform with an aboveground diesel fuel tank would be installed within the STA to provide electrical power for the lights. Like the generator proposed for operating the UMTE, the fuel consumption rate would be approximately 1 gallon per hour. Electrical wiring from the generator to the STA would be placed parallel to existing roads and buried underground to minimize hazards for aircraft operations.

Communications – The equipment at the STA would be remotely operated through the existing microwave telemetry system located at Childs Mountain (see Figure 2-1). To be effective, there would need to be an uninterrupted line-of-sight microwave transmission path between the STA and the Childs Mountain telemetry site; locations without adequate line-of-sight would require construction of an additional tower to connect the signals. No other communications system is required.

Maintenance Activities

EOD Clearance – Prior to the development of the STA, the ground surface of the site selected would need to be cleared of any UXO or other ordnance or target waste materials to allow for the safe development of the site. In addition, a buffer extending 1,000 feet beyond the one-square-mile STA site would be cleared. Therefore, the total surface area to be cleared prior to development of the site would be 1,217 acres (7,280 feet × 7,280 feet = 52,998,400 square feet ÷43,560 [square feet in an acre]).

Additionally, periodic EOD clearance would be necessary to support operational training at the STA to clear items proposed for use at the STA, such as illuminating flares and infrared rocket warheads. In accordance with Air Force guidance (U.S. Department of the Air Force 2007b and 2007c), biennial EOD clearance would extend 300 feet from each target. Every 10 years, the EOD clearance area would extend to either (1) a radius of 1,000 feet from each target or (2) the shorter radius where the density of debris items is less than five per acre in each direction from the STA's targets. For example, if less than five debris items are being found per acre at a radius of 700 feet from the target, the clearance radius for the decennial clearance would be shortened to 700 feet.

The EOD clearance process at BMGR East is typically conducted using trucks spaced at about 100-foot intervals in a line-abreast formation. The trucks are driven in parallel transects across the areas surrounding each target so that ordnance delivered to that target may be located.

Lightweight training ordnance, such as the rockets and flares expected to be used at the STA, would be tossed into four- or six-wheeled trucks and transported to an existing RMCP or onsite storage area and later transported to one of the existing RMCPs. At the RMCP, the ordnance would be processed to ensure it is safe for removal from BMGR East. Because the STA clearance area would be small in comparison to the area cleared within the tactical ranges, the process potentially could be completed with fewer trucks, or ordnance waste could be collected and hauled by truck to the RMCP. Rather than relying on heavy trucks, it is also anticipated that smaller footprint vehicles would be used to minimize environmental disturbance.

It is anticipated that EOD clearance would be completed within a one-week period or less for the 10-year clearance requirement and in a few days for biennial EOD clearance. The actual clearance time may be even shorter because the area is relatively small and the quantity and types of ordnance released would be limited. The season in which EOD clearance would occur is subject to the overall schedule for all EOD operations. However, training schedules and environmentally sensitive periods (such as the fawning season for the endangered Sonoran pronghorn) would be avoided to minimize potential conflicts or environmental impacts.

Most waste associated with spent munitions can be commercially recycled once it has been processed to eliminate potentially ignitable, explosive, pyrotechnic, or propellant residue and milled to eliminate its militarized appearance. Hazardous quantities of ignitable materials may remain on munitions because of a partial burn of pyrotechnics, propellants, or incendiary materials. For efficiency, munitions are not processed and removed from the range until a sufficient quantity has accumulated to make it cost effective. This typically occurs on an annual basis, but also is subject to availability of funds. RMCPs have already been established at four locations within BMGR East for the munitions cleared from the tactical and manned ranges. The RMCPs are secured with a perimeter fence and locked gate. Approximately once a year, contractor services and equipment are retained to crush/shred the munitions to reduce the volume and to render the waste unrecognizable as ordnance. In addition, the waste may be thermally processed to burn off any dangerous residue before it is hauled off-range to a commercial recycling facility.

A detailed discussion of the crushing/shredding and flash burning systems, fuel requirements, system portability, and operational safety of the process is addressed in a separate Environmental Assessment (EA) that was prepared in January 2001 to address the proposed flash burning of military munitions residue at BMGR East (Luke AFB, 56 FW/RMO 2001b). A Finding of No Significant Impact (FONSI) was signed on 11 May 2001 (Luke AFB, 56 FW/RMO 2001c) and this processing of munitions waste during routine EOD clearance operations is currently being implemented at the established RMCPs. The findings of this 2001 EA are hereby incorporated by

reference as this same process would be used to process the flares, rockets, and any other munitions waste recovered from the STA during EOD clearance operations.

Equipment Maintenance – The threat emitter, LSTSS sites, and other equipment would need to be checked approximately once or twice a week to ensure that all features are undamaged and are working optimally. Ongoing maintenance conducted once per week could include activities such as changing the oil filter on a generator, which is typically needed after every 100 hours of operating time; refilling diesel generator fuel storage tanks; and re-stocking Smokey SAM rockets. Most routine maintenance visits could be completed in less than one hour, but non-standard maintenance (for example an equipment malfunction or repairs from equipment damage) could require an unforeseeable amount of time. An annual major maintenance period of approximately one week would be scheduled; EOD clearance of access roads and maintenance areas would precede this annual maintenance.

Access

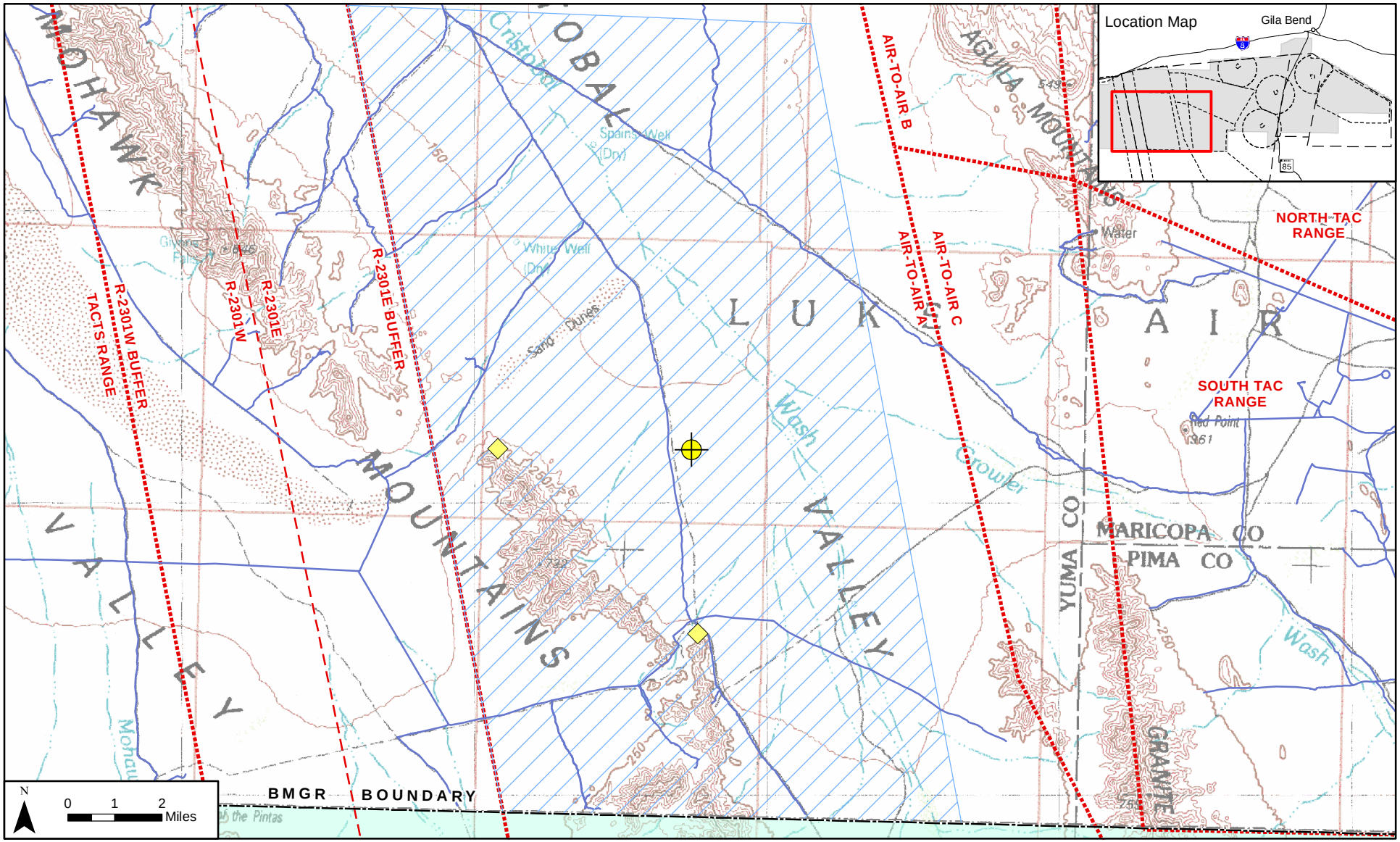
Access to the STA would be via existing dirt roads (leading to the STA site from Interstate 8 or State Route 85) when available. However, road widening and minor improvements potentially would be required to facilitate construction of the STA, equipment maintenance, and EOD clearance operations. The extent of road improvements would vary depending on the site selected. Most of the access road improvements and maintenance could be sufficiently addressed by periodic grading of the road. It is estimated that the grading would widen access roads to the equivalent of approximately 1.5 times the width of the grader blade, or approximately 18 to 20 feet.

In some areas, particularly where the access road crosses a wash or sandy soils, additional improvements may be required. This may include installing culverts to facilitate proper drainage or topping the road with gravel to provide a more firm roadway surface.

Some unpaved internal roads within the one-square-mile STA site may be developed to provide better access to equipment. In addition, roads or simulated roads would be developed within the STA site to provide the proper appearance of an urban area to aircrews. The specific location of these roads cannot be determined at this time, but it is presumed that disturbance could occur anywhere within the one-square-mile site.

2.2.2 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Alternative 1.A would be to develop and operate the proposed STA at a site located within the San Cristobal Valley and underlying the Air-to-Air Range (see Figures 2-1 and 2-4). This location is the proposed action because it provides optimum airspace for target ingress and egress as well as defensive maneuvering, acceptable communication with the existing microwave



Sensor Training Area Site Alternative

Alternative Potential Ground Forward Air Controller Locations

Air-to-Air Firing Range

Subrange Airspace Boundary

Restricted Airspace Boundary

BMGR Boundary

BMGR Roads

Cabeza Prieta National Wildlife Refuge

Figure 2-4

ALTERNATIVE 1.A
AIR-TO-AIR RANGE SENSOR TRAINING AREA SITE

telemetry system, and a location that would not unduly conflict with ongoing training operations at either North or South TAC ranges. An airspace boundary, separate from those that currently exist for the tactical and manned ranges, would be established for purposes of scheduling the STA subrange and airspace, if it were established within the San Cristobal Valley. Because the airspace would be within restricted airspace already controlled by the Air Force, the airspace boundary would be to provide internal safety and control of military operations and would have no effect on commercial or private flight operations or on FAA operations.

Because the proposed site is outside of the existing tactical ranges, Alternative 1.A would have relatively little impact on the competing airspace and other operational needs of North or South TAC ranges as compared to the Alternative 1.B and 1.C STA sites within South TAC and North TAC range, respectively. By comparison, the Alternative 1.B and 1.C sites would (1) require a suspension of other aircrew training activities in the tactical range when the STA is active and (2) shut down the STA during the typical 6-week closure period that is needed annually to remove spent ordnance and to repair and replace targets at tactical ranges.

While the Alternative 1.A site is not near an existing RMCP, spent ordnance and other debris would be collected during routine EOD clearance procedures and temporarily consolidated within the STA. Periodically, the collected ordnance would be transported from the consolidation location to an existing RMCP for processing.

Access for site preparation and construction would be via existing road. One option is a road on the west side of the Mohawk Mountains that crosses to the east side of the mountains through the Mohawk Gap.

However, to retain operations and maintenance within BMGR East, access is expected to ultimately use an existing road that extends approximately 17 miles from Stoval Airfield near Interstate 8 to the proposed Alternative 1.A site within the San Cristobal Valley. A portion of this road is the historic Yager Road. Like most roads on the BMGR, this is a dirt road that generally is only wide enough for a single vehicle, although vegetation in the area is sparse and a vehicle could pull off the road to allow another vehicle to pass. Portions of the road require four-wheel drive, particularly where the soils are sandy or where natural drainage has cut channels in the road. Alternative 1.A would require some improvements to this road.

This would include grading the road (which would also widen it to approximately 18 to 20 feet), installing culverts where the road intersects with a wash, and reinforcing unstable soil surfaces with a layer of gravel. In addition to the improvements to the road providing access to the site, it is anticipated that up to 3 miles of other existing roads may be similarly improved to provide better access to support facilities such as a ground forward air controller point or a microwave

repeater station. Specific sites for the ground forward air controller observation point and microwave repeater station (if needed) have not yet been selected. However, the selection criteria for such support facilities includes being along an existing access road and in areas that have previously been disturbed or where any new disturbance can be minimized.

EOD clearance needed in advance of STA development under this alternative would most likely include deployable aerial rigged targets (DARTs) and associated tow cables[3], dud (or unfired) .50 caliber or 20-millimeter rounds, or any of a variety of air-to-air rockets or missiles that may have been expended or jettisoned in the Air-to-Air Range during the last 65 plus years. A low density of these ordnance items would be expected as compared to the density of ordnance of all types that would be anticipated at the Alternative 1.B South TAC range site. The Alternative 1.A site has never been used as a known air-to-ground target and the site is well away from the South TAC targets that have been authorized for the delivery of live, explosive ordnance. However, the potential presence of sub-caliber or full-size practice (i.e., inert) or explosive ordnance employed for air-to-ground attack has to be acknowledged at any BMGR location that has not previously been subject to clearance.

2.2.3 Alternative 1.B – South Tactical Range Site

With Alternative 1.B, the proposed STA would be constructed and operated at the Target 220 site within South TAC (see Figures 2-1 and 2-5). This alternative would offer adequate airspace that would not constrain maneuverability, would provide a secluded area for laser operations, and would be in an existing target area that has been previously disturbed. Compared to Alternative 1.A, this site would not provide a readily available line-of-sight telemetry path to Childs Mountain for operating the equipment remotely via a microwave signal. An additional microwave signal relay site would have to be constructed. A specific location for this relay has not yet been determined, but would be along or near an existing road. Existing television ordnance scoring system (TOSS) towers would be evaluated for suitability to make use of existing features and avoid or minimize the need for any new disturbance. The video cameras, which were mounted on two TOSS towers to observe and score practice munitions hits on specific targets, have been removed so the towers are not currently serving a functional purpose and could be used for a microwave link.

[3] A DART is a type of target that simulated an aircraft and was used from about 1956 to 1994 for air-to-air gunnery training in the airspace overlying portions of the BMGR. Each DART consists of a 12-foot aluminum frame with four wings constructed of corrugated fiberboards that is reinforced with wooden edges and sandwiched between skins made of thin-gauge aluminum sheet metal. A tow aircraft would pull the DART with a 1,500-foot cable. Some DARTs were lost during aerial gunnery training because the tow cable was severed by gun fire or because the target became aerodynamically unstable and had to be jettisoned.

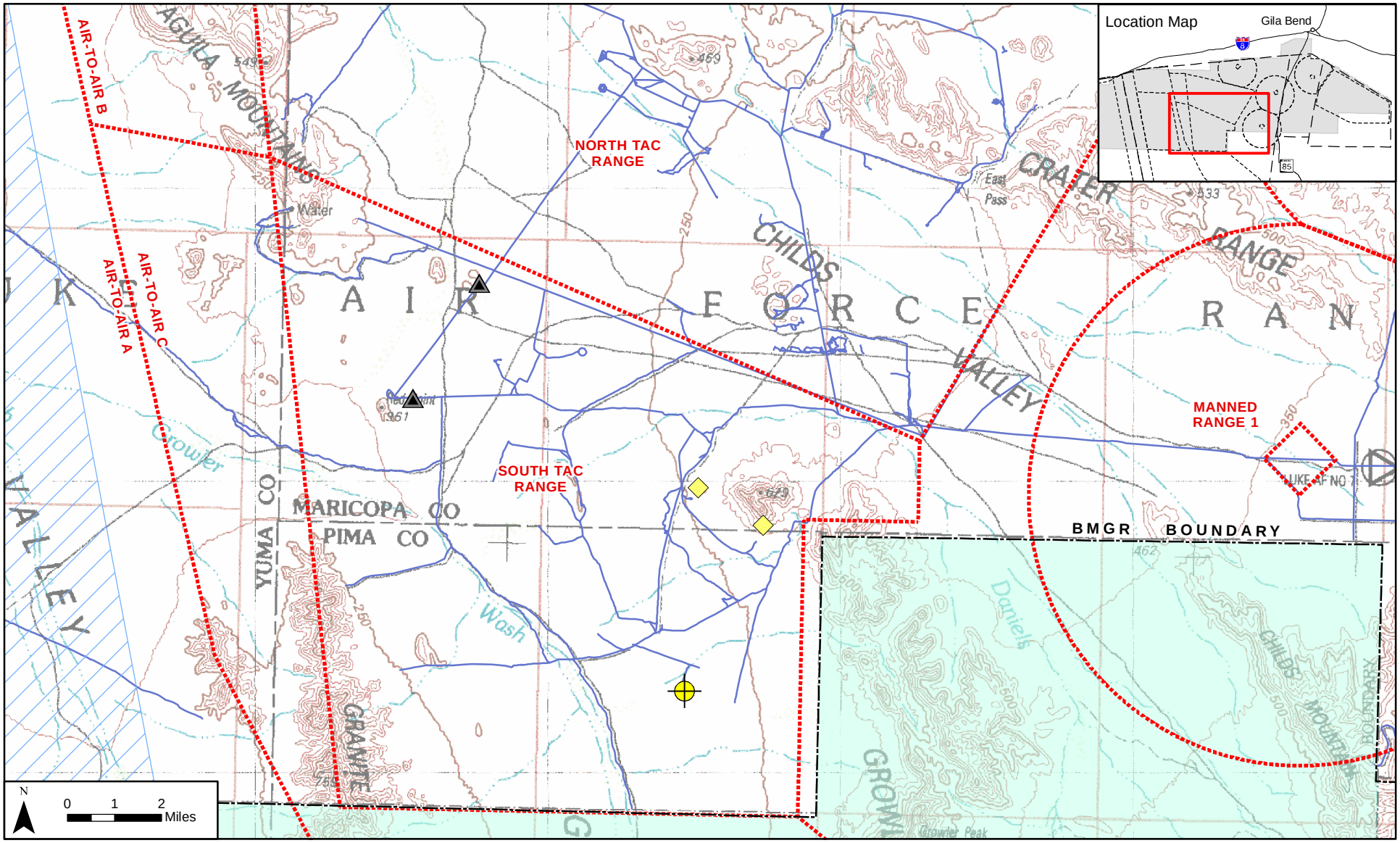


Figure 2-5

ALTERNATIVE 1.B
SOUTH TAC SENSOR
TRAINING AREA SITE

Another important deficiency of the Alternative 1.B site would be that operation of the STA would disrupt other training operations within South TAC. Although the Alternative 1.B site would be operationally viable strictly from the perspective of the STA, placement of the STA within a target complex in South TAC would reduce training capacity of BMGR East because of the scheduling conflicts with other missions using South TAC.

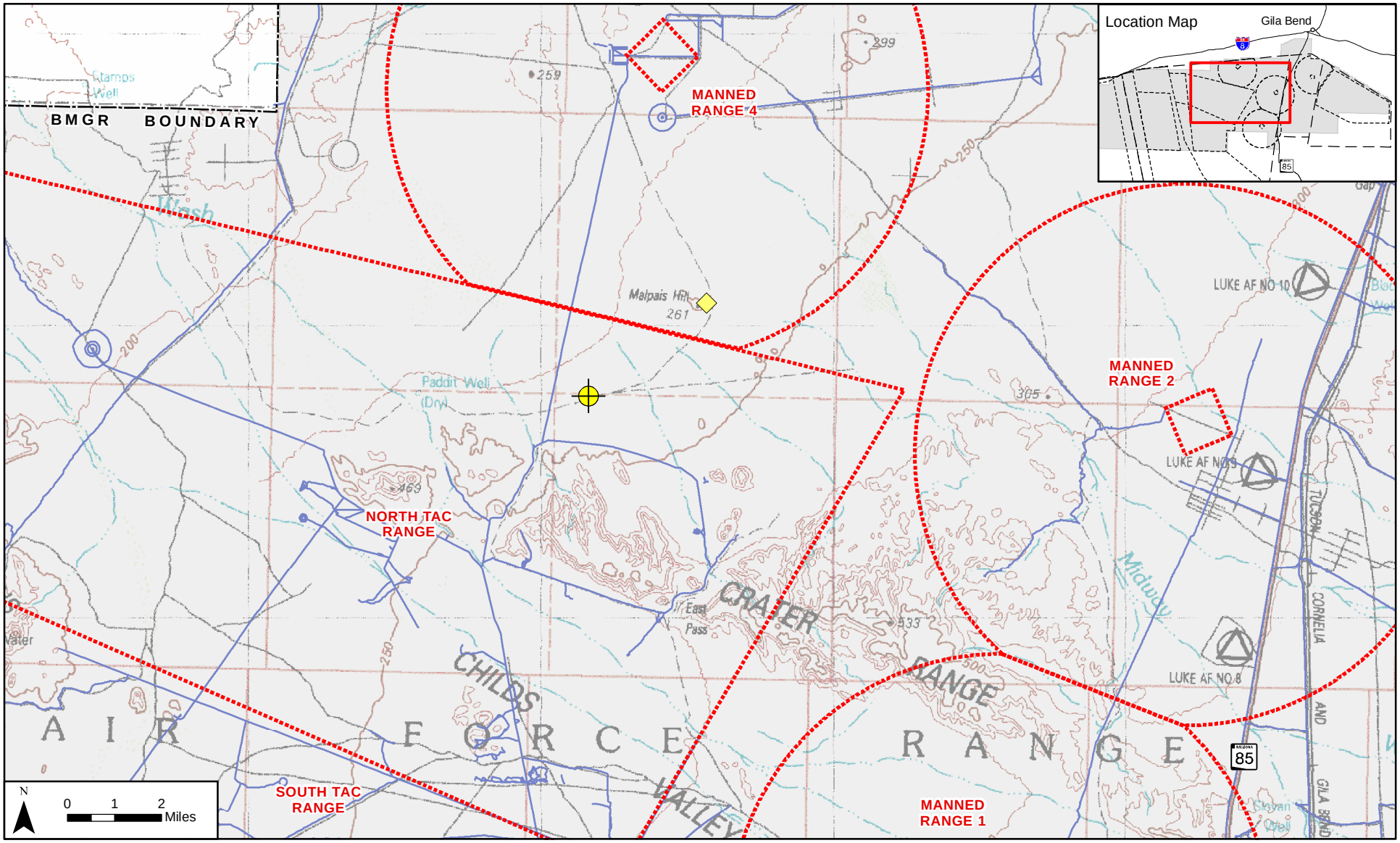
Because Alternative 1.B is within the target impact area of an existing tactical range, the site has already been disturbed and subjected to ordnance delivery and EOD clearance operations. There also is a higher potential for surface and subsurface ordnance than in either the Alternative 1.A (Air-to-Air Range Site) or Alternative 1.C (North TAC Site), which have been less exposed to air-to-ground ordnance training. Consequently, a more intensive effort to clear ordnance from the South TAC site prior to establishment of the STA would be expected than with the other alternative sites. Periodic EOD clearance would coincide with the normal clearance cycle for South TAC, and the existing RMCP 1 (refer to Figure 2-1) would be used.

A portion of the EOD clearance for the STA area would overlap with existing EOD clearance requirements for Target 220 and may overlap with clearance requirements for other targets within South TAC, thereby requiring less BMGR East-wide EOD clearance than with the Alternative 1.A (Air-to-Air Range Site) or Alternative 1.C (North TAC Site). However, compared to Alternative 1.A, locating the STA within South TAC would result in less availability of the STA due to EOD clearance procedures.
Access road improvements to the Alternative 1.B site would not be necessary because the proposed site is in a location where the existing roads already support access by heavy equipment. However, if road improvements to support facilities (such as microwave equipment or a ground forward air controller point) are needed, improvements may include grading the road, installing culverts, and/or adding gravel to the surface.

2.2.4 Alternative 1.C – North Tactical Range Site

The Alternative 1.C site for the proposed STA in North TAC would be constructed and operated within the tactical range near its contiguous airspace boundary with the Manned Range 4 airspace (see Figures 2-1 and 2-6). This alternative offers adequate airspace that would not constrain maneuverability, would provide a secluded area for laser operations, and would be outside of the current range of the endangered Sonoran pronghorn. The Alternative 1.C site would have an adequate line-of-sight transmission path to the existing microwave link in Manned Range 4 for telemetry communication.

An operational disadvantage of the Alternative 1.C site is that use of the STA would reduce the availability of North TAC for other simultaneous training missions. Because the Alternative 1.C



Sensor Training Area Site Alternative

Alternative Potential Ground Forward Air Controller Location

Subrange Airspace Boundary

BMGR Boundary

BMGR Roads

Figure 2-6

ALTERNATIVE 1.C
NORTH TAC SENSOR
TRAINING AREA SITE

site is proposed outside of the existing North TAC target complexes, it would potentially be less disruptive to other missions than Alternative 1.B, under which the STA would be placed in an existing target area within South TAC. However, the airspace needed for maneuvers for attacking the STA within North TAC would likely interfere with the simultaneous use of both Manned Range 4 and Manned Range 2 and reduce the training capacity of those ranges.

The Alternative 1.C site has not been previously used for air-to-ground attack training as a target impact area. The potential for ordnance contamination at this site cannot be dismissed, however, as current or previous targets authorized for attack with air-to-ground ordnance are located within a few miles of the site. The type of ordnance contamination that may be present would be the same as at the Alternative 1.B site (South TAC STA), although the expected density of ordnance would be far less because the site is not an active target. Periodic EOD clearances needed to support operations at the Alternative 1.C site would occur during the biennial North TAC clearance and collected materials would be taken to a nearby existing RMCP for processing. Compared to Alternative 1.A, locating the STA within North TAC would result in less availability of the STA due to EOD clearance procedures.

The existing road between Manned Range 4 and North TAC would serve as the primary access route. With Alternative 1.C, it is anticipated that approximately 4 miles of road would need to be upgraded. As with the other alternatives, access roads would be unpaved, approximately 18- to 20-feet wide, and would be periodically maintained with a road grader. Developing up to a mile of new road for this alternative would disturb approximately 2.5 acres of land.

2.2.5 Alternative 1.D – No-Action Alternative

The Alternative 1.D (no-action) alternative would be to not construct or operate the STA within BMGR East at this time. The no-action alternative would not address the pressing need at BMGR East for comprehensive MOUT training for aircrews. Because there are no Air Force MOUT training areas within the operational vicinity of BMGR East and only two such facilities are currently available outside of the BMGR East area, it is likely that aircrews trained at BMGR East would continue to not receive this training and would likely continue to enter combat situations without receiving vital MOUT training.

2.2.6 Alternatives Eliminated from Detailed Consideration

In addition to the three action alternatives being considered, four other geographic locations within BMGR East—Stoval Auxiliary Airfield, North San Cristobal, Target 101 in North TAC, and Manned Range 1—were initially considered as alternative sites for the STA (see Figure 2-1). However, these sites were eliminated from detailed consideration because they were not operationally viable.

Stoval Auxiliary Airfield, located near the northwest corner of BMGR East and R-2301E, was eliminated because its close proximity to both the northern and western boundaries of BMGR East and R-2301E would curtail realistic air combat maneuvers by aircraft around the proposed STA. The Stoval site would not provide the restricted airspace required for at least 15 NM of attack ingress to and egress from the proposed STA in multiple directions. Targeting laser use at the Stoval site would also be curtailed because its proximity (about 2 miles) to the northern boundary of BMGR East and Interstate 8 would pose unacceptable public safety hazards.

North San Cristobal, located southeast of Stoval Auxiliary Airfield, was eliminated because it lacked a communications signal and the targeting laser use would have to be curtailed because of the site's proximity to Interstate 8.

Because of its proximity to the northern boundary of the range, Target 101 in North TAC would also be unable to provide adequate restricted airspace for attack ingress to and egress from the proposed STA in multiple directions.

A site within Manned Range 1 was considered, but the airspace in that vicinity is too congested to safely operate the STA and maintain existing Manned Range 1 operations. Opportunities for attack ingress and egress maneuvers around the STA from multiple directions would require some use of the contiguous Sells Military Operations Area (MOA), but would be limited at lower altitudes by the proximities of the Town of Ajo and the Ajo Municipal Airport. The proximity to Ajo would also pose a conflict for night attack training at the proposed STA because of noise concerns. Surface development of the site for the STA would be inconsistent with the continued operation of Manned Range 1.

Developing a STA at a location outside of BMGR East was also eliminated from detailed consideration. This alternative would not provide a cost effective way to provide regular and deployed users of the BMGR with realistic training in air-to-ground combat in urban settings. Deploying to other ranges results in operational costs for fuel, training time that is spent in transport rather than in more valuable combat training, and added strain on family relationships when aircrews and support crews are away from their home base. In addition, the frequency of the training would be condensed into short periods of time followed by long lapses in time when the aircrews return to BMGR East for other training. Skills are more perishable when they are not routinely reinforced, thus diminishing the value of training conducted at remote ranges.

2.3 PROPOSAL 2 – TARGET RECONFIGURATION

2.3.1 Alternative 2.A – Proposed Action

The Alternative 2.A proposed action is to establish new procedures specifically designed to guide environmental reviews and approvals for target reconfigurations needed to update BMGR East tactical ranges. Target reconfigurations will be needed over approximately the next 10 years to bring the tactical ranges, which have not been upgraded in a comprehensive manner in over two decades, up-to-date with current and emerging aircrew training requirements. North, South, and East TAC ranges currently have 23, 20, and 34 target complexes, respectively. These complexes provide simulations of tactically important features such as airfields, air defense sites, vehicle convoys, railroads, battle lines between opposing forces, and supply areas. Each complex includes simulations of multiple individual targets (such as parked aircraft, armored vehicles, SAM launchers, runways, and airfield buildings). In aggregate, the target complexes in the tactical ranges provide several hundred aim points for air-to-ground attack training.

Target reconfigurations generally may include:

- partially or completely modifying a target simulation in its existing location, such as converting outdated 1970s and 1980s SAM simulations to represent modern SAM installations, or using the runway, taxiways, and parking ramps of an existing airfield simulation to represent streets in a simulated industrial park or other urban setting;
- expanding the size or complexity of an existing target such as enlarging the perimeter of an airfield simulation or adding additional building, SAM, radar, power plant, or vehicle parking simulations;
- eliminating an existing target that is no longer relevant to training;
- developing a new simulation in a tactical range location where a target does not currently exist; or
- a combination of the actions (or similar actions) listed above.

Alternative 2.A is programmatic in nature; that is, it addresses a program for target reconfiguration rather than a site-specific action. This proposed action would provide Air Force environmental managers with a guide regarding the scale of review that proposed future reconfigurations of targets are likely to trigger relevant to NEPA and other environmental regulations. The guidelines would help aircrew training planners and environmental managers be more effective in selecting locations for target reconfiguration and in determining an appropriate level of NEPA review for new target proposals.

Proposals 1, 3, 4, and 6 in this EIS (see Sections 2.2, 2.4, 2.5, and 2.7) pertain to new targets, or reconfiguration of a target complex for rotary-wing rather than fixed-wing aircraft training. These proposals are used in this analysis as examples of how the new procedures might be applied; however, these proposals are considered independent actions from this target reconfiguration proposal because the site-specific location and other details associated with Proposals 1, 3, 4, and 6 are known at this time.

The environmental review and approval parameters for implementing target reconfigurations proposed with Alternative 2.A identify the actions that would be taken to satisfy the NEPA and related environmental compliance requirements when proposing new target reconfiguration(s). The proposed parameters are anticipated to increase the consistency, efficiency, and effectiveness with which environmental review and approval processes are performed for proposed future target reconfigurations. Target reconfigurations occurred on a relatively infrequent schedule over the past several decades and were generally addressed as isolated, individual actions. The proposed parameters would not circumvent any environmental compliance requirements, but rather would establish a process that would be more consistent, efficient, and effective for considering the series of target reconfigurations. The future reconfigurations that are anticipated to update targets would provide maximum flexibility to keep aircrew training at BMGR East abreast of and relevant to emerging readiness needs. The need to update individual targets or selected groups of targets would be expected to occur as frequently as every 1 or 2 years.

While approval of this proposed action would not result in immediate, on-the-ground changes to existing targets or establish targets in new locations, the need for target reconfiguration is real and specific actions would likely be identified in the near term. Therefore, the proposed environmental review and approval parameters are provided in this EIS to alert parties with an interest in BMGR East operations of the anticipated future actions to reconfigure targets and to provide an opportunity for public comment on the approach that the Air Force is considering for addressing the potential environmental consequences of target reconfigurations.

The proposed action would provide a set of standard procedures for determining the level of environmental assessment and approval necessary before a proposed target reconfiguration could be implemented. The level of environmental assessment would be based on how past military use has affected the proposed target location. For the purposes of this action, five categories of military use areas have been established based on the long-term patterns of direct military surface use that have occurred since the current tactical ranges were established in the 1960s and on the patterns of ongoing military use. Direct military surface use at BMGR East principally includes, but is not limited to, roads established and used for range operations, target placement

and construction, air-to-surface ordnance impact areas, and EOD clearances. As illustrated in Figure 2-7 and 2-8, and as listed in order from the areas that have received the longest-term and most intensive direct surface use to the areas that have received the least surface use, the five long-term military use areas are:

1. Active Intensive Use Category – currently active target positions and biennial EOD clearance areas (The current biennial EOD clearance area is a 300-foot radius around targets designated for inert ordnance and a 500-foot radius around targets designated for live ordnance.)
2. Active Moderate Use Category – those portions of the currently active decennial EOD clearance areas that are within the pre-2007 annual EOD footprint. (The current decennial EOD clearance area is a 1,000-foot radius around each target and the pre-2007 annual EOD footprint also was a 1,000-foot radius around a target, but the two areas may not be identical because targets may have been added or retired, thereby resulting in offset alignments in some locations.)
3. Infrequent Moderate Use Category – the 2001-2006 5-year EOD footprint (From 2001 to 2006, the 5-year EOD footprint extended to 1 kilometer around each target. The area that is between 1,000 feet and 1 kilometer from the perimeter of a target would be considered an area of infrequent moderate use.)
4. Reserve Light Use Category – the pre-2001 5-year EOD footprint (Before 2001, the 5-year EOD footprint extended to 1 NM around each target. The area that is between 1 kilometer and 1 NM from the perimeter of a target has generally been lightly used to date for air-to-ground attack training and other military operations, but remains in reserve for newly identified military needs.)
5. Negligible Use Category – tactical range locations outside of the pre-2001 5-year EOD footprint (The areas of each tactical range beyond 1 NM from the 2001 target locations that to date have served primarily as essential ordnance delivery safety buffers, but military surface use has been so sparsely distributed and infrequent that use in these buffer areas is considered to be negligible.)

The key to defining the proposed internal parameters for implementing target reconfigurations is in identifying in which of the long-term military surface use areas of each tactical range a proposed reconfiguration action would occur and determining if it would likely alter the historic or ongoing patterns of surface use effects in that area to a degree that is distinguishable from the existing environmental baseline. Toward this end, the most accurate benchmarks of existing military surface use patterns and areas of effects in each tactical range are provided by the geographic distributions of EOD clearance areas. The EOD clearance areas encompass the direct

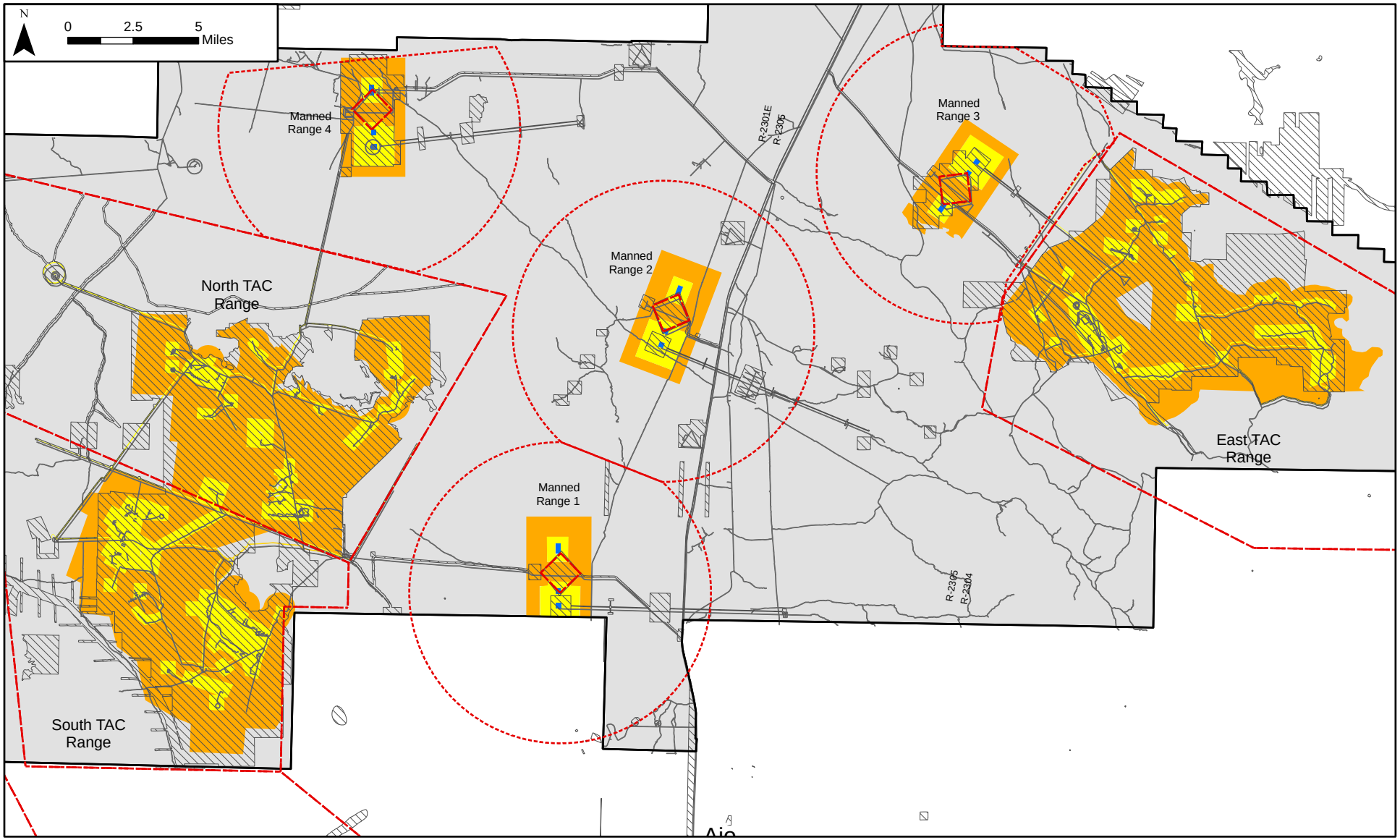
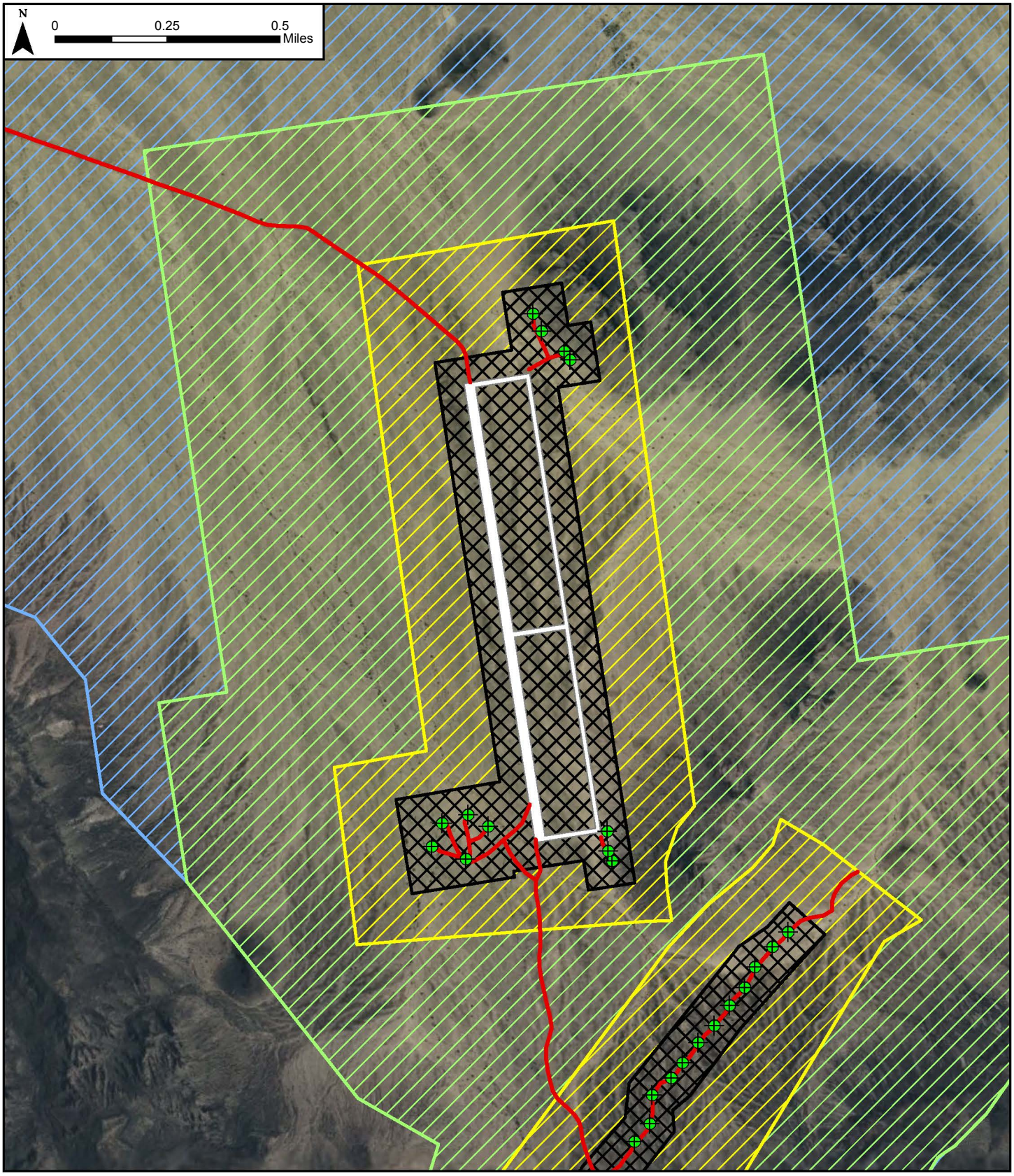


Figure 2-7

FORMER EXPLOSIVE ORDNANCE DISPOSAL AREAS IN WHICH TARGET RECONFIGURATIONS MAY BE PROPOSED



Targets
Roads
Simulated Airfield Target

*or 500 ft for live targets

Active Intensive Use Category, Review Procedure #1
300 ft* from Targets

Active Moderate Use Category, Review Procedure #2
300+ ft - 1,000 ft from Targets

Infrequent Moderate Use Category, Review Procedure #3
1,000+ ft – 3,821 ft (1 km) from Targets

Reserve Light Use Category, Review Procedure #4
3,821+ ft – 6,076 ft (1 NM) from Targets

Figure 2-8

EXAMPLE OF REVIEW PROCEDURE AREAS AT A REPRESENTATIVE INERT TARGET AREA

effects of most tactical range roads, individual vehicle access ways to target sites, target construction and maintenance, air-to-ground ordnance impacts, and EOD activities. Consequently, EOD clearance areas effectively demarcate both the principal military surface use footprint in BMGR East and the physical extent to which military use affects soil surfaces and vegetative communities. This is why current and historic EOD clearance areas were used to define the five aforementioned long-term military surface use areas. Each of the five long-term military surface use areas and the military surface use effects that occur on them are described in detail in the *Legislative Environmental Impact Statement for the Renewal of the Barry M. Goldwater Range* (U.S. Department of the Air Force 1999), the EIS for the BMGR INRMP (Departments of the Air Force, Navy, and Interior 2006; U.S. Air Force and U.S. Marine Corps 2007), and the Integrated Cultural Resources Management Plan (ICRMP) for the range (Luke AFB 2009). Brief descriptions of these military use areas and their relationships to target reconfigurations are provided below.

The surfaces of the tactical ranges at BMGR East have been cleared of expended ordnance on a regular periodic basis since 1975. From 1975 to 2001, expended ordnance was cleared from the ground surface to a radius of 1,000 feet from each target annually and to a radius of 1 NM (6,076 feet or 1.15 statute miles) once every 5 years.

The 1975 to 2001 annual clearance areas included all targets, the maintained access road system within each tactical range, unmaintained vehicle access ways from the maintained road system to the targets, the majority of the range surface area affected by concentrated ordnance impacts, and the area affected by target construction and maintenance. Target development and maintenance, ordnance impacts, and EOD activities within the annual EOD clearance area caused moderate to complete levels of physical disturbance to the original soil surfaces and vegetative communities. The annual EOD clearance areas of the three tactical ranges in aggregate encompassed about 25,500 acres from 1975 to 2001 (see the blue and yellow areas shown on Figure 2-7) (U.S. Department of the Air Force 1999).

Ordnance impacts occur at decreasing densities with distance from the target. Therefore, the EOD clearance activities that extended to 1 NM occurred only once every 5 years during the period from 1975 to 2001. As a result, physical disturbance of soil surfaces and vegetative communities occurred at low to moderate levels in this clearance zone. The aggregate area of the 5-year clearance areas for the three tactical ranges encompassed about 92,000 acres (see the orange areas shown on Figure 2-7) (U.S. Department of the Air Force 1999). This is considered the reserve light military use category for purposes of this proposed action (this is also depicted as the blue-hatched area on Figure 2-8).

In 2001, the Air Force determined that improvements in the accuracy of weapons delivery systems had reached a point where the 5-year EOD clearance requirement could be reduced in size and still provide adequate control of surface build-up of expended ordnance at training range targets. The 5-year clearance requirement was reduced from a 1 NM (1.85 kilometers) radius around each target to 1 kilometer. The 2001 5-year clearance requirement was in effect for only about 5 years, so the new clearance radius was not implemented at all tactical range targets within BMGR East. If left in effect, the 2001 clearance radius would have reduced the aggregate area of the three tactical ranges cleared every 5 years from about 92,000 acres prior to 2001 to about 42,000 acres after 2001 (see the black-, yellow-, and green-hatched areas shown on Figure 2-8 for an example based on an actual target) (Departments of the Air Force, Navy, and Interior 2006).

In 2007, the Air Force determined that EOD clearance requirements for tactical ranges could be further reduced without jeopardizing either range safety or its objectives to control the accumulation of ordnance on the surfaces of training ranges (U.S. Department of the Air Force 2007b and 2007c). The new system, which includes annual, biennial, and decennial clearance requirements, has been implemented at BMGR East. On an annual basis, expended ordnance is now cleared just prior to annual maintenance, reconstruction, or replacement of existing targets. Ordnance is cleared from the ground surface to 50 feet on either side of tactical range roads and vehicle access ways to targets and in the close proximity to targets to provide maintenance crews with safe access and work areas. Once every 2 years, expended ordnance is now cleared to a radius of 300 feet from each target that is used only for training ordnance (for example, see black-hatched area shown on Figure 2-8) and to a radius of 500 feet from each target used for live explosive ordnance. Once every 10 years, expended ordnance will now be cleared to a radius of 1,000 feet from all targets (for example, see yellow-hatched area shown on Figure 2-8). Thus, the new biennial and decennial clearance areas are all currently located within the 1,000-foot annual clearance area that was in effect from 1975 to 2007 (see yellow areas shown on Figure 2-7). The active target and the current biennial EOD clearance area considered the active intensive use category and the current decennial EOD clearance area is considered the active moderate military use category for this proposal.

Like the previous 1,000-foot annual clearance area, the new biennial clearance area includes all of the targets; vehicle access ways to targets; most of the range surface area affected by ordnance impacts; and the area affected by vehicles used for target construction, maintenance, and annual and biennial EOD clearance activities. A large proportion of the maintained tactical range road system is also within the biennial EOD clearance area. The pattern of moderate to complete levels of physical disturbance of soils and vegetation within the new biennial EOD clearance

areas was established by the annual clearances that occurred in these same areas from 1975 to 2007. Target construction and maintenance, ordnance deliveries, and EOD activities within the biennial clearance areas would be expected to continue this established pattern of disturbance, although the 50 percent reduction in the frequency of EOD clearances will reduce the pace of disturbance and may allow for some increase in revegetation. The biennial EOD clearance areas of the tactical and manned ranges in aggregate encompass about 10,900 acres, compared to the about 25,500 acres that were previously cleared annually.

The decennial clearance area is located beyond the outer perimeter of the biennial clearance area and generally coincides with the area that was formerly cleared annually from 1975 to 2007. However, because some targets have been retired in recent years, today's decennial clearance area equates to approximately 23,000 acres combined for the three tactical ranges. This is about a 75 percent reduction compared to the about 92,000 acres that were cleared every 5 years prior to 2001 and about a 45 percent reduction compared to the about 42,000 acres that were cleared every 5 years after 2001 until July 2007.

Compared to the current biennial clearance area, the density of ordnance impacts and EOD vehicle transects is much reduced in the decennial clearance. Soil and vegetation disturbance within the former annual clearance areas was classified as moderate to complete (U.S. Department of the Air Force 1999). However, the new decennial clearance areas occupy the exterior portion of the former annual clearance areas beyond the areas where targets are located. Therefore, the new decennial clearance areas are located in the portions of the former annual clearance areas where soil and vegetation disturbance is classified as generally being moderate (U.S. Department of the Air Force 1999). Looking forward, the low frequency of decennial clearances suggests that some soil stabilization and revegetation may be expected that will reduce the overall patterns of soil and vegetation disturbance that currently exist in these areas.

The environmental effects of long-term military training use of each of the five long-term military use areas (active intensive use to negligible use category) areas have been addressed in detail in the *Legislative Environmental Impact Statement for the Renewal of the Barry M. Goldwater Range* (U.S. Department of the Air Force 1999), the *Final Yuma Training Range Complex Supplemental Environmental Impact Statement* (U.S. Marine Corps 2001), the *Environmental Impact Statement for the Integrated Natural Resources Management Plan (INRMP) for the Barry M. Goldwater Range* (Departments of the Air Force, Navy, and Interior 2006). These effects are most readily characterized by the degree to which authorized military use of the tactical ranges has resulted in physical disturbance to the ground surface and vegetation in each of the five use areas. The recently implemented INRMP and Integrated Cultural Resources Management Plan (ICRMP) prescribe management measures for conserving

and, where appropriate, restoring and protecting natural and cultural resources consistent with the military purposes of the range.

The operational concept behind the proposed parameters for implementation of proposed target reconfigurations is based on the fact that most of the foreseeable reconfigurations would occur within the target and ordnance impact areas on each tactical range that have received the longest-term and most intensive historical use and that continue to be used for these purposes. Further, the types of materials and construction methods used to reconfigure target simulations would change little, if at all, from the materials and construction methods used to maintain the existing targets. In most cases, there also would be little or no change in the types of ordnance delivered on the reconfigured target, and the distribution of ordnance delivery impacts would be the same or closely similar to the distribution of ordnance delivered on the previous target. As a result, the likely environmental effects of most reconfigured targets would not be expected to be distinguishable from the long-prevailing environmental conditions established by their predecessor targets. Few target reconfigurations are expected to be planned for locations that are completely outside of the historical target use areas of the tactical ranges.

Thus, rather than considering the likely environmental effects of all proposed target reconfigurations on a case-by-case basis, the environmental assessment and approval process would be accomplished by (1) assessing the extent and scale of environmental effects that would be likely to occur from proposed target reconfiguration actions in each of the five long-term military use areas, and (2) determining the degree to which additional environmental review, if any, would be necessary before target reconfigurations could be implemented in each of the five long-term military use areas. The environmental review procedures would be gauged relative to the particular environmental conditions in each military use area. For example, if the central point of a new target were located 1,000 feet from the perimeter of a previously established target and the target area extended 100 feet from the center point, part of the target would be in the active moderate use category and part would be in the infrequent moderate use category. Documentation to comply with NEPA would be required to assess the effects of the target, but the infrequent moderate use areas may require a more in-depth review than the active moderate use areas that have already been surveyed for natural and cultural resource concerns.

Figure 2-8 provides a scaled example of an actual target simulating an airfield in North TAC and the current and past EOD clearance areas associated with this. As shown in the figure, clearance requirement changes are reducing the overall area routinely affected by military operations. Clearance is typically conducted in rectangular patterns based on the clearance radius because EOD trucks spaced at about 100-foot intervals are driven in a line-abreast formation along parallel transects that cross the area surrounding each target that is potentially contaminated with

ordnance. However, due to mountainous terrain, EOD clearances are not always performed to the specified distance because some ordnance is too heavy to carry by hand and trucks cannot traverse the rough terrain and would cause more environmental damage by doing so.

The environmental review parameters proposed for target reconfigurations in each of the five long-term military use areas include the following.

1. **Active Intensive Use Category.** Very limited environmental compliance review would generally be required prior to implementing a target reconfiguration if the proposed reconfiguration were (1) at an existing tactical range target position or within the current biennial EOD clearance area (for example, see the black hatched area immediately surrounding the simulated airfield on Figure 2-8); (2) the footprints of the decennial EOD clearances would remain within active decennial footprints or the pre-2007 annual EOD footprint (as noted previously, these EOD clearance areas may differ slightly, but extend to 1,000 feet from the existing or former target locations); (3) there would be no change from training ordnance to live ordnance; (4) the weapons surface danger zone, which provides a safety buffer, would not change an existing land use; and (5) the new target simulation would be constructed using existing methods and materials.

   In general, the type of target reconfiguration that satisfies these parameters differs little from target maintenance and the environmental effects would not be expected to change from ongoing operations. In situations where target locations are moved, but still meet the defined parameters, it is anticipated that compliance with Section 106 of the National Historic Preservation Act (NHPA) would be required as described in the regulation at 36 CFR Part 800. The Section 106 process includes identification and evaluation of historic properties, assessing effects, and resolving adverse effects. By considering cultural resources early in the planning process, when options for the proposed action are being developed and avoidance of impacts to cultural resources is easiest, most proposed actions can be designed to avoid impacts. For example, one option may be to select another target position to avoid the direct effect. If no other position is suitable, the proposed action would be designed to minimize, mitigate, or, if possible, avoid adverse effects. Compliance with Section 7 of the Endangered Species Act (ESA) also would be required.

   A simple target reconfiguration example of this type would be changing a SAM site to a command and control center simulation. A complex example would be changing a simulated airfield with adjacent aircraft parking revetments and hangars to simulate an urban setting where the former runway, taxiways, and aircraft parking areas become streets with vehicles and adjacent buildings.

2. **Active Moderate Use Category**. Minimal environmental compliance review would generally be required prior to implementing a target reconfiguration if the proposed reconfiguration were (1) positioned in a new location within the footprints of the active biennial EOD clearances or the pre-2007 annual EOD footprint (for example, see the black- and yellow-hatched areas on Figure 2-8), (2) the new biennial EOD clearance for the target would remain within areas of previous EOD clearance, (3) there would be no change from training ordnance to live ordnance, (4) the weapons surface danger zone would not change an existing land use, (5) the new target simulation would be constructed using existing methods and materials, and (6) the new location would not adversely affect an inventoried archaeological site or a listed species. Appropriate consultation and coordination in compliance with Section 106 of the NHPA would be required. Consultation with the USFWS, Ecological Services Office, would be necessary if the relocation may affect a species protected by the Endangered Species Act.

   The alternative Sensor Training Area location within South TAC, which is Alternative 1.B described in Section 2.2.3 of this EIS, would be an example of the type of future target reconfiguration that would fall into this category because the new target would be within an existing active target position, but it would be larger than the current target, thus changing the EOD clearance footprint from the existing condition.

3. **Infrequent Moderate Use Category**. Some environmental compliance review would be required, as provided in Parameter 2, prior to implementing a target reconfiguration if a proposed reconfiguration were to be positioned in an infrequent moderate use area (see the green-hatched area on Figure 2-8, for example). A proposal to deliver live ordnance on the target, to change existing land use based on the weapons surface danger zone, or to construct the new target simulation using other than existing methods and materials would likely further increase the need for a more in-depth environmental review. Appropriate consultation and coordination in compliance with Section 106 of the NHPA would be required. Consultation with the USFWS, Ecological Services Office, would be necessary if the relocation may affect a species protected by the ESA.

   An example of a target change described in this EIS that would fit this environmental review and approval category would be the reconfiguration of the Manned Range 3 left conventional target for helicopter gunnery training described as Alternative 6.A in Section 2.7.1. The proposed reconfiguration would establish new targets near an existing active target, but would result in an EOD clearance footprint that exceeds the current biennial and decennial footprints of the current target.

4. **Reserve Light Use Category**. The need for further review under NEPA and other applicable laws would be more likely than under the conditions listed for Parameter 3 if a proposed reconfiguration were to be positioned in a new location within a reserve light use area (see the blue-hatched area on Figure 2-8, for example). A proposal to deliver live ordnance on the target or to construct the new target simulation using other than existing methods and materials would further increase the need for an in-depth environmental review. Appropriate consultation and coordination in compliance with Section 106 of the NHPA would be required. Consultation with the USFWS, Ecological Services Office, would be necessary if the relocation may affect a species protected by the ESA.

   Alternatives 3.A and 3.C described in Section 2.4.2 and 2.4.4, respectively, in this EIS would be examples of future targets that would fall in this environmental review and approval category because these locations are within the pre-2001 5-year EOD clearance areas, which is considered the reserve light use category. While portions of the moving vehicle target system track would be within a current target area where greater prior military disturbance has occurred, portions of the proposed tracks would be in less disturbed areas so the entire target area would need the more detailed review under NEPA and other applicable laws.

5. **Negligible Use Category**. The need for additional environmental compliance review, as described in Parameter 2, would be necessary for the NEPA compliance document if a proposed reconfiguration were to be positioned in a new location within a negligible use area (see the area beyond that colored, hatched areas on Figure 2-8, for example). A NEPA compliance document would also be necessary if a training ordnance target were reconfigured for live ordnance use. Appropriate consultation and coordination in compliance with Section 106 of the NHPA would be required. Consultation with the USFWS, Ecological Services Office, would be necessary if the relocation may affect a species protected by the ESA.

   For example, the locations proposed for the Sensor Training Area underlying the Air-to-Air Range and within North TAC (Alternative 1.A described in Section 2.2.2 and Alternative 1.C described in Section 2.2.4) would fall into this fifth environmental review and approval category because the proposed target would be in an area that has not previously been subjected to EOD clearance. Another proposed action in this EIS that would fall into this category would be Alternative 4.A to establish a new air-to-ground missile target; while the location would be within an area previously subjected to more frequent EOD clearance, the proposed target would be for live ordnance and thus require NEPA compliance documentation.

The number of target complexes and/or individual targets that would ultimately be reconfigured within each tactical range has not been specified. The process of reconfiguring each range would necessarily be an unfolding reflection of evolving real-world defense threats and combat conditions, and an ongoing assessment of the training objectives achieved with each evolution of target renovations. Target reconfigurations would likely occur in increments over 10 or more years rather than over just a few years. Changes to the overall configurations of the tactical ranges would be expected to be modest, however, with most major target complexes (such as the simulated airfields) generally remaining in their current orientations. Still, the realism and relevance of most target complexes would be enhanced by updating individual target simulations, such as SAM launcher and radar sites, to reflect the current technology of potential adversaries and, where needed, repositioning individual targets.

New individual targets or target complexes also likely to be added would include simulations of features such as airfields, modern aircraft storage bunkers, cave openings, targets with vertical development (multi-story buildings), urban complexes, industrial sites, and communication sites. Some of the current targets within BMGR East simulate these types of facilities, but may need to be enlarged to increase their complexity to meet new mission objectives and support more realistic training with PGMs. Other existing targets simulate features that were significant to the tactical conditions of the Vietnam War and Cold War eras but are no longer relevant for either current or future training purposes. These types of targets may be removed entirely or rebuilt to simulate current battlefield scenarios. Thermal reflective panels and/or heated features would likely be added to some targets to support training with infra-red target detection sensors and infra-red guided munitions. Some lighted features would likely be incorporated in some targets, such as simulated buildings, to enhance night attack training.

Each of the three tactical ranges is closed to training use once a year for a 6-week period for EOD clearances, road maintenance, and target construction and repair. As has been the case historically, the construction activities needed to implement the proposed target reconfigurations would occur during these annual closure periods.

The expected reconfigurations of tactical range targets would likely realign the geographic distribution of some of the EOD clearance areas. Most of the targets that would be reconfigured would be located within either the new biennial or decennial clearance areas (for example, the black- and yellow-hatched areas on Figure 2-8), which combined are essentially equivalent to the former annual clearance areas (see yellow areas on Figure 2-7). Some currently active targets and biennial or decennial clearance areas would likely be inactivated as a result of the proposed target reconfiguration actions. Additionally, some reconfiguration actions would be at existing target sites, but could include enlarging some targets and their corresponding EOD clearance

areas. Some reconfigurations may require that targets be placed in or near former 5-year clearance areas used from 2001 to 2006 (that is, within 1 km of targets active during that period) such that up to an estimated 300 acres of the former 5-year clearance areas in each tactical range may become part of either a biennial or decennial clearance area.

If existing targets are abandoned, they would be subject to an EOD clearance operation to minimize safety risks by clearing away surface munitions and target debris. Materials that serve as target features (such as old vehicles and battlefield tanks, external fuel tanks, or wood structures) may or may not be removed at the time the target is abandoned. This would depend, in part, on the availability of resources to remove the features and the potential to redevelop the target site in the future.

When a specific target reconfiguration is proposed, it will be evaluated for environmental effects. Because there could be environmental effects that are specific to new target sites, or there could be environmental issues associated with construction or earthwork within an existing target site, follow-on documentation would be prepared as necessary to comply with NEPA and other environmental laws and regulations when specific target locations and configurations are determined.

In the case of Parameters 1 and 2, the reconfiguration would occur within the footprint of an existing target or within the current biennial EOD clearance area that extends 300 feet from inert targets and 500 feet from live ordnance targets. Because there is existing and ongoing disturbance within the target footprint and the EOD clearance area, the NEPA clearance could be considered addressed through this EIS for BMGR East range enhancements or a separate Categorical Exclusion. A review would be made to determine if the reconfiguration would comply with Section 7 of the Endangered Species Act, Section 106 of the National Historic Preservation Act, Section 404 of the Clean Water Act, and other environmental regulations; no reconfiguration activities would be initiated until compliance requirements are satisfied.

In the case of Parameters 3 and 4, in which the reconfiguration would occur within a former EOD clearance area that is no longer subject to active and ongoing military activity, the level of NEPA clearance would likely be a Categorical Exclusion or and Environmental Assessment. Target reconfigurations within areas described by Parameter 5 would be within existing military use areas, but where prior surface disturbance has been very limited so the type of NEPA document could potentially range from a Categorical Exclusion to an EIS.

With all future proposed target reconfiguration activities, the environmental requirements would be examined and decisions about what is required to comply with all environmental laws and regulations would be determined on a case-by-case basis. Considerations would include, but not

be limited to, existing data on known resources (such as cultural sites, suitable habitat for special status species, etc.), type of target being proposed (inert ordnance, live ordnance, strafe, no-drop electronic scoring system, etc.), and site condition (observable prior disturbance, amount of vegetative cover, etc.). Scoping with appropriate agencies may be conducted to ensure regulatory agencies concur with the Air Force's proposed environmental clearance activities.

Because additional environmental review and applicable environmental compliance would occur in advance of future target reconfiguration activities, potential impacts to environmental resources would still be addressed on a site-specific basis. In all cases, proposed reconfigurations would be reviewed for compliance with Section 7 of the ESA and Section 106 of the NHPA.

2.3.2 Alternative 2.B – No-Action Alternative

With the no-action alternative, aircrews would continue to use the existing targets within BMGR East and no targets would be reconfigured by enlarging existing targets or moving targets to new locations within current or former EOD clearance areas.

2.3.3 Alternatives Eliminated from Detailed Consideration

Rather than reconfiguring tactical range targets at BMGR East at this time, deploying BMGR East users to other ranges with more up-to-date target complexes could be considered when a target complex within BMGR East is found to be losing its relevancy. However, this strategy would be increasingly expensive in terms of costs and time for regular BMGR users to deploy to other ranges and would be completely unresponsive to the need to maintain the usefulness of BMGR East as a productive training resource. Therefore, this alternative was eliminated from detailed consideration.

2.4 PROPOSAL 3 – MOVING VEHICLE TARGET SYSTEM

2.4.1 Proposed Action Alternatives

The proposed action is to introduce the use of a moving vehicle target system to BMGR East. Various target platforms may be employed, but would essentially consist of a remotely operated, global positioning system (GPS) guided, unoccupied vehicle (such as a 4x4 pickup or sport utility vehicle) with an approximately 250-foot-long cable pulling a target. Some options being explored include disposable targets or a vehicle and target that are armored to resist damage when hit by ordnance. For safety, the vehicle pulling the target would be remotely monitored by trained personnel who would have the ability to stop the vehicle if necessary. The vehicle pulling the target would be fueled with gasoline that is brought to the site by fuel truck.

The proposed action is to have the tow vehicle pull the target on an oval-like track that allows the vehicle to turn around at the end of a straight-away and return to the starting point on a different

straight-away portion of the track. As shown in Figure 2-9, three alternative locations for a moving vehicle track have been identified as suitable from an operational perspective. Alternatives 3.A, 3.B, and 3.C are all located south-southwest of the Crater Mountains within North TAC. All alternative locations are within an existing tactical range to allow for aircraft maneuverability and targeting opportunities within a safe environment where access is controlled. In order to achieve the objective of a viable moving target, the track must be long enough to allow time for effective targeting with on-board sensors while also providing changes in direction and speed to complicate the targeting solution.

Each of these alternatives partially consists of an existing road, and surface grading will be required to create the remainder of the track sections. The track would be relatively flat and approximately 50 feet wide to provide for inaccuracies of the remote system. Road maintenance would be required on a recurring basis (approximately once a month) to remove munitions impact scars so that vehicle damage would be minimized and required vehicle speed could be achieved. Gravel may be added to the road during maintenance operations and water would be used to help compact the surface.

Approximately 85 percent of the time, the vehicle towing the target would be driven at speeds up to 45 miles per hour (mph). About 15 percent of the time, the vehicle would travel at speeds between 45 mph and 60 mph. It is estimated that the moving vehicle target system would be used in 30-minute blocks approximately 4 times per day, 5 days per week, and 46 weeks per year. Annually, it is estimated that the system may be driven up to 20,000 miles per year, although the average is likely to be about 11,500 miles a year.

Aircrews would attack the vehicle target from a perpendicular angle as it travels on the straight-away portions of the track. Most of the attacks would be strafing with inert practice ammunition, but other types of training ordnance could also be used such as rockets, small air-to-ground missiles, laser-guided or other bomb dummy units (BDUs[4]), and inert full-scale bombs (gravity, laser, or GPS guided). Bullets used in strafing do not require EOD clearance. However, if rockets, missiles, BDUs, or inert full-scale bombs are used, the road corridors used for the moving vehicle target system would be treated as linear targets and periodically cleared of ordnance in accordance with the established EOD clearance requirements and schedule for North TAC. This would include clearing expended ordnance within 50 feet of the track used for the moving target on an annual basis and to a radius of 300 feet of the track every other year.

[4] The BDU-33 is the most frequently used practice bomb on the BMGR. It is a small 25-pound bomb equipped with a phosphorous and black powder or titanium tetrachloride spotting charge. Although it is only a fraction of the size of bombs used in actual combat, the BDU-33 can be used in training to accurately simulate the delivery of full-scale weapons. The BDU-33 is composed of high-grade recyclable steel.

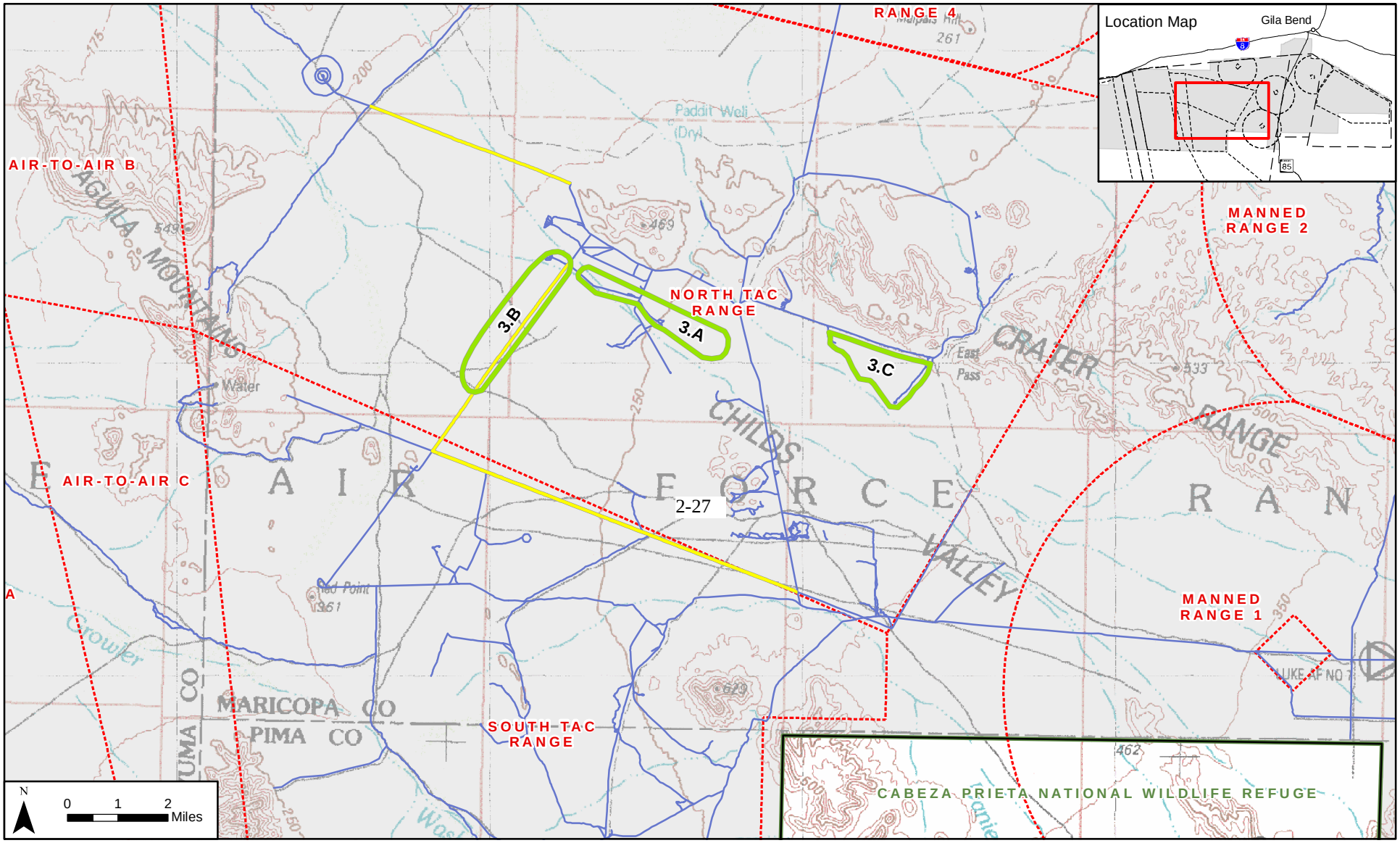


Figure 2-9

ALTERNATIVE LOCATIONS FOR MOVING VEHICLE TARGET SYSTEM

Training with the moving vehicle target system would be a scheduled event. Therefore, signs could be posted to notify other personnel that may drive on the track roads of the training exercise. In addition, the moving vehicle target system would have forward- and aft-looking cameras. Up to four additional cameras are anticipated to monitor traffic or other activity on the track and would be established near the track on towers with up to a 1,000-foot base. These would be used prior to the training event to help ensure the track is cleared of people, vehicles, and large wildlife. The cameras would also be used to help with scoring aircrew accuracy in engaging the target. Special attention would be given to grading the track roads during maintenance periods to ensure that the moving vehicle target system would not be stopped or diverted by an uneven or impassable road bed.

Because the action alternatives are within the current range of Sonoran pronghorn, action would be taken to ensure no Sonoran pronghorn are in the vicinity of the target when it is used. The cameras that would be installed with this alternative would be adjustable and may be used to scan the area. To further ensure that impacts to Sonoran pronghorn are avoided, trained spotters would be deployed to the target area to ensure the area is clear of Sonoran pronghorn. The Air Force is consulting with the USFWS on the actions proposed in this EIS and additional mitigation measures, if required, may be identified through the consultation process.

2.4.2 Alternative 3.A – Proposed Action

Alternative 3.A, which is co-located with Target 104/106 (the old main airfield) is the preferred alternative. The total length of the Alternative 3.A track would be approximately 7.3 miles. Much of the area has been previously disturbed for target features associated with the Target 104/106 complex.

2.4.3 Alternative 3.B

Alternative 3.B is located west of and adjacent to the road that provides primary ground access to interior locations in North TAC, including the Target 104 complex. The total length of the Alternative 3.B track would be approximately 7.3 miles. This area has not been previously disturbed for simulated target infrastructure.

2.4.4 Alternative 3.C

Alternative 3.C is located southeast of the North TAC simulated rail yard and west of the double-bladed road that forms the eastern boundary of NTAC. The total length of the Alternative 3.C track would be approximately 5.4 miles. This area has not been previously disturbed for simulated target infrastructure. This alternative location is highly susceptible to flash flooding and erosion.

2.4.5 Alternative 3.D – No-Action Alternative

With Alternative 3.D, the no-action alternative, no moving vehicle target system would be introduced at BMGR East. Existing roads within North TAC would not be modified to form tracks for moving vehicle operations, but these existing roads would continue to be used for other military operations and support functions. Cameras would not be established along the proposed tracks. Aircrews would need to train at other ranges to become proficient in attacking a moving vehicle target.

2.4.6 Alternatives Eliminated from Detailed Consideration

Three existing straight road segments within North TAC were considered as possible alternatives. These included the road to Target 101, the North TAC west perimeter road, and the double-bladed road. To use these roads, turn-around points, likely in a tear-drop shape with about a 300-foot-diameter cleared area, would have been established at either end of the roads. These roads were eliminated from detailed consideration because they are routinely used for ongoing operations and maintenance. Having the roads also serve as the path for a moving target would have limited their use for range operations and maintenance, and would have resulted in routine damage to the road from munitions impacts.

Establishing a moving vehicle target system within South TAC was considered. However, there are few existing roads that are not needed routinely for access and that are still long enough to form part of the track. The soils in South TAC are less stable so the track would need to be maintained more frequently. Compared to North TAC, Sonoran pronghorn are more likely to be in South TAC and constrain the opportunities to use the moving vehicle target system. Finally, South TAC is a longer distance away from the base for operations and maintenance crews.

Establishing a moving target at a range outside of BMGR East was also eliminated from detailed consideration for the same reasons that constructing an STA at a range other than BMGR East was eliminated from detailed consideration (see Section 2.2.6). That is, the cost of fuel, expending training time for transport, potential strain on personnel and family relationships, and the inability to reinforce the training skills through repetitive exercises over time make this alternative much less valuable than the alternatives being considered in detail.

2.5 PROPOSAL 4 – NEW TARGET FOR AIR-TO-GROUND MISSILES

2.5.1 Alternative 4.A – Proposed Action

BMGR East has long supported training with air-to-ground missiles for the aircrews of fixed-wing and rotary-wing aircraft. Both inert (practice munitions that are not armed with high explosives warheads but may contain a small spotting charge that produces flash and smoke to

reveal where the round has struck) and live (exploding) air-to-ground missiles are authorized for use at BMGR East but only against designated targets. There is currently one live missile target and one inert missile target in North TAC and one live missile target and one inert missile target in East TAC (Figure 2-10).

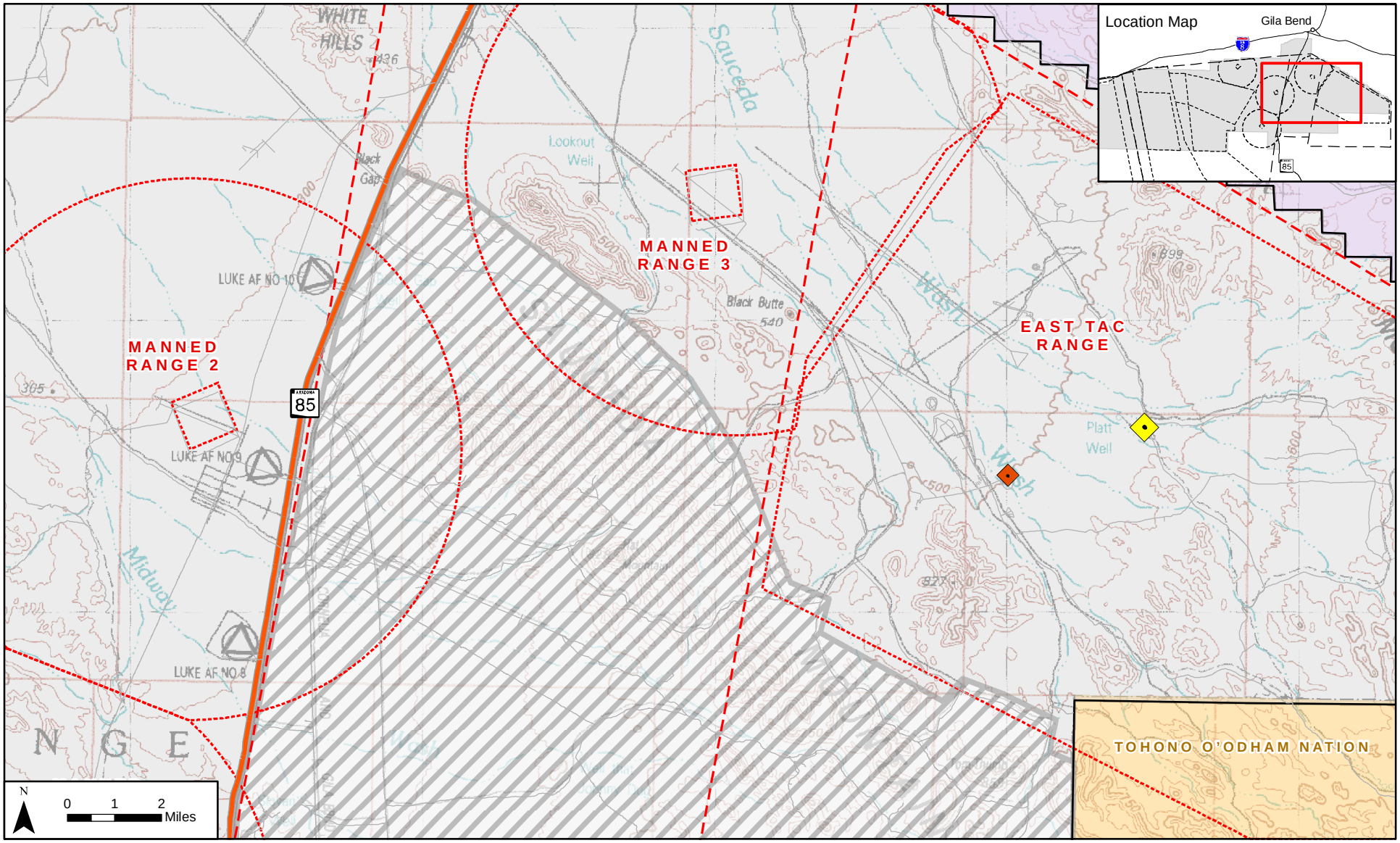
Two types of air-to-ground missiles, the AGM (air-to-ground missile)-114 Hellfire and the AGM-65 Maverick, are typically used at BMGR East. The Hellfire missile is a helicopter-launched, precision-guided missile designed to defeat tanks and other individual targets while minimizing the exposure of the launch vehicle to enemy fire. Both live and inert Hellfire missiles are used at BMGR East. The AGM-65 Maverick is a tactical, air-to-ground guided missile designed for close air support, interdiction, and defense suppression missions. The A-10 and F-16 aircraft are designed to carry as many as six Mavericks. Mavericks can be launched from altitudes from tree-top level to above 10,000 feet and can hit targets ranging from a distance of a few thousand feet to 13 NMs at medium altitude (U.S. Department of the Air Force 2007a). The Maverick missiles used at BMGR East are live missiles.

The proposed action is to develop a second live missile target in East TAC in a location that would support attacks from multiple directions and optimal altitudes. The existing live missile target is adequate for training with Hellfire missiles, but attacks on this target with Maverick missiles can only be approached from a couple of directions and the target is also constrained to low release altitudes by its position near the southwestern boundary of East TAC. The proposed live missile target would be more centrally positioned to allow attacks with Maverick missiles from a wider variety of headings and optimal altitudes (Figure 2-10). Normal attack altitudes would be in the range of 1,000 to 1,500 feet AGL, but could be as low as 100 feet AGL. The target would generally include plywood features constructed to simulate combat vehicles or other battle scene scenarios; hits on these targets would only be scored visually. While the target could be used at night, live sorties at night would be rare (estimated at no more than 16 per year). The proposed target location is within prior EOD clearance areas.

The existing air-to-ground missile target would be retained for Hellfire or other munitions training, but would be retired from live Maverick use.

2.5.2 Alternative 4.B – No-Action Alternative

With the no-action alternative, the existing live air-to-ground missile target in East TAC would continue to be used for both Hellfire and Maverick missiles and an additional air-to-ground missile target for Maverick missile use would not be developed.



Proposed Air-to-Ground Missile Target

Existing Air-to-Ground Missile Target

Restricted Airspace Boundary

Subrange Airspace Boundary

General Public Access with BMGR Permit

BMGR Boundary

Highway

Sonoran Desert National Monument

Tohono O'odham Nation

Figure 2-10

EXISTING AND PROPOSED AIR-TO-GROUND MISSILE TARGET LOCATIONS

2.6 PROPOSAL 5 – LOWERING FLIGHT TRAINING ALTITUDE OVER A PORTION OF THE CABEZA PRIETA NATIONAL WILDLIFE REFUGE

2.6.1 Alternative 5.A – Proposed Action

The proposed action is to renegotiate a 1994 MOU to provide for lowering the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL to enable more realistic attack approaches to targets in South TAC and low-altitude intercepts in the air-to-air range. Some low-level attacks originating from over the Cabeza Prieta NWR would also occur in association with training at the proposed STA if both the proposal to develop the STA and the proposal to lower the general floor over the refuge are implemented, although the STA would still add value even with only higher altitude approaches. The area that would be affected by Alternative 5.A would be entirely within R-2301E and would extend from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary, and south of the South TAC boundary to a distance of 15 NM, as shown in Figure 2-11. The R-2301E airspace from 500 feet AGL up to 1,500 feet AGL over the Cabeza Prieta NWR would be available to be scheduled for either day or night missions in association with R-2301E airspace above 1,500 feet AGL. Use of this low-level airspace block would be restricted to missions that require this airspace for realistic training. Because of the high airspeeds and abrupt maneuvers required of air combat training, nonparticipating aircraft (such as surveillance aircraft flown by the Border Patrol) would have to be restricted from the proposed low-level airspace block when it is scheduled for training use.

The entire Cabeza Prieta NWR is overlain by the R-2301E and R-2301W restricted airspaces from the surface to 80,000 feet MSL. However, the general operating floor for military aircraft overflying the refuge was voluntarily set at 1,500 feet AGL and above in a 1951 agreement between the Air Force and the Department of the Interior. The general operating floor provided in the 1951 agreement, and as renewed in several superseding MOUs, has remained in effect through to the present. However, in the 1975 edition of the MOU between the Air Force, Navy, and USFWS, the operating floor provision was amended to state that "…military aircraft flying over the Game Range shall maintain a minimum altitude of at least 1,500 feet above ground level, except along mutually approved low-level corridors." The low-level flight provision was included in the MOU to support training missions requiring ingress to BMGR East at low altitudes. Three low-level military training routes (MTRs, identified as VR-260 and VR-263, which converge, and SR-244), with floors of 500 feet AGL, were subsequently designated across the northeastern portion of the refuge to support Air Force training missions and a mix of east-west corridors with floors of 200 feet AGL for fixed-wing aircraft and 50 feet AGL for

helicopters were eventually established overlying the refuge to accommodate Marine Corps training needs.

Both the Air Force MTRs and the Marine Corps low-level corridors continue to be in effect. The current MOU regarding use of the airspace over the Cabeza Prieta NWR, which reaffirms the basic low-level flight provisions of the 1975 MOU, was placed in effect in 1994. The MTRs are typically in use on a daily basis. The low-level corridors used by the Marine Corps are typically used once daily during the twice-a-year WTI training course for a period of about 2 weeks, but they may be activated more frequently.

Authorization for the BMGR was renewed by Congress through the MLWA of 1999. Congress used the MLWA of 1999 to remove about 822,000 acres of the Cabeza Prieta NWR surface from the land withdrawal and reservation for the BMGR but, in another provision of the Act, Congress also found that:

> Continued use of the Cabeza Prieta National Wildlife Refuge and Cabeza Prieta Wilderness by the Marine Corps and the Air Force to support military aviation training will remain necessary to ensure the readiness of the Armed Forces [P.L. 106-65 § 3032(a)(2)].

Consistent with this finding, the MLWA of 1999 stipulates [in P.L. 106-65 § 3032(b)(1)] that:

> The Secretary of the Interior, in coordination with the Secretary of the Navy and the Secretary of the Air Force, shall manage the Cabeza Prieta National Wildlife Refuge and Cabeza Prieta Wilderness--
>
> > (A) for the purposes for which the refuge and wilderness were established; and
> >
> > (B) to support current and future military aviation training needs consistent with the November 21, 1994, memorandum of understanding among the Department of the Interior, the Department of the Navy, and the Department of the Air Force, including any extension or other amendment of such memorandum of understanding under this section.

The MLWA of 1999 further provides [in P.L. 106-65 § 3032(d)(1)(A)] that:

> When determined by the Secretary of the Navy or the Secretary of the Air Force to be essential to support military aviation training, the Secretary of the Navy, the Secretary of the Air Force, and the Secretary of the Interior shall negotiate amendments to the memorandum of understanding referred to in subsection (b)(1)(B) in order--

(i) to revise existing or establish new low-level training routes or to otherwise accommodate low-level overflight.

This last provision provides the authority to amend the 1994 MOU to support additional low-level flight training, including that outside of flight corridors, over the Cabeza Prieta NWR when such training is necessary to ensure the national defense readiness. In order to implement Alternative 5.A, the 1994 MOU would have to be renegotiated consistent with the MLWA of 1999.

It is estimated that approximately 19,000 fixed-wing sorties currently use the R-2301E airspace overlying the Cabeza Prieta NWR annually. Most of these sorties would continue to be flown at altitudes at or above 1,500 feet AGL, but approximately 4,200 sorties currently fly to the 1,500-foot altitude floor and about another 2,000 sorties approaching targets in South TAC accounted for in the count of medium altitude sorties actually enter the low altitude arena during tactical operations. Therefore, it is estimated that on an annual basis, between 4,200 and 6,200 fixed-wing sorties require the use of the airspace from 500 feet to 1,500 feet AGL over the Cabeza Prieta NWR to provide tactically realistic training, but are constrained from doing so under the current provisions of the 1994 MOU.

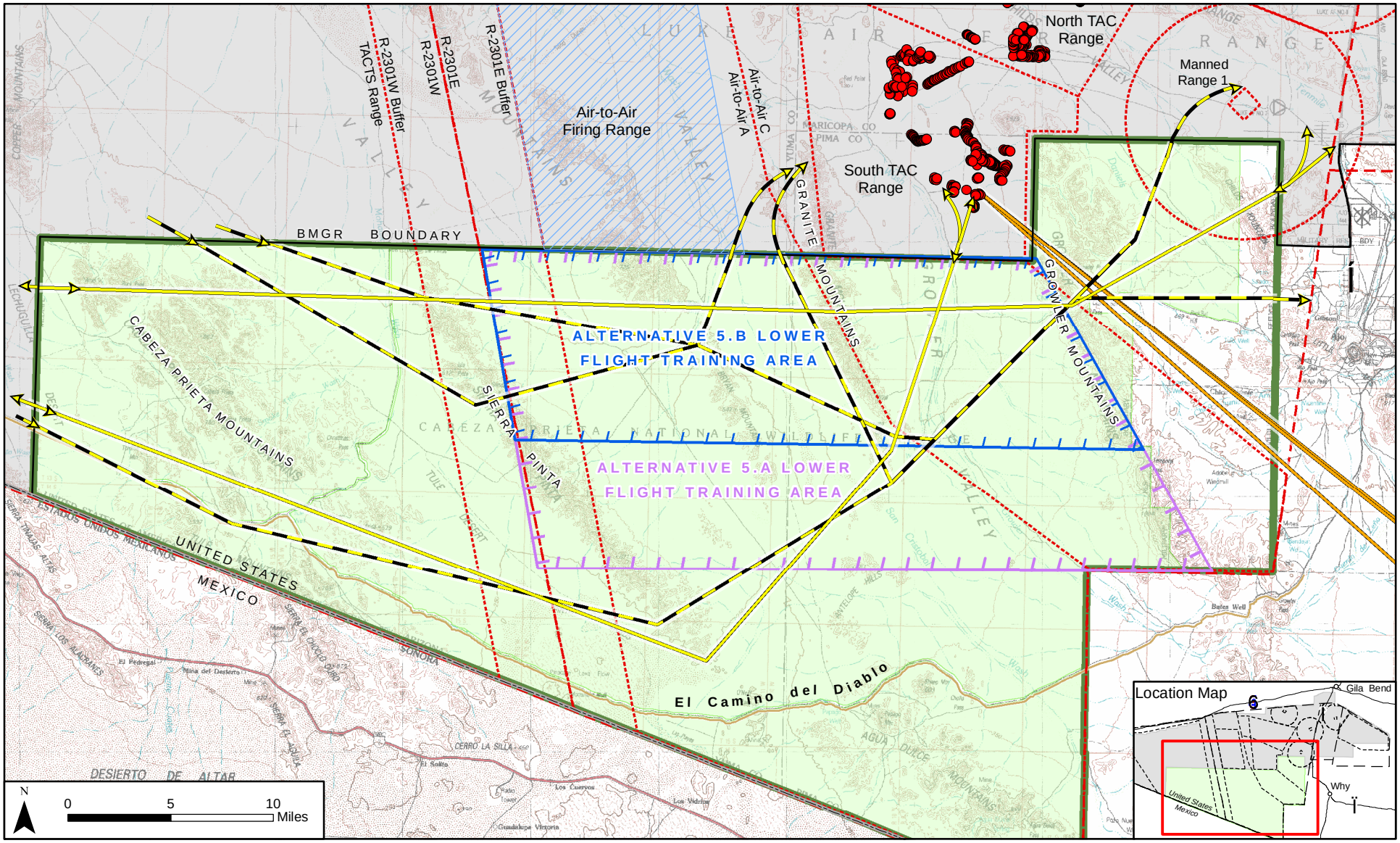
It should be noted that sortie numbers and altitudes fluctuate routinely from year to year based on training needs. For example, since flight data were collected in the late 1990s for the analysis of effects associated with the renewal of the BMGR land withdrawal, the total number of sorties flown has decreased, but about 30 to 40 percent more of the current sorties are being flown at the lower altitudes. Fluctuations are also likely to occur in the future, but the type of change cannot be predicted.

2.6.2 Alternative 5.B

Alternative 5.B would be similar to Alternative 5.A except that the lowered flight floor area would extend 8 NM south of South TAC rather than 15 NM to the south as proposed in Alternative 5.A (see Figure 2-11).

2.6.3 Alternative 5.C – No-Action Alternative

With the no-action alternative, the 1994 MOU would not be renegotiated and military aircraft would continue to fly at altitudes of 1,500 feet AGL or higher when in the airspace overlying the Cabeza Prieta NWR except for those authorized flights along mutually designated low-level corridors.



- Target
- Air-to-Air Firing Range
- Restricted Airspace Boundary
- Subrange Airspace Boundary
- Alternative 5.A Lower Flight Training Area
- Alternative 5.B Lower Flight Training Area
- WTI Low-level Fixed-wing Aircraft Flight Track
- WTI Low-level Rotary-wing Aircraft Flight Track
- Military Training Route
- El Camino del Diablo (non-wilderness)
- Cabeza Prieta National Wildlife Refuge
- Wilderness Area
- BMGR Boundary

Figure 2-11

LOWERING FLIGHT TRAINING AREA OVER CABEZA PRIETA NATIONAL WILDLIFE REFUGE

2.6.4 Alternatives Eliminated from Detailed Consideration

Alternatives for low-level approaches to the southern targets in South TAC were considered. However, the shape and dimensions of South TAC and the R-2301E airspace are such that the southernmost targets in this range must be approached from the south for certain types of low-angle weapons deliveries in order to provide (1) a low-level approach to the target of sufficient length over relatively flat ground and within restricted airspace and (2) preferably an attack heading that is oriented such that the safety fan for the munitions employed remains within South TAC or other parts of BMGR East. Although the MLWA of 1999 provides that portions of the Cabeza Prieta NWR may be used as safety buffer areas for BMGR training operations, the preference is to minimize the extent to which the refuge would be subject to the impacts of off-target weapons that would necessitate the need to close portions of the refuge to public use.

An east-to-west attack heading would keep the weapons safety fan inside of BMGR East but was eliminated from further consideration because it would require that the approach to the target be initiated outside of R-2301E, which would still require flight down to 500 feet AGL over the Cabeza Prieta NWR, and would require aircrews to descend rapidly after they crossed the Growler Mountains to reach the required low-angle of attack prior to reaching the weapon release point.

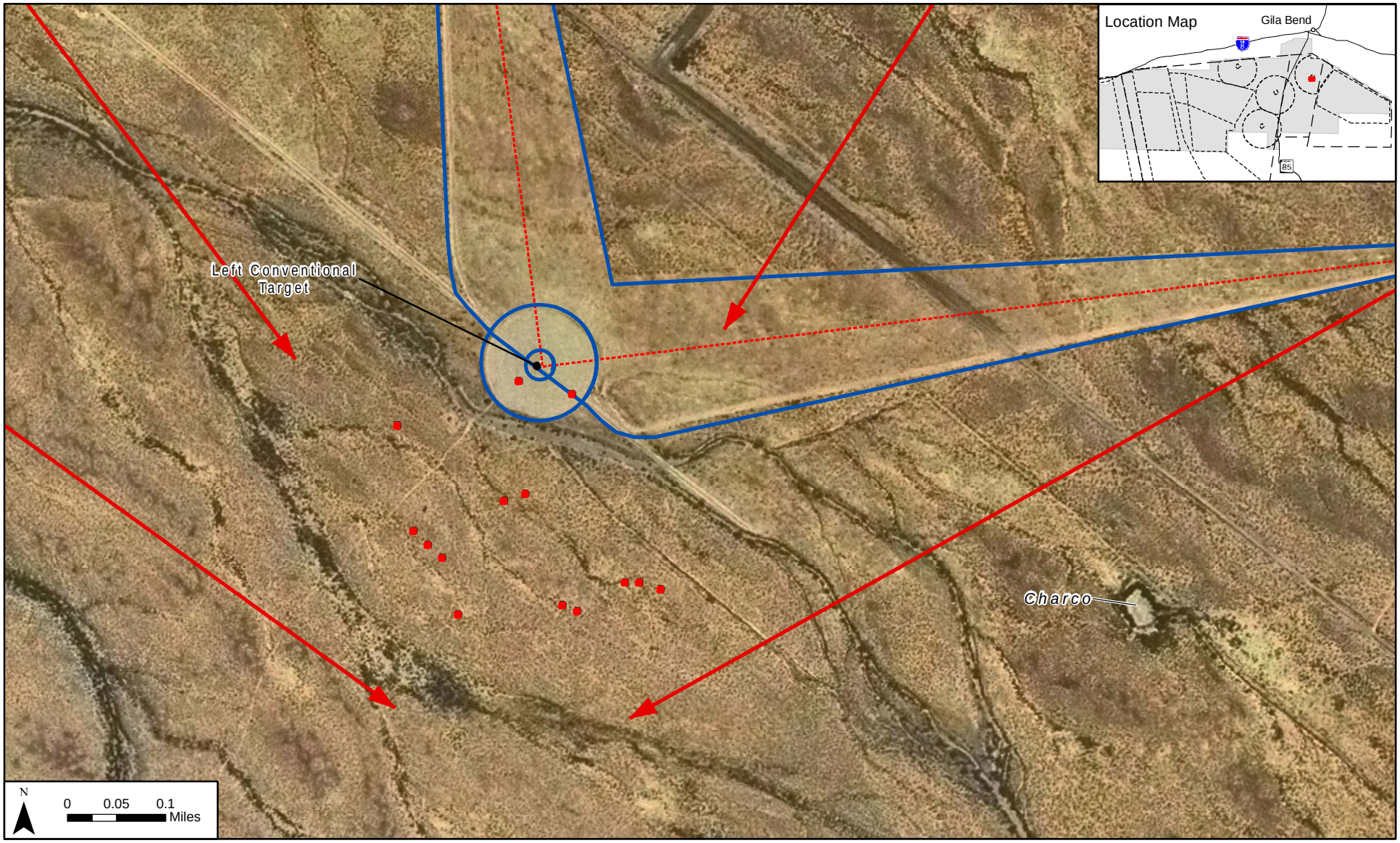
A west-to-east attack heading would provide an approach to the target within restricted airspace, but was eliminated from further consideration because it would require aircrews to descend rapidly after they crossed the Granite Mountains to reach the required low-angle of attack prior to reaching the weapon release point and would extend the weapons safety fan to the east into the Cabeza Prieta NWR.

A north to south attack heading would provide the needed low-level approach to the target within restricted airspace, but was eliminated from further consideration because it would extend the weapons safety fan to the south into the Cabeza Prieta NWR.

2.7 PROPOSAL 6 – RECONFIGURE MANNED RANGE 3 FOR HELICOPTER TRAINING

2.7.1 Alternative 6.A – Proposed Action

With Alternative 6.A, an area of approximately 400 acres in the southern portion of Manned Range 3, including the left conventional target south of the tower, would be converted into a helicopter gunnery range. The fixed, moving, and pop-up targets would provide more appropriate training for the Army National Guard and other rotary-wing units that train at BMGR East (Figure 2-12). It is anticipated that the 56 FW/RMO would initially purchase and place



- Proposed Pop-up Targets
- Manned Range 3
- Helicopter Attack Profile
- Axis of Fire
- Restricted Access Area
- Restricted Airspace Boundary
- Subrange Airspace Boundary
- General Public Access with BMGR Permit

Figure 2-12

PROPOSED RECONFIGURATION OF THE MANNED RANGE 3 LEFT CONVENTIONAL TARGET FOR HELICOPTER GUN TRAINING

about 15 to 25 pop-up systems. The pop-up systems may collectively consist of approximately 75 total silhouettes of armored personnel carrier or human facade targets along with about eight static vehicles and four containers (8-feet wide by 20-feet long by 8-feet high). Installation of the targets would require some ground disturbance in specific areas. Power is available on site so no new electrical line would need to be established.

Targets would be strafed with small munitions (such as .50 caliber [.50-cal]) to avoid shredding the targets. EOD clearance would be conducted prior to establishing the targets. Once targets are established, EOD clearance would typically consist of clearing the roads as part of routine maintenance. Weapons would be deployed to the south, southwest, and southeast with the Sauceda Mountains serving as a backdrop to retain errant strikes or munitions that ricochet.

The target complex would be used for daytime and nighttime training missions. Nighttime operations would be expected to occur on approximately 40 nights per year, which is comparable to the existing helicopter nighttime use at Manned Range 3. Helicopters would typically be flown at altitudes of 300 to 1,000 feet AGL. While there is an existing landing pad at Manned Range 3 that could be used, take offs and landings are not anticipated in the course of the training that would be associated with the proposed reconfiguration of the range.

2.7.2 Alternative 6.B – No-Action Alternative

Manned Range 3 would not be reconfigured with Alternative 6.B. Targets would not be added or removed and the range would continue to be used by fixed and rotary-wing aircraft.

2.7.3 Alternatives Eliminated from Detailed Consideration

Manned Ranges 1, 2, and 4 were considered as alternative ranges that could be reconfigured for helicopter training, but all were eliminated from detailed consideration because Manned Range 3 is operationally superior for this proposed action. Manned Range 3 receives the least amount of fixed-wing use compared to the other manned ranges, and it is close enough to the helicopter bases to allow training exercises without refueling. Manned Range 1 is less suitable because of its close proximity to the Cabeza Prieta NWR and because helicopters would need to refuel to train at this range. Manned Range 2 is too close to State Route 85 for parallel gunnery and is beyond the optimal training range for helicopters. Manned Range 4 is too close to the restricted airspace boundary to allow aircraft to fire to the north, and would constrain target approaches from the north for south-firing gunnery. In addition, the nuclear circle target at Manned Range 4 is to the south so there is less available space to reconfigure this range for a helicopter training range.

2.8 PROPOSAL 7 – ON-THE-GROUND TRAINING EXERCISES

2.8.1 Alternative 7.A – Proposed Action

With Alternative 7.A, CSAR teams, and potentially other small special tactics teams of approximately 10 or fewer troops, would use BMGR East for ground-based training activities. Training for CSAR or similar small team missions would involve clandestine insertions and extractions from helicopters or vehicles driven on existing range roads, and performance of cross-country land navigation and other on-the-ground exercises, such as shooting at targets, while traveling on foot. Targets for the on-the-ground training exercises may be made of wood, metal, stucco, mud, sea-land containers, concrete, or other materials; however, no native vegetation or other natural features would serve as targets. Targets would generally be established within the tactical ranges along existing roads. Teams may remain within BMGR East for several days and camp at night.

These training missions would typically involve two to six teams that would generally consist of four to six troops in each team, but could consist of up to 10 troops. The teams would conduct long-range, cross-country reconnaissance patrols on foot with the intent of remaining undetected. The reconnaissance patrols would be inserted into BMGR East by parachute drop or helicopter, or by utility or all-terrain vehicles using existing roads. Vehicles would be pulled off the road and parked within 50 feet of the road. No development of drop zones would be necessary to support parachute or helicopter insertions or extractions. Insertions and extractions generally would be limited to personnel, but could include small vehicles such as an all terrain vehicle that would be driven only on existing open roads.

The destination of these cross-country patrols could be anywhere within BMGR East, but the principal areas of insertion and extraction, particularly for CSAR and special tactics teams, would be in Area B with teams moving into the military target areas of East TAC. Area B is the Sauceda Mountains area of BMGR East (located southwest of East TAC and east of State Route 85) that is open to general public access with a BMGR permit (see Figure 2-1). Most of the maneuvers would occur in mountainous areas, such as the Sauceda Mountains west of East TAC. If any live-fire exercises were to occur within Area B, the exercise area would be controlled to exclude non-participants, including the general public. The duration of these training missions would typically be one to several days. It is estimated that there may be about 30 events per year lasting up to one day and four events per year that would include an over-night component.

In scheduling the small tactical team training exercises, the Air Force would consider data from the ongoing monitoring programs that track the general distribution of the Sonoran pronghorn herd. Monitoring and military activity restrictions protocol as established in Luke AFB

Operating Instruction 13-01, *Sonoran Pronghorn Monitoring*, would be applied to avoid or minimize team maneuvers within areas occupied by Sonoran pronghorn. In addition, ground personnel would be provided with video training regarding their responsibilities to conduct training in a manner that complies with environmental laws and regulations. Ground personnel would be provided with pre-coordinated locations, access, and allowable operations during maneuvers (such as walking, camping, length of time on the Range, etc.) to avoid or minimize environmental impacts.

Certain events, including the WTI course, could include up to 100 troops. These events would be infrequent (typically no more than two or three events per year) and would generally occur within the tactical ranges in areas of previous military ground disturbance. These larger-scale events would be less likely to involve land maneuvers that exceed about 5 kilometers (3 miles).

Units conducting tactical training on the ground would be self-contained and would carry out all trash or other items that they brought into the range (including parachutes). They would bury their human waste.

2.8.2 Alternative 7.B – No-Action Alternative

No new ground training exercises by CSAR or other units would occur with Alternative 7.B. Existing ground navigation and reconnaissance activities conducted by the Marine Corps and Navy Sea, Air, and Land Commandos (SEALs) in BMGR East for the WTI course or other operations would continue as these have been previously authorized and assessed for environmental effects, but no new training would be added.

2.9 PROPOSAL 8 – NEW TAXIWAY AND AIR TRAFFIC CONTROL TOWER AT THE GILA BEND AIR FORCE AUXILIARY FIELD

2.9.1 Alternative 8.A – Proposed Action

The proposed actions at the Gila Bend AFAF involve two key improvements to support airfield operations. One improvement would be to construct a taxiway parallel to the airfield runway to increase the safety and capacity of the airfield by eliminating the need for aircraft to taxi on the runway. The second improvement would be to construct a new air traffic control tower in an appropriate location that has the height needed to provide adequate observation of aircraft movements on the runway and taxiways and sufficient interior space to house the needed equipment. The location must provide the necessary visual field of view to safely control aircraft traffic on the airfield and in the airspace near the airfield. The new tower would replace the existing tower that was built in 1964. Locations being considered for the proposed air traffic control tower have been previously disturbed.

Taxiway

Runway 17/35 at Gila Bend AFAF has a north-south orientation. The proposed parallel taxiway would be constructed to the west of the runway (Figure 2-13). The taxiway would be constructed in accordance with Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*, 1 November 2001, change of 19 May 2006. Per UFC, the taxiway must be a minimum of 1,000 feet from the runway centerline.

The taxiway would be 75 feet wide and include a 50-foot shoulder on each side of the main taxiway. The existing runway, which is 8,500-feet long with 1,000-foot overruns on each end (10,500 feet in total length), would be tied to the proposed taxiway by expanding the ends of the runway arming areas. The dimensions of the arming areas would be expected to be 1,075 feet by 200 feet. Actual ground disturbance would be approximately 42 acres consisting of the dimensions of the taxiway (8,500 feet by 125 feet), plus the extension of the runway arming area to tie the taxiway to the runway. To comply with UFC, if may be necessary to relocate the existing helicopter landing pads. If required, the helicopter landing pads would be moved to a previously disturbed and environmentally cleared area. Should the proposed action to construct the taxiway be implemented, actual siting of the airfield features may be adjusted somewhat during final design, but the general location and features would be expected to remain as described.

Standard safety equipment for the taxiway would include lights for night operations. The start of construction would depend on availability of funding. Construction activities would be expected to be limited to daylight hours and would likely last about 12 months.

Construction activities would be expected to include clearing approximately 42 acres, establishing drainage on the site, constructing all pavements, installing lighting structures and systems, and painting taxiway markings. The types of construction equipment and vehicles likely to be used would include excavators, bulldozers, trucks, milling machines, asphalt pavers, and rollers. An asphalt batching plant would be established temporarily at a location within Gila Bend AFAF for the construction action. It is anticipated that the asphalt plant, other special equipment, and construction crews would be sourced from the Phoenix or Tucson metropolitan areas, although qualified companies from other locations would be free to compete in the open bid process to select a construction company. The size of the construction crew would depend on the contractor, but is estimated to consist of approximately 12 workers who would have to travel daily from a location outside of Gila Bend AFAF to the construction area.

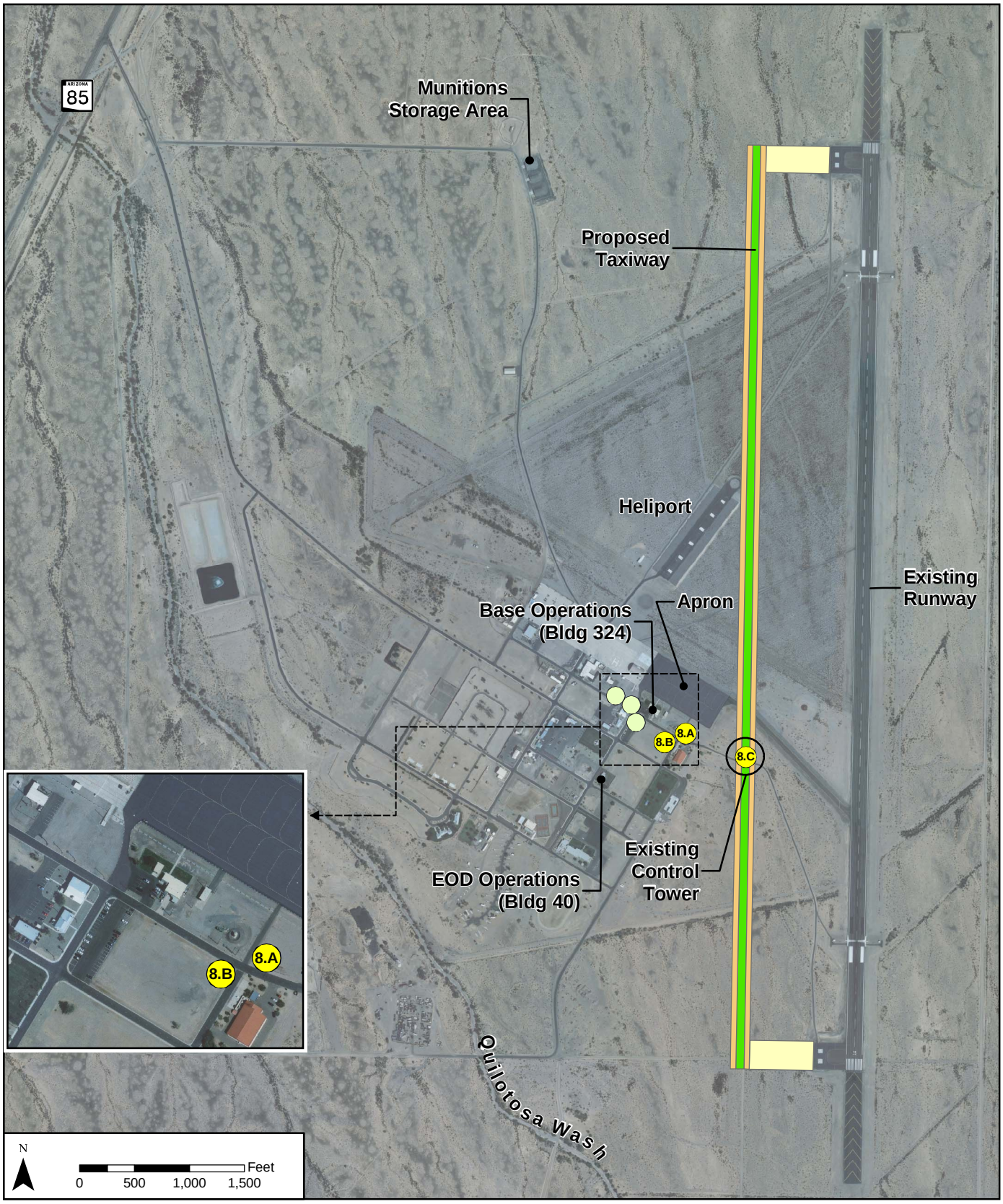


Figure 2-13

PROPOSED TAXIWAY AND AIR TRAFFIC CONTROL TOWER AT GILA BEND AFAF

Air Traffic Control Tower

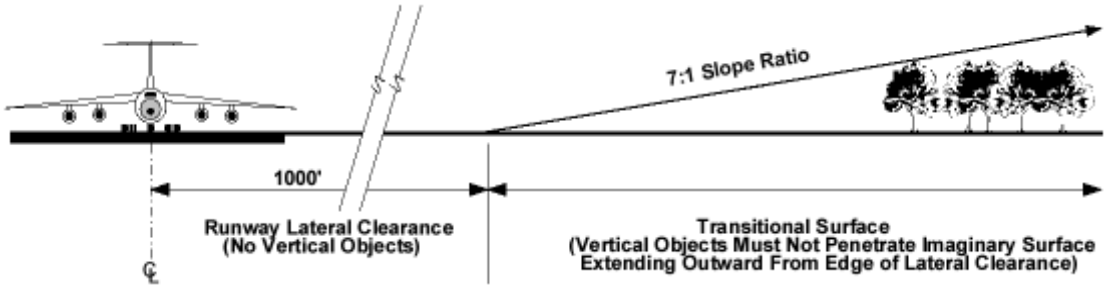
The proposed location for the new air traffic control tower is approximately 3,100 feet north of the Runway 35 threshold (the beginning of the portion of the runway that is usable for landing) and 1,600 feet west of the Runway 17/35 centerline (see Figure 2-13). This location is approximately 1,100 feet west of the existing tower. The proposed tower would be constructed in accordance with UFC 3-260-01 and would consist of five floors and the control tower cab, with the tower cab floor approximately 55 feet above ground level. The floors would be designated for the following purposes:

- first floor: mechanical yard, building controls, and telephone demarcation room;
- second floor: administrative office;
- third floor: lower electronics room;
- fourth floor: upper electronics room;
- fifth floor: mechanical room;
- top floor: control tower cab.

The proposed location for the tower with Alternative 8.A is preferred because it would provide the greatest degree of visibility for air traffic control operations compared to the other alternatives considered. The proposed tower height would meet the requirements of UFC 3-260-01 (Air Force Civil Engineer Support Agency [Preparing Activity], *et al.* 2006). The site has available power, water, sewer, gas lines, and telecommunications cables within 150 feet, which would minimize costs compared to having to run utilities for longer distances. Wastewater service would be integrated with the existing Gila Bend AFAF wastewater treatment system and the tower would be connected to the existing potable water service and supplemented with a point-of-use filter. The location would allow for the needed tower height without penetrating the 7:1 slope extending outward and upward from the primary[5] and approach-departure clearance surfaces[6] at right angles to the runway centerline or the runway centerline extended, as shown in the following diagram. This slope is referred to as an imaginary surface and is used in planning for compatibility of surrounding objects with airfield operations.

[5] **Primary Surface** (Fixed-Wing Runways) – An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end (Air Force Civil Engineer Support Agency [Preparing Activity], et al. 2006.).

[6] **Approach-Departure Clearance Surface –** An inclined plane or combined inclined and horizontal planes arranged symmetrically about the runway centerline extended. The first segment or the beginning of the inclined plane is coincident with the ends and edges of the primary surface, and the elevation of the centerline at the runway end. This surface flares outward and upward from these points (Air Force Civil Engineer Support Agency [Preparing Activity], et al. 2006.).



2.9.2 Alternative 8.B – Alternative Tower Site B

Alternative 8.B would include the taxiway construction as described for Alternative 8.A, but the air traffic control tower would be located approximately 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline. Alternative 8.B would result in a field of view that is impacted by power lines and other base structures.

2.9.3 Alternative 8.C – No-Action Alternative

With the no-action alternative, no taxiway would be constructed parallel to the runway and the existing control tower would continue to be used. Aircraft would continue to use the runway for taxiing.

By continuing to use the existing air traffic control tower, air controllers would not have the required visibility to the approach, touchdown zone of Runway 17/35 nor adequate depth perception in order to differentiate the number and type of grouped aircraft and ground vehicles. The tower would remain inadequate for equipment space requirements. The capacity of the airfield would continue to be constrained by these deficiencies.

2.9.4 Alternatives Eliminated from Detailed Consideration

No alternative locations were considered for the proposed taxiway, but some alternative locations for the air traffic control tower were considered and eliminated from detailed analysis.

Constructing a new control tower in the same location as the existing tower was considered but rejected because the current tower location does not meet Air Force siting requirements. The current location is within the airfield runway lateral clearance zone and requires a waiver. To comply with UFC, the taxiway would be constructed 1,000 feet from the runway centerline, and the existing tower would be within the footprint of the taxiway. Even if a waiver were sought to build the taxiway closer to the existing runway so that the tower would not be within the footprint of the taxiway, an interim tower facility would be needed while the new tower was being constructed.

Constructing a new control tower in at least four other locations had been considered. The environmental effects among these alternatives would be indistinguishable, and all would be more expensive to build than Alternatives 8.A and 8.B because they would either need to be substantially taller for adequate visibility or they lacked existing utilities. Some of the locations would conflict with existing power lines or other base structures and one would penetrate the 7:1 transition slope. The alternative locations considered include:

- approximately 3,500 feet north of the Runway 35 threshold and 1,200 feet east of the Runway 17/35 centerline;
- approximately 3,200 feet north of the Runway 35 threshold and 2,000 feet west of the Runway 17/35 centerline;
- approximately 3,400 feet north of the Runway 35 threshold and 2,100 feet west of the Runway 17/35 centerline; and
- approximately 3,470 feet north of the Runway 35 threshold and 2,250 feet west of the Runway 17/35 centerline.

2.10 PROPOSAL 9 – MANNED RANGE 1 TO RMCP 1 ROAD PAVEMENT

2.10.1 Alternative 9.A – Proposed Action

The Alternative 9.A proposed action is to pave approximately 7 miles of the road from the main tower within Manned Range 1 to the water well and adjacent RMCP 1 located near the boundary of the North and South TAC ranges to the west of Manned Range 1 (Figure 2-14). The current roadbed and drainage way is approximately 30 feet wide; however, only the center 16 feet would be paved. The total area to be paved would cover approximately 13.5 acres.

To prepare for the paving process, the road would be graded to obtain a smooth and level surface with a slight crown to facilitate drainage. It would not be necessary to build up the roadbed by first adding sand and gravel. The grading process would disturb the previously graded dirt roadbed to a maximum depth of 6 inches to obtain a smooth and level surface. The area disturbed by the grading process would not extend substantially beyond the 16-foot-wide lane proposed to be paved. After preparing the site by grading, the surface of the road bed would be covered with a material designed to make the asphalt stick, followed by a 1-inch leveling course of asphalt, and topped with the asphalt paving itself to a thickness of 3 inches. Approximately 35 to 40 loads of asphalt would be trucked to the paving site. It is estimated that the construction crew would consist of about seven workers, not including the asphalt truck drivers. Existing, previously disturbed staging areas located adjacent to the Manned Range 1 main tower would be used for temporary storage of equipment and materials during construction.

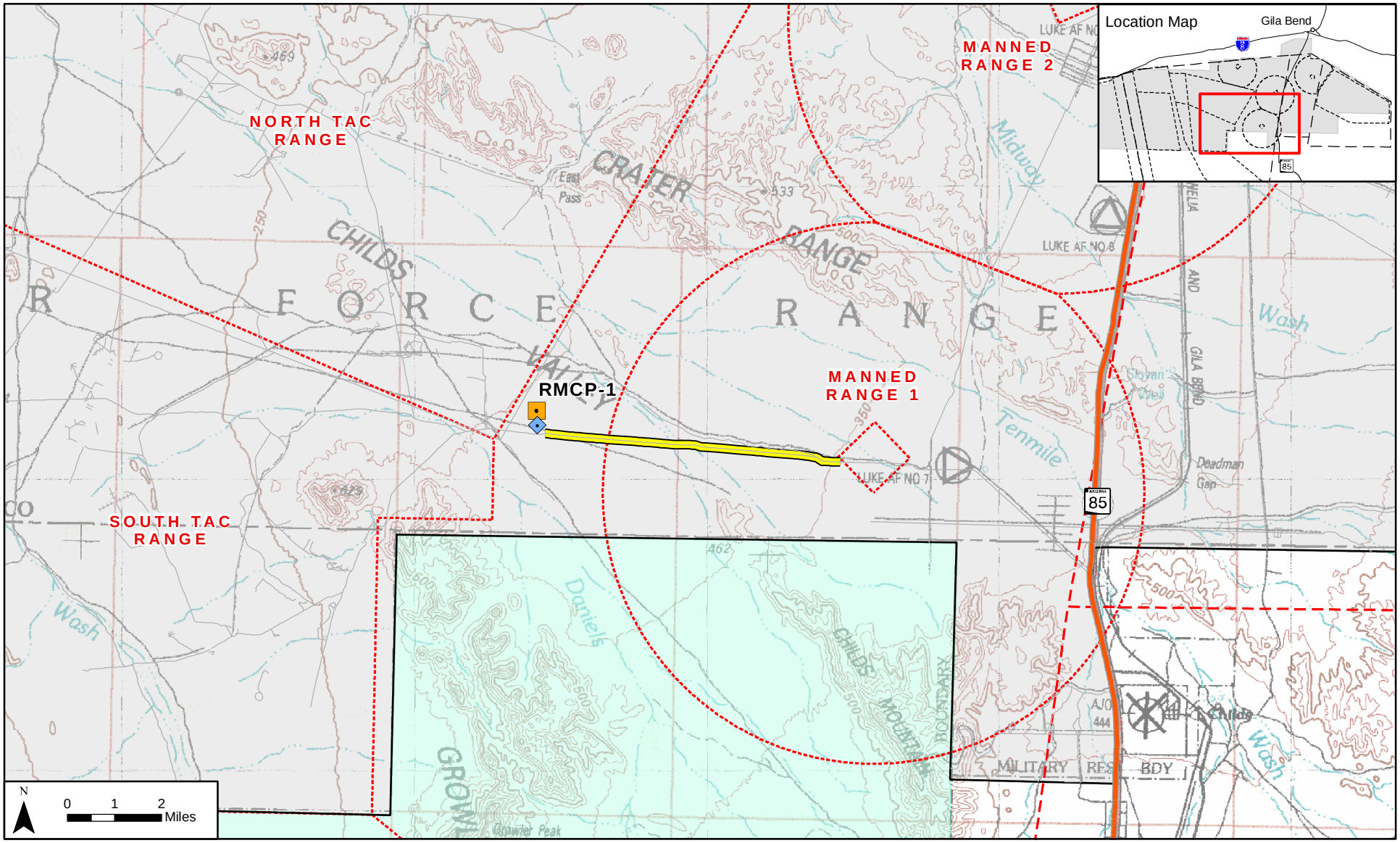


Figure 2-14

PROPOSED MANNED RANGE 1 TO RMCP 1 ROAD PAVEMENT

If the proposed action were implemented, maintenance of the road would not be expected to be necessary for at least 5 years. After this time, the Air Force would likely seal the road with a tar and asphalt slurry every 2 to 3 years, or as necessary, to prevent deterioration of the road surface. The planned slurry sealing would be subject to the availability of funding.

Existing traffic volumes, traffic speeds, and types of vehicle using this road are not expected to change with the proposed action. The current speed limit of 35 mph established by the Air Force for this road would not be changed, and speed limit signs would be posted along the road. In addition to the existing speed limit, the signs would indicate that the speed restriction is for endangered species (Sonoran pronghorn) protection compliance.

2.10.2 Alternative 9.B – No-Action Alternative

The no-action alternative (Alternative 9.B) would be to continue the ongoing practice of using the unpaved road in its current condition and to continue to incur the high ongoing costs of maintaining both this heavily used access road in a serviceable condition and the vehicles that must use the road accordingly. Dust generated from use of the unpaved road would not be controlled.

2.10.3 Alternatives Eliminated from Detailed Consideration

The proposed action is specific to the road segment identified; therefore, no alternative sites would meet the purpose and need of the proposed action. During the initial planning phases, the use of dust suppressants and soil cements was considered; however, most traffic along this road segment consists of heavy trucks and equipment that would quickly deteriorate the material used as a dust suppressant or surface hardener; therefore, such alternatives would not provide a cost-effective or long-lasting maintenance solution.

2.11 PROPOSAL 10 – SAND AND GRAVEL EXCAVATION, STOCKPILING, AND USE ON BMGR EAST

2.11.1 Alternative 10.A – Proposed Action

The Alternative 10.A proposed action is to excavate sand and gravel from ten sites within BMGR East to be used for on-range road maintenance, target reconstruction, and target maintenance. The proposed action would also include transporting the material to four new stockpile sites on BMGR East and to one existing site on the Gila Bend AFAF where the materials could be accessed as needed. Figure 2-15 depicts the locations of the proposed excavation and stockpile sites, although minor variances may be made in final siting if conditions indicate that another nearby location may minimize natural and cultural resource concerns. (For example an area that lacks mature vegetation as a result of a recent wildfire may

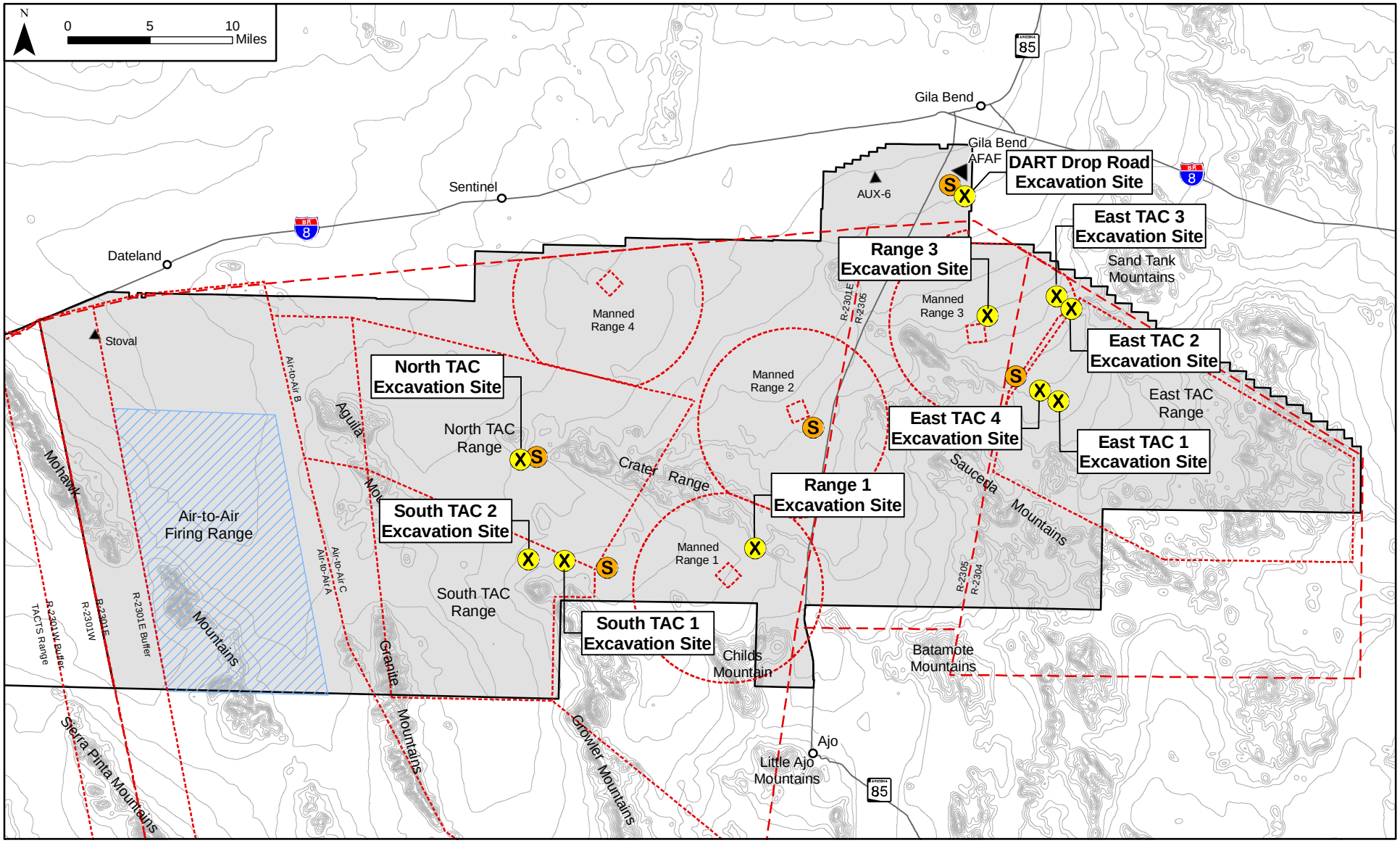


Figure 2-15

SAND AND GRAVEL EXCAVATION AND STOCKPILE SITES

have less effect on the environment.) As provided by the MLWA of 1999, the use of sand, gravel, or similar mineral material resources from BMGR East by the Air Force is authorized for construction needs on BMGR East (P.L. 106-65 § 3036).

The proposed material source sites are all located in highly ephemeral washes located adjacent to existing roads. Ephemeral washes are desert surface drainage channels that flow only in response to local rainfall runoff, but are typically dry because rainfall is infrequent. The proposed sites have material of sufficient quantity and quality for the intended uses.

Material from the source sites would be removed and the open excavations would not be filled. The source sites are in areas open enough to provide reasonable access for a loader and where trees along the banks of the washes can be avoided. Five of the excavation sites are in areas that burned in 2005 wildfires and two sites are near the burned areas. The materials would be excavated in a manner to ensure a gentle slope from the top to the bottom of the excavation site so that animals are not trapped in a pit.

Using the proposed sand and gravel sources would not result in additional expense to the maintenance budget, nor would the use be expected to import noxious weeds because the sources and use destinations are all local to BMGR East.

Table 2-2 indicates the proposed volumes to be excavated annually from the ten proposed source sites. The area listed in Table 2-2 is an estimate of the area to be disturbed for resource recovery; the annual volumes (approximately 13,000 cubic yards, which is equivalent to about 16,000 tons) reflect a three-foot excavation depth over the delineated area at each source site. As detailed in Table 2-2, a combined area of 2.68 acres would be disturbed in sites ranging from 0.12 to 0.69 acres in size. The areas most affected would be Tenmile Wash (0.88 acre), Quilotosa Wash (0.84 acre), Daniels Arroyo (0.4 acre), Sauceda Wash (0.3 acre) and Midway Wash (0.26 acre). The sand and gravel excavation contractor would operate under established guidelines and be subject to period monitoring to ensure excavation does not exceed 3 feet in depth and that other standard protocols for environmental protection (e.g., stormwater, spill response, dust control, etc.) are being implemented.

Because the demand for source material is primarily associated with target maintenance on the ranges, excavation would primarily be focused within the three 6-week periods when each of the tactical ranges is closed to operations for maintenance and EOD clearance activities. While excavation would not be limited exclusively to these periods, excavation and movement of sand and gravel would not occur year-round so the potential for disturbances to wildlife in the area would be in relatively short durations and would not occur throughout the year.

Table 2-2 Estimated Disturbance Area and Annual Volume of Excavated Material by Source Site

Source Site	*Wash Bed*	*Location*			*Area*		*Volume*	*Approx. Wash Bed Width at Proposed Excavation Site (feet)*
		Town-ship	*Range*	*Section*	*square feet*	*acres*	*cubic yards*	
East TAC 1	Sauceda Wash	8S	4W	36	5,250	0.12	583	100
East TAC 2	Quilotosa Wash	7S	3W	31	12,000	0.28	1,333	100
East TAC 3	Quilotosa Wash	7S	4W	36	9,600	0.22	1,066	50
East TAC 4	Sauceda Wash	8S	4W	27	8,050	0.18	894	75
South TAC 1	Daniels Arroyo	3S	8W	19	11,400	0.26	1,267	75
South TAC 2	Daniels Arroyo	3S	9W	23	6,000	0.14	667	<50
North TAC	Tenmile Wash	5S	5W	23	8,100	0.19	900	100
Manned Range 1	Tenmile Wash	3S	7W	13	30,000	0.69	3,333	200
Manned Range 3	Midway Wash	8S	4W	5	11,520	0.26	1,280	100
DART Drop Road	Quilotosa Wash	6S	5W	25	15,000	0.34	1,667	75

The materials proposed to be excavated from the source sites would be removed using existing equipment such as a front-end loader mounted on a rubber-tired tractor. The material would be loaded into a dump truck and transported to a stockpile site for later use. All source sites and stockpile sites are accessible by existing roads and only the loader would travel off the road to and from the wash. Stockpile sites would be outside of washes so that runoff from storms would result in minimal movement of the stockpiled sand and gravel.

Rainfall events with enough rain to produce runoff on BMGR East would likely restore the excavated wash sites to pre-excavation grades by filling the excavation pits with sand and gravel redistributed from upstream by the ephemeral flows. Rainfall events that produce runoff usually occur several times annually so it is anticipated that the source sites would remain suitable for use each year, although this may not be the case in years with little rainfall. In any event, the extraction sites would not be excavated to a depth that exceeds 3 feet.

The proposed annual volume to be excavated is approximately 4,000 tons more than what has historically been hauled to BMGR East from commercial sources. A greater quantity of sand and gravel is desired for range operations and maintenance, but the cost of using commercial sources and paying for transporting the materials currently limits the quantity used to the minimal need.

2.11.2 Alternative 10.B – No-Action Alternative

The no-action alternative would continue the ongoing practice of conducting maintenance without the benefit of additional on-range sand and gravel resources to repair eroded and displaced materials from roads and strafe pits. When funds are available, the 56 FW/RMO would

continue to purchase materials from approved, outside, commercial sources that have the desired material composition and have them delivered to BMGR East for needed maintenance. In recent years, approximately 12,000 tons of sand and gravel have been transported to BMGR East from the Phoenix area annually. The use of commercial, off-BMGR sources would require a greater use of the unimproved road system than using on-range sources because the source is farther removed from the use sites. It is roughly 70 miles from the central Phoenix area to Gila Bend, and Gila Bend is located just north of the range. The number of miles that material is transported depends on the specific location of the source material and the specific site on BMGR East where the materials are needed.

The use of commercial sources also may potentially introduce noxious weed seeds that are not native to BMGR East if such seeds are in the sand and gravel materials.

2.12 ALTERNATIVES ELIMINATED FROM DETAILED CONSIDERATION

An alternative to obtain materials from different sources on BMGR East was considered but eliminated from detailed analysis.

There is a source of large gravel/cinder material on BMGR East that is approved for use in maintenance activities; however, this source is limited in quantity, lacks a central location, and has a material composition that is not appropriate for all required uses. Other locations on BMGR East with sand and gravel resources are available. However, like the proposed source sites, these locations are not approved for use. Because these sites are in areas that generally experience infrequent travel, they would introduce a new source of traffic and potential need for road maintenance compared to the locations identified in the proposed action, Alternative 10.A, which are already along established roads that are routinely used for other operations. While cinder materials from the approved source will continue to be used for some road maintenance applications, the alternative of obtaining materials from other source locations on BMGR East, other than those identified in Alternative 10.A, was eliminated from detailed analysis.

2.13 COMPARISON OF THE ALTERNATIVES

The predicted environmental consequences of the proposed actions, alternative actions (where applicable), and the no-action alternative on the relevant environmental resource categories are presented in summary in Tables 2-3 through 2-12. The intent of these tables is to present the findings of the EIS with regard to the possible impacts of each alternative for each proposed action in an unbiased, concise, and comparative format.

If Section 106 review of individual proposals results in substantial modification of the undertaking, the selection of mitigation measures not analyzed in any manner in this Final EIS,

or the identification of significant new circumstances or information relevant to the particular action, its impacts or any cumulative impacts, the Air Force would conduct any necessary supplemental environmental analysis in accordance with 40 CFR § 1502.9 and 32 CFR § 989.20(b).

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Earth Resources	• Short-term ground disturbance with establishment of the STA. • Most disturbance expected to be within 400 acres of the 640-acre site. • Activities would be subject to conditions of the AZPDES CGP, which would minimize construction-related impacts.	Same as Alternative 1.A.	Similar to Alternative 1.A, except: • Approximately 2.5 acres of additional land would be disturbed for development of new road. • Upgrades to 4 miles of existing road would improve the long-term erosion potential.	• Ongoing accelerated erosion associated with use of existing roads would continue.
Water Resources	• Potential sedimentation of San Cristobal Wash and minor tributaries down gradient from vegetation removal, grading, and construction activities. • Construction BMPs, storm water control features, and adherence to AZPDES CGP requirements would protect surface waters from sedimentation and minimize the potential impacts.	Similar to Alternative 1.A, except: • Slightly higher potential risk of erosion since the site is previously disturbed. • Potential sedimentation of Growler Wash from vegetation removal, grading, and construction activities.	Similar to Alternative 1.A, except: • Potential sedimentation of Tenmile Wash from vegetation removal, grading, and construction activities.	• No impact to water resources within the study area.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				

Air Quality	• Short term, localized increase in emissions, particularly dust, during construction activities over portions of 2010 and 2011:
	  • Volatile organic compounds (VOC): 1.46 tons
	  • Carbon monoxide (CO): 10.26 tons
	  • Oxides of nitrogen (NO_x): 10.95 tons
	  • Sulfur dioxide (SO_2): 1.12 tons
	  • Particulate matter less then 10 microns in size (PM_{10}): 126.05 tons
	  • Particulate matter less the 2.5 microns in size ($PM_{2.5}$): 13.10 tons
	• Construction activities would require an earthmoving permit from Maricopa County and would use construction BMPs to reduce emissions.
	• Estimated emissions from operation of the STA site:
	  • VOC: 2.59 tons
	  • CO: 0.32 tons
	  • NO_x: 0.07 tons
	  • SO_2: 0.18 tons
	  • PM_{10}: 0.86 tons
	  • $PM_{2.5}$: <0.86 tons
		Same as Alternative 1.A.	Same as Alternative 1.A.	• No impact to air quality within the study area.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Biological Resources	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the San Cristobal Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 1.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the Growler Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 1.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 1.B were implemented, consultation with the USFWS was not completed for Alternative 1.B and so no alternative-specific terms and conditions were developed.	• Construction and operation could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential disturbance to individual Le Conte's thrashers and individual western burrowing owls; but would not be expected to impact the distribution or overall abundance of the species in the Sentinel Plain. • Not considered to result in adverse affects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS. Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 1.C were implemented; because Alternative 1.C is not the preferred alternative and only the preferred action (Alternative 1.A) is consulted on with the USFWS, a request for concurrence by the USFWS with the not likely to adversely affect determination was not initiated.	• No impact to biological resources either within or adjacent to BMGR East.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Land Use	• May result in reconfiguration of air-to-air low and air-to-air high ranges when STA activated. • Creates military training ground features within a currently natural area affecting 1 square mile. • Requires widening of 17 miles of existing road for access. • Requires new ground forward air controller point and access to this point. • Increases existing EOD clearance requirements • Minimally increases vehicular travel in the San Cristobal Valley.	• Reduces availability of South TAC when STA activated. • Uses area of prior military disturbance (Target 220). • Requires no access road improvements. • No change in existing EOD clearance requirements. • Minimally increases vehicular travel in South TAC.	• Reduces availability of North TAC when STA activated. • Creates military training ground features within a currently natural area affecting 1 square mile. • Requires upgrading of 4 miles of existing road for access. • Requires new ground forward air controller point and access to this point. • Reduces training capacity at Manned Ranges 2 and 4 due to airspace requirements. • Increases existing EOD clearance requirements.	• Limits BMGR East to existing training opportunities. • No change to land use.
Outdoor Recreation	• Minimal, localized impacts from recreation access closures within the laser safety footprint while STA is in use. • Land available for big horn sheep hunts may be reduced from recreational access closures; however, sheep occur within other game management units and mountains in the vicinity.	• No impact to recreation within the study area.	Same as Alternative 1.B.	• No impact to recreation within the study area.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Health and Safety	• Increased potential for contact with health and safety hazards during construction, maintenance, and training activities. • Positive impacts to traffic safety through widening and improving the roads. • Safety protocols needed to address hazard of potential damage to eyesight from lasers during firing operations and radar emissions produced by the threat emitter. • Slight potential for a wildfire to ignite from use of illuminating rockets and flares at the STA; however, limited vegetative fuel minimizes this risk. • Luke AFB Supplement to AFI 13-212 would be updated to address procedures, protocols, and logistics for the safe operation of the STA.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No health and safety impacts within the study area.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	Alternative 1.B, South TAC Site	Alternative 1.C, North TAC Site	Alternative 1.D, No-Action Alternative
Resources				
Cultural Resources	• Intensive cultural resource survey of 100 percent of the access road and vicinity, and the STA/EOD footprint identified 11 prehistoric and historical-period cultural resource sites. Of these, 10 have been determined eligible for inclusion on the NRHP; one historic site is not eligible. • Nine of the 10 historic properties are located within 50 m (about 150 ft) of Stoval Road and have been disturbed to some extent.. Road improvements along the existing alignment would introduce new potential impacts to sites; however, impacts to some sites may be avoided. Maintenance of a passable road would have a beneficial effect on sites immediately adjacent to the existing road. • Places that may be eligible for inclusion on the NRHP for their traditional cultural value may be identified through ongoing consultation with tribes that attach cultural importance to places on BMGR East. • Assessment and resolution of adverse effects, and if needed, implementation of mitigation measures, would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of 100 percent of the project area identified no historic properties that might be affected by this alternative. • Places that may be eligible for inclusion on the NRHP for their traditional cultural value may be identified through ongoing consultation with tribes that attach cultural importance to places on BMGR East. • Assessment and resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Intensive cultural resource survey of 65 of the roughly 1,200 acres potentially affected has been completed. A single prehistoric site was recorded along a road about 2 miles from this alternative STA location; it has been determined eligible for inclusion on the NRHP. That site will not be affected by construction and maintenance of the STA in this location, but might be affected if this road is used in connection with training at this location. • Based on findings of surveys in similar environmental settings near the project area, it is likely that one or more small sites may be located in the area Disturbance from construction, maintenance, and ongoing operation and use of the STA, including accelerated erosion, would potentially impact cultural resources, if identified, within this project area. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Baseline conditions for cultural resources would continue.

Table 2-3
Proposed Sensor Training Area
Comparison of the Alternatives

	Alternative 1.A, Air-to-Air Range Site (Proposed Action)	**Alternative 1.B, South TAC Site**	**Alternative 1.C, North TAC Site**	**Alternative 1.D, No-Action Alternative**
Resources				
Hazardous Materials and Waste Management	• Temporary increase in use of petroleum, oils, and lubricants (POL) and waste disposal from construction. • Minor long term increase in POL use to power equipment. • No change in overall levels of munitions delivered to BMGR East or increase potential for munitions constituents to be transported off-range.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain during construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 1.A.	Same as Alternative 1.A.	• No socioeconomic impact or environmental justice concerns within the study area.
Noise	• Low to moderate increase in "A-weighted" Onset Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) noise exposure level within the STA aircraft operating area. • Moderate temporary increases in noise levels ranging from 70 to 90 dBA from construction of the STA would occur during daytime working hours. • There may be slight increases in noise exposure levels within the Cabeza Prieta NWR, but no other off-range noise impacts.	Same as Alternative 1.A, except: • Greater concentration of aircraft operations in South TAC could increase cumulative L_{dnmr} noise exposure at or above the 65 dB DNL threshold, but would be at interior locations to BMGR East and would not result in incompatible community noise levels. • Noise level increase would be less noticeable as compared to Alternative 1.A because there are more existing operations in the tactical ranges.	Same as Alternative 1.B, except: • Noise exposure levels as described for Alternative 1.B would occur within North TAC as opposed to South TAC and potentially result in less noise exposure within Cabeza Prieta NWR as compared to Alternative 1.A.	• No noise impacts within the study area.

Table 2-4
Proposed Target Reconfiguration
Comparison of the Alternatives

	Alternative 2.A, Target Reconfiguration (Proposed Action)	**Alternative 2.B, No-Action Alternative**
Resources		
Earth Resources	• Localized increased rates of erosion with land disturbance activities associated with target reconfiguration. • Activities would be subject to AZPDES CGP, which would minimize construction-related impacts.	• Potential for localized increased rates of erosion with land disturbance activities that may occur with ongoing routine target maintenance.
Water Resources	• Potential for increased sedimentation in runoff from target reconfiguration in Tenmile Wash, Growler Wash/Daniels Arroyo Wash, Quilotosa Wash, and Sauceda Wash systems. • Adherence to AZPDES CGP requirements would minimize potential impacts.	• Potential for localized increased rates of sedimentation in runoff from land disturbance that may occur with ongoing routine target maintenance.
Air Quality	• Construction activities at specific target locations may create short term, localized air emissions.	• Ongoing routine target maintenance activities would continue to result in some minor, short-term, localized air emissions.
Biological Resources	• No impacts to vegetation, wildlife, or special status species for reconfiguration in areas with moderate to high prior military use. Actions in less disturbed areas would be reviewed for potential biological impacts on a site-specific basis.	• No impact to biological resources either within or adjacent to BMGR East.
Land Use	• Establishes opportunities for modern, more realistic training. • Focuses on reconfiguring targets within areas of prior military use, thereby minimizing changes to land use.	• Continues training with outdated target scenarios. • No change to existing land use.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• No health and safety impacts within the study area. • Luke AFB Supplement to AFI 13-212 would be updated with procedures for safe operation of reconfigured targets.	• No impact to health and safety.

Table 2-4
Proposed Target Reconfiguration
Comparison of the Alternatives

	Alternative 2.A, Target Reconfiguration (Proposed Action)	Alternative 2.B, No-Action Alternative
Resources		
Cultural Resources	• Review under NEPA would be limited for target reconfigurations that meet certain criteria; however, with few exceptions, all target reconfigurations will require review under Section 106 of the NHPA. • Most target reconfigurations (Types 1, 2, and 3) would occur in the Active Intensive Use category (the current 2-year EOD clearance area). Intensive cultural resource surveys of 100 percent of these areas have identified 22 prehistoric and historic period resources which might be affected by target reconfiguration and use. All but two sites have been recommended eligible for inclusion on the NRHP; none has been determined eligible to date. • Most target reconfigurations away from existing target locations are likely to fall within previously surveyed areas that have been disturbed to some extent by past military training and support activities including the Active Moderate Use, Infrequent Moderate Use, and Reserve Light Use categories. Intensive archaeological surveys of from 90 to 100 percent of these areas have been completed. Impacts from renewed ground disturbance might occur to cultural resources located in the vicinity of targets reconfigured outside of the existing biennial but within areas previously cleared by EOD. • Target reconfigurations in the Active Moderate Use category (about 26,000 acres), 100 percent of which has been intensively surveyed, might affect 62 unevaluated sites, most of which have been recommended eligible for inclusion on the NRHP. • Target reconfigurations in the Infrequent Moderate Use category (the 2001-2006 5-year EOD clearance zone; roughly 42,000 acres) might impact as many as 250 unevaluated cultural resource sites. • Target reconfigurations in the Reserve Light Use category (about 50,000 acres) might affect over 400 recorded but unevaluated sites. • New ground disturbance might impact cultural resources in currently undisturbed areas outside the pre-2001 5-year EOD footprint on tactical ranges (Negligible Use category). Very little survey has been completed in this area.	• Baseline cultural resource conditions would continue.

Table 2-4
Proposed Target Reconfiguration
Comparison of the Alternatives

	Alternative 2.A, Target Reconfiguration (Proposed Action)	**Alternative 2.B, No-Action Alternative**
Resources		
	• Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA for target reconfigurations outside existing target complexes.	
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction occurring in increments over 10 or more years. • Changes in munitions constituents to be addressed through ongoing program to periodically review the potential for munitions constituents to be transported off-range.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• Long-term minor economic gains from sporadic construction activities associated with reconfiguring targets as needs are identified. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concerns within the study area.
Noise	• Equipment used for reconfiguration activities would create noise at the sites in the range of 70 to 90 dBA; sites are well within interior locations of BMGR East.	• No noise impacts within the study area.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Earth Resources	• Disturbance of approximately 44 acres of previously disturbed soils for construction of track. • Long term soil degradation from operation of the 4x4 vehicle that pulls the moving target. • Adherence to AZPDES CGP requirements would minimize construction-related erosion potential.	Same as Alternative 3.A, except: • There is less previous disturbance at this site.	Similar to Alternative 3.A, except: • Disturbance of approximately 33 acres of relatively undisturbed soils for construction of track. • Site location at base of Crater Range would experience higher erosion rates than Alternative 3.A and 3.B sites due to runoff and flash flooding following heavy rain events.	• No impact to earth resources within the study area.
Water Resources	• Potential for increased sedimentation in tributary of Tenmile Wash from construction and ongoing operation of moving vehicle target system. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• Potential for increased sedimentation in tributaries of Tenmile Wash and San Cristobal Wash from cultural surveys, construction, munitions delivery, and EOD clearance activities. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• Similar to Alternative 3.A. and 3.B, but with the highest potential for increased sedimentation of Tenmile Wash since site drains directly into the main channel of the system instead of a tributary. • Adherence to AZPDES CGP requirements would minimize the potential construction-related impact.	• No impact to water resources within the study area.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				

Air Quality	• Short term, localized increase in emissions from road construction:
	  • VOC: 0.02 tons
	  • CO: 0.25 tons
	  • NO_x: 0.13 tons
	  • SO_2: 0.01 tons
	  • PM_{10}: 5.15 tons
	  • $PM_{2.5}$: 0.52 tons
	• An earth moving permit would be required from Maricopa County for construction activities.
	• Short term localized increase in dust (PM_{10}) emission would occur from operation of the moving vehicle target system on unpaved roads during training exercises.
		Same as Alternative 3.A.	Same as Alternative 3.A.	• No air quality impacts within the study area.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Biological Resources	• Project activities could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 3.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• Project activities could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 3.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 3.B were implemented, consultation with the USFWS was not completed for Alternative 3.B and so no alternative-specific terms and conditions were developed.	• Project activities adjacent to Tenmile Wash could disrupt the ability of wildlife to effectively use this important habitat area to safely move across the landscape. • Potential to impact individual crested saguaro. • Could contribute to degradation of desert tortoise habitat and impact individual animals. • Potential for disturbance to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley. • Could result in disturbance to individual peregrine falcons possibly associated with the cliffs of the Crater Range. • Could result in disturbance to California leaf-nosed bats through modification of suitable foraging habitat. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 3.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the	• No biological resources impacts either within or adjacent to BMGR East.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
			programmatic consultation would be applied if Alternative 3.C were implemented, consultation with the USFWS was not completed for Alternative 3.C and so no alternative-specific terms and conditions were developed.	
Land Use	• Creates a loop road using some existing roadway, affecting 44 acres. • Limits access to this area of North TAC during moving target training exercises.	• Creates a loop road using some existing roadway, affecting 44 acres. • Limits access to this area of North TAC during moving target training exercises.	• Creates a loop road using some existing roadway, affecting 33 acres. • Limits access to this area of North TAC during moving target training exercises.	• Limits training within BMGR East to static targets. • No change to land use or range accessibility.
Outdoor Recreation	• No impact to recreation within the study area.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No impact to recreation within the study area.
Health and Safety	• Hazards associated with heavy equipment operation and vehicle use for construction activities would not differ substantially from those already encountered during periodic maintenance. • Luke AFB Supplement to AFI 13-212 would be updated to address safe operation and training at the moving vehicle target system.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No health and safety impacts within the study area.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area identified one prehistoric site recommended eligible for inclusion on the NRHP. • Ground disturbance and soil erosion at the project site associated with the proposed action would potentially result in impacts to this site, unless avoidance is possible. • Evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of approximately 70 percent of the project area has identified no sites recommended eligible for inclusion on the NRHP. One site excavated in 1979 has since been determined not eligible. • Surface disturbance and associated erosion could impact cultural resources, if present in unsurveyed areas. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan, would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation.	• Intensive cultural resource survey of 100 percent of the project area identified two archaeological sites recommended eligible for inclusion on the NRHP. • Ground disturbance and soil erosion at the project site associated with the proposed action would potentially result in impacts to this site, unless avoidance is possible. • Evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA. Mitigation measures may include avoidance through project design, protection in place, oral-historical or archival research, archaeological data recovery, or other measures identified through ongoing consultation •	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction. • Minor long term increase in POL use to power equipment.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.

Table 2-5
Proposed Moving Vehicle Target System
Comparison of the Alternatives

	Alternative 3.A, Establish Moving Vehicle Target System at Target 104/106 Complex(Proposed Action)	**Alternative 3.B, Establish Moving Vehicle Target System West of Main Access Road to North TAC (Alternative Action)**	**Alternative 3.C, Establish Moving Vehicle Target System Southeast of Simulated Rail Yard (Alternative Action)**	**Alternative 3.D, No-Action Alternative**
Resources				
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Moderate temporary increases in noise levels in the range of 70 to 90 dBA from construction of the moving vehicle target system. • Intermittent noise-generating activity associated with operation of the moving vehicle target system. Site is well within the interior of BMGR East.	Same as Alternative 3.A.	Same as Alternative 3.A.	• No noise impacts within the study area.

Table 2-6 Proposed New Target for Air-To-Ground Missiles Comparison of the Alternatives		
	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Earth Resources	• Live air-to-ground missiles result in larger surface disturbance footprints as compared to inert munitions. • Estimated to be 75-acre disturbance area in area of some prior disturbance associated with inert munitions delivery. • Ongoing target maintenance and construction would have localized impacts to soils. • Shift of munitions delivery from existing air-to-ground missile target to the proposed target site (approximately 2.5 miles closer to the BMGR East boundary) would shift associated munitions constituent content in soils localized to the proposed target site, with no change in potential for munitions constituents in soils to migrate off-Range.	• No impacts to earth resources within the study area.
Water Resources	• New target would be located in close proximity to Quilotosa Wash. • Delivery of live missiles at new target would destabilize soils in the area, increasing sedimentation in the wash during rain events which could alter flow of the channel. • Low increased probability that future delivery of munitions to the proposed air-to-ground missile target would increase the potential for munitions constituents to migrate off-range and cause an unacceptable risk to human and/or ecological receptors due to the comparative proximity of the proposed site and Quilotosa Wash pathway to the existing air-to-ground target site and Sauceda Wash pathway. Ongoing assessment requirements are noted under Hazardous Material s and Waste Management. • No federal or state water quality standards would be exceeded and impacts would be localized.	• No impacts to water resources within the study area.
Air Quality	• Although emissions from missile delivery would shift from one localized site to another, there would be no impact to air quality within the study area.	• No impact to air quality within the study area.

Table 2-6
Proposed New Target for Air-To-Ground Missiles
Comparison of the Alternatives

	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Biological Resources	• Live fire activity could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife safely across the landscape. • Potential to impact individual crested saguaro and the wildlife that rely on saguaros for food and/ or shelter. • Potential for disturbance to individual Le Conte's thrashers, but would not be expected to impact the distribution or overall abundance of the species. • Potential to impact individual California leaf-nosed bats but would not be expected to alter the local distribution or abundance of the bat. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 4.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 4.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats.	• No impact to biological resources within or adjacent to BMGR East.

Table 2-6
Proposed New Target for Air-To-Ground Missiles
Comparison of the Alternatives

	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Land Use	• Provides air-to-ground missile training opportunity with improved angles of attack. • Establishes new target for live ordnance, precluding approximately 75 acres from other land uses for the life of the target. • Compatible with other land uses in East TAC.	• Limits training to two live air-to-ground missile targets, one of which is constrained by its location in providing a full range of attack angles and altitudes of approach. • No change to land use, thereby retaining the area for other future compatible land uses.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Potential health and safety impacts associated with construction and ongoing operation would not differ from those that typically occur for periodic range clearance and maintenance. • Luke AFB Supplement to AFI 13-212 would be updated to include safe procedures for this activity.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area did not identify historic properties. • Section 106 review of this proposal resulted in a finding of *no historic properties affected*..	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction. • Although the proposed air-to-ground missile site/Quilotosa Wash pathway is approximately 2.5 miles closer to the range boundary than the existing air-to-ground missile site/Sauceda Wash pathway no increased potential for unacceptable risk to human and/or ecological receptors would be expected given the source-interaction-receptor analysis conducted to date. Potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years; or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concerns within the study area.

Table 2-6
Proposed New Target for Air-To-Ground Missiles
Comparison of the Alternatives

	Alternative 4.A, Establish New Target for Air-to-Ground Missiles (Proposed Action)	**Alternative 4.B, No-Action Alternative**
Resources		
Noise	• Minor temporary increases in noise levels ranging from 70 to 90 dBA from construction of the target. • Minor changes to noise exposure levels in the immediate vicinity of the new target, which is well within the interior of BMGR East.	• No noise impacts within the study area.

Table 2-7
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
Earth Resources	• No impacts to earth resources within the study area.	Same as Alternative 5.A.	• No impacts to earth resources within the study area.
Water Resources	• No impact to water resources within the study area.	Same as Alternative 5.A.	• No impact to water resources within the study area.
Air Quality	• Operation of aircraft at a lower altitude would not generate additional emissions, but rather impact a more localized area of the Cabeza Prieta NWR. • Oxides of nitrogen estimated at highest quantity, in excess of 6 tons per year; actual impact would be a fraction of this estimate since aircraft operations already produce these emissions. • All pollutant emissions would be considered negligible.	• Same as Alternative 5.A except that the area of potential effect would be about half the size of Alternative 5.A	• No impact to air quality within the study area.

Table 2-7
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
Biological Resources	• Though some individuals of various species may be disturbed by the low level overflights, these activities are not expected to result in impacts to the distribution or abundance of wildlife. • Potential impacts to individual cactus ferruginous pygmy-owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual Le Conte's thrashers, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual peregrine falcons but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to individual California leaf-nosed bats but would not be expected to alter the local distribution or abundance of the bat. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 5.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 5.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 5.A, as part of a programmatic	• Same as Alternative 5.A except that the area of potential effect would be about half the size of Alternative 5.A • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, consultation with the USFWS is required only for the preferred action (Alternative 5.A). Though the general conservation measures for Sonoran pronghorn identified in the Biological Assessment for the programmatic consultation would be applied if Alternative 5.B were implemented, consultation with the USFWS was not completed for Alternative 5.B and so no alternative-specific terms and conditions were developed.	• No impact to biological resources within or adjacent to BMGR East.

Table 2-7
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
	consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required. •		
Land Use	• No impact to land surface (ground disturbance) either within BMGR East or Cabeza Prieta NWR. • Requires new scheduling procedures so that authorized military and non-military users do not simultaneously use the affected airspace between 500 feet AGL and 1,500 feet AGL. • Creates minor inconvenience in scheduling airspace for authorized non-military surveillance flights, such as those made by wildlife agencies or the Border Patrol.	• Same as Alternative 5.A except that only about half as much airspace would be affected by the change in scheduling procedures.	• No impact to land use either within or adjacent to BMGR East. • Reduces realism in altitude of attack training for certain targets located near the southern boundary of BMGR East.
Outdoor Recreation	• Minor overflight disturbance to recreation within the remote areas of Cabeza Prieta NWR and Wilderness and Organ Pipe Cactus National Monument and Wilderness. • No impact to recreation within BMGR East.	• Same as Alternative 5.A except that overflight effects would be more concentrated on an area about half the size of Alternative 5.A in the northern portion of the Cabeza Prieta NWR and Wilderness.	• No impact to recreation within the study area.
Health and Safety	• Negligible increased risk of an aircraft mishap could occur with lower flight training altitude. • Luke AFB Supplement AFI 13-212 would be updated to address safety procedures for lower flight training altitude.	Same as Alternative 5.A.	• No impact to health and safety within the study area.
Cultural Resources	• Less than 1 percent of the land area underlying this airspace area has been surveyed for cultural resources. Seven prehistoric and historical-period cultural resources have been recorded. • Auditory and visual intrusions, and possibly vibratory impacts, to cultural resources on these lands from aircraft overflights would potentially increase. • Identification and evaluation of historic properties,	• Less than 1 percent of the land area underlying this airspace area has been surveyed for cultural resources. One prehistoric cultural resource has been recorded. • Auditory and visual intrusions, and possibly vibratory impacts to cultural resources on these lands from aircraft overflights would potentially increase.	• Auditory and visual intrusions to cultural resources from overflights of Cabeza Prieta NWR would continue at current levels. Impacts from vibrations caused by overflights are possible; however, none have been documented to date.

Table 2-7
Proposed Lower Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge
Comparison of the Alternatives

	Alternative 5.A, Lowering Flight Training Altitude for Distance of 15 NM South of Range Boundary (Proposed Action)	**Alternative 5.B, Lowering Flight Training Altitude for Distance of 8 NM South of Range Boundary (Alternative Action)**	**Alternative 5.C, No-Action Alternative**
Resources			
	assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	
Hazardous Materials and Waste Management	• Minor increase in potential for aircraft crashes, which would be addressed with crash response protocols already in place.	Same as Alternative 5.A.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• No socioeconomic impact. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 5.A.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• L_{dnmr} noise exposure levels in areas underlying the Air-to-Air range, including the Cabeza Prieta NWR would increase approximately 5 dB, but would remain significantly below community noise impact levels, ranging from 48 dB to below 45 dB.	Noise exposure levels under Alternative 5.B would increase at the same magnitude as described for Alternative 5.A; however, the area exposed to the approximately 5dB increase would be reduced due to the reduced size of the lowered flight training area.	• No noise impacts within the study area.

Table 2-8
Proposed Reconfiguration of Manned Range 3 for Helicopter Training
Comparison of the Alternatives

	Alternative 6.A, Reconfigure Manned Range 3 for Helicopter Training (Proposed Action)	**Alternative 6.B, No-Action Alternative**
Resources		
Earth Resources	• Localized disturbance from EOD clearance activities prior to establishing targets. • Disturbance at sites for the establishment of 15 to 25 pop-up systems to be dispersed within a 400-acre area. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impacts. • Training activities and helicopter use would increase localized soil disturbance and erosion potential at the target area.	• No impact to earth resources within the study area.
Water Resources	• Localized soil disturbance throughout 400-acre site from establishment of 15-25 pop-up systems could increase potential for sedimentation during heavy rain events in tributaries of Sauceda Wash. • Adherence to AZPDES CGP requirements would minimize the construction-related impact.	• No impact to water resources within the study area.
Air Quality	• Emissions associated with the minor construction of pop-up systems would be short term, negligible, and preclude quantification.	• No impact to air quality within the study area.
Biological Resources	• Potential impacts to small areas of desert lowland vegetation. • Live fire activity could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife across the landscape. • Potential impacts to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 6.A, as part of a programmatic consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 6.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats.	• No impact to biological resources within or adjacent to BMGR East.

Table 2-8
Proposed Reconfiguration of Manned Range 3 for Helicopter Training
Comparison of the Alternatives

	Alternative 6.A, Reconfigure Manned Range 3 for Helicopter Training (Proposed Action)	**Alternative 6.B, No-Action Alternative**
Resources		
Land Use	• Establishes new training opportunity for helicopter gunnery training that includes pop-up target systems • Establishes targets in a new area within Manned Range 3, introducing new small munitions impacts and resulting in minor increase in EOD clearance area	• Limits helicopter gunnery training to existing opportunities. • No change in land use.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Health and safety conditions would not differ appreciably from those already present at the range. • Luke AFB Supplement AFI 13-212 would be updated to include safety procedures for the reconfigured range.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource survey of 100 percent of the project area identified no historic properties. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*. • .	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and waste disposal from construction and, in the long-term, with target maintenance. • No increased potential for transport of munitions constituents off-range.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain would result from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• During construction, there would be minor temporary increases in noise levels ranging from 70 to 90 dBA in this interior location within BMGR East. • Minor changes to noise exposure levels in the immediate vicinity of the new targets associated with change in aerial gunnery and aircraft operations at the reconfigured target.	• No noise impacts within the study area.

Table 2-9 Proposed On-the-Ground Training Exercises Comparison of the Alternatives		
	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
Earth Resources	• Minimal and localized erosion from foot traffic and vehicular use. • Wind erosion from helicopter blade wash down at previously disturbed points of insertion/extraction.	• No impact to earth resources within the study area.
Water Resources	• Minor, localized potential for increased erosion which could result in sedimentation from increased vehicular use on roads and parking on unpaved roadside shoulders. • Ground-based training activities could slightly increase erosion potential, specifically when training occurs during or following a rain event in areas where there are semi-erodible and highly erodible soils.	• No impact to water resources within the study area.
Air Quality	• Localized dust (PM_{10}) from helicopter blade wash down in insertion/extraction exercise, but no impact to air quality within the study area.	• No impact to air quality within the study area.
Biological Resources	• Clandestine activities by troops on foot would not be expected to generally disturb wildlife or vegetation; however there is potential for minimal impacts to vegetation associated with vehicle parking for troop insertion or extraction. • Troops camping in a fixed location may temporarily impact individual wildlife movements, but no lasting impacts are anticipated; no long-term change in movement patterns or habitat use is anticipated. • There is potential for minimal impacts to xeroriparian habitats by vehicle traffic in the area and maintenance activities at the targets, as well as minimal impacts to vegetation adjacent to wash channels in the vicinity of the new targets. • Potential impacts to individual desert tortoise but would not be expected to alter the local distribution or abundance of the tortoise. • Potential impacts to individual Le Conte's thrashers and individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential impacts to the California leaf-nosed bat, if roost sites are entered or disturbed by troops moving through. • Potential adverse effects to individual lesser long-nosed bats but would not be expected to alter the local distribution or abundance of the bat. The result of formal consultation with the USFWS determined that Alternative 7.A, as part of a programmatic	• No impact to biological resources within or adjacent to BMGR East.

Table 2-9
Proposed On-the-Ground Training Exercises
Comparison of the Alternatives

	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
	consultation on Air Force activities on BMGR East, may result in adverse effects to the lesser long-nosed bat but would not be likely to jeopardize the continued existence of the lesser long-nosed bat. The Biological Opinion notes that Proposed Action 7.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 7.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	
Land Use	• Provides for land navigation and other on-the-ground training opportunities for CSAR and other small teams of troops. • Negligible effects on land use from dispersed cross-country travel on foot.	• Limits CSAR ground training to locations outside of BMGR East. • No change in land use.
Outdoor Recreation	• Minor impacts to recreationists within Area B from the possibility of observing a military training exercise.	• No impact to recreation within the study area.
Health and Safety	• Military personnel involved in training exercises would be exposed to various environmental health and safety issues; however, updates to Luke AFB Supplement to AFI 13-212 would establish safe training procedures to protect personnel.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource survey in of 2,341 acres in sample survey blocks and along 80 miles of roads in Area B has identified 75 prehistoric and historical-period cultural resources. • Cultural resources could be impacted by minimal ground disturbance from roadside vehicle parking, foot traffic, and helicopter rotor wash in previously disturbed and surveyed areas in tactical ranges and Area B, a portion of BMGR East that is open to the public. • Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects would be completed in accordance with Section 106 of the NHPA.	• Baseline conditions for cultural resources would continue.

Table 2-9
Proposed On-the-Ground Training Exercises
Comparison of the Alternatives

	Alternative 7.A, Allow on-the-Ground Training by Small Teams (Proposed Action)	**Alternative 7.B, No-Action Alternative**
Resources		
Hazardous Materials and Waste Management	• Minor amount of use of fuels and coolants in equipment used for troop insertion and extraction. • No impacts from small arms munitions use. • Troops to carry out solid waste and bury human waste.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• Potential minor economic gain if deployed units seek services or supplies in the communities around BMGR East. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Minor, intermittent noise impacts associated with aircraft operations and activity from ground troops.	• No noise impacts within the study area.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Earth Resources	• Construction-related disturbance of 42 acres of previously disturbed soil for development of new taxiway. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impact. • Long term stabilization of soil with addition of tarmac and asphalt surfaces for taxiway and design of drains and culverts to manage runoff from increased impervious surface.	• Short term soil disturbance of less than 1 acre at previously disturbed site for air traffic control tower. • Existing storm water controls would minimize erosion impacts. • Activities may be subject to AZPDES CGP requirements if final design exceeds1 acre, which would minimize construction-related impact.	Same as Alternative 8.A air traffic control tower impacts.	• Proposed site would continue to be subject to wind and water erosion, but controlled through existing storm water culverts and controls at the airfield.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Water Resources	• The taxiway would result in 42 acres of impervious surface that would eliminate natural infiltration and alter the flow and velocity of storm water. • Utilizing Low Impact Development would minimize the potential long-term impacts from increased impervious surface and storm water runoff. • Adherence to AZPDES CGP requirements would minimize potential construction-related impacts.	• New control tower would be constructed at a confined and disturbed site on disturbed land where existing storm water controls are present. • Existing storm water controls and adherence to AZPDES CGP requirements during construction would minimize the potential impacts. • Integration with existing Gila Bend AFAF wastewater and potable water service with no discernible impact to function or capacity nor any change to the regulatory status of the systems.	Same as Alternative 8.A air traffic control tower impacts.	• No impact to water resources within the study area.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				

Air Quality	• Short term, localized increase in air emissions would occur during construction of taxiway and control tower:
	  • VOC: 2.60 tons
	  • CO: 2.09 tons
	  • NO_x: 4.26 tons
	  • SO_2: 0.48 tons
	  • PM_{10}: 15.60 tons
	  • $PM_{2.5}$: 1.77 tons
	• A dust control permit would be required from Maricopa County for construction activities.
		Same as Alternative 8.A (emissions calculations included tower construction).	Same as Alternative 8.A.	• No impact to air quality within the study area.

Biological Resources	• The project area does not provide any substantial wildlife habitat. • To accommodate the new taxiway configuration, Bird/ wildlife-Aircraft Strike Hazard (BASH) survey protocols would be modified to minimize risk to pilots, aircraft, and wildlife. • Potential impacts to individual burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• The project area does not provide any substantial wildlife habitat. • Potential impacts to individual western burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• The project area does not provide any substantial wildlife habitat. • Potential impacts to individual western burrowing owls but would not be expected to alter the local distribution or abundance of the bird.	• No impact to biological resources within or adjacent to BMGR East, including Gila Bend AFAF.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Land Use	• Benefits military operations by enhancing airfield capacity. • Requires replacement of existing air traffic control tower, which is also an element of proposal. • Potential adverse effect on existing land use if helicopter pads must be relocated (depends on final design). • Precludes other land uses within the approximately 42-acre area, although uses are already limited based on runway use and safety requirements.	• Provides for an air traffic control tower that meets UFC requirements, which improves safe military land use and operations.	• Provides for an improved air traffic control tower compared to existing conditions, improving safe military land use and operations but failing to meet all UFC requirements.	• Potential for adverse effects on military operations during flight emergencies if the runway cannot be rapidly cleared of aircraft. • Continues use of existing air traffic control tower that does not provide adequate space or field of vision to meet UFC requirements.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Positive impact on flight safety by separating aircraft movement at the airfield through development of the taxiway. • Luke AFB Supplement to AFI 13-212 would be updated to address safety procedures associated with operations of the new taxiway.	• Luke AFB Supplement to AFI 13-212 would be updated to address safety procedures associated with operation of new air traffic control tower.	• The location for the control tower would not be optimal for safety improvements as the field of view from the tower would be impacted by power lines and other structures.	• The existing runway would continue to function as the taxiway, maintaining the suboptimal airfield situation. • Existing air traffic control tower would continue to be inadequate for observing the entire unobstructed airfield.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Cultural Resources	• An intensive cultural resource survey has been completed for 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• An intensive cultural resource survey of 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Same as Alternative 8.A air traffic control tower impacts. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Ongoing operations at the existing Gila Bend AFAF taxiways and air traffic control tower would continue with no impact to cultural resources.
Hazardous Materials and Waste Management	• Temporary increase in POL use, including use of an asphalt batching plant, and waste generation during construction.	• Increase in POL use and waste generation during construction. • Potential for asbestos containing materials and lead-based paint to be present in facilities to be demolished. • Long-term demands on fuels for heating and power of the new air traffic control tower would likely be slightly less.	• Same as Alternative 8.A air traffic control tower impacts.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.

Table 2-10
Proposed New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field
Comparison of the Alternatives

	Alternative 8.A and 8.B, New Parallel Taxiway (Proposed Action and Common to all Alternatives)	**Alternative 8.A, Air Traffic Control Tower Located 3,100 Feet North of the Runway 35 Threshold and 1,600 feet west of the Runway 17/35 centerline (Proposed Action)**	**Alternative 8.B, Air Traffic Control Tower Located 3,050 feet north of the Runway 35 threshold and 1,750 feet west of the Runway 17/35 centerline**	**Alternative 8.C, No Action Alternative**
Resources				
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	Same as Alternative 8.A air traffic control tower impacts.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Minor temporary increases in noise levels ranging from 70 to 100 dBA from construction, which would be confined to the construction site within Gila Bend AFAF.	• Minor temporary increases in noise levels ranging from 70 to 100 dBA from construction, which would be confined to the construction site within Gila Bend AFAF.	Same as Alternative 8.A air traffic control tower impacts.	• No noise impacts within the study area.

Table 2-11
Proposed Paving of Road from Manned Range 1 to RMCP 1
Comparison of the Alternatives

	Alternative 9.A, Pave Approximately 7 Miles of Road (Proposed Action)	**Alternative 9.B, No-Action Alternative**
Resources		
Earth Resources	• Disturbance of 23 acres of soils for road development. • Paving would stabilize soils and reduce erosion potential in the long term. • Activities would be subject to AZPDES CGP requirements, which would minimize construction-related impacts. • Over the long term, minimal impact from roadside runoff would occur; any problem spots would be addressed through engineering controls.	• Erosion from frequent use and grading of the 7-mile unpaved road would continue.
Water Resources	• Improvement of current erosion and sedimentation problems associated with frequent use and maintenance of the 7-mile unpaved road. • Creation of additional impervious surface that could increase storm water runoff during heavy rain events creating erosion concerns along the roadside shoulders; however, these impacts could be minimized with the construction of culverts to manage the flow.	• Erosion and subsequent sedimentation of natural surface water drainages would continue with frequent use and maintenance of the unpaved road.

Air Quality	• Construction activities would result in short term, minor, and localized increase in air emissions:
	  • VOC: 0.46 tons
	  • CO: 1.20 tons
	  • NO_x: 1.17 tons
	  • SO_2: 0.11 tons
	  • PM_{10}: 6.87 tons
	  • $PM_{2.5}$: 0.74 tons
	• A dust control permit would be required from Maricopa County for construction activities.
	• Over the long-term, reduction in fugitive dust emissions from frequent travel over a paved versus unpaved surface and frequent grading and maintenance activity.
		• Uncontrolled fugitive dust emissions would continue from the frequent use of the unpaved road.

Table 2-11
Proposed Paving of Road from Manned Range 1 to RMCP 1
Comparison of the Alternatives

	Alternative 9.A, Pave Approximately 7 Miles of Road (Proposed Action)	**Alternative 9.B, No-Action Alternative**
Resources		
Biological Resources	• The construction and potentially the use of a paved road could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential impacts to individual Le Conte's thrashers and individual burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Potential disturbance to individual Sonoran pronghorn; could result in adverse effects to Sonoran pronghorn. The result of formal consultation with the USFWS determined that Alternative 9.A, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• The existing road usage could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.
Land Use	• Could result in minor inconveniences and delays for personnel needing to use the road during road preparation and paving. • No change in the way the road is used.	• No change in land use or road and vehicle maintenance requirements.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• Positive impact to safety from reducing dust-impaired visibility along the road.	• Continued dust-impaired visibility would occur from frequent use of unpaved road.
Cultural Resources	• An intensive cultural resource survey has been completed for 100 percent of the project area has been completed and no cultural resources eligible for inclusion on the NRHP were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of *no historic properties affected*.	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary increase in POL use and use of an asphalt batching plant during construction.	• No impact to hazardous materials and waste management within or adjacent to BMGR East.
Socioeconomics and Environmental Justice	• One-time regional economic gain from expenditures for construction activities. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.

Table 2-11
Proposed Paving of Road from Manned Range 1 to RMCP 1
Comparison of the Alternatives

	Alternative 9.A, Pave Approximately 7 Miles of Road (Proposed Action)	**Alternative 9.B, No-Action Alternative**
Resources		
Noise	• Minor temporary increases in noise levels in interior locations of BMGR East ranging from 70 to 90 dBA from construction. • Periodic road grading would no longer be required, reducing noise exposure associated with this activity.	• Long-term intermittent noise associated with grading the unpaved road for maintenance would continue.

Table 2-12
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		
Earth Resources	• Excavation of 12,990 cubic yards of sand and gravel annually would reduce the sand and gravel material at each excavation site. • Stockpiling the excavated material would have localized soil disturbance and minor increased erosion from runoff of the fine silts and sands integrated with the excavated material. • Using excavated material to reinforce surfaces susceptible to erosion would reduce erosion within BMGR East. • Effects from use of and transport of materials from off-range sand and gravel supply sites would discontinue.	• Continued use of off-range sources for sand and gravel would create impacts at those excavation sites. • Using off-range sources would result in higher heavy vehicle traffic on range and other roads resulting in minimally greater levels of erosion.
Water Resources	• A combined area of 2.68 acres would be disturbed with excavation of sand and gravel from wash beds affecting Tenmile Wash, Quilotosa Wash, Daniels Arroyo, Sauceda Wash, and Midway Wash. • Excavation of the wash beds would alter the natural hydrology of each wash to a depth of 3 feet over an area ranging from 0.12 to 0.69 acres (depending on the wash). • The change in depth would be a localized impact and normal conditions would return to the wash beds over time as the excavation sites are filled with sediment from rain events. • The 56 FW/RMO would obtain an AZPDES Multi-Sector General Permit under the industrial sector of sand and gravel operations for BMGR East. Since the floodplains at BMGR East have not been delineated, they are exempt from permitting requirements of the Regulatory Division of the Flood Control District. No Clean Water Act Section 404 or Section 401 State Water Quality Certification would be required.	• Continued use of off-range sources for sand and gravel would potentially contribute to the water resource impacts at these source sites.

Table 2-12
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		

Air Quality	• Annual operation emissions would be negligible with the exception of PM_{10} (5.36 tons per year) generated by the movement of dump trucks on unpaved roads to and from stockpile locations:
	  • VOC: 0.04 tons
	  • CO: 0.15 tons
	  • NO_x: 0.42 tons
	  • SO_2: 0.04 tons
	  • PM_{10}: 6.04 tons
	  • $PM_{2.5}$: 0.62 tons
	• Fugitive dust generation would be short term and localized.
	• A Maricopa County dust control permit and would be required.
		• No impact to air quality within the study area.

Biological Resources	• The excavation of sand and gravel in washes and the use of roads by heavy equipment could temporarily frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area. • Potential for disturbance to xeroriparian vegetation at the excavation site and downstream of the site, as well as to associated floral and faunal communities. • Potential impacts to individual Le Conte's thrashers and individual western burrowing owls, but would not be expected to alter the local distribution or abundance of the bird. • Not considered to result in adverse affects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS. The result of consultation with the USFWS determined that Alternative 10.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of a programmatic consultation on Air Force activities on BMGR East, would not be likely to jeopardize the continued existence of the Sonoran pronghorn. Adherence to the terms and conditions issued with the USFWS biological opinion would be required.	• The use of commercial sand and gravel sources may potentially introduce noxious weed seeds that are not native to BMGR East if such seeds are in the sand and gravel materials.

Table 2-12
Proposed Excavation and Use of Sand and Gravel on BMGR East
Comparison of the Alternatives

	Alternative 10.A, Excavate, Transport, Stockpile, and Use BMGR East Sand and Gravel Resources (Proposed Action)	**Alternative 10.B, No-Action Alternative**
Resources		
Land Use	• Excavation and stockpile sites would be along existing roadways so no new access would be required. • Could result in minor inconveniences and delays for personnel needing to use the roads near excavation and stockpile site when materials are being loaded or unloaded. • May benefit military maintenance operations through more readily available sources of sand and gravel	• Continues to require that sand and gravel be hauled from off-site sources to BMGR East over public roadways, resulting in a negligible adverse effect to some BMGR East and off-range roads.
Outdoor Recreation	• No impact to recreation within the study area.	• No impact to recreation within the study area.
Health and Safety	• No impact to health and safety within the study area.	• No impact to health and safety within the study area.
Cultural Resources	• Intensive cultural resource surveys of 100 percent of the project area have been completed. No cultural resource sites were identified. • Review of this proposal in accordance with Section 106 of the NHPA resulted in a determination of no historic properties affected.	• Baseline conditions for cultural resources would continue.
Hazardous Materials and Waste Management	• Temporary, intermittent increase in use of POLs during operation of the excavation and transport equipment.	• Continued increased fuel consumption associated with the longer distance transport of sand and gravel resources.
Socioeconomics and Environmental Justice	• Slight reduction in military spending in the local economy if sand and gravel are no longer purchased from outside sources. • Slight increase in military expense from using equipment to excavate, stockpile, and use sand and gravel on BMGR East; however, this would be less than what is currently spent using outside sources. • No adverse impacts have been identified that extend off-range; therefore, there are no environmental justice concerns.	• No socioeconomic impact or environmental justice concern within the study area.
Noise	• Periodic and intermittent, short-term daytime noise ranging from 70 to 95 dBA from heavy equipment used to excavate, stockpile, and use material at dispersed locations within BMGR East.	• Short term intermittent noise associated with transporting sand and gravel from off-range sources would continue.

3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes relevant existing conditions for resources potentially affected by the proposed action and alternatives described in Chapter 2. Information presented in this section represents the environmental baseline to which the proposed action is compared in Chapter 4. In accordance with NEPA and CEQ guidelines, this chapter discusses the existing condition of the human and natural environment that could potentially be affected, beneficially or adversely, by the alternatives.

Descriptions of the affected environment are provided for the following resources: earth resources, water resources, air quality, biological resources, land use, outdoor recreation, health and safety, cultural resources, hazardous materials and waste, socioeconomics, and noise. Each resource is defined, along with a study area or region of influence (ROI) in which potential impact would occur. The ROI varies by resource. For some resources the ROI is largely confined within the area of potential development at BMGR East (i.e., soils, vegetation). For other resources the ROI includes a larger geographic area (i.e., land use, socioeconomics, etc.). The assessment of the affected environment is based on available data including published and unpublished literature, Geographic Information System (GIS) databases, agency consultations, and public and tribal input.

3.2 EARTH RESOURCES

3.2.1 Definition of Resource

Earth resources are defined as the topography, geology, and soils of a given area. Long-term geological, erosional, and depositional processes typically influence the topographic relief of an area. The principal geologic factors influencing stability of structures are soil stability and seismic properties. Soil, in general, refers to unconsolidated earthen materials overlying bedrock or other parent material. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support structures and facilities. Relative to development, soils typically are described in terms of their type, slope, physical characteristics, and relative compatibility or limitations with regard to particular construction activities and types of land use.

3.2.2 Study Area

The study area, or ROI, for earth resources consists of the areas that would potentially be disturbed by the implementation of the proposed actions and alternatives. Background information is provided about the overall geologic, seismic, and mineral resource conditions at BMGR East to provide further context of the affected environment. This is followed by a more specific discussion of the topographic and soil resource conditions in the areas that would potentially be disturbed with implementation of the proposed actions evaluated in this EIS.

3.2.3 Geology, Seismicity, and Mineral Resources

Geology

The mountain ranges are formed of Precambrian to Tertiary-aged igneous, metamorphic, and sedimentary rocks. Valley fill materials consist of Quaternary to Holocene unconsolidated to moderately consolidated silts, clays, sands, and gravels. A rocky desert pavement occurs where fine alluvial material has been removed by wind erosion. Alluvial fans and bajadas, fan-shaped depositional features formed from alluvial and colluvial deposits, commonly occur along portions of the mountain bases (Departments of the Air Force, Navy, and Interior 2006).

Seismicity

BMGR East is in the Southern Basin and Range seismic source zone, which extends from Mexico into southern California and includes most of southwestern and central Arizona. BMGR East is in a tectonically stable area with low levels of seismic (or earthquake) activity and few active faults. The most prevalent seismic activity in the region is west of BMGR East, generally from along the Colorado River area and from a northwest to southeast trending zone through Yuma that includes the San Andreas and related faults. Known active faults in the region include the Algodones Fault near Yuma and the Sand Tank Fault near Gila Bend. These fault lines are greater than 60 and 10 miles from BMGR East, respectively.

Mineral Resources

Numerous large and small mining and placer operations that were first established after prospecting during the mid- and late-1800s are located on and adjacent to the BMGR. The area contains numerous varied occurrences and deposits of metalliferous and nonmetalliferous minerals as well as energy resources. Several metallic mining districts are located on or near the BMGR. Mining districts are determined by type of mineralization and age of the mineral resource deposits. Mining was active on portions of the BMGR until the area was originally withdrawn for military use in 1941; at which point mining and mineral leasing were excluded from the range. Since mineral prospecting and mining have been excluded from the BMGR for

over 60 years, modern geologic and mineral resource information about the range is limited. The major mining operations located off of the BMGR in Ajo began after the 1941 withdrawal (Departments of the Air Force, Navy, and Interior 2006).

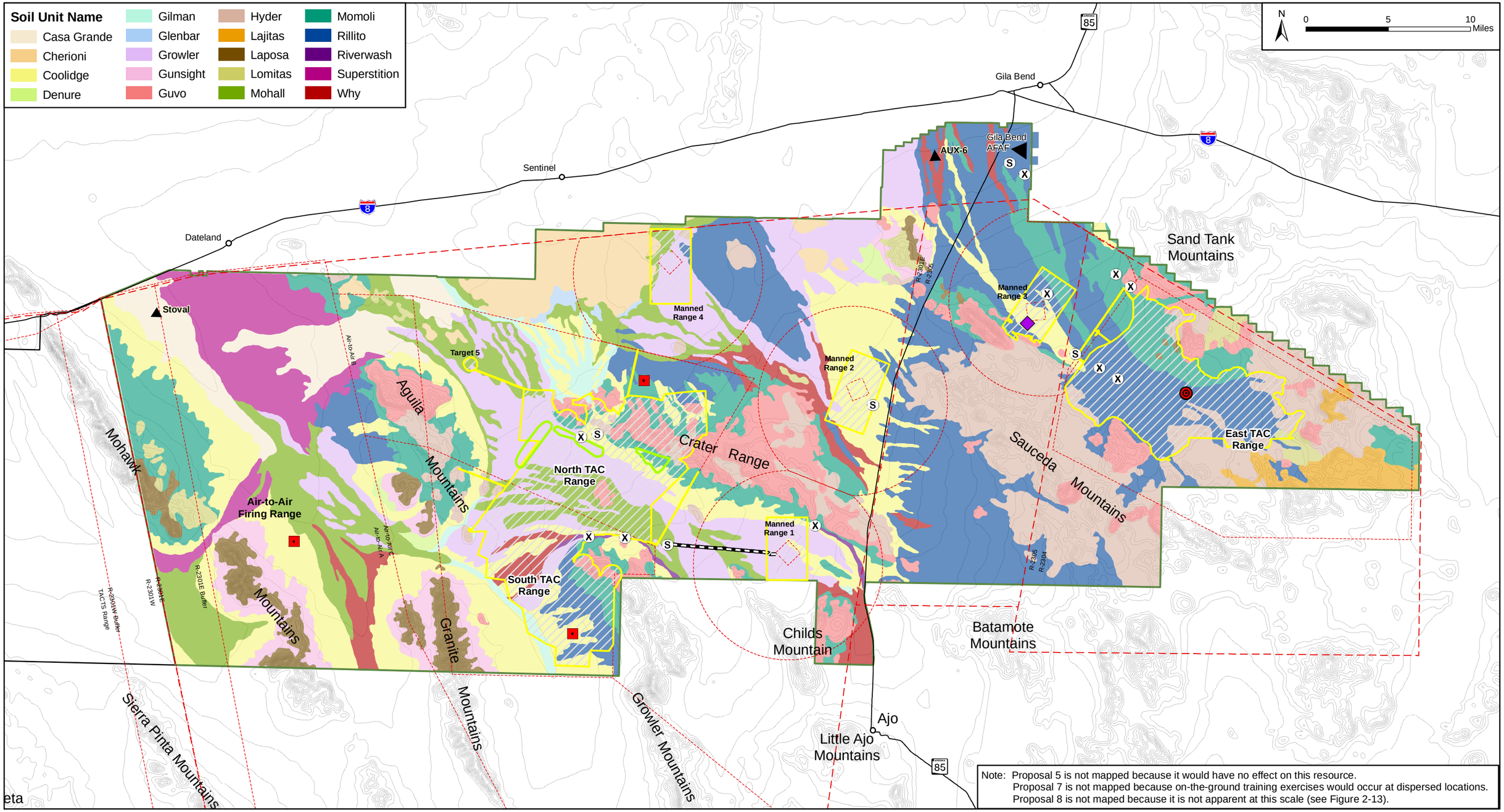
3.2.4 Topography

BMGR East is located in the Desert portion of the Basin and Range Physiographic Province of Arizona. The geologic base that supports the Sonoran Desert has evolved from millions of years of volcanic eruption, uplift, mountain building, faulting, and erosion. From a landform perspective, the BMGR is located in the Basin and Range Physiographic Province of Arizona, which is distinguished by broad alluvial valleys separated by steep, discontinuous, northwest to southeast trending mountain ranges. The modern landscape of the BMGR primarily resulted from past mountain building activity and erosion from natural forces. Human activities have caused some accelerated erosion; however, such effects are isolated. There is a broad representation of geological processes and landforms on the range. The mountain ranges are formed of all three main rock types—igneous, metamorphic, and sedimentary. All or portions of seven named mountain ranges are found in the vicinity of BMGR East. The BMGR East's highest mountains (the Sand Tank Mountains, which rise to nearly 3,700 feet MSL) and valley floors (which are over 1,200 feet MSL in elevation) occur in the easternmost portion of the range (Departments of the Air Force, Navy, and Interior 2006).

3.2.5 Soils

The soils of BMGR East are quite variable ranging from fine-grained sands and silts on the valley floors to very gravelly soils in the mountainous regions. Figure 3-1 depicts the distribution of soil units on BMGR East and Table 3-1 provides an outline of soil units at BMGR East in data provided by the Natural Resource Conservation Service.

[This page intentionally left blank.]



Note: Proposal 5 is not mapped because it would have no effect on this resource.
Proposal 7 is not mapped because on-the-ground training exercises would occur at dispersed locations.
Proposal 8 is not maped because it is not apparent at this scale (see Figure 2-13).

Proposal 1 - Sensor Training Area
- Alternative Sites

Proposal 2 - Target Reconfiguration
- Maximum Target Reconfiguration Footprint

Proposal 3 - Moving Vehicle Target
- Alternative Sites

Proposal 4 - New Target for Air-to-Ground Missiles
- Proposed Site

Proposal 6 - Reconfigure Manned Range 3 for Helicopter Training
- Proposed Site

Proposal 9 - Manned Range to RMCP 1 Road Pavement
- Proposed Site

Proposal 10 - Sand and Gravel Excavation, Stockpiling, and Use
- X Proposed Excavation Site
- S Proposed Stockpile Site

BMGR General Features
- BMGR East Boundary
- Auxiliary Airfield Boundary
- Subrange Airspace Boundary
- Restricted Airspace Boundary

Figure 3-1

SOIL ASSOCIATIONS IN THE BMGR EAST

Table 3-1
BMGR East Soil Units and K-Values

Unit Name	Unit Description	K-Value
Casa Grande	fine-loamy	0.24
Cherioni	loamy-skeletal	0.28
Coolidge	alluvial fans	0.24
Denure	alluvial fans	0.24
Gilman	coarse-loamy	0.43
Glenbar	fine-silty	0.43
Growler	alluvial fans, basin floors	0.32
Gunsight	alluvial fans	0.28
Guvo	hills, mountains	0.28
Hyder	alluvial fans	0.28
Lajitas	hills, mountains	0.28
Laposa	mountains	0.28
Lomitas	hills	0.28
Mohall	alluvial fans, basin floors	0.28
Momoli	alluvial fans	0.24
Rillito	alluvial fans	0.28
Riverwash	sand, gravel	N/A
Superstition	alluvial fans, basin floors	0.17
Why	alluvial fans, floodplains	0.28

Source: Natural Resource Conservation Service 2008
Note: N/A = not available

Soil erodibility factor (K factor) is a measure of the susceptibility of soil particles to detachment and transport by rainfall and runoff. Soil erodibility factor K represents both susceptibility of soil to erosion and the rate of runoff, as measured under the standard unit plot condition. A standard plot has a specified size and slope and is subject to specific farming practices such as plowing, disking, and cultivating. For a particular soil, the soil erodibility factor is the rate of erosion when compared to an erosion index from a standard plot.

The K factor reflects the fact that different soils erode at different rates when the other factors that affect erosion (e.g., infiltration rate, permeability, total water capacity, dispersion, rain splash, and abrasion) are the same. Soils high in clay content have low K values, about 0.05 to 0.15, because they are resistant to detachment. Although coarse textured sandy soils, have low K values (about 0.05 to 0.20) due to low runoff, such soils are easily detached. Medium textured soils, such as the silt loam soils, have moderate K values, about 0.25 to 0.40, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having high silt

content are the most erodible of all soils. They are easily detached, tend to crust, and produce high rates of runoff. Values of K for these soils tend to be greater than 0.40 (Institute of Water Research 2008).

Soil units in BMGR East are typically in the low range of the moderate K values (0.24 to 0.28) with the exception of the Gilman and Glenbar units (which fall in the high range of the moderate K values, at 0.43) (see Table 3-1). The Gilman and Glenbar units are located mainly in the area north of North TAC Range between the western end of the Crater Range and the Sentinel Plain Lava Flow (see Figure 3-1).

Wind erosion potential is greatest where soils are fine-grained sands and silts. On the BMGR, many of the valley soils are subject to moderate or high wind erosion potential. Rill and gully erosion are also common in some of the valleys. Water erosion potential typically increases with greater slope and is influenced by the presence of vegetation, desert pavement, and biotic crusts.

Desert pavements and biological soil crusts, also known as cryptogrammic soils, are found within BMGR East and are likely to occur in some of the areas that would be potentially disturbed with implementation of the proposed actions. Desert pavement is a flat surface covered with a complete layer of tightly spaced pebbles, gravel, or rocks varnished by a slow accumulation of micron-thick black metallic oxide films and clear protein-rich coatings where exposed to air. They are slow to form and are vulnerable to disruption and destruction by human disturbance, such as a single pass of a heavy vehicle or the chipping away of a rock varnish to uncover the lighter internal rock color.

Biological soil crusts are formed from very small living organisms consisting of cyanobacteria (or "blue-green algae") along with other algae, lichens, mosses, fungi, and bacteria. Cyanobacteria create sticky materials that bind soil particles together and increase soil stability. They are susceptible to damage and slow to recover. Disturbance of biological soil crusts requires considerable time to revegetate, up to 56 years from one study and perhaps a century or more under other accounts. Vehicle tires have been demonstrated to be particularly destructive to biological soil crusts (Departments of the Air Force, Navy, and Interior 2006).

3.2.6 Soil Sampling and Evaluations for Munitions Constituents

As noted in Section 3.10, an evaluation completed in 2005 concluded that there is no potential for munitions constituents from an operational range to migrate off-range and cause unacceptable risk to human and/or ecological receptors. The conclusion was based, in part, on a 2004 Limited Field Study that evaluated surface soil samples taken from the predominant drainageways near the northern BMGR East boundary. Analytical results indicated that all munitions constituents were below detectable concentrations, laboratory sample quantization limits, or residential

human-health screening levels. In addition, this evaluation considered the results of sampling for perchlorate at East TAC HE Hill in 2003. Perchlorate is commonly used as an oxidizer in solid propellants and munitions and is one of the more mobile munitions constituents in the environment. Sampling results indicated high levels of perchlorate were confined to soils immediately adjacent to the impact areas of the target. Based on these results, it is unlikely that other target areas not receiving high explosive ordnance will have significant migration of munitions constituents (U.S. Department of the Air Force 2005).

3.3 WATER RESOURCES

3.3.1 Definition of Resource

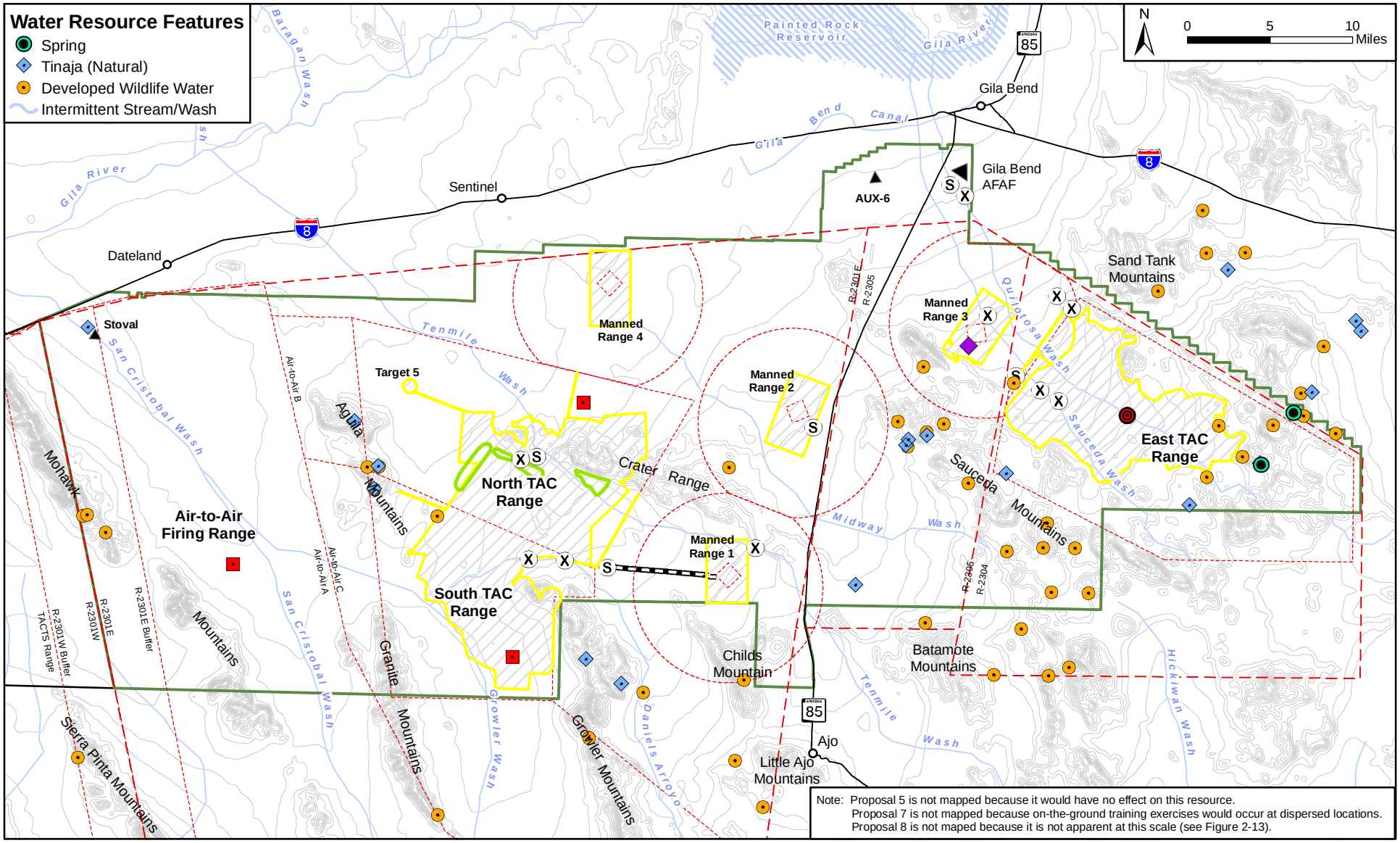
Water resources are classified broadly as surface or groundwater systems. Whereas surface waters are open to the atmosphere, groundwater is a closed system of subsurface water. All surface water resources are protected by the Clean Water Act of 1972 (CWA). Per Section 404d of the Act, CWA jurisdiction includes navigable waters, impoundments, tributary streams, and wetlands. The definition of navigable waters may also include some ephemeral washes, intermittent streams, playas, and wetlands. Floodplains are further protected by Executive Order 11988, Floodplain Management, which instructs federal agencies to consider the risks, danger, and potential impacts of locating projects within floodplains. The Federal Emergency Management Agency defines floodplains as areas subject to a one percent chance of flooding in any given year (often referred to as the 100-year floodplain).

3.3.2 Study Area

The ROI for water resources includes the surface waters near the ten proposed actions, including the isolated permanent and ephemeral waters; the ephemeral wash drainages and the waters that they drain into; and the groundwater underlying BMGR East.

3.3.3 Drainage, Watershed, and Surface Waters

BMGR East is located in one of the most arid and hot regions of North America and lies within the central portion of the Sonoran Desert in the Basin and Range Lowlands Hydrogeologic Province. There are no perennial or intermittent streams present on BMGR East and ephemeral stream flow, in otherwise dry stream beds, occurs only in immediate response to sizable rainfall events. The rainfall pattern is distinctly bimodal (winter and summer). Surface water drainage is outward from the mountain ranges by ephemeral feeder washes into larger washes that flow northward to the Gila River, which in turn flows into the Colorado River. Some storms cause flash flooding in the smaller mountain drainages and short-term flooding in the larger valley



Proposal 1 - Sensor Training Area
Alternative Sites

Proposal 2 - Target Reconfiguration
Maximum Target Reconfiguration Footprint

Proposal 3 - Moving Vehicle Target
Alternative Sites

Proposal 4 - New Target for Air-to-Ground Missiles
Proposed Site

Proposal 6 - Reconfigure Manned Range 3 for Helicopter Training
Proposed Site

Proposal 9 - Manned Range to RMCP 1 Road Pavement
Proposed Site

Proposal 10 - Sand and Gravel Excavation, Stockpiling, and Use
X Proposed Excavation Site
S Proposed Stockpile Site

BMGR East Boundary
Auxiliary Airfield Boundary
Subrange Airspace Boundary
Restricted Airspace Boundary

Figure 3-2

SURFACE WATER RESOURCES IN THE BMGR EAST VICINITY

washes and floodplains. Figure 3-2 displays the major water features within BMGR East and the vicinity.

The entire Gila Watershed drains approximately 57,900 square miles of the southwestern United States (Arizona Department of Water Resources 2001). The Gila River and its tributaries constitute the main drainage in the Lower Gila River Basin. Following the construction of upstream dams, flow became ephemeral in response to heavy, localized rainfall or water releases from these dams. Most of the time the riverbed is dry except for local ponds and agricultural drainage siphoned into the riverbed. Drainage from the Gila River flows west-southwest into the Colorado River. The Gila River and tributary drainages flow in response to the brief but intense summer monsoonal rainstorms or the longer duration rainfall events typical of the winter and spring.

That portion of the Lower Gila River watershed within BMGR East is considered to function within a normal range of variation. With the exception of the Gila Bend AFAF and a few drainages that have been interrupted or diverted by backcountry roads, most of the watershed and drainage systems within BMGR East are both unaltered and unregulated in any substantial way and lack impediments to natural surface water flows. A few drainages in BMGR East are closed, emptying into playas (dry lakes) that hold water temporarily after heavy rainfall events. Some rain water is collected in natural rock depressions (referred to as "tinajas"), sand tanks (saturated sand depressions), charcos (pools within adobe flats and washes), man-made modified natural catchments, or artificially constructed tanks where the water may persist for weeks or months without recharge until it eventually evaporates and/or is consumed by wildlife (Departments of the Air Force, Navy, and Interior 2006).

The drainage system is highly erosive but depended on infrequent, high-energy events to generate runoff and sediment transport. During the infrequent heavy rainfall events, the braided drainages carry highly turbid waters into the main wash beds. The highly turbid waters alter the wash beds as sand and gravel are transported with each rainfall event, particularly the highest energy monsoon rain/flash flooding events. Most of the surface water sources within BMGR East are not located near the areas potentially affected by the proposed actions (see Figure 3-2). The exceptions are noted in the impact analysis.

3.3.4 Major Drainages within the ROI

From west to east within the ROI, major wash systems include the San Cristobal/Growler Wash System in the San Cristobal Valley, Daniels Arroyo in South TAC, Tenmile Wash near Manned Range 1 and North TAC, Midway Wash south of Manned Ranges 2 and 4, and Sauceda and Quilotosa washes in the Sand Tanks within BMGR East (see Figure 3-2).

3.3.4.1 San Cristobal/Growler Wash System

The San Cristobal Wash lies centrally within the lands underlying air-to-air firing range, and runs from south to north between the Mohawk Mountains to the west and the Aguila and Granite Mountains to the east. The Alternative 1.A STA site lies to the west of San Cristobal Wash (see Figure 3-2). A major tributary to this wash is the Growler Wash, which drains the Growler Valley to the east of the Granite Mountains and to the west of the Growler Mountains. The Growler wash system provides the predominant drainage of South TAC. The Alternative 1.B STA site lies to the east of the Growler Wash (see Figure 3-2). The San Cristobal-Growler system collectively drains a major portion of Organ Pipe Cactus National Monument, Cabeza Prieta NWR, and Bureau of Land Management (BLM) properties south of Ajo. The San Cristobal/Growler wash system, as it occurs within the BMGR and the refuge, is significant due to the very low gradient along much of its course, which has created a broad interlacing network of many small, branching and reuniting shallow channels. Resembling the strands of a complex braid, this wash system and the associated Valley Bottom Floodplain Complex Natural Community are recognized in Marshall *et al.* (2000) and Hall *et al.* (2001) as some of the best remaining examples of this natural community and its associated watersheds in Arizona. The San Cristobal Wash terminates in a playa-like area at the northwest end of this valley west of Stoval Auxiliary Airfield before it exits the range to the north (U.S. Department of the Air Force 1986). That exit is now via a culvert beneath the railroad and Interstate 8 on the northern range boundary (Departments of the Air Force, Navy, and Interior 2006).

3.3.4.2 Daniels Arroyo

Daniels Arroyo is the major tributary of Growler Wash. Two of the proposed excavation sites are located along the arroyo (see Figure 3-2). It drains northward from the portion of Childs Valley between the Growler Mountains and Childs Mountain/Little Ajo Mountains on the Cabeza Prieta NWR and adjacent BLM lands. Within the eastern portion of South TAC, Daniels Arroyo curves west around the northern extent of the Growler Mountains before turning south/southwest and draining to the Growler Wash in the center of South TAC.

3.3.4.3 Tenmile Wash

Tenmile Wash extends from north and east of Ajo south of the Batamote Mountains through the Childs Valley between Childs Mountain and the Growler Mountains and the Crater Range and then northwest to the Gila River north of the BMGR and Interstate 8. The drainage basin is a wide and flat alluvial basin that traverses north of Manned Range 1 and provides the main drainage for North TAC. One proposed excavation site is located within Tenmile Wash and one excavation and stockpile site are located within tributaries to the wash. The Alternative 1.B and

Alternative 1.C moving target locations are located in close proximity to Tenmile Wash (see Figure 3-2).

3.3.4.4 Midway Wash

The valley between the Sauceda Mountains and Crater Range drains into Midway Wash, which extends from Area B east of State Route 85, between Manned Ranges 1 and 2 and to just south of Manned Range 4. No proposals are located in close proximity to Midway Wash (see Figure 3-2).

3.3.4.5 Sauceda and Quilotosa Washes

The Sauceda and Quilotosa washes drain the Sauceda Valley, which occurs between the high-relief Sand Tank and Sauceda Mountains. Well-established mountain channels drain to these washes, which drain north and east toward the Gila River. Quilotosa Wash primarily drains the Sand Tank Mountains and Sauceda Wash primarily drains the Sauceda Mountains. These two systems flow northwest through East TAC; east of Manned Range 3; and diagonally across the southwestern quarter of the Gila Bend AFAF. The two systems do not join and are independent drainage systems. The Sauceda and Quilotosa washes terminate at the Gila River. Three of the sand and gravel excavation sites are located along Sauceda Wash and one is located along the Quilotosa Wash. The proposed air-to-ground missile site also is located along Quilotosa Wash (see Figure 3-2).

3.3.5 Floodplains and Jurisdictional Waters of the United States

Although there are flood hazards in the BMGR along the major washes, the Federal Emergency Management Agency has not delineated 100-year floodplains on the BMGR (Department of the Air Force, Navy, and Interior 2006). Some of the ephemeral surface drainage ways in BMGR East, including the major wash systems described above, may be considered jurisdictional waters of the United States and possibly subject to the CWA. Activities in and around jurisdictional waters require adherence to the CWA. Activities with the potential to impact such waters may require state water quality certification under Section 401 and/or federal permit under Section 402 and/or 404 of the CWA. The U.S. Army Corps of Engineers, Environmental Protection Agency (EPA), and ADEQ, as authorized by the EPA, administer these permits.

3.3.6 Groundwater

Groundwater within BMGR East occurs primarily in tertiary volcanic rocks and alluvial deposits. Groundwater recharge occurs from infiltration of rainfall runoff in stream channels and along mountain fronts, and underflow from adjacent alluvial basins. Depth to groundwater on the BMGR, based on limited water level data from wells, ranges from about 50 feet below ground

surface along major wash tributaries near the Gila River to nearly 600 feet below ground surface near the mountain ranges (Arizona Department of Water Resources 2001). Depth to groundwater is typically on the order of several hundred feet below ground surface.

The quality of groundwater within BMGR East has been found to be poor. It typically has high concentrations of total dissolved solids, boron, and fluoride. Approximately 50 wells occur in BMGR East (ARCADIS Geraghty & Miller 1998). Most of these wells are abandoned or are no longer in use. Five wells are registered to the Air Force: three at Gila Bend AFAF, one within North TAC, and one at RMCP 1. Two production wells, one at the Gila Bend AFAF and one at RMCP 1, currently supply Air Force use for construction, dust control, and potable water supply for selected facilities (Departments of the Air Force, Navy, and Interior 2006). Wells established to support Sonoran pronghorn forage plots are located east of the southern portion of the air-to-air firing range and east of the San Cristobal Wash (see Figure 3-3 in Section 3.5).

3.3.7 Potential for Contaminated Water

The potential for those military activities that occurred prior to the advent of modern environmental compliance requirements to have contaminated water resources was investigated in a Site Inspection Report prepared for the BMGR (U.S. Army Corps of Engineers 1995). All identified sites were investigated, remediated (as required), and received authorization for site closure. No evidence of surface or water contamination was found in these investigations. Current military activities on BMGR East that require the use, transfer, or storage of hazardous materials or wastes are required to operate within the guidelines established in their respective spill prevention control and countermeasures plans to minimize potential contamination. As further detailed in Section 3.10, an evaluation completed in 2005 concluded that there is no potential for munitions constituents from an operational range to migrate off-range and cause an unacceptable risk to human and/or ecological receptors.

3.3.8 Stormwater and Stormwater Permit Requirements

Stormwater at BMGR East is managed by Luke AFB and is regulated under the base's general stormwater AZPDES. The 56 FW/Civil Engineering Squadron holds a Multi-Sector General Permit for Gila Bend AFAF for the primary industrial category of airports, flying fields, and airport terminal services; management practices are implemented at Gila Bend AFAF on an ongoing basis is accordance with the associated Storm Water Pollution Prevention Plan (SWPPP). The 56 FW/RMO applies appropriate management practices throughout BMGR East to limit sedimentation into any stream. Construction activities involving clearing, grading, and excavating activities (which disturb one or more acres of land), require a permit under the AZPDES construction permitting program. The AZPDES CGP applies to construction activities

on BMGR East and the Gila Bend AFAF. The CGP authorizes stormwater discharges from construction-related activities where those discharges have a potential to enter surface waters of the United States or a storm drain system. CGPs require that the applicant submit a Notice of Intent to the ADEQ Surface Water Section. The CGP requires development of a SWPPP that satisfies the conditions of the permit. The SWPPP defines the measures to be employed to prevent the release of pollution from a specific construction site. The SWPPP identifies Best Management Practices (BMPs) to reduce site erosion and sediment loss, as well as manage construction-related wastes; identifies maintenance procedures; describes control measures and timing/sequence of implementation; and defines responsibilities. The SWPPP must be onsite whenever construction activities are actively underway and must be fully implemented and maintained during the construction phase. Following completion of construction and when the area disturbed by the construction activities is stabilized to at least 70 percent of natural background density, a submission of a Notice of Termination to the ADEQ Surface Water Section is required to end participation in the AZPDES CGP process (ADEQ 2008).

3.4 AIR QUALITY

3.4.1 Definition of Resource

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions.

The significance of the pollutant concentration is determined by comparing it to the federal and state ambient air quality standards. The Clean Air Act (CAA) and its subsequent amendments established the National Ambient Air Quality Standards for the following "criteria" pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns (PM_{10}) and less than 2.5 microns ($PM_{2.5}$), and lead (Pb).

These standards, presented in Table 3-2, have been adopted by the state of Arizona and represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Short-term standards (1-, 8-, and 24-hour periods) are established for pollutants contributing to acute health effects, while long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects. On March 12, 2008, EPA promulgated a revision to the 8-hour ozone standard for ground-level ozone, reducing it from 0.08 parts per million (ppm) to 0.075 ppm. This standard became effective on May 27, 2008.

Table 3-2 National and Arizona Ambient Air Quality Standards

***Pollutant*[1]**	***Averaging Time***	***Primary***	***Secondary***
Ozone (O_3)	8 Hours	[2]0.075 ppm	Same as Primary
Carbon Monoxide (CO)	8 Hours	9.0 ppm	None
	1 Hour	35 ppm	
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.053 ppm	Same as Primary
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.03 ppm	None
	24 Hours	0.14 ppm	
	3 Hours	---	0.5 ppm
Particulate Matter (PM_{10})	24 Hours	[2]150 $\mu g/m^3$	Same as Primary
Particulate Matter ($PM_{2.5}$)	Annual	15 $\mu g/m^3$	Same as Primary
	24 Hours	35 $\mu g/m^3$	---
Lead (Pb)	Quarterly Arithmetic Mean	1.5 $\mu g/m^3$	Same as Primary

Notes: [1.] These standards, other than for ozone and those based on annual averages, must not be exceeded more than once per year. The ozone standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one.

[2.] ppm = parts per million by volume, $\mu g/m^3$ = micrograms per cubic meter.

In addition to the ambient air quality standards for criteria pollutants, national standards exist for hazardous air pollutants (HAPs) which are regulated under Section 112(b) of the 1990 CAA Amendments. The National Emission Standards for Hazardous Air Pollutants regulate 188 HAPs based on available control technologies. Examples of HAPs include benzene, which is found in gasoline; perchlorethlyene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper. Examples of other listed air toxins include dioxin, asbestos, toluene, and metals such as cadmium, mercury, chromium, and lead compounds. The majority of HAPs are volatile organic compounds (VOCs).

Arizona maintains its own regulations regarding the federal list of HAPs. These regulations apply to particular source categories that are minor sources of HAP emissions and all major HAP sources. The state HAP regulations do not apply to sources for which a standard under 40 CFR 61 or 40 CFR 63 imposes an emissions limitation.

3.4.2 Study Area

The air quality ROI is defined as the Maricopa County Intrastate Air Quality Control Region (defined in 40 CFR Part 81.36) which covers Maricopa County only. Thus, the air quality analysis focuses on the impacts to the Maricopa County Air Quality Control Region since that is both the ROI and the primary location where construction and operational impacts would occur (if Alternative 1.A were selected for the STA, the construction activities would be in Yuma County and if Alternative 1.B were selected, the construction activities would occur in Pima County).

3.4.3 Introduction

Evaluation of air quality impacts requires knowledge of: 1) applicable regulatory requirements for criteria, hazardous, and toxic air pollutants; 2) types and sources of emissions for stationary sources and the horizontal and vertical extent of emissions from mobile sources such as construction equipment or motor vehicles; 3) location and context of the ROI associated with the proposed action or actions; and 4) baseline conditions.

3.4.4 New Source Review and Prevention of Significant Deterioration

As part of the 1977 CAA Amendments, Congress established the New Source Review program. This program is designed to ensure that air quality is not significantly degraded from the addition of new and modified factories, industrial boilers, and power plants. The New Source Review assures that new or modified emission sources do not have significant adverse impacts on a locality's air quality. In areas with clean air, especially pristine areas like designated Class I areas, New Source Review assures that new emissions do not significantly worsen air quality.

The CAA Amendments also established a national goal of preventing degradation or impairment in any federally-designated Class I area. As part of the Prevention of Significant Deterioration program, mandatory Class I status was assigned by Congress to all international parks, national wilderness areas, memorial parks greater than 5,000 acres and national parks greater than 6,000 acres in existence in 1977. The closest Class I area to BMGR East is Superstition Wilderness Area, which is 93 miles (150 km) away.

Under the new Federal Land Manager's Air Quality Related Values Workgroup Final Draft Phase I Report (June 2008), the Workgroup established criteria for sources greater than 50 km from a Class I area. These criteria state that a source located greater than 50 km from a Class I area is considered to have negligible impacts if its total oxides of sulfer (SO_x), oxides of nitrogen (NO_x), PM_{10} and H_2SO_4 (sulfuric acid) annual emissions (in tons per year, based on 24-hour maximum allowable emissions), divided by the distance (in km) from the Class 1 area is 10 or less (U.S. Forest Service, National Park Service, and USFWS 2008).

3.4.5 Attainment Status

Air quality is of concern relative to some of the proposed actions because implementation of some actions has the potential to introduce some of the above-described air pollutants to the atmosphere. The current attainment status designations for areas within Arizona are summarized in 40 CFR Part 81.303. BMGR East lies in an area that is listed as either better than national standards, or nonclassifiable/attainment for all criteria pollutants.

Gila Bend AFAF maintains a Non-Title V Air Quality Permit (January 2008) issued by the Maricopa County Air Quality Department. As per Maricopa County Air Pollution Control Regulations, Rule 303, Gila Bend AFAF has established emissions and throughput limits and is required to maintain records on operations, maintenance, and usage emissions to verify compliance with permit conditions. The permit includes a list of the applicable regulations, the emissions limits, and specifics on how equipment is to be operated in order to minimize emissions. Types of emission sources found at Gila Bend AFAF include:

Boilers	Emergency Generators	Non-retail Gas Operations
Spray Coating Operations (Range Targets)	Woodworking Operations	Petroleum Storage

The only permitted activity on BMGR East, outside of those occurring at Gila Bend AFAF, is open burning, which must comply with the Open Burning Permit (April 2004) issued by the Air Quality Division, ADEQ to Luke AFB for burning on the range. Open burning is limited to dud flares and four munitions burn/detonation activities per month, with no more than 2,000 pounds of total net explosive per burn and must only include specified munitions. Additionally, one simulated burn per year is allowed, using propane, wood and /or thermite grenades.

3.5 BIOLOGICAL RESOURCES

Biological resources include native or naturalized plant and animal species and the vegetative communities within which they occur. The following discussion of the affected environment for biological resources begins by addressing the region where the BMGR lies and then focuses on the biotic communities within BMGR East where the proposed actions may occur. Biotic communities include the vegetative associations and the habitat they provide for wildlife species. Refer to Appendix D for a listing of common and scientific names of species mentioned in the text.

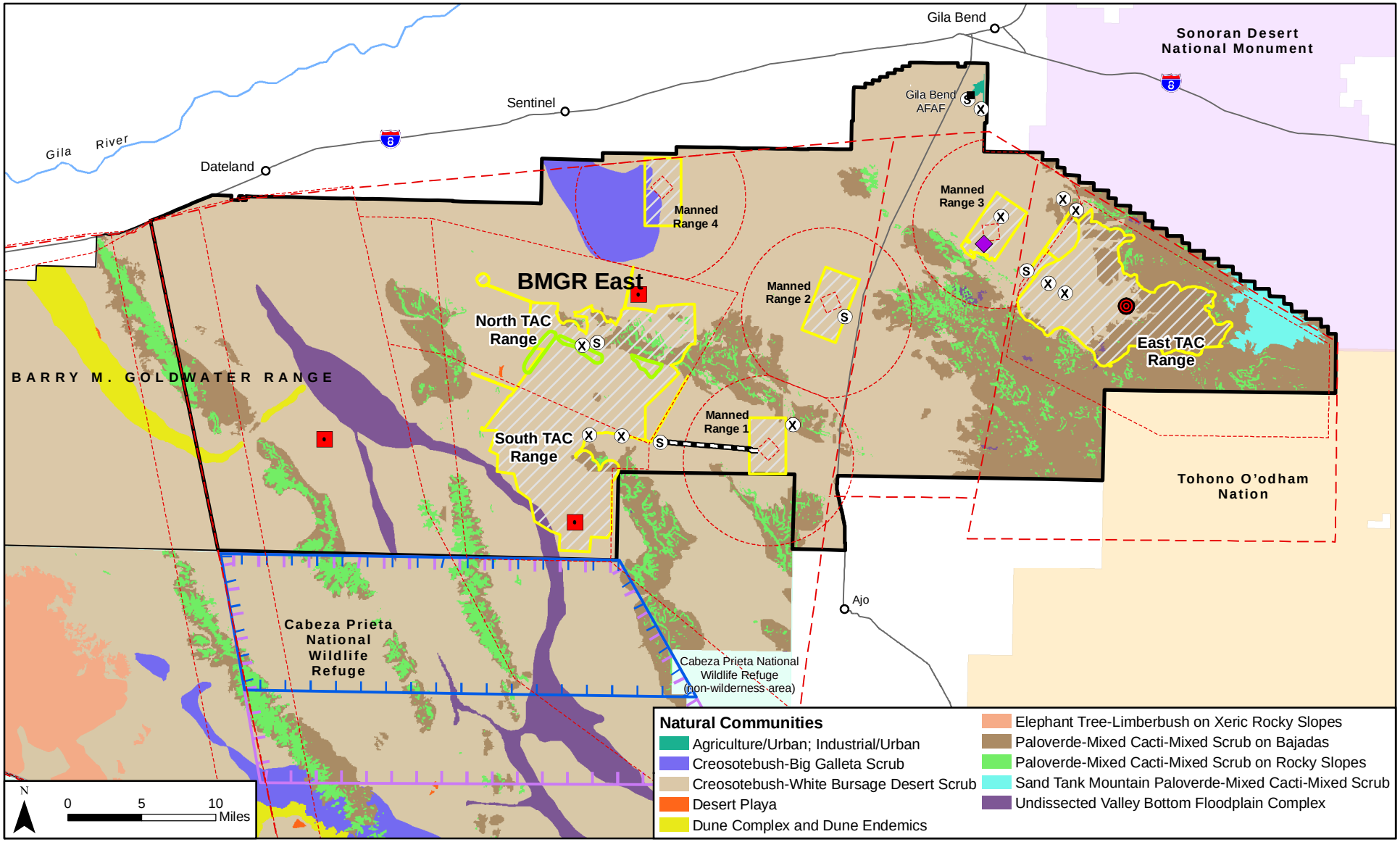
3.5.1 Sonoran Desertscrub Biotic Community

The Sonoran Desert Ecoregion encompasses 55 million acres (almost 86,000 square miles) in southern Arizona, southeastern California, Baja California, and northwestern Sonora. It has the greatest biological diversity of the three North American warm deserts (Chihuahuan, Mojave, and Sonoran), including the highest known diversity of bee species in the world (Phillips and Comus 2000). More than 500 bird species migrate through, seasonally breed in, or permanently reside in the ecoregion—nearly two-thirds of all bird species that occur in northern Mexico, the United States, and Canada combined. As a result, the Sonoran Desert Ecoregion was identified by the World Wildlife Fund as deserving special conservation attention (Olson and Dinerstein

1998). The BMGR is a critical component in the largest remaining tract of relatively unfragmented Sonoran Desert in the United States. Composed of the BMGR, Cabeza Prieta NWR, Organ Pipe Cactus National Monument, Sonoran Desert National Monument, and the BLM-administered Sentinel Plain area, this tract currently totals about 5,000 square miles of which the BMGR contributes almost 55 percent of the land area. The BMGR is also important because it encompasses significant east to west ecological gradients, incorporating much of the diversity of landforms, rainfall, and elevation that are present within the Sonoran Desert in Arizona that contribute to the biodiversity of this ecoregion (Hall *et al.* 2001).

On the BMGR, the Sonoran Desert biotic community (Brown 1982) is primarily represented by two major vegetation subdivisions (also referred to as vegetation series): 1) the Lower Colorado River Valley Sonoran Desertscrub and 2) the Arizona Upland Sonoran Desertscrub. The Lower Colorado River Valley Sonoran Desertscrub occurs throughout most of the BMGR and consists primarily of the creosotebush-white bursage desertscrub association on undissected valley bottoms, and other vegetation associations that include the floodplain complex composed of various desert tree species adjacent to wash channels, minor inclusions of the paloverde-mixed cacti-mixed scrub on bajadas and adjacent rocky slopes, and limited areas of creosotebush-big galleta scrub. The Arizona Upland Sonoran Desertscrub is found on the mountains, hills, and bajadas in the vicinity of the eastern boundary of the BMGR and consists primarily of the paloverde-mixed cacti-mixed scrub associations, and to a lesser extent creosotebush-white bursage desertscrub (Figure 3-3). Precipitation decreases from east to west across the BMGR, resulting in a parallel decrease in diversity and density of vegetation with correlating influences on the distribution of wildlife on the BMGR. The Arizona Upland and Lower Colorado River Valley Desertscrub communities share many of the same floristic elements.

Past and on-going military activities have resulted in localized impacts to desert habitats. After more than six decades of military use, about 2.5 percent of the current BMGR surface area (including BMGR West and BMGR East) has been modified at a moderate to high level; another 7.5 percent of the BMGR has experienced low to moderate levels of surface impacts. Military surface use areas are often clearly defined sites that are widely scattered across the BMGR with a network of interconnecting roads. Overall, most lands on the BMGR are undisturbed; military impacts have little influence on the biotic communities at a landscape level, and natural ecological processes are the primary influence on native biological communities across the expanse of the BMGR with similar processes represented at the Cabeza Prieta NWR and Organ Pipe Cactus National Monument.



Proposal 1 - Sensor Training Area
Alternative Sites
Proposal 2 - Target Reconfiguration
Maximum Target Reconfiguration Footprint
Proposal 3 - Moving Vehicle Target
Alternative Sites
Proposal 4 - New Target for Air-to-Ground Missiles
Proposed Site

Proposal 5 - Lower Flight Training Altitude Over Cabeza Prieta NWR
Alternative 5.A
Alternative 5.B
Proposal 6 - Reconfigure Manned Range 3 for Helicopter Training
Proposed Site
Proposal 9 - Manned Range to RMCP1 Road Pavement
Proposed Site
Proposal 10 - Sand and Gravel Excavation, Stockpiling, and Use
X Proposed Excavation Sites
S Proposed Stockpile Sites

Barry M. Goldwater Range
Restricted Airspace Boundary
Subrange Airspace Boundary
National Wildlife Refuge
National Monument
Indian Reservation

Figure 3-3

NATURAL COMMUNITIES IN THE BMGR EAST VICINITY

Note: Proposal 7 is not mapped because on-the-ground training exercises would occur at dispersed locations. Proposal 8 is not maped because it is not apparent at this scale (see Figure 2-13).

3.5.1.1 Lower Colorado River Valley Subdivision of the Sonoran Desert

The Lower Colorado River Valley Subdivision is represented on the valley floors by creosotebush and white bursage associations, often with or replaced by several species of saltbush. The various creosotebush desertscrub associations typically occur where soil composition is proportionately high in silt and clay (Reichenbacher and Duncan 1989). Other plant species that may be present, often on rocky slopes, in gravelly soils, or along dry washes include various species of shrubs (e.g., jojoba, cholla, ocotillo, and brittlebush), scattered trees (e.g., paloverde, mesquite, smoketree, ironwood, and saguaro), and stands of the grass big galleta (Turner and Brown 1982). Within this vegetative community are extensive areas mostly devoid of perennial plants but covered by a single layer of tightly packed, varnish colored pebbles referred to as desert pavement (Brown 1982).

The presence of wildlife species is often in response to soil conditions that influence vegetative diversity, density, and structure. In creosotebush habitats where the soils are friable (i.e., not compacted or hardpan), there are often many rodent burrows at the base of plants that may also be used by many species of lizards and snakes. In areas where the shrubs provide a relatively dense canopy cover, species such as pocket mice, deer mice, and long-tailed brush lizards may be found; open areas and where canopy cover is sparse provide habitat for species such as kangaroo rats, burrowing owls, and zebra-tailed lizards. Creosotebush habitats are notably lacking in breeding bird diversity, due in part, to the limited vegetative structural diversity (Turner and Brown 1982). Birds commonly breeding in these habitats include black-throated sparrow, burrowing owl, common poorwill, and lesser nighthawk. The abundance of rodents inhabiting these areas attracts a variety of predators such as coyote, kit fox, American badger, and seasonally, various avian raptors such as red-tail hawk and American kestrel. The endangered Sonoran pronghorn forages throughout this vegetative community, particularly during the spring (U.S. Air Force 1986).

3.5.1.2 Arizona Upland Subdivision of the Sonoran Desert

Arizona Upland Subdivision habitats are characterized by greater diversity of vegetation and more complex vertical structure (Turner and Brown 1982). The Arizona Upland Subdivision within the BMGR is comprised of a variety of trees, shrubs, and cacti, as well as those species represented in the Lower Colorado River Valley Subdivision. This region is often dominated by paloverde, saguaro, and various shrubs, including triangle-leaf bursage. On the BMGR, the Arizona Upland Subdivision reaches its greatest development on the bajadas (i.e., alluvial fans), foothills, and slopes of the Sand Tank, Sauceda, and Batamote mountains, but is still largely transitional with the Lower Colorado River Valley Subdivision (U.S. Marine Corps 1997). In

response to rainfall patterns, species such as paloverde, ironwood, mesquite, and saguaro are more common in upland habitats in the eastern portion of the BMGR than to the west.

Arizona Upland habitats support a diverse wildlife community, which includes desert bighorn sheep, mule deer, coyote, black-tailed jack rabbit, desert tortoise, numerous species of lizards and snakes (e.g., western whiptail lizard, collared lizard, common kingsnake, long-nosed snake, and western diamondback rattlesnake) and a variety of desert adapted amphibians (e.g., Sonoran desert toad, Great Plains toad, and Couch's spadefoot toad). Caves, crevices, and abandoned mine shafts provide roosting and nursery colony sites for many resident bat species. Many species of breeding birds also occur in these habitats including Gambel's quail, turkey vulture, Gila woodpecker, Say's phoebe, and curved-billed thrasher. Many other bird species commonly migrate through or winter in Arizona Upland habitats. The Arizona Upland community includes most of the species within the Lower Colorado River Valley community but often at higher densities; however, many of the species from the Arizona Upland community are not found within the hotter and drier Lower Colorado River Valley community. The presence of some vertebrate species on the BMGR is primarily restricted to the eastern portion of the BMGR, these include: javelina, antelope jackrabbit, rock squirrel, white-tailed deer, Harris's hawk, crissal thrasher, Bell's vireo, pyrrhuloxia, and canyon towhee.

3.5.1.3 Desert Wash Habitats

Desert washes are the most diverse wildlife habitats on the BMGR. Often referred to as xeroriparian communities, these washes generally include many of the same plant species found in upland areas throughout the landscape, achieving more lush growth and greater densities due to the increased availability of surface and/or subsurface water. Paloverde, ironwood, and mesquite are important trees along these washes. Also, big galleta, a drought tolerant native grass, is often found along washes and drainage channels. Its dense, clumped growth form captures soils and reduces the potential for soil erosion, and provides cover for small mammals, reptiles, and birds.

Wildlife, especially birds, large mammals, and invertebrates, make disproportionate use of the resources within the desert wash habitat when compared with surrounding communities. The increased diversity and density of vegetation along the typically dry washes provide more seeds and vegetation for herbivores, prey for predators, a variety of nest and perch sites, hiding and thermal cover, movement corridors, and moisture for wildlife than is available in surrounding habitats. Organic material composed of leaf litter and other vegetative debris that is present within the xeroriparian communities provides an important source of nutrients for plants and animals, as well as providing cover and nesting material for some animals (Hall *et al.* 2001).

Xeroriparian habitats support more nesting bird species than any other habitat on the BMGR and represent an important stop-over habitat for migrating birds. Representative breeding species include western screech-owl, verdin, black-tailed gnatcatcher, and Lucy's warbler. Neotropical migrants such as western tanager, MacGillivray's warbler, Swainson's thrush, ruby-crowned kinglet, and tree swallow pass through the Southwest deserts during the flowering periods of paloverde, mesquite, and ironwood. These flowering events support a rich insect fauna, which provide forage for a variety of migrating and resident birds and bats (Johnson and Haight 1985; Morrison *et al.* 1997; and U.S. Marine Corps 1997).

Within the Lower Colorado River Valley Subdivision, xeroriparian areas are estimated to occupy less than five percent of the landscape but support 90 percent of its bird species (Phillips and Comus 2000). Large mammalian species, such as mule deer, depend on these habitats for forage, shade, movement corridors, and cover for critical life history events such as fawning. Small mammals forage on the seeds and/or other vegetation from the relatively rich flora associated with the xeroriparian communities. The insectivorous California leaf-nosed bat, which does not hibernate nor migrate, forages year-round along these dry washes. Many reptile species also occur in xeroriparian habitats where there is a diversity of insects for lizards to forage, and rodents and lizards available for snakes (Hall *et al.* 2001; and U.S. Air Force 1986).

While xeroriparian areas are better represented along the eastern limits of the BMGR where precipitation is somewhat greater, several significant xeroriparian areas occur across the central and western portions of the BMGR, including Tenmile Wash, Growler Wash, and San Cristobal Wash. However, these washes reflect the vegetation present in the adjacent landscape, with decreasing vegetation diversity and density from east to west. Many of the smaller washes within the Lower Colorado Valley Subdivision consist of shallow, narrow, and poorly defined drainage channels and often include only single or small groups of mesquite, paloverde, and/or ironwood, or small stands of big galleta.

3.5.1.4 Sand Dune Habitat

Aeolian (wind-blown) dunes exist on the BMGR primarily on the west side of the Mohawk Mountains (on BMGR West, outside of the project area). However, an extension of the Mohawk dunes extends through Mohawk Pass into the west side of BMGR East; there are also various scattered sites, primarily on the north and west sides of BMGR East, with minor occurrences of sand dune habitat that has been largely stabilized by vegetation (U.S. Marine Corps 1997). In these sandy areas, vegetation often has a clumped distribution and is composed of a variety of shrubs. Mesquite, due to its deep root system, is often well represented on dunes. Several plant species such as the Ajo lily and sand verbena are largely restricted to sandy habitats. Dunes and/or adjacent areas of fine, sandy soils are inhabited by many of the same species of vertebrate

animals that are found in adjacent areas. However, some species such as the little pocket mouse and desert kangaroo rat are found in greater densities. Other mammals that are likely to be found in or near dune systems include desert cottontail, jackrabbit, Harris's antelope squirrel, white-throated woodrat, grasshopper mouse, coyote, and kit fox (U.S. Marine Corps 1997).

No bird species are uniquely characteristic of sand dune habitats; however, there is often a greater diversity of birds in dunes than adjacent habitats due to the presence of plants that provide greater vertical structure such as mesquite and ocotillo. Species likely to be encountered on the BMGR in or near sand dune systems include loggerhead shrike, mockingbird, black-tailed gnatcatchers, and black-throated sparrows. Some species of reptiles are uniquely adapted to life in sand dune systems. Unique adaptations by the Colorado Desert fringe-toed lizard for burrowing in the sand or moving quickly across the surface include countersunk lower jaws, well-developed ear flaps, and fringe-like scales on the toes. Other reptiles found in greater abundance in sandy habitats include the desert iguana, western shovel-nosed snake, western ground snake, and sidewinder.

3.5.1.5 Desert Playa

Desert playas typically form as a result of periodic flooding and subsequent evaporation in poorly drained soils within desert basins. These sites are rare in Sonoran Desert systems, and are generally sparsely vegetated and often located within a matrix of creosotebush-bursage desertscrub. Little is known about the hydrology of the desert playas on the BMGR (Hall *et al.* 2001) but these areas may be important as amphibian breeding pools and provide temporary sources of water for wildlife.

3.5.1.6 Water Sites and Associated Habitats

Water availability and associated wildlife habitat is restricted to managed and natural tanks, tinajas (plunge pools), playas, ephemeral washes, and roadbeds that may flood during heavy rains. These are important as seasonal, temporary water sources on which many vertebrate and invertebrate species depend. These areas provide water for bighorn sheep, deer, Sonoran pronghorn, coyote, and various other species of wildlife. Tinajas, tanks, and playas that hold water long enough for amphibians to complete their metamorphosis from tadpole to adult form are critical for the survival of Couch's spadefoot and several species of true toads (U.S. Air Force 1986).

Both permanent and ephemeral tinajas may support a variety of aquatic invertebrates (Larsen and Olson 1997). Some of the invertebrates are broadly distributed, though others are unique to tinaja habitats (Larsen and Olson 1997). There have been no comprehensive surveys of the invertebrate fauna present in tinajas and other aquatic habitats on the BMGR.

Artificial catchments were created to retain precipitation runoff for wildlife. Most of the water catchments present on the BMGR were constructed by the Arizona Game and Fish Department (AGFD) between the 1940s and late 1980s, although a few water catchments have been added since then and some existing water catchments have been reconstructed. Ongoing AGFD maintenance actions consist of monitoring the condition of the catchment and the water levels; monitoring wildlife use; and enforcing the state requirement that all campsites be more than a quarter mile away from water sources. Occasionally, supplemental water may be hauled to water catchments when deemed necessary due to wildlife, climactic, or habitat conditions. Wildlife most likely to use the managed waters includes bighorn sheep, mule deer, and game birds; although other species, such as coyote, bobcat, mountain lion, Sonoran pronghorn, and birds, may use these waters (BLM 1999, Rosenstock *et al.* 2004). Often, these species concentrate near these water sources during periods of drought. It is unclear how the presence of managed water sources influences predator behavior and vulnerability of prey species.

3.5.2 Wildlife

Wildlife found on the BMGR that are considered big game by the AGFD includes mule deer, white-tailed deer, javelina, bighorn sheep, and mountain lion. Small game mammals that occur on the BMGR include the desert cottontail and black-tailed jackrabbit. Game birds occurring on the BMGR are the mourning dove, white-winged dove, and Gambel's quail. The BMGR includes portions of two state game management units, 40A and 40B. Game unit 40A is east of State Route 85; game unit 40B includes the remainder of the BMGR. AGFD regulates all hunting on the BMGR.

Ground disturbance due to military operations has primarily occurred in valley bottom and low hill habitats, so wildlife species that typically occupy creosotebush desertscrub and desert xeroriparian habitats have been exposed to the greatest potential for impacts due to military activities. Fencing, installed for public safety and military security purposes, can change wildlife movements or deny wildlife access to certain areas. Vehicle traffic and human presence throughout most of the BMGR is controlled by the military. Virtually the entire airspace over the BMGR and parts of the Cabeza Prieta NWR is used by military aircraft, resulting in temporary exposure to high levels of engine noise.

Military features within target areas and at developed facilities sometimes provide artificial wildlife habitat. For instance, elevated military structures are sometimes used as perch sites for raptors and other bird species. Small mammals burrow in target areas where soil has been loosened by target construction and maintenance and/or munitions impacts. Surface disturbing activities that alter natural runoff patterns, such as collection of rainwater in disturbed soils (e.g., bomb craters, along roadsides) and application of water for dust suppression can create

more mesic microhabitats in localized areas that support more lush vegetation that attracts foraging wildlife. Reptiles, small mammals, and invertebrates may use targets (e.g., vehicle bodies, and simulated tanks and structures) and/or munitions debris (e.g., expended munitions casings, and parachutes) for cover. Representative species are discussed for purposes of analysis.

3.5.2.1 Mule Deer

Mule deer occupy mountains, hills, and desert washes, and are reliant on perennial water. Most of the BMGR is considered marginal habitat for mule deer (particularly west of State Route 85), although they are more common than white-tailed deer. Mule deer are the most numerous and widely distributed of the big game on the BMGR. In southwestern Arizona, mule deer are not migratory and have reported home range areas of 121 square kilometers for females (Rautenstrauch and Krausman 1989). During dry periods, mule deer are especially dependent on the availability of perennial water sources, including the presence of man-made water tanks (Hoffmeister 1986). Mule deer adapt to hot and dry periods by modifying their activity. They have been reported to decrease their daytime activity and increase their nighttime activity to avoid hot daytime temperatures (Hays and Krausman 1993). Breeding occurs over winter, with the peak rutting behavior between December and the middle of January. Fawns are born seven months later from July through September (Hoffmeister 1986).

3.5.2.2 White-tailed Deer

In Arizona, white-tailed deer occur throughout central and southern portions of the state, but not in southwestern Arizona. White-tailed deer are typically found at higher elevations than mule deer. Breeding occurs between mid-December and March, with the peak in January. Most fawns are born in July and August in Arizona, coinciding with new plant growth following the summer rains (AGFD 2002). White-tailed deer are found on the far eastern edge of the BMGR (BLM 1990) and are known from the Sauceda, Sand Tank, Growler, and Ajo mountains (Hoffmeister 1986).

3.5.2.3 Desert Bighorn Sheep

Desert bighorn sheep occupy essentially all mountain habitats within the BMGR (BLM 1990). They prefer the steep and rough terrain of the higher elevations; however, they will move down onto the bajadas when forage is available, sometimes crossing valleys between mountain ranges. On rare occasions desert bighorn sheep utilize lowland habitats, especially when moving from one mountain range to another. When crossing, they tend to take the shortest routes possible across level terrain (Simmons 1980). Desert bighorn sheep require steep terrain to escape from predators and for lambing areas. Desert bighorn sheep forage on forbs, grasses, and shrubs, which are also preferred by burros (BLM 1990). In southern Arizona, lambing can occur in any

month; however, it tends to peak during January, February, and March. The peak mating period (rut for rams, estrus for ewes) is during July, August, and September (Russo 1956). Group size and composition is variable and dependent on season, often ranging from one to 15 individuals with a mean group size of three. Except during the mating period, groups tend to be segregated into those of adult rams, and mixed groups of ewes, lambs, and juveniles (Simmons 1969). The mountain lion is the major predator of the bighorn sheep. Shrub density and height may be an important aspect of desert bighorn sheep habitat. Lower shrub densities and heights provide less cover for mountain lions and may allow desert bighorn sheep to more easily detect and escape predators.

3.5.2.4 Javelina

The range of the javelina encompasses much of southern Arizona to southern Texas and south as far as northern Argentina in South America (Hoffmeister 1986; Nowak and Paradiso 1983). In Arizona, they occur in the southeastern and central portions of the state with isolated populations in the west (Hoffmeister 1986). Statewide, the most important and productive biotic community for javelina is the Arizona Upland Subdivision of the Sonoran Desert, and they eat roots, tubers, seeds, mesquite beans, green vegetation, cactus fruits, agaves, and prickly pear cactus pads. Like mule deer, javelina prefer washes and bajadas. In Arizona, javelina can give birth to young in every month of the year, although young are mostly born between June and August. On the BMGR, javelina are scattered in small herds primarily east of State Route 85 in the Sauceda and Sand Tank mountains where succulent vegetation such as buckhorn cholla, prickly pear, and agave are more prevalent. Several javelina have been sighted in the vicinity of the Tinajas Altas Mountains by Border Patrol and AGFD personnel (Gilbert 1994). Within their range, javelina distribution is limited primarily by the availability of water.

3.5.2.5 Carnivores

Carnivores present on the BMGR include mountain lion, bobcat, gray fox, kit fox, coyote, and American badger. Mountain lions are seldom seen but may occur throughout the BMGR. Although it is possible to find mountain lions anywhere on the BMGR, their population density is very low. Mountain lions have ranges of 25 square miles or more, occurring in rugged, often heavily vegetated areas, but also can be found in any habitat that supports good prey populations such as bighorn sheep and mule deer (Phillips and Comus 2000). On the BMGR, they are found primarily in the mountains of the eastern portion (U.S. Air Force 1986).

Bobcats occupy many of the same habitats as mountain lions, but take smaller prey. The bobcat's home range is only a few square miles. If prey is scarce, bobcats may wander extensively (Phillips and Comus 2000; Morgart 2002). Coyotes are extremely adaptable, wide ranging, and

may be encountered in almost any habitat, but are generally less common in rocky uplands. Gray foxes occur along major washes and in rocky uplands where they prey on a variety of small mammals, birds, and reptiles. Kit foxes inhabit the open, sparsely vegetated valley bottoms where they dig dens in deeper, friable soils and prey on kangaroo rats, pocket mice, other rodents, and rabbits. American badgers are present on the BMGR on alluvial fans and flats adjacent to mountain ranges (Hoffmeister 1986) where they prey primarily on burrowing species of rodents (U.S. Marine Corps 1997).

3.5.2.6 Small Mammals

Small mammals on the BMGR include jackrabbits, cottontails, and many species of bats and rodents. Rodents found on the BMGR include pocket mice, kangaroo rats, ground squirrels, wood rats, and grasshopper mice.

Bat species observed on the BMGR include California leaf-nosed bat, cave myotis, western pipistrelle, California myotis, pallid bat, big brown bat, and the endangered lesser long-nosed bat (Dames & Moore 1996 and 1997). The greater western mastiff bat may also be present with limited occurrence on the BMGR (Barry 1997). A systematic survey of all known mines on the BMGR was initiated in 1992 (Dalton and Dalton 1994). Of the 101 sites visited, 11 sites were found to contain bats and an additional 10 sites were considered important to bats. A follow-up study of the mines in which bats were detected in 1992 was completed in 1997 (Dames & Moore 1997). Twenty-nine sites were visited during the summer reproductive season (May to July) and the winter season (November to February). Bats were found in 16 of the 19 sites identified by Dalton and Dalton (1994) and in several additional sites not previously examined. Most recently, surveys have been conducted in the Sand Tank and Sauceda mountains to locate and study bat roosts, and to determine the home range, major roosting sites, habitat use, and foraging requirements of California leaf-nosed bats. Several occupied and potential roost sites for California leaf-nosed bats have been discovered by Dalton and Dalton (1994; 1999), Dalton *et al.* (2000), and Dalton (2001). In addition to these surveys, the military and BLM have coordinated installation of bat-friendly gates at the entrances to some mines and caves on the BMGR to protect roosting sites from recreational users.

3.5.2.7 Birds

More than 200 bird species may occupy the BMGR. Throughout the BMGR, desert washes support the largest populations of breeding birds and they are also important habitat for migratory birds. The structural diversity and density of vegetation provides habitats for a large number of bird species. Saguaros provide nesting substrate for cavity nesting birds, including American kestrel, elf owl, Gila woodpecker, and gilded flicker. Harris's hawks may also nest on

saguaros and hunt where perch sites are available. Other birds often associated with Arizona Upland vegetation include cactus wren, curve-billed thrasher, verdin, Gambel's quail, white-winged dove, mourning dove, and greater roadrunner.

Creosotebush communities (Lower Colorado River Valley Subdivision) provide suitable nesting habitat for limited numbers of bird species (Turner and Brown 1982). LeConte's thrashers, black-throated sparrows, and lesser nighthawks breed in creosotebush associations. Several species of migratory, wintering birds (e.g., horned lark, American pipit, white-crowned sparrow, and sage sparrow) are also associated with creosotebush vegetation.

Based on Arizona's Comprehensive Wildlife Conservation Strategy (CWCS) prepared by the AGFD (May 2006), there are more than 100 avian species of concern within the state. Nine of these species have a status of Tier 1A, which affords protections; 40 are considered Tier 1B and are either petitioned for listing under the ESA, are high priority in the Arizona Partners in Flight Bird Conservation Plan (June 1999) or are included on any of the following species of special concerns lists: BLM Sensitive Species, U.S. Forest Service Sensitive Species, National Park Service Sensitive Species, Pima County Priority Vulnerable Species, Trilateral Committee Species of Common Concern, or Wildlife of Special Concern in Arizona; and another 52 are Tier 1C and are considered "vulnerable" within Arizona (CWCS 2006).

The majority of these species do not occur on the BMGR and even fewer of them breed in the region. However, a number of species may winter on the BMGR or pass through on migration. The Le Conte's thrasher, western burrowing owl, and peregrine falcon are avian species of concern that may breed on BMGR East and, therefore, are considered in the evaluation of potential impacts of each of the proposed actions. Additionally, there has been increased interest in the population status of the western burrowing owl by AGFD, which has developed a burrowing owl survey protocol and provides survey training.

3.5.2.8 Reptiles and Amphibians

The herpetofauna of the BMGR is diverse, and the assemblage of species is characteristic of many Sonoran Desert habitats. Many species have their population centers in the arid Southwest (e.g., Gila monster, desert iguana, chuckwalla, long-tailed brush lizard, spotted leaf-nosed snake, and banded sand snake) while others are more widespread (e.g., western whiptail, coachwhip, gopher snake, and night snake). Six species of rattlesnakes (western diamondback, Mohave, speckled, black-tailed, tiger, sidewinder) occur on the BMGR. In addition, Colorado Desert fringe-toed lizard occurs in sandy habitats throughout the BMGR (Turner *et al.* 1997).

Even with the extreme aridity of the BMGR landscape, a variety of amphibians may be found such as the Sonoran desert toad, Couch's spade-foot toad, Great Plains toad, and red-spotted

toad. Most become active on the surface in response to summer rains, seeking temporary pools of water in which to lay their eggs.

3.5.2.9 Wildlife Movement Corridors

Large mammals, such as mule deer, white-tailed deer, desert bighorn sheep, Sonoran pronghorn, javelina, mountain lion, and burros may range widely across the landscape in search of food and water or in response to changing environmental factors, often following seasonal movement patterns. Natural and man-made barriers to wildlife movement may prevent animals from reaching important resources and/or limit the availability of habitats that may otherwise become occupied.

Abrupt escarpments, mountain ridges, and even open valley floors are types of natural barriers (Lee *et al.* 1998) that may discourage or prevent movement of some species. Man-made obstacles such as highways, fences, railroads, and irrigation canals that are found in association with or adjacent to the BMGR are partial or complete barriers to movement of some wildlife species. Major highways in the vicinity include Interstate 8, State Route 85, and Mexico Highways 2 and 8. The effect of highways as barriers to Sonoran pronghorn movement may be attributed to right-of-way fencing, traffic volume, and possibly the speed of traffic (USFWS 1998). Additionally, surrounding land use may have also reduced wildlife access to historic water sources adjacent to the BMGR.

Interstate 8, north of the BMGR, and Mexico Highway 2 south of the BMGR, restrict wildlife's access to water in the Gila and Sonoyta rivers, respectively. While there are no historic scientific studies that monitored or tracked movements of wildlife to the Gila and Sonoyta rivers during times of drought, reliable anecdotal accounts do indicate that such movements occurred. Most of the data that has been compiled on this subject has been focused on the Sonoran pronghorn, but is also representative of other large mammals. A 1981 AGFD report on significant known historic and contemporary information about Sonoran pronghorn states that:

> *By far the most important and historic watering areas for the Sonoran pronghorn in Arizona were the Gila River and the Rio Sonoyta. Both were free-flowing, permanent rivers at one time. Today, the Gila is normally dry and the Rio Sonoyta flows only intermittently. [The Gila River was a...] wide, shallow river 100 years ago [and] provided the well-developed riparian communities [that were] a haven for desert wildlife. Early reports of pronghorn, bighorn sheep, deer, thousands of ducks, and fish were common. … Sixty years ago, the Rio Sonoyta was a permanent live stream. … The importance of these two rivers in supporting historic Sonoran pronghorn populations cannot be discounted. The rivers not*

> *only supplied a dependable source of [life]-sustaining water, but the banks also provided green foliage and cover.*

While roadways themselves may not impede pronghorn movements, right-of-way fences constructed adjacent to roadways are often a barrier to pronghorn. Unlike deer, pronghorn rarely jump fences and their primary means to cross fences is to move underneath them.

Fences are located along the State Route 85 corridor and within other operational areas of the BMGR to protect military assets, such as sensitive equipment, or to exclude non-authorized personnel from certain areas for safety purposes. Railroads in the vicinity include the currently inactive Tucson, Cornelia, and Gila Bend Railroad and the two Union Pacific Railroad lines located north of the BMGR. Major canals in the vicinity of BMGR include the Gila Bend, Wellton, and Mohawk canals.

Mountain passes, including the Mohawk Pass and Cipriano Pass, provide important corridors for movement of some wildlife species between major BMGR valleys. Desert riparian areas are also used as corridors for wildlife movement as they provide more cover and forage than adjacent habitats and have terrain that supports the movement for many species.

3.5.3 Wildlife Management and Protected Species

Management responsibilities and regulatory authority applicable to general wildlife, habitats, and wildlife management on BMGR are:

- **Executive Order 13112*, Invasive Species.*** Requires federal agencies to identify actions that may affect invasive species, use relevant programs to prevent introduction of invasive species; detect, respond, and control such species; monitor invasive species populations; provide for restoration of native species; conduct research on invasive species; and promote public education.
- **Sikes Act (16 U.S. Code [U.S.C.] 670a *et seq*.)**. Provides for cooperation by the Departments of the Interior and Defense with state agencies in planning, development, and maintenance of fish and wildlife resources on military reservations throughout the United States. A cooperative plan is to be developed to provide for fish and wildlife habitat improvements or modifications; range rehabilitation where necessary for support of wildlife; control of off-road vehicle traffic; and specific habitat improvement projects and related activities, including adequate protection for species of fish, wildlife, and plants considered threatened or endangered.
- **DoD Instruction 4715.3*, Environmental Conservation Program.*** Outlines Department of Defense policy for the management of natural resources and the preparation of

INRMPs. The most applicable provisions with regard to general wildlife and wildlife habitat are those requirements to manage natural resources to support and be consistent with the military mission, while protecting and enhancing those resources for multiple use, sustainable yield, and biological integrity; to base land use practices and decisions on scientifically sound conservation procedures and techniques, and use scientific methods and an ecosystem approach; to incorporate the principles of ecosystem management in INRMPs; to inventory, manage, and protect biologically or geographically significant or sensitive natural resources or species; and to promote biodiversity.

- **Fish and Wildlife Conservation Act of 1980.** Promotes state programs to conserve, restore, and benefit non-game fish and wildlife and their habitat.
- **Title 17 of the Arizona Revised Statutes, Game and Fish**. Directs the responsibility for maintenance and management of the State's wildlife resources to the Commission and AGFD. Arizona Revised Statutes (ARS) 17-102 establishes that most wildlife in Arizona is the property of the State. ARS 17-231 establishes that through the Commission, the AGFD may establish policies and programs for the management, preservation, and harvest of wildlife; establish hunting, trapping, and fishing rules and prescribe the manner and methods which may be used in taking wildlife; enforce laws for the protection of wildlife; and develop and distribute information about wildlife and activities of the AGFD.
- **Arizona Administrative Code Rules, Title 12, Natural Resources, Chapter 4, Game and Fish Commission.** Under the authority of ARS 17-201 *et seq.*, establishes detailed rules for licenses and permits, taking and handling of wildlife, possession of live wildlife, heritage grants, and wildlife areas among others.

Primary jurisdiction for resident wildlife management is implemented on behalf of the State by the AGFD, except where pre-empted by federal law (e.g., ESA listed species).

Protected species are species of plants or animals that, because of their scarcity or documented declining population numbers in the state or nation, have been designated special status for protection and/or management. Regulatory compliance requirements vary based on whether the species are protected under the authorities of the ESA, Migratory Bird Treaty Act (MBTA)/Executive Order 13186, Arizona Native Plant Law of 1993, are listed as a Wildlife of Special Concern in Arizona, and/or are included as sensitive species in the BMGR INRMP.

Federal Endangered Species Act

Federal protection is provided under the ESA, for which the USFWS and the National Marine Fisheries Service share administrative responsibilities. The USFWS has primary responsibility for terrestrial and freshwater organisms. The USFWS is responsible for the federal listing of plant and animal species on the basis of the best scientific and commercial data available, and the species' biological status and threats to its existence. Species federally listed as threatened or endangered, or proposed for such listing, have specific protections under the ESA. Section 9 of the ESA prohibits "take" of a listed species. Section 10 of the ESA allows for exemptions to the take prohibition, based on incidental take statements issued in accordance with Biological Opinions or other authorized permits. Section 7 of the ESA requires a federal agency to consult with the USFWS if the agency determines that any proposed action may affect a listed species.

Categories of species listed under the ESA are as follows:

- **Endangered:** Species identified by the USFWS under the ESA as being in danger of extinction throughout all or a significant portion of its range.
- **Threatened:** Species identified by the USFWS under the ESA that are likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.
- **Proposed:** Species identified by the USFWS under the ESA that are proposed in the Federal Register to be listed as threatened or endangered.
- **Candidate:** Species for which USFWS has sufficient information on biological vulnerability and threats to support proposals to list them as endangered or threatened.
- **Critical Habitat:** For some threatened or endangered species, specific geographic areas (whether occupied by listed species or not) that are determined to be essential for the conservation and management of listed species are deemed Critical Habitat.
- **Conservation Agreement:** Though not an official listing category, conservation agreement species have special management plans that obligate land and resource management agencies or other entities to certain conservation actions. The implementation of these plans often provides the basis from which USFWS has precluded listing under the ESA.
- **Petitioned:** Species that have been formally requested to be federally listed by the USFWS as a threatened or endangered species.

Migratory Bird Species

Migratory birds are federally protected by the MBTA, and Executive Order 13186 *Responsibilities of Federal Agencies to Protect Migratory Birds*, dated 10 January 2001. The MBTA is the domestic law that implements the United States' commitment to four international conventions (with Canada, Japan, Mexico, and Russia) for the protection of a shared migratory bird resource. Each of the conventions protect selected species of birds that are common to both countries (i.e., they occur in both countries at some point during their annual life cycle). The USFWS is the lead federal agency for managing and conserving migratory birds in the United States; regulating the take of migratory birds for educational, scientific, and recreational purposes; and requiring harvest to be limited to levels that prevent over-utilization. Executive Order 13186 directs federal agencies taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations to develop and implement an MOU with the USFWS that shall promote the conservation of migratory bird populations within two years of the date of the order. The order outlines specific requirements of the MOU and 15 conservation measures that agencies are encouraged to immediately begin implementing, as appropriate and practicable.

Species Listed by the State of Arizona

Based on the authorities from ARS, Chapter 17, the AGFD maintains lists of wildlife species of concern (AGFD 1996). The 1996 list of Wildlife of Special Concern in Arizona remains in draft form and is pending approval from the Arizona Game and Fish Commission. This list identifies species in Arizona that may be in jeopardy due to known or perceived threats or population declines. The listing of wildlife in the Wildlife of Special Concern in Arizona is intended to indicate to land management agencies those species that should be emphasized in habitat management from AGFD's perspective. Many of these species are also listed under the ESA.

The Arizona Native Plant Law of 1993 (ARS, Chapter 7, 3-901 *et seq.*) is administered by the Plant Industries Division of the Arizona Department of Agriculture. The law identifies protected plants belonging to the following four categories: highly safeguarded, salvage restricted, salvage assessed, and harvest restricted. The most protective category and the category most directly parallel to the protection afforded wildlife species is highly safeguarded. Species falling into the salvage restricted, salvage assessed, or harvest restricted categories pertain to the commercial salvage, removal for sale, and harvest of certain plant species that are vulnerable to theft, vandalism, or over utilization. These four categories are defined as follows.

- **Highly Safeguarded:** Those Arizona native plants whose prospects for survival in the state are in jeopardy or are in danger of extinction throughout all or a significant

portion of their ranges, or are likely to become so in the foreseeable future, including federally listed species.

- **Salvage Restricted:** Those Arizona native plants that are not included in the highly safeguarded category but are subject to damage by theft or vandalism.
- **Salvage Assessed:** Those Arizona native plants that are not included in either the highly safeguarded or salvage restricted category but have a sufficient value if salvaged to support the cost of salvage.
- **Harvest Restricted:** Those Arizona native plants that are not included in the highly safeguarded category but are subject to excessive harvesting or overcutting because of their intrinsic value.

3.5.3.1 Federally Protected Species and State Listed Species that May Occur within the Study Area

The USFWS list of threatened, endangered, proposed, candidate and conservation agreement species potentially occurring in Maricopa, Pima, and Yuma counties was reviewed to determine if any of these species has the potential to occur in the project area. Species included on the USFWS county lists are addressed in Table 3-3. Additionally, any species listed by the AGFD as Wildlife of Special Concern in Arizona, and plants listed by the Arizona Department of Agriculture as highly safeguarded are also included based on species occurrence records from the AGFD's Heritage Data Management System, the most comprehensive listing of rare species data for the State. Table 3-3 lists these species and their corresponding ESA status; state status; a brief description of habitat; and the potential for occurrence of the species or its habitat on BMGR East. Excluded from this table are any species that are aquatic obligates (i.e. native fishes) for which no potential habitat is found within BMGR East. BMGR East is not currently within federally designated or proposed critical habitat for any endangered or threatened species.

Table 3-3 Protected Species in the Region and their Potential to Occur within BMGR East

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygymy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Plants				
Acuña cactus (*Echinomastus erectocentrus acunensis*)	ESA C	HS	Restricted range occurring on well-drained knolls and gravel ridges between major washes on granite soils in Sonoran Desert scrub association from 1,300 to 3,610 feet elevation.	One confirmed individual located on BMGR East in the Sauceda Mountains; also in Organ Pipe Cactus National Monument.
Arizona cliffrose (*Purshia subintegra)*	ESA LE		Found in central Arizona on white limestone soils derived from tertiary lakebed deposits at less than 4,000 feet elevation.	Outside of range; no suitable habitat.
Crested (fan-topped) saguaro (*Carnegiea gigantean*)		HS	Rocky or gravelly soils of foothills, canyons, and benches along washes in the Sonoran Desert from 600 to 3,600 feet elevation.	Within saguaro populations throughout the range; presence confirmed on BMGR East.
Gooddings onion (*Allium gooddingii*	CA		Found in forested drainage bottoms and on moist north facing slopes of mixed conifer and spruce fir forests at greater than 7,500 feet elevation.	Outside of range; no suitable habitat.
Huachuca water umbel (*Lilaeopsis schaffneriana ssp. recurva*)	ESA LE		Cienegas, perennial low gradient streams, wetlands between 3,500 and 6,500 feet elevation.	Outside of range; no suitable habitat.
Kearney blue star *Amsonia kearneyana*	ESA LE		West-facing drainages in the Baboquivari Mountains between 600 and 3,800 feet elevation.	Outside of range; no suitable habitat.
Nichol Turk's head cactus (*Echinocactus horizonthalonius var. nicholii)*	ESA LE		Found in unshaded microsites in Sonoran desertscrub on dissected alluvial fans at the foot of limestone mountains and on inclined terraces and saddles on limestone mountain sides between 2,400 and 4,100 feet elevation.	Outside of range; no suitable habitat.
Peirson's milkvetch (*Astragalus magdalenae peirsonii*)	ESA LT		Active sand dunes.	On low, partially stabilized dunes at the western edge of BMGR; not in project area.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygymy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Plants (Continued)				
Pima pineapple cactus (*Coryphantha scheeri var. robustispina)*	ESA LE		Sonoran desertscrub or semi-desert grassland communities. Occurs in alluvial valleys or on hillsides in rocky to sandy or silty soils between 2,300 and 5,000 feet elevation.	Outside of range; no suitable habitat.
Sand food (*Pholisima sonorae*)		HS	Drifting sandy soil and other sandy areas, in low desert below 500 feet elevation within the Yuma Desert, Southern Yuma County, along the boundary with Mexico.	Sand dunes in the extreme southwestern portion of BMGR; not in project area.
Reptiles and Amphibians				
Chiricahua leopard frog (*Lithobates [Rana] chiricahuensis*)	ESA LT		Permanent or nearly permanent streams, rivers, backwaters, ponds, and stock tanks ranging from 3,300 to 8,900 feet elevation that is mostly free from introduced fish, crayfish, and bullfrogs.	Outside of range; no suitable habitat.
Colorado (Yuman) Desert fringe-toed lizard (*Uma notata rufopunctata*)		WC	Restricted to sparsely vegetated fine, windblown sand dunes, flats, riverbanks and washes of very arid desert. Vegetation is sparse, consisting of creosote bush, burroweed, croton, mesquite, or other scrubby growth from sea level to approximately 600 feet elevation.	Confirmed on BMGR East; within project area primarily found in San Cristobal valley.
Desert tortoise (Sonoran population) (*Gopherus agassizii*)	Petitioned for ESA listing[c]	WC	Primarily on rocky slopes and bajadas of Sonoran desertscrub. Caliche caves in incised, cut banks of washes (arroyos) are also used for shelter sites, especially in the Lower Colorado River Valley subdivision. Shelter sites are rarely found in shallow soils.	Mountains east of San Cristobal Valley; confirmed on BMGR East.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygmy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Reptiles and Amphibians (Continued)				
Flat-tailed horned lizard (*Phrynosoma mcalli*)	CA	WC	Fine packed sand or pavement, overlain with loose, fine sand in areas that are sparse or lacking in vegetation. In *Larrea tridentata - Ambrosia dumosa –Hilaria rigida* dominated sandy flats from 155 to 540 feet elevation in Arizona.	BMGR and Yuma Desert west of the Gila Mountains; not in project area.
Great Plains narrow-mouthed toad (*Gastrophryne olivacea*)		WC	In south central Arizona, from mesquite semi-desert grassland to oak woodland, in the vicinity of streams, springs and rain pools. Found in deep, moist crevices or burrows, often with various rodents, and under large flat rocks, dead wood, and other debris near permanent or ephemeral water sources, from 1,400 to 4,700 feet elevation.	Occurs on adjacent Tohono O'Odham Nation lands and in the Vekol Valley; no suitable habitat within the project area and not recorded on BMGR.
Sonoyta mud turtle (*Kinosternon sonoriense longifemorale)*	ESA C		Ponds and streams around 1,100 feet elevation; known from Organ Pipe Cactus National Monument.	Suitable habitat not present in project area.
Birds				
Bald eagle (*Haliaeetus leucocephalus*)	ESA LT	WC	Breeding sites include large trees or cliffs near water at variable elevations; foraging primarily on fish and waterfowl.	Suitable habitat not present in project area.
Belted kingfisher (*Ceryle alcyon*)		WC	Rivers, brooks, ponds, lakes, coasts, streams, tidal creeks, mangroves, swamps and estuaries from 1,840 to 8,400 feet elevation.	Rare transient, no suitable breeding habitat; not in project area.
Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*)	Petitioned for ESA listing[c]	WC	Streamside cottonwoods and willows and adjacent mesquite bosques, usually with saguaros on nearby slopes from 1,300 to 4,000 feet elevation. Also dry washes with large mesquite, paloverde, ironwood, and saguaro.	Potentially present on BMGR East in suitable habitat along certain desert washes.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygmy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Birds (Continued)				
California brown pelican (*Pelecanus occidentalis californicus*)	ESA LT Proposed delisting		Species found around many Arizona lakes and rivers at varying elevations.	Uncommon transient in Arizona.
Crested caracara (*Caracara cheriway*)		WC	Open country, including pastureland, cultivated areas, and semidesert, in both arid and moist habitats but more commonly in the former with low-profile ground vegetation and scattered tall vegetation suitable for nesting. In Arizona, inhabits paloverde-saguaro desert from 1,890 to 3,360 feet elevation.	Observed in nearby Vekol Valley and on the Tohono O'Odham lands (Sells area); BMGR is outside their normal range but they may occasionally occur on BMGR East as a transient.
Ferruginous hawk (*Buteo regalis*)		WC	In Arizona, the open scrublands and woodlands, grasslands, and Semidesert Grassland from 3,500 to 6,000 feet elevation in the northern and southeastern parts of the state.	Uncommon winter visitor; no suitable nesting habitat on BMGR.
Le Conte's Thrasher *(Toxostoma lecontei)*	This bird has no official status; however, due to its confirmed breeding on the BMGR and its CWCS T1C status it is included for evaluation.		In the Sonoran desert, open, flat to gently rolling hills and shallow braided washes with very sparse vegetation from 150 to 1500 feet elevation.	Confirmed nesting on the BMGR, ongoing studies occurring in the San Cristobal Valley.
Masked bobwhite *(Colinus virginianus ridgewayi)*	ESA LE		Desert grasslands with a diversity of dense native grasses, forbs, and brush from 1,000 to 4,000 feet elevation.	Outside of range; no suitable habitat.
Mexican spotted owl (*Strix occidentalis lucida*)	ESA LT		Nests in canyons and dense forests with multilayered foliage structure from 4,100 to 9,000 feet elevation.	Outside of range; no suitable habitat.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygmy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Birds (Continued)				
Peregrine falcon (*Falco peregrines anatum*)		WC	Near cliffs where sufficient prey is present; in Arizona from 400 feet elevation along the lower Colorado River to 9,000 feet elevation along the Mogollon Rim.	Possible winter migrant and one possible breeding observation on BMGR East.
Snowy egret (*Egretta thula*)		WC	Marshes, lakes, ponds, lagoons, mangroves and shallow coastal habitats; from 100 to 1,950 feet elevation.	May be found on BMGR East following storms; no suitable breeding habitat.
Southwestern willow flycatcher (*Empidonax traillii extimus*)	ESA LE	WC	Riparian obligate. Prefers dense canopy cover and large foliage volume of well-developed riparian areas with cottonwood, willow, or tamarisk usually where there is surface water during the summer; from 75 to 9,180 feet elevation.	No suitable habitat on BMGR.
Sprague's pipit (*Anthus spragueii*)		WC	In migration and winter, found in pastures, weedy fields, grasslands with dense herbaceous vegetation, or grassy agricultural fields from 4,285 to 4,960 feet elevation.	Occasionally reported from nearby agricultural fields; possible transient occurrence on BMGR.
Tropical kingbird (*Tyrannus melancholicus*)		WC	Lowlands near water from 1,070 to 4,100 feet elevation in Arizona. Often nests in cottonwoods.	No suitable nesting habitat on BMGR; may occur as a transient.
Western burrowing owl (*Athene cunicularia*)	This bird has no official status; however, due to the recent conservation concerns and its CWCS T1C status it is included for evaluation.		Flat, open, low-stature grasslands, sparsely vegetated desertscrub, and edges of human disturbed lands. They primarily rely on fossorial mammals to provide suitable nest burrows. They also require unobstructed perching locations.	Found sparingly from Phoenix to Yuma, usually associated with disturbed areas, agricultural fields in particular. Potentially could occur within the project area.
Yellow-billed cuckoo (*Coccyzus americanus)*	ESA C		Found in large blocks of riparian woodlands (cottonwood, willow, or tamarisk galleries) at less than 6,500 feet elevation.	Suitable habitat not present in project area.
Yuma clapper rail (*Rallus longirostris*)	ESA LE	WC	Fresh water and brackish marshes below 4,500 feet elevation.	No suitable habitat on BMGR.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygmy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Mammals				
California leaf-nosed bat (*Macrotus californicus*)		WC	Forages for aerial insects in Sonoran desertscrub; non-migratory; roost in mines, caves, and rock shelters below 4,000 feet elevation.	Confirmed roosting on BMGR East.
Jaguar (*Panthera onca*)	ESA LE		Found in Sonoran desertscrub up through subalpine conifer forest between 1,600 and 9,000 feet elevation.	Suitable habitat not present in project area.
Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*)	ESA LE	WC	Roosts in mines and caves; forages in nectar and pollen from flowers of agave and columnar cacti, below 6,000 feet elevation.	No roosts are documented from BMGR though summer maternity roosts are known within foraging distances.
Mexican long-tongued bat (*Choeronycteris mexicana*)		WC	In Arizona, primarily found in mesic canyons of mixed oak-conifer forests, but wanders widely; forages on nectar of saguaro and agave. Roosts in caves, abandoned mines, or rock shelters from 2,540 to 7,320 feet elevation.	Not documented on BMGR, marginal foraging habitat may be present, minimal potential for transients.
Ocelot (*Leopardus [=Felis] pardalis)*	ESA LE		Prefer humid tropical and subtropical forests, savannahs, and semi-arid thornscrub at less than 8,000 feet elevation.	Suitable habitat not present in project area.
Sonoran pronghorn (*Antilocapra americana sonoriensis*)	ESA LE	WC	Broad intermountain alluvial valleys with creosote/bursage and paloverde/mixed cacti associations from 500 to 2,000 feet elevation.	Known to occur east of Gila and Tinajas Altas mountains to State Route 85 and south of Interstate 8; also on Cabeza Prieta NWR and Organ Pipe Cactus National Monument.
Southern yellow bat (*Lasiurus ega*)		WC	Desertscrub to humid forest and open areas. Roost in Washington fan palms, California fan palms, hackberries, and sycamores. Found in scattered areas of southern Arizona primarily in association with palm trees, palm oases, and riparian habitats.	Not documented on BMGR, no native palm habitat.

Species	ESA Status[a]	State Status[b]	Habitat Requirements	Potential for Occurrence in Project Area
[a] Endangered Species Act Status definitions: ESA=Endangered Species Act; LE=Listed Endangered; LT=Listed Threatened; C=Candidate, CA=Conservation Agreement. [b] State Status definitions: HS= Highly Safeguarded; WC=Wildlife of Special Concern in Arizona; CWCS=Comprehensive Wildlife Conservation Strategy, T1C=Tier 1C. [c] The desert tortoise and cactus ferruginous pygmy-owl are both petitioned for listing; they both currently have state status but no federal status. Therefore, ESA consultation is not required for either of these species.				
Mammals (Continued)				
Spotted bat (*Euderma maculatum*)		WC	Varied. In low desert to high desert and riparian habitats, ponderosa pine forest, conifer forests in Arizona from 110 to 8,670 feet elevation. Likely roosts among steep, rocky, cliff faces; often within approximately one mile of riparian habitat.	Not documented on BMGR, one record from Yuma County.
Yuma puma (*Felis cancolor browni*)		WC	Mountainous, semi-arid terrain associated with prey species, such as mule deer.	Because anatomical corroboration for the subspecific status is still being debated; it will not be reviewed further for the purpose of this document.
Invertebrates				
San Xavier talussnail (*Sonorella eremite)*	CA		Deep, limestone rockslide with outcrops of limestone and decomposed granite between 3,850 and 3,920 feet elevation.	Outside of range; no suitable habitat.

Source: U.S. Fish and Wildlife Service list of threatened, endangered, candidate, and conservation agreement species potentially occurring in Yuma, Pima, and Maricopa counties, http://www.fws.gov/southwest/es/arizona/

Species that may occur within the project area are analyzed in detail in this document for potential project-related effects. No additional analysis is conducted for those species that may occur on the BMGR as transients or otherwise may be present in the general project vicinity or county but for which suitable habitat is not present in the project area.

Acuña Cactus

The acuña cactus is a federal candidate species (64 Federal Register 57533; 25 October 1999) and is Highly Safeguarded under the Arizona Native Plant Law. The distribution of the acuña cactus is Arizona, and Sonora, Mexico, and is found in granitic soils (Arizona Rare Plant Committee 2001) and on limestone hills and flats between 1,300 and 2,600 feet elevation (Heil and Melton 1994), although records indicate this species may be found as high as 2,700 feet elevation (Taylor 1997). It occupies well-drained knolls and gravel ridges between major washes in the paloverde-saguaro association of Sonoran desertscrub (Benson 1969; Phillips *et al.* 1982).

A survey of 560 acres in eastern BMGR located one acuña cactus (Geraghty & Miller 1997) reported within the Sauceda Mountains (Arizona Rare Plant Committee 2001). Two populations of less than 50 individuals were found just south of the BMGR boundary on Coffeepot Mountain (the southern end of the Sauceda Mountains) on pale pink-gray ryolitic gravel and rock (Geraghty & Miller 1997). In addition, acuña cacti occur in the Sand Tank Mountain portion of the Sonoran Desert National Monument that formerly comprised the northeast corner of the BMGR (Dahlem 2002); in Organ Pipe Cactus National Monument; the Little Ajo Mountains; the vicinity of Florence, Arizona (Pinal county); and Sonoyta, Mexico. Additional individuals may occur within BMGR East in the Sand Tank Mountains (AGFD 2004).

Crested (Fan-topped) Saguaro

The crested (fan-topped) saguaro is Highly Safeguarded under the Arizona Native Plant Law. Individual crested saguaros may occur within larger saguaro populations throughout the project area. Crested saguaro are an abnormal growth form resulting from actively proliferating tissue at the growing tip of the cactus that broadens from its normal point into a fan-like pattern. Crested saguaros are rare, estimated to occur in one out of 100,000 saguaros (Phillips and Comus 2000).

Colorado Desert Fringe-toed Lizard

The Colorado Desert fringe-toed lizard is identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996).This lizard is found in extreme southwestern Arizona and adjacent Mexico. Within Arizona, the lizards are found in the southwestern portion of the state south of the Gila River, mainly in the Mohawk and Yuma dune systems in Yuma County, and in the Pinta Sands in Pima County (AGFD 1996).

On the BMGR, this lizard is primarily found in and adjacent to the Mohawk and Yuma dunes (AGFD 1996). It also occurs in scattered locations in the San Cristobal Valley where pockets of sand dunes, including partially stabilized dunes, are found. The preferred habitat on the Yuma Dunes is swales (low points on dunes), which have more vegetation than the un-vegetated ridgelines. Conversely, in the Mohawk Dunes, the lizards are found on the dune ridgelines and not the swales because the soils of the Mohawk Dune swales often have a microbiotic soil crust and are much more stable than those of the Yuma Dunes (Hall *et al.* 2001).

Desert Tortoise

The desert tortoise (Sonoran population) is identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996); the USFWS is currently preparing a 12-month finding to determine if a petition to list the Sonoran population of desert tortoise as threatened or endangered is warranted. The Sonoran population of the desert tortoise includes tortoises that occur south and east of the Colorado River. In Arizona, they range from the Kingman area in Mohave County south to the

Chocolate Mountains (Arizona), and southeast as far as the San Pedro River. In southern Arizona, desert tortoises occur primarily on rocky slopes and bajadas of the Arizona Upland and Lower Colorado subdivisions of the Sonoran Desert (Schneider 1981; Vaughan 1984). They most often occur in paloverde-mixed cacti associations (Vaughan 1984). Within the Arizona Upland Subdivision, tortoises are most commonly found in areas with boulders, rocky outcrops, and natural cavities that provide cover sites. Vaughan (1984) reported that home range sizes of tortoises in upland habitats of the Picacho Mountains in Arizona range between eight and 135 acres. Desert tortoises are also occasionally found away from the mountains on bajadas and valley floors in association with caliche caves along major arroyos. Burrows and caliche caves are important for the tortoise to escape temperature extremes. Eastern and northern slopes are used during the summer months, but tortoises tend to hibernate on southern and western slopes during the winter (Hall *et al.* 2001).

Surveys conducted on the BMGR in the Sand Tank, Sauceda, and Aguila mountains, and the Crater Range identified tortoise sign in all mountain ranges except for the Aguila Mountains (Dames & Moore 1996). Tortoise sign was most often observed along ridgelines and on rolling terrain at the base of steep slopes; tortoises or sign were never observed on intermountain flats. The Sand Tank Mountains support a relatively large population of tortoises compared to other BMGR mountain ranges surveyed, but this population density is moderate in comparison to other areas in Arizona (Dames & Moore 1996, Hall *et al.* 2001). Based on surveys conducted by the BLM in the Mohawk and Tinajas Altas mountains, extremely low numbers of tortoises may occur in mountains west of the San Cristobal Valley.

Ongoing long-term tortoise monitoring efforts are aimed at determining and comparing the status of the desert tortoise within and outside the boundaries of the tactical ranges in order to assess any impacts that military operations may have on tortoise populations (Wirt 1994). From a scientific research perspective, the BMGR is a prime location for long-term study of the Sonoran population of desert tortoises because of the lack of previous human disturbance throughout most of the area and because of strict control of access to the site.

Cactus Ferruginous Pygmy-owl

The cactus ferruginous pygmy-owl is identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996) and was previously listed as an endangered species until being delisted in May 2006 (71 Federal Register 19425; 14 April 2006). The USFWS is currently preparing a 12-month finding to determine if a petition to list the cactus ferruginous pygmy-owl as threatened or endangered is warranted. The bird's range includes roughly the southern half of Arizona and Texas, south to Colima in western Mexico, and Tamaulipas and Nuevo Leon in eastern Mexico. In Arizona, the bird is considered very rare, with resident populations in Arizona Upland

Sonoran desertscrub and xeroriparian washes of Organ Pipe Cactus National Monument, Altar Valley, and northwest Tucson. Historically, the owl was more widespread, occurring throughout southern Arizona. These owls are small, most active early in the morning and late in the day, and prey on lizards, insects, rodents, and birds. Habitat preferences are not well known, but in Arizona they typically occur in microphyll woodland washes of paloverde and ironwood, and saguaro-ironwood forests. They nest in cavities in trees and columnar cacti. Their territories have been described as linear (e.g., along washes), and between approximately 1.3 to 2.5 acres in size (Millsap and Johnson 1988).

Based on the known distribution of this species in southwest Arizona, the cactus ferruginous pygmy-owl could occur on BMGR East. Potentially suitable habitat is present along washes throughout much of the BMGR, but primarily on the eastern side. However, no pygmy owls have been detected on the BMGR since surveys began in 1992 (Departments of the Air Force, Navy, and Interior 2006). In recent years, cactus ferruginous pygmy-owls have been detected in areas near the eastern BMGR boundary. There is one historical observation of the owl near the BMGR at the Cabeza Prieta Tanks on the Cabeza Prieta NWR (Millsap and Johnson 1988) and another confirmed documentation on the refuge at Papago Well in 2001 (USFWS 2003).

Le Conte's Thrasher

The Le Conte's thrasher, is not currently included as an ESA-listed species or a Wildlife Species of Special Concern in Arizona. However, this non-migratory songbird is recognized as one of five bird species that serve as indicators of Sonoran desertscrub habitat health in the Arizona Partners in Flight Conservation Plan (Latta *et al.* 1999) and is listed in the AGFD's CWCS as a T1C species (i.e., a vulnerable species in Arizona).

Within the Sonoran desert, the bird inhabits some of the arid regions consisting of open, flat to gently rolling hills and shallow braided washes with very sparse vegetation (Corman 2005). Common plants include creosote and lower growing shrubs such as saltbush, bursage, graythorn, and wolfberry. Trees and larger shrubs are usually very sparingly distributed and can include mesquite, palovede, ironwood, ocotillo, and crucifixion thorn. Saguaros are typically absent from areas where Le Conte's thrashers are found (Corman 2005). Le Conte's thrashers typically nest in isolated shrubby trees or large shrubs, which are densely vegetated and usually protect by thorns (Corman 2005). The Le Conte's thrasher is mostly insectivorous, feeding on soil larvae, but it may also eat spiders, centipedes, small lizards, berries, and seeds. The majority of food is found under the litter of desert vegetation or on the substrate. As a result, the species requires accumulated leaf litter under plants within its territory to provide diurnal cover for its arthropod prey (Departments of the Air Force, Navy, and Interior 2006).

In Arizona, the Le Conte's thrasher is found in extreme western and southwestern Arizona east through the Gila River valley to the Florence and Picacho Peak regions. The largest populations of Le Conte's thrasher are found on the Cabeza Prieta NWR and the BMGR. Potentially suitable habitat is present within those natural communities within BMGR East that are characteristic of the Lower Colorado River Valley subdivision. Breeding has been confirmed on the BMGR, with high concentrations (11 to 100 breeding pairs) occurring east of the Mohawk Mountains and north of the Crater Range; as well as lower concentration (2 to 10 breeding pairs) occurring both east and west of the Mohawk Mountains, west and southwest of the Aguila Mountains, west of the Growler Mountains, south and northeast of the Crater Range, and west of the Sauceda Mountains (Departments of the Air Force, Navy, and Interior 2006).

Peregrine Falcon

The peregrine falcon is identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996). This falcon is found across North America from Alaska and Canada south to western Mexico including Baja California (Corman 2005). Peregrines occur on isolated cliff ledges throughout Arizona (Monson and Phillips 1980). Rosenberg *et al.* (1991) describe the species as an uncommon transient and winter visitor along the lower Colorado River from September to late March, and a rare but consistent visitor from May through August. Nest sites in Arizona are located in extensive mountain ranges or canyon systems usually near water where prey is abundant (Ellis 1982). Their principal prey includes passerine birds, waterfowl, and shore birds (Snow 1972). Falcons may travel up to 17 miles to hunting areas that often include cropland, meadows, river bottoms, marshes, and lakes, which attract abundant bird life.

Peregrine falcons occasionally winter along the lower Colorado River, but generally do not breed or winter in southwestern Arizona. They are, however, seen on the BMGR over the winter and during migration (BLM 1990). At least two late winter/early spring observations of peregrine falcons have been reported in the vicinity of the Aguila Mountains during recent years, which may indicate breeding on the BMGR (Barry 2002).

Western Burrowing Owl

The western burrowing owl is not currently included as an ESA-listed species or a Wildlife Species of Special Concern in Arizona. However, concerns for this species have been increasing due to habitat loss and perceived population declines; therefore, potential project-related impacts to this species are evaluated. Burrowing owls are generally non-migratory in Arizona, occurring year-round throughout most of their range in the state (AGFD 2001).

Unlike most birds, the burrowing owl nests in holes in the ground, generally relying on mammals such as ground squirrels and other rodents to provide suitable nest burrows. Where they are non-

migratory, these birds use and maintain their burrows year-round. They prefer flat, open, low-stature grasslands, and sparsely vegetated desertscrub. These owls also need unobstructed perching locations, and often make use of nearby dirt mounds, fences, or other elevated objects (Corman 2005). Burrowing owls tend to be most active from late afternoon until dark, but can often be observed throughout the day near their burrow sites. These owls are opportunistic feeders, taking both invertebrates (e.g., beetles and grasshoppers) and small vertebrates (e.g., lizards, mice, and occasionally birds). In Arizona, they feed primarily on large insects and small mammals (AGFD 2001).

Based on the known distribution of burrowing owls throughout Arizona (Corman 2005), the burrowing owl is expected to occur throughout the open valleys of BMGR East, often inhabiting burrows created by the desert kangaroo rat. Western burrowing owls have been recorded in several locations on the BMGR including in the San Cristobal Valley.

California Leaf-nosed Bat

The California leaf-nosed bat is identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996). This bat is a year-round resident in desertscrub habitats (mostly Sonoran desertscrub) of southern and western Arizona (Hoffmeister 1986). It roosts colonially in mines, caves, and sometimes under bridges (AGFD 1988; Cockrum 1964). California leaf-nosed bats do not hibernate but remain active throughout the year in Sonoran desertscrub habitats in the relatively mild climate. Warm, geothermally active mines are particularly important for these cold-intolerant bats. Xeroriparian corridors and larger tinajas are important foraging areas, as well as high density saguaro areas because they attract many insects (Hall *et al.* 2001). They feed primarily on large night-flying beetles, grasshoppers, and moths. They also feed on insect larvae, especially of butterflies, which are taken from bushes or on the ground. There is some evidence that they also feed on fruits, including those of cacti. Their home range and local seasonal movements are largely unknown (Hoffmeister 1986). Their numbers are thought to be low, apparently due to limited winter roosts and vandalism at roost sites (AGFD 1988).

The California leaf-nosed bat has been located throughout the entire BMGR and is purported to be the most common bat on the BMGR (Hall *et al.* 2001). Roosting locations have been surveyed in the Sand Tank and Sauceda mountains (Dalton and Dalton 1999; Dalton *et al.* 2000; Dalton 2001). Active roosts have been documented at 11 sites throughout the BMGR including two sites in the Mohawk Mountains; in the Sand Tank, Sauceda, Gila, and Copper Mountains; and Wellton Hills. Some mines have been estimated to support as many as 300 individuals (Dalton and Dalton 1994). During the course of two consecutive studies of these bats in the Sand Tank Mountains, bats were found to move among a maximum of seven different day roosts, and a minimum of four night roost sites. Foraging areas for individual bats ranged from 0.73 to 47.3

square kilometers; and ranged from valley floors to slopes and ridges, with a tendency towards valleys in the summer and slopes and ridges in winter.

Lesser Long-nosed Bat

The lesser long-nosed bat is listed as an endangered species and identified as a Wildlife Species of Special Concern in Arizona (AGFD 1996). These bats are medium-sized with a distinctively elongated nose with a leaf-shaped tip. Their known range extends from extreme southwestern New Mexico and southeastern Arizona north to the Phoenix area, west to the Agua Dulce Mountains in the Cabeza Prieta NWR, south through western Mexico (Cockrum and Petryszyn 1991), and possibly to El Salvador (Spicer 1988). In Arizona, they are summer residents within desert grasslands and scrubland up to the edge of oak woodland (Hoffmeister 1986, Hayward and Cockrum 1971). They begin migration into Arizona in early April. When they arrive, the females are pregnant and congregate in maternity colonies; males occupy separate roosts (Hoffmeister 1986). The young are born between early May and late June (Hoffmeister 1986). They migrate south in the fall, leaving Arizona by early October (Hayward and Cockrum 1971).

Lesser long-nosed bats are nectar, fruit, and pollen feeders, foraging at night in areas of saguaro, agave, ocotillo, paloverde, prickly pear, and organ pipe cactus (Hoffmeister 1986; Hayward and Cockrum 1971). They are found in areas of dense columnar cacti in the spring, and at higher elevations in areas of high agave density in oak-piñon forests in the summer and fall (Hall *et al.* 2001). Lesser long-nosed bats fly long distances (up to 75 miles) between roosting and feeding areas (USFWS 1994). During the day, they roost in mine tunnels and natural caves where they can find total darkness and a specific temperature range (Hayward and Cockrum 1971, Hall *et al.* 2001).

There is a maternity colony of 5,000 female lesser long-nosed bats in the Growler Mountains on the Cabeza Prieta NWR; a large colony (16,000 to 19,000 females) is present in the vicinity of Montezuma's Head in the Ajo Range in Organ Pipe Cactus National Monument (Hall *et al.* 2001). The bats are also known from the Agua Dulce Mountains in the southeast corner of the Cabeza Prieta NWR (Cockrum and Petryszyn 1991). No lesser long-nosed bat roosts have been documented on the BMGR despite a number of bat surveys (Dames & Moore 1997, Dalton and Dalton 1994, Cockrum and Petryszyn 1991). Densities of agaves and columnar cacti are likely too low to provide an important food source for the bats throughout most of the BMGR (U.S. Air Force 1997). Lesser long-nosed bats have been recorded foraging on the BMGR (Dalton and Dalton 1994), though they are not considered to be abundant. The easternmost areas of the BMGR, particularly near the Sand Tank Mountains, represent good habitat for foraging and possibly roosting (Hall *et al.* 2001). Dalton and Dalton (1999) consider the presence of lesser long-nosed bat in this part of the BMGR to be likely.

Sonoran Pronghorn

The Sonoran pronghorn is listed as endangered under the ESA (32 Federal Register 4001; 11 March 1967) without designation of critical habitat. This animal is also listed as a Wildlife Species of Special Concern in Arizona (AGFD 1996). The BMGR comprises a significant portion of the total occupied range of this animal. The USFWS recovery plan (2001) establishes specific criteria to guide management and recovery of the species that includes: 1) improving habitat for fawn survival and recruitment through the establishment of forage enhancement plots on the BMGR; 2) initiating a quantitative evaluation of pronghorn use and reliance on sources of free water; 3) reducing predation through the selective removal of coyotes from specific areas and times of the year; 4) evaluating potential transplant locations, establishing relocation methodology and protocols, developing interagency agreements, acquiring funding, and initiating reestablishment projects; 5) increasing frequency and expanding scope of aerial monitoring in Mexico to improve comparability with U.S. surveys; 6) investigating potential pronghorn disease vectors; 7) reducing disturbance at critical times of the year; and 8) investigating and reducing movement barriers.

Sonoran pronghorn are the smallest and palest pronghorn subspecies, and are proportionately long-legged and small-bodied. Both sexes have horns with a single prong projecting forward, although they are larger in males. Pronghorns are the fastest land mammals in North America; they canter at 25 mph, gallop easily at 44 mph, and run flat out at 55 to 62 mph. Sonoran pronghorn does (females) become sexually mature at 16 months, and bucks (males) at one year. Rut occurs July through September, gestation is approximately 240 days, and fawns are dropped from February through May. Fawn drop appears to coincide with spring forage abundance. Females typically produce a single fawn in their first pregnancy and twins thereafter. Fawns appear to suckle for about two months, thereafter feeding on vegetation. Free-roaming adults appear to live no more than seven to nine years (USFWS 1998).

Sonoran pronghorn are opportunistic foragers. Although 132 different plant taxa have been found in their diet, they prefer plants that are rich in nutritional content and provide moisture, when they are available (USFWS 1998). Green forbs are highly nutritious, and sought especially by does and fawns in the spring during late gestation, lactation, weaning, and early fawn growth. Cactus fruits, such as chain fruit cholla, are often the last nutritional choice in hot, dry seasons. Adult Sonoran pronghorn may survive a prolonged summer drought on a diet reduced primarily or solely to cactus fruit, but fawns are likely to perish (USFWS 1998). Water is used opportunistically, when available, by adults and fawns.

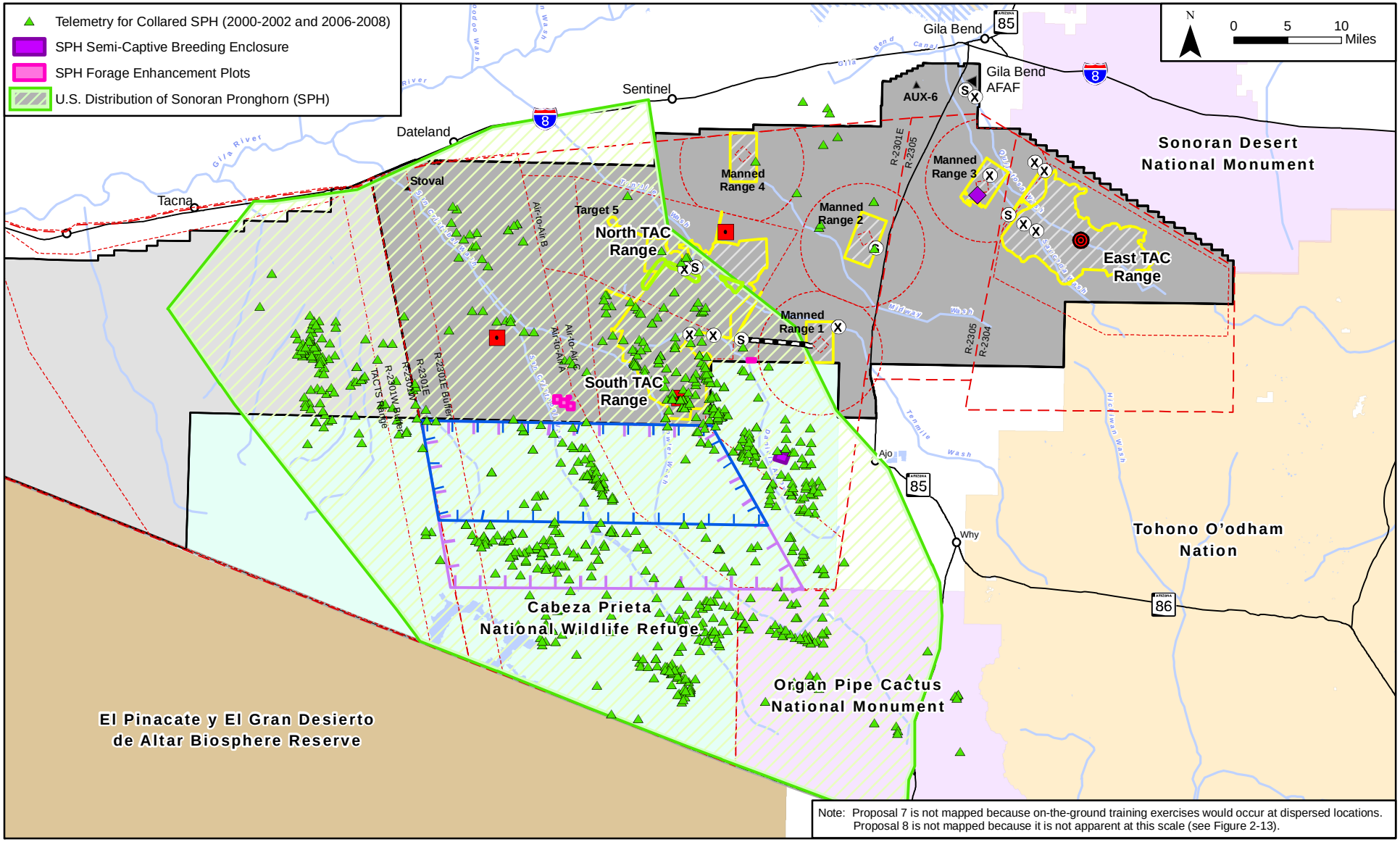
The current distribution of the Sonoran pronghorn is limited to three geographically isolated populations—one in the United States and two in Mexico (USFWS 2003). The U.S. population

is limited primarily to the BMGR (west of State Route [SR] 85), Cabeza Prieta NWR, and Organ Pipe Cactus National Monument west of State Route 85 and south of Interstate 8 (Figure 3-4). The two Mexican populations are located south of the Cabeza Prieta NWR and Organ Pipe Cactus National Monument and are geographically isolated from each other into eastern and western groups by Mexico Highway 8. The U.S. and Mexican populations are isolated from each other by Mexico Highway 2.

Typically in the United States, Sonoran pronghorn winter in the valley floors and bajadas of the western portion of its range, and move south, east, and upslope into foothills in the summers (USFWS 1998); however, movements are variable depending on environmental conditions. Slopes greater than 20 percent are generally avoided (Lee *et al.* 1998). Almost 1,765,000 acres are encompassed in the current distribution of the U.S. population of which about 1,580,000 acres have slopes of less than 20 percent. Almost 42 percent of the area in the United States occupied by Sonoran pronghorn is within the BMGR. Another approximately 55 percent of the current pronghorn distribution is under non-military federal land management within the Cabeza Prieta NWR and Organ Pipe Cactus National Monument (U.S. Marine Corps 2001).

In the late 1800s, Sonoran pronghorn were found over much of southwestern Arizona, northwestern Mexico, and southeastern California. However, this range was greatly reduced prior to the establishment of BMGR in 1941(USFWS 1998; U.S. Marine Corps 2001). Population decline has been attributed to habitat loss and modification from livestock grazing, farming, mining, and settlement; habitat fragmentation from roads (especially Interstate 8 and State Route 85), fences, railroads, irrigation canals, and large-scale agriculture; hunting (prior to the 1920s) and some poaching (especially in Mexico); disease introduction by livestock; and dewatering of the Gila River by dams and diversions (USFWS 1998).

With the designation of Organ Pipe Cactus National Monument (1937), Cabeza Prieta NWR (1939) and BMGR (1941), core Sonoran pronghorn habitat in the United States was beginning to be protected, though livestock use was not fully curtailed in these habitats until the 1980s. However, the three populations were becoming progressively more isolated due to increased habitat fragmentation from highway improvements resulting in increased traffic volume and vehicle speed (Interstate 8, State Route 85, and Mexican Highways 2 and 8), and recent U.S.-Mexico border protection activities, which have prevented migration and genetic exchange among the populations. The Sonoran pronghorn lives in a harsh environment of extreme heat and prolonged drought. Habitat loss and barriers to the animals' movements across the landscape have isolated populations and limited access to other areas for food and water that greatly exacerbated the effects of drought (Tunnicliff 2005).



Proposal 1 - Sensor Training Area
- Alternative Sites

Proposal 2 - Target Reconfiguration
- Maximum Target Reconfiguration Footprint

Proposal 3 - Moving Vehicle Target
- Alternative Sites

Proposal 4 - New Target for Air-to-Ground Missiles
- Proposed Site

Proposal 5 - Lower Flight Training Altitude Over Cabeza Prieta NWR
- Alternative 5.A
- Alternative 5.B

Proposal 6 - Reconfigure Manned Range 3 for Helicopter Training
- Proposed Site

Proposal 9 - Manned Range to RMCP 1 Road Pavement
- Proposed Site

Proposal 10 - Sand and Gravel Excavation, Stockpiling, and Use
- Proposed Excavation Sites
- Proposed Stockpile Sites

- BMGR East
- BMGR West
- National Wildlife Refuge
- National Monument
- Indian Reservation
- Subrange Airspace Boundary
- Restricted Airspace Boundary
- Auxiliary Airfield
- Intermittent Stream/Wash

Figure 3-4

U.S. SONORAN PRONGHORN DISTRIBUTION

Active research and management for the Sonoran pronghorn began in the mid-1970s; radio collaring and tracking began in the 1980s and was coupled with weekly aerial surveillance in the 1990s; and biennial population surveys began in 1992. These efforts provided information on herd composition and movements, habitat preferences and use of water, survivorship and fawn recruitment, impacts of disease and predators, the consequence of severe drought, and other factors influencing the continued survival of the Sonoran pronghorn (Tunnicliff 2005).

Sonoran pronghorn population estimates in the United States have been developed using standardized transects and a sightability index since 1992. Biennial surveys have been conducted in December since 1992 (coordinated by the AGFD) and show a declining trend from a high of 282 in 1994 (Bright et al. 1999) to a low of 21 in 2002 following extreme drought (Bright and Hervert 2005). The population increased to 58 in 2004 (Bright and Hervert 2005); to about 75 in 2005 (USFWS 2008); 68 in 2006 (USFWS 2008); around 70 in 2007 (USFWS 2008); and an estimated 68 in 2008 (AGFD 2009). (Note: population numbers for even years are the estimated population as determined using the sightability index, and not the actual number of animals observed; population numbers for odd years were determined based on known and suspected mortality and recruitment). The population in Mexico was estimated to be around 634 in 2006 (USFWS 2008). Due to the impacts of severe drought, supplemental forage plots and waters have been provided to help stabilize the U.S. population. As of fall 2008, five forage plots (three in Cabeza Prieta NWR and two in BMGR East) had been developed (Arizona Antelope Foundation 2008), and nine wildlife waters have been constructed since 2002 for the benefit of Sonoran pronghorn (six in Cabeza Prieta NWR, one in Organ Pipe Cactus National Monument, and two on BMGR East in association with the forage plots) (Arizona Antelope Foundation 2008).

A captive breeding program was initiated in 2004 to augment the wild herd, with the goal of producing 10 to 25 fawns each year for release into the wild population. A one-mile square, semi-captive breeding enclosure was constructed in Childs Valley within the Cabeza Prieta NWR. The program began with two does from Mexico and one buck from the United States in the fall of 2004. Four adult does captured on the BMGR during December 2004 were found to be pregnant (three with twins) and were placed in the pen. The six does in the captive breeding program gave birth to a total of 10 fawns in the spring of 2005; in mid-July, four of the fawns died suddenly and unexpectedly, apparently from starvation. In response, additional irrigation was used to promote the growth of nutritious forbs. Two male yearlings were released in late 2006 and another two males in early 2007; all appeared to have integrated into the wild herd. In 2007 18 fawns were produced; and in 2008, 27 fawns. Five males were released in 2008; three drowned in the Paloma Canal south of Interstate 8 near Gila Bend, and the other two continue to

survive—one in the United States and the other in Mexico. As of January 2009, the captive herd includes 47 animals; as many as 11 yearlings may be released during the winter of 2008/2009. Of eight animals released in December 2008 through January 2009, three were killed by coyotes and several remain missing (AGFD 2009). A periodic exchange of animals among the U.S. breeding facility and all three Sonoran pronghorn sub-populations is planned as part of the program to ensure the genetic diversity of the overall population (USFWS 2004 and 2005). A proposal by USFWS is currently being considered to establish an additional population of Sonoran pronghorn in Arizona but outside its current distribution (USFWS 2008).

In order to reduce potential impacts to Sonoran pronghorn due to military exercises, monitoring is conducted in association with and prior to activities at the Air Force tactical ranges inhabited by pronghorn. Protocols for standardized biological monitoring are described in *Luke AFB Operating Instruction 1-13, Sonoran Pronghorn Monitoring* (December 2008). Monitoring includes visual observations with the aid of binoculars and spotting scopes, as well as telemetry surveillance of collared animals, to locate Sonoran pronghorn. Biologists survey the ranges from hilltops or other vantage points before the first scheduled mission of the day to determine if Sonoran pronghorn are in the area. When Sonoran pronghorn are located, basic biological information is collected including: location of sighting, coordinates, activity when sighted, number and composition of herd (i.e., bucks, does, and fawns), and last known direction of travel. North and South TAC monitoring is conducted prior to live ordnance missions; every Monday; the day after a Sonoran pronghorn is located on a range; prior to live-Maverick missile missions; and prior to any munitions detonation. If a Sonoran pronghorn is located within a 5 kilometer (km) radius of a live drop zone, no high explosive ordnance deliveries are authorized on the affected tactical range and the mission is diverted or cancelled. In addition, no ordnance deliveries of any kind (e.g., inert ordnance) are authorized within a 3 km radius of any pronghorn location for the remainder of the day. The monitors work together and with other range personnel to ensure all personnel are aware of Sonoran pronghorn locations in an effort to minimize disturbance (USFWS 2001).

Tactical ranges are used year-round except for scheduled range maintenance periods. Each tactical range is closed for a period of approximately six weeks each year for range maintenance and clearance of unexploded munitions. In studying the impacts to Sonoran pronghorn behavior from noise associated with military over-flights, Krausman *et al. (*2001) found that ground-based activities during range maintenance may startle Sonoran pronghorn and cause them to trot or run for brief spurts, which may negatively affect the animal's water balance in the hot, dry summer months. To prevent or minimize this response by pronghorn during the summer heat, the tactical

range maintenance schedule was changed as follows: East TAC (15 March – 15 May), North TAC (1 January – 28 February), and South TAC (1 October - 15 December) (USFWS 2001).

3.6 LAND USE

3.6.1 Definition of Resource

This section addresses land status, land use, and land management of BMGR East. Land status pertains to land jurisdiction and/or ownership. While most federal agencies do not own land, they are charged with the responsibility for the administration of the land. For federal land, land use is defined as the purposes for which land is used to support an agency's mission. The discussion in this section on land use also describes other non-Air Force users of BMGR East and how they use the land. Land management is defined as the activity pursued to support continuation of the agency's land use. The use of land by defense agencies is grounded in the need to use land for defense mission purposes rather than for the management of land for its own sake. Defense agencies must manage land first and foremost so that land uses necessary to support military missions can continue while simultaneously ensuring compliance with the suite of laws governing protection of natural and cultural resources. In turn, compliance with environmental and cultural resource laws is necessary to accomplish the military mission.

3.6.2 Introduction

Per the MLWA of 1999 (P.L. 106-65), the BMGR is currently withdrawn from all forms of appropriation under the general land laws, including the mining laws and mineral leasing and geothermal leasing laws. The lands withdrawn for BMGR East are reserved for use by the Secretary of the Air Force for:

1. an armament and high-hazard testing area;
2. training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support;
3. equipment and tactics development and testing; and
4. other defense-related purposes consistent with these purposes.

While this land withdrawal and reservation reserves BMGR East primarily for military purposes, it also allows for non-military use subject to the constraints of the overriding military mission for which the range was established. BMGR East is accessible for compatible non-military use subject to the permitting system of the administering agency. The Air Force is responsible for issuing access permits for non-military use within BMGR East. The BLM is consulted for non-military land uses, such as applications for right-of-way easements. The USFWS is responsible

for issuing permits for all land use on the Cabeza Prieta NWR, which underlies some of the restricted airspace associated with BMGR East.

The use of the airspace associated with the BMGR by civil aviation is generally prohibited because of air-to-ground training as well as aerial maneuvering by military aircraft. The restricted airspace sections of the BMGR are established by the FAA to contain and segregate activities that would be hazardous to other non-participating aircraft. Only aircraft scheduled to do so may enter active restricted airspace.

3.6.3 Land Status

Land status is typically defined in terms of jurisdiction and/or ownership. In the case of BMGR East, the Air Force owns and/or administers all of the land. The natural and cultural resource management responsibilities for BMGR East were shifted from the BLM to the Air Force in the MLWA of 1999. Also, lands formerly held in trust by the Arizona State Land Department and privately owned lands within BMGR East were purchased by the Air Force in the 1990s, and all fee and mineral interests in lands belonging to the State of Arizona lying within the BMGR East boundaries have been acquired by the Air Force.

3.6.4 Land Use and Management

As noted above, the Air Force is the primary user of BMGR East and has also been assigned the responsibility for managing the natural and cultural resources. However, there are other agencies that use BMGR East lands that also have management responsibilities. In particular, the AGFD plays a major role in the management of wildlife resources both within the BMGR and on lands within Arizona that neighbor the range. The proximity of the range to the international border between the United States and Mexico has given the U.S. Border Patrol an active law enforcement mission that, in part, takes place within the range.

3.6.4.1 Military Land Use

The BMGR was established in 1941, as the United States was about to enter into World War II, to train military aircrews how to fight in aerial combat and how to strafe and bomb targets on the ground. Initially, the range supported training programs at Luke Field and Williams Field (later to become Luke AFB and Williams AFB), but was soon expanded to the west to also support flight training programs at Yuma Army Air Base (known today as MCAS Yuma). Today, the BMGR continues to train military aircrews, including those based at Luke AFB, Davis-Monthan AFB, MCAS Yuma, as well as aircrews from installations across the nation and some allied nations.

As noted in Chapter 1, the BMGR is divided into eastern and western portions with the western portion (BMGR West) assigned to the Secretary of the Navy and locally operated by MCAS Yuma. The focus of this document, however, is on proposed actions to enhance training within BMGR East, which is assigned to the Secretary of the Air Force and is locally operated by Luke AFB.

The land and restricted airspace of BMGR East are partitioned into several subranges much like a school building is partitioned into classrooms so that different training events or courses of study can be conducted simultaneously. The subranges also serve to ensure safety by excluding non-participating aircraft and potential ground operations. The major subranges within BMGR East include three tactical ranges, four manned ranges, and a primary air-to-air range. These subranges and their associated airspace is discussed in Section 1.2 and illustrated in Figure 1-2 and the following information about military land use supplements that discussion.

The three tactical ranges—known as North TAC, South TAC, and East TAC—support target complexes for use in training aircrews to use gunnery, bombs, rockets, and missiles to attack enemy position, equipment, and material. Collectively, the three tactical ranges cover approximately 309,500 acres. Nearly all of the targets within the tactical ranges are authorized for live-fire, inert munitions. Each of the tactical ranges includes a target, known as HE Hill, in which armed, explosive munitions may be used. In addition to the HE Hill targets, the tactical ranges support two targets in which live air-to-ground missiles may be fired; one of the air-to-ground missile targets is within East TAC and the other is located in North TAC near its common boundary with South TAC. The target complexes within the tactical ranges include realistic simulations of tactical features such as airfields, railroad yards, missile emplacements, truck convoys, and battlefield tank formations.

The targets and their directly associated ordnance impact and laser hazard areas constitute a fairly small portion of the tactical ranges, and the intended impact areas continue to grow smaller as weapons become more precise. Lasers are used as part of the target sighting systems of some aircraft and munitions and may cause eye damage to surface users. While the target features occupy a relatively small portion of the tactical range, the subrange boundaries are established to include an area large enough to serve as surface danger zones in which errant ordnance or laser energy may strike without harm to people or property. Most munitions hit within their intended impact area; however, all locations within the tactical ranges must be regarded as potentially hazardous during live-fire training missions. Therefore, personnel are generally excluded from tactical range ground areas during live-fire training unless authorized personnel are needed to occupy a designated observation post. Unexploded armed ordnance or inert ordnance with

unfired signal cartridges may also be found in surface or subsurface locations throughout the tactical ranges.

The four manned ranges—known as Manned Range 1, 2, 3, and 4—include air-to-ground targets and enough surrounding land to encompass the area likely to be impacted by misaimed ordnance or munitions that ricochet. Each manned range has:

- two bull's-eye targets for scorable training in conventional bombing and rocketry;
- one bull's-eye target for scorable training in simulated nuclear weapons delivery or conventional bombing;
- one applied tactics target (a single target vehicle without a cleared area or bull's-eye) for unscored conventional bombing or rocketry training;
- one scorable target for training in low-angle strafe; and
- one unscorable tactical strafe target for low-angle strafe.

Manned ranges are restricted to inert training practice munitions only; thus, the surface danger zone does not have to account for blast effects. Together, the four manned ranges cover approximately 44,400 acres.

A primary air-to-air gunnery range generally overlies the San Cristobal Valley between the Mohawk and Granite mountains. The air-to-air range is used for aerial gunnery training and does not include targets on the ground. However, expended tow targets, munitions, and target and munitions debris occur on the land underlying this aerial training range.

BMGR East lands underlying restricted airspace, but outside of the tactical, manned, and aerial gunnery ranges are currently managed primarily to:

- serve as access control areas that could safely contain rare and unplanned impacts from inadvertently released ordnance or aerial targets without undue risk to people or property;
- support routine, low-level overflights by excluding incompatible land uses;
- support ongoing target maintenance and EOD functions; and
- provide positive access control to lands adjacent to live-fire ranges.

As discussed in Section 3.7 on recreation, some of this land is open to public use, with the required range permit, for recreational purposes. Outside of authorized public use areas and tactical and manned ranges, there is an approximately 3-acre Air Force small arms range.

Located to the north of restricted airspace R-2301E and R-2305 are AUX-6 and Gila Bend AFAF. AUX-6 is used on an irregular schedule throughout the year as a staging area or forward

arming and refueling point for helicopter operations, for KC-130 landings during WTI, and as a field training/bivouac site for Army National Guard or Air Force Security Force units.

Gila Bend AFAF is a 1,885-acre installation located approximately five miles south of the Town of Gila Bend and east of State Route 85. Gila Bend AFAF includes an 8,500-foot by 150-foot fixed-wing aircraft runway and a six-pad heliport. An air traffic control tower provides air traffic control whenever Gila Bend AFAF is open; normal operating hours are 7 a.m. to 11 p.m. Monday through Friday. Flight line services (including a fire department, tie down ramp, aprons, and an aircraft hangar) are available at Gila Bend AFAF to support emergency or precautionary recoveries of military aircraft that experience in-flight emergencies or have hung ordnance during operations on the BMGR. These aircraft are repaired at Gila Bend AFAF by maintenance crews that travel from their home base to the auxiliary airfield for each event.

The runway is used routinely by aircrews from Luke AFB and Davis-Monthan AFB, and the Air National Guard 162 FW. Approximately 37,000 operations per year are conducted at Gila Bend AFAF, but no aircraft are permanently based at this airfield (56 FW/RMO, Luke AFB 2005). Aircraft, including F-16s from Luke AFB and A-10s from Davis-Monthan AFB, routinely use the airfield for practicing traffic pattern and emergency simulated engine flameout (engine power loss) procedures. It is also used for emergency recoveries of military aircraft that experience malfunctions on the BMGR and diversion of aircraft due to factors such as bad weather at their home base, unsafe ordnance, or low fuel. The total aircraft diversions to Gila Bend account for approximately 250 operations annually, with approximately 70 additional emergency and/or weather diversions (Arizona Department of Commerce 2005). The airfield is equipped with a simulated laser target transmitter that is used to practice illuminating a target with a weapons system aiming laser. No weapons are actually employed at the airfield and no hazardous laser energy is emitted in this activity (U.S. Air Force 1999).

Helicopter aircrews from the WAATS including the 1-285 Attack Helicopter Battalion (in Marana, Arizona) use Gila Bend AFAF as a forward operating area to support live-fire training that occurs in select locations within the BMGR. These activities include aircrew changes and helicopter refueling and rearming. The Gila Bend Munitions Storage Area complex supports the rearming operations.

Gila Bend AFAF also houses support facilities for the control, maintenance, EOD clearance, and security functions within BMGR East, including the BMGR East Security Force Office. Billeting for visiting personnel working temporarily on BMGR East is also located at the airfield. The primary parachute training drop zone is located about 3.5 miles west southwest of Gila Bend AFAF. An alternate parachute training drop zone is located on the airfield.

In 2005, a Joint Land Use Study was prepared for AUX-1, Gila Bend AFAF, and the BMGR. The purpose of the study is to facilitate implementation of compatible land uses around the Range and Gila Bend AFAF through a cooperative coordinated program among the affected jurisdictions in Maricopa and Yuma Counties that have the authority and responsibility to implement land use regulations for their communities, along with Luke Air Force Base, MCAS Yuma, and other interested and affected parties. The study serves as a planning tool to guide growth and development in the context of preserving the military mission of the BMGR as the economies of local communities are directly affected by these military installations. As a planning tool, certain assumptions are included in the study that may not reflect currently used aircraft or flight patterns, but offer a projection of potential future operations and use to help ensure land use compatibility.

The land use compatibility element of the Joint Land Use Study considered the effects of existing and anticipated military operations on noise and safety. This included recognition that the most probable successor aircraft to the F-16 is the F-35, also known as the Joint Strike Fighter. However, F-35 data for use in noise modeling programs was not yet developed and there also was no flight profile data regarding how quickly the aircraft would climb away from the ground, which also affects noise levels. Although it was not possible to generate an accurate prediction of specific future noise contours for the F-35, noise contours were defined using an alternative aircraft, the F-18E Super Hornet, as this was viewed as a reasonable approximation of future noise profiles. Noise contours were generated using standard Air Installation Compatible Use Zone noise methodology and the results are shown in Figure 3-5. This area is larger than the area contained within the noise contours for current operations. The Joint Land Use Study (JLUS) assumed different flight departure routes from those analyzed in the Air Installation Compatible Use Zone study and therefore have different accident potential zones (APZs). The Town of Gila Bend has adopted the findings of the Joint Land Use Study and uses the noise and safety compatibility factors in land use planning for the community.

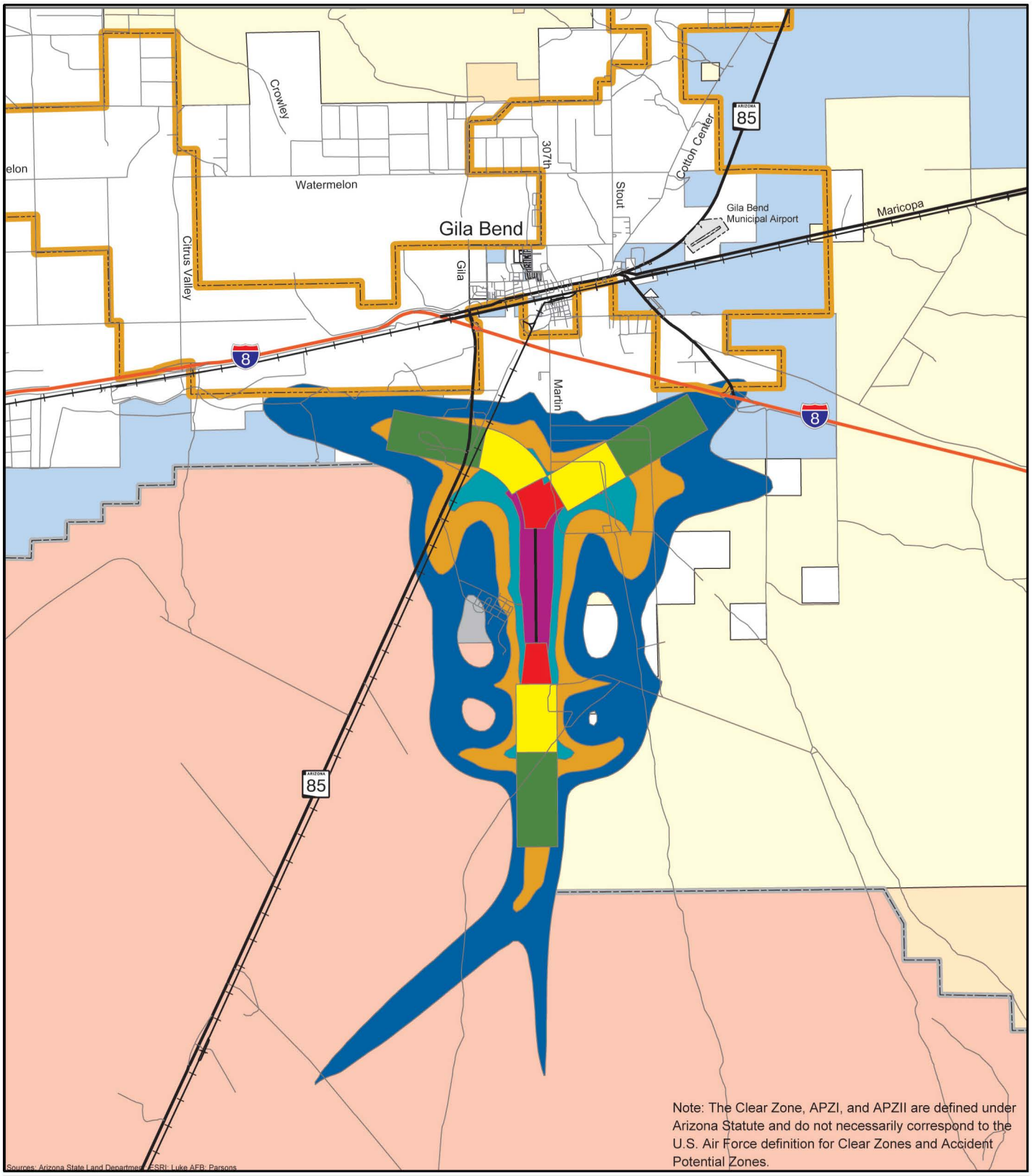


Figure 3-5

COMPATIBLE LAND USE PLAN ZONES AT THE GILA BEND AFAF

3.6.4.2 Arizona Game and Fish Department

The AGFD has management authority of the state's wildlife, which is held in trust for the citizens of the State of Arizona; this wildlife management responsibility also applies to the BMGR unless otherwise pre-empted by federal law. AGFD is directed by the Arizona Game and Fish Commission, the governing body of the department. Under the provisions of Arizona Revised Statutes 17-231, the Arizona Game and Fish Commission establishes policy for the management, preservation, and harvest of wildlife. Under the umbrella of the Commission, the AGFD's mission is as follows:

> *To conserve, enhance, and restore Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and to provide wildlife resources and safe watercraft and off-highway vehicle recreation for the enjoyment, appreciation, and use by present and future generations.*

The primary wildlife management responsibilities of AGFD on the BMGR include:

- enforce hunting regulations;
- develop and maintain habitat assessment/evaluation, protection, management, and enhancement projects (e.g., artificial water developments and Sonoran pronghorn forage plots);
- conduct wildlife population surveys;
- establish game limits for hunting, trapping, and non-game species collection;
- manage wildlife predators and endangered species/special status species (management of federally listed endangered species is a responsibility shared with the USFWS);
- manage off-highway vehicles in terms of habitat protection and user opportunities; and
- issue hunting permits.

Management activities include conducting wildlife censuses to determine population trends, followed by recommendations for restoring or maintaining resident species; controlling wildlife populations at appropriate sustained levels for protection of other BMGR resources values; and enforcing state game laws. AGFD organizes and conducts bighorn sheep surveys every year on BMGR lands, however specific mountain ranges within the BMGR are usually surveyed only every 3 years. AGFD also conducts research on Sonoran pronghorn through aerial and vehicular tracking of individual animals via radio-collar telemetry (U.S. Air Force 1986). AGFD conducts low-level flights of the BMGR East and Cabeza Prieta NWR for these survey efforts. AGFD is

also a member of the Sonoran Pronghorn Recovery Team, which also consists of representatives from the USFWS, Luke AFB, MCAS Yuma, National Park Service, BLM, the University of Arizona, and the Mexican Government (U.S. Air Force, Luke AFB 2000).

The AGFD role in executing the INRMP for the BMGR includes maintenance and enhancement of habitat for certain protected species, selected big game species, upland game, nongame species, and other sensitive wildlife habitat on the BMGR. To implement these objectives, AGFD is actively engaged in water hole management on the BMGR. This involves the construction and maintenance of man-made and reconstructed natural water catchments and development of support roads (U.S. Air Force 1986).

In managing the state's wildlife, AGFD makes determinations on the appropriateness and need to transplant wildlife, which may include transplants into or out of BMGR East. Such proposed actions are subject to compliance with NEPA.

3.6.4.3 U.S. Department of Homeland Security, Border Patrol

The U.S. Border Patrol, a unit of Customs and Border Protection, is responsible for preventing undocumented immigrants (UDIs) from illegally entering the United States and apprehending UDIs who have already entered the United States illegally. While BMGR East is not adjacent to the international border between the United States and Mexico, UDIs entering the United States through the Cabeza Prieta NWR, BMGR West, Organ Pipe Cactus National Monument, and the Tohono O'odham Nation may continue their northbound journey by passing through BMGR East lands. In the Border Patrol's Yuma Sector, there were 108,747 UDI apprehensions in fiscal year 2001. These numbers dropped to 42,654 in fiscal year 2002 and then started to climb again with a peak in fiscal year 2005 of about 139,000 apprehensions. Apprehensions in the Yuma Sector then declined to 118,000 in fiscal year 2006 before dropping significantly to about 39,000 in fiscal year 2007. In the first half of fiscal year 2008 (through November), there were about 8,300 apprehensions (Bernacke 2008). Similar trends occurred in the Tucson Sector. U.S. Air Force Security on BMGR East apprehended 377 UDIs in calendar year 2007, which is a subset of the total apprehensions made by all security forces. The number of apprehensions made by Air Force security in BMGR East in calendar year 2008 has been averaging about half of those made in 2007 (Buchanan 2008).

On the BMGR (predominantly along the international border in BMGR West), the Border Patrol conducts daily reconnaissance by air or ground surveillance. Activities involving the smuggling of drugs or other contraband also occur on the BMGR, although it is less common than in more populated border areas.

There are two Border Patrol jurisdictional sectors on the BMGR, the Tucson and Yuma sectors, divided by the Pima/Yuma County line. These two jurisdictional units, the Tucson and Yuma sectors of the Border Patrol, are responsible for the entire Arizona-Mexico border and portions of the California-Mexico border (in Imperial County). The western unit, the Yuma Sector, includes BMGR lands within Yuma County, which includes a small portion of BMGR East. The eastern unit, the Tucson Sector, performs operations in Pima, Santa Cruz, and Cochise counties, and a small portion of BMGR East is within Pima County. The Ajo field station within the Tucson Sector is located near BMGR East in Why, Arizona.

Traditional Border Patrol operations/activities include patrolling roads and off-road areas; conducting ground and aerial reconnaissance, including the use of noise and motion sensors, listening posts, observation posts, ground surveillance radar, and ground and air patrols; inspecting vehicles at checkpoints; and creating and maintaining roads that are periodically cleared of tracks, typically by dragging tires over the roads. These "drag roads" aid the Border Patrol in observing footprints of UDIs traveling northward across the BMGR. Currently, the Tucson and Yuma sectors maintain six OH6 Alpha helicopters and three fixed-wing aircraft (two Cessnas and one Piper Supercub) that can provide assistance to any station within the two sectors. There is one established helicopter flight route within the Yuma Sector. Each morning, a helicopter flies from the Yuma station to the U.S.-Mexico border, flies along the border, and returns to the station. This flight takes approximately four hours. The three fixed-wing aircraft are used for higher elevation surveillance and pilot training (Immigration and Naturalization Service 2001). While most of these activities occur south of BMGR East lands, some of the aerial survey occurs within R-2301E restricted airspace.

Border Patrol activities within the Ajo Station area, including the BMGR, consist of road patrols and off-road operations utilizing four-wheel drive vehicles and dirt bikes. No dragging operations are conducted from this field station and air patrol flights are usually related to search and rescue missions (Immigration and Naturalization Service 2001).

Due to the extreme temperatures that occur in southwestern Arizona from May through October, it is necessary that the Border Patrol conduct rescue missions to save UDIs who are severely dehydrated or suffering from other heat-related distress. In recent years, some of the border crossing points that historically have been used the most extensively are being monitored more closely. This has resulted in an increase in crossings of more remote areas, particularly through the Cabeza Prieta NWR and Organ Pipe Cactus NM, but also the BMGR. Because of the remoteness of these areas and the harsh environmental conditions, the Border Patrol's role in rescue missions has also been increasing.

The Border Patrol also offers assistance on the range (and the Cabeza Prieta NWR) to AGFD, BLM, and USFWS. Border Patrol helicopters are occasionally used to locate lost recreationists, report illegal off-highway vehicle (OHV) usage, and assist in wildlife management activities (USFWS 2000b). The Border Patrol also maintains distress beacons that may be activated by persons needing rescue services.

3.6.4.4 Other Land Uses

Other land users within BMGR East include various utilities, the Arizona Department of Transportation, educational institutions, and the public, including Native American communities. Non-military land uses of the range include transportation corridors, utility rights-of-way, recreation, and natural and cultural resource management.

The only major transportation and utility corridor passing through BMGR East is the State Route 85 corridor, which connects Gila Bend on the north to Ajo on the south. The highway was constructed by and is maintained by the Arizona Department of Transportation. The Tucson, Cornelia and Gila Bend Railroads generally parallel this highway. The railroad was last upgraded in about 1997 for the primary purpose of serving the Phelps Dodge Ajo Incorporated Mine. Within the highway corridor, Arizona Public Service Company operates and maintains the Gila Bend to Ajo 69 kilovolt (kV) transmission line. Should copper prices increase to the point that it becomes economically feasible to reopen the Phelps Dodge Ajo Incorporated Mine located in Ajo, there are associated proposals to upgrade the railroad and to construct a 230 kV transmission line within this corridor. Per the terms in the MLWA of 1999, the Secretary of the Air Force is to consult with the Secretary of the Interior before using the BMGR East lands for any purpose other than the purposes specified as the allowing military uses of the land. Therefore, BLM would need to be consulted before the Air Force could issue a new right-of-way that is not for the specified military purposes of the BMGR.

The Air Force has primary responsibility for managing the natural and cultural resources within BMGR East, which may include scientific surveys and studies conducted by educational institutions and consulting firms. Educational institutions may also propose research activities on the range, which may be conducted through a special use permit. Through the MLWA of 1999, the Secretary of the Interior has been assigned an oversight management function for the BMGR. The natural and cultural management responsibility for BMGR East may be transferred to the Department of the Interior if the Secretary of the Interior determines that (1) the Air Force has failed to manage BMGR natural and cultural resources in accordance with the INRMP and (2) this failure is resulting in significant and verifiable degradation of the natural or cultural resources of the BMGR.

Public uses within BMGR East are limited by safety factors, which are discussed in more detail in Section 3.8. Public uses include travel along State Route 85 and limited recreational use of BMGR East, which is discussed in more detail in Section 3.7. Native Americans may be granted special use permits for access to BMGR East lands for access to traditional plant gathering areas and other places of cultural significance within the otherwise restricted inter-range areas to the extent compatible with military training and support activities.

3.6.4.5 U.S. Fish and Wildlife Service

The USFWS is responsible for the administration and management of the Cabeza Prieta NWR. While the Cabeza Prieta NWR land surface is not part of BMGR East or BMGR West, the airspace overlying the refuge is encompassed within the R-2301E and R-2301W restricted airspace areas from the surface to 80,000 feet MSL. Both R-2301E and R-2301W are critical to flight operations in BMGR East and BMGR West. Luke Air AFB is the designated controlling and scheduling agency for R-2301E as well as for R-2304 and R-2305. MCAS Yuma is the designated controlling and scheduling agency for R-2301W. Both R-2301E and R-2301W are typically active 24 hours a day and 7 days per week. All use of the restricted airspace at the BMGR must be scheduled. Non-participating aircraft are restricted from flight within R-2301E, R-2304, R-2305, and R-2301W when these restricted airspaces are active. Non-military use of active restricted airspace at the BMGR is scheduled on request for legitimate purposes such as Border Patrol surveillance, search and rescue flights, or flights for resource management purposes such as wildlife surveys. All authorized military and non-military flights within restricted airspace are assigned specific operating locations, or subranges, and times to deconflict air traffic that is not participating in the same training, law enforcement, management, or other authorized activity.

In a policy dating from August 1951, as agreed upon by the Department of the Air Force and the Department of the Interior, routine military overflights of the Cabeza Prieta NWR are limited to altitudes of 1,500 feet AGL or higher. This policy has been reaffirmed in a series of four such agreements, the most recent of which was a November 1994 MOU. The restricted airspace over the refuge below 1,500 feet AGL is also used for military flights but only along low-level corridors mutually approved by the Air Force, Marine Corps, and USFWS as agreed in the 1994 MOU.

Non-military use of the R-2501E airspace from the floor to 1,500 feet AGL over the Cabeza Prieta NWR routinely includes aerial surveillance conducted by the Border Patrol and periodically includes flights by USFWS and AGFD for conducting surveys for Sonoran pronghorn, other wildlife, or other management purposes.

Currently managed under a broad set of goals and objectives, the USFWS released the Comprehensive Conservation Plan, Wilderness Stewardship Plan and EIS for the Cabeza Prieta NWR in August 2006. The EIS presents four general goals for the refuge (USFWS, Division of Planning, National Wildlife Refuge System, Southwest Region 2006). The refuge goals are as follows.

- *Wildlife and Habitat Management*: to protect, maintain, enhance and/or restore the diversity and abundance of wildlife species and ecological communities of the Sonoran Desert represented at Cabeza Prieta NWR.
- *Wilderness Stewardship:* to protect and conserve refuge wilderness employing strategies of wildlife and plant conservation that will conserve, maintain, and where possible, restore the wilderness character of the refuge.
- *Visitor Services Management:* to provide visitors with compatible, high quality wildlife-dependent recreational and educational experiences designed to foster better appreciation, understanding, and protection of the plant, animal, and wilderness resources.
- *Cultural resources:* to protect, maintain, and interpret cultural and historic resources on the Cabeza Prieta NWR, in cooperation with Tribal governments and the State of Arizona for the benefit of present and future generations.

3.7 OUTDOOR RECREATION

3.7.1 Definition of Resource

Recreational resources encompass those outdoor activities which occur away from the residence of the participant. Factors that influence recreational experiences include recreation opportunities (i.e., types of recreation available) and setting (i.e., municipal park versus wilderness area).

3.7.2 Introduction and Study Area

The value of the natural and cultural resources present in the vicinity of BMGR for recreation has been recognized by the establishment of adjacent or nearby national monuments, two national wildlife refuges, several areas of designated Wilderness, and the international biosphere reserve in Mexico. Many of the same recreation settings of these adjacent areas also occur on BMGR East. BMGR East is accessible for public recreation use subject to the constraints of the overriding military training mission for which the range was established. Such use is managed by rules and regulations established to prevent interference with military training missions, protect public health and safety, and reduce federal liability. Recreational use is also actively managed to protect and preserve the natural and cultural resources of the range.

Opportunities for recreation on the range include hunting, backpacking, hiking, camping, picnicking, photography, auto touring, nature study, some four-wheel drive use, visiting cultural sites, and sightseeing. The suitability of areas within the range for recreation varies, depending on area-specific military training missions. For example, tactical and manned ranges, which include live-fire targets, are necessarily closed to recreation. Other range locations used for air-to-air training with little or no live firing are available for a wider variety of activities and for most of the year.

In terms of outdoor recreation, the area potentially affected by the proposed range improvement projects includes locations within the range where outdoor recreation is permitted, and/or those areas outside the range where the effects of the actions may be either directly or indirectly observed. Due to the nature of the proposed range improvements, the only recreational area outside BMGR East that has the potential to be directly impacted by the proposal would be Cabeza Prieta NWR.

Recreational areas in the vicinity of BMGR East that could be indirectly impacted include: Sonoran Desert National Monument, Organ Pipe Cactus National Monument, Cabeza Prieta NWR, areas of BMGR West open to public access, and other BLM lands surrounding the range.

Numerous local residents and tourists are attracted to the Sonoran Desert because of its climate, varied topography, and abundant natural resources which provide ample opportunities for outdoor recreation. Historically, recreational use of the BMGR was limited in comparison to the nearby areas such as Organ Pipe Cactus National Monument and Imperial Sand Dunes Recreation Area, which recorded 323,512 and 1,466,929 visitors for 2007, respectively (BLM 2008a; Hamada 2008). This represents a much higher visitation rate than that of BMGR, which issued 6,467 visitor permits in 2007 (Whittle 2008) and 7,927 permits in 2008 (Buchannan 2009). Low levels of recreational use on the range result from location (near other similar recreation attractions and remote from major population centers), permit requirements for access, possible concerns about military operations and safety, fears from illegal activities related to undocumented immigrant (UDI) crossings and contraband smuggling, and the lack of any substantial surface water attractions within or near its borders; furthermore, as the population of southern Arizona increases, demand for recreational opportunities on BMGR East will increase.

3.7.3 Outdoor Recreation within BMGR East

3.7.3.1 Access Permits

Recreational access to BMGR is by permit only. Permit applications and associated rules, regulations, and other information are made available to the public at the Gila Bend AFAF, Luke AFB, MCAS Yuma, BLM Field Office in Phoenix, BLM Public Lands Information Center in

Phoenix, and the Cabeza Prieta NWR in Ajo. Permits issued from any of these offices provide the permit holder access to all parts of the range that are open to the public (BMGR East, BMGR West) and also to Cabeza Prieta NWR.

Each person in a party 18 years or older is required to obtain an individual permit. Permits are valid for 1 year from July 1 through June 30. Permit holders to BMGR East:

- are restricted to approved areas within BMGR East;
- must view a visitor safety video each year as a condition for obtaining an entry permit for the range;
- must call a designated Gila Bend AFAF phone number (provided when the permit is issued) prior to each trip to the BMGR;
- must notify Gila Bend AFAF, by phone or in person, when they depart the BMGR to ensure visitor safety and prevent any interruption of the military mission;
- must sign a "Release and Hold Harmless Agreement" form, which documents the acknowledgement of recreational visitors to possible dangers on the range, as a condition for obtaining an entry permit (also required for BMGR West, the form is also used for emergency notification, return of lost property, and to track user statistics); and
- must adhere to the general rules of conduct and vehicle operating rules in the Visitor Regulations provided with the range permit application (Departments of the Air Force, Navy, and Interior 2006).

Public, street legal OHV travel is prohibited on the entire BMGR. The use of OHVs—vehicles equipped for travel over unimproved roads or with four-wheel drive (e.g., all terrain vehicles, jeeps, sport utility vehicles) – is limited to travel on existing roads and trails in areas where public access is allowed. Vehicle operators are required to comply with the vehicle operating rules associated with their permits (Departments of the Air Force, Navy, and Interior 2006).

3.7.3.2 Recreational Opportunities

As shown in Figure 3-6, approximately 87.1 percent of the BMGR East is regularly restricted from recreational access because of incompatibility with the military mission. Those areas of BMGR East which comprise the remaining 12.9 percent can generally accommodate public visitation on a regular basis if certain necessary restrictions are observed (Whittle 2008). Public access opportunities align closely with the BMGR Management Units established in the BMGR INRMP. All of the BMGR East Management Units (4, 5, 6, and 7) are within the area of potential effect for this EIS. In addition, BMGR West Management Unit 3 is within the area of potential effect for Alternative 1.A, the proposed STA site. Areas open to the public include most of Management Unit 6 and a small area of Management Unit 7; however, such areas also become unavailable to recreational users to accommodate safety/security concerns surrounding special training exercises. In the areas generally unavailable for recreation use (Management Units 4, 5, and most of 7), some special use recreation is allowed when compatible with the military mission (e.g., on a case-by-case basis, hunter access may be granted in areas normally closed to recreational access during bighorn sheep hunting season). Without exception, all BMGR East recreation users are required to obtain an access permit for entry to the range.

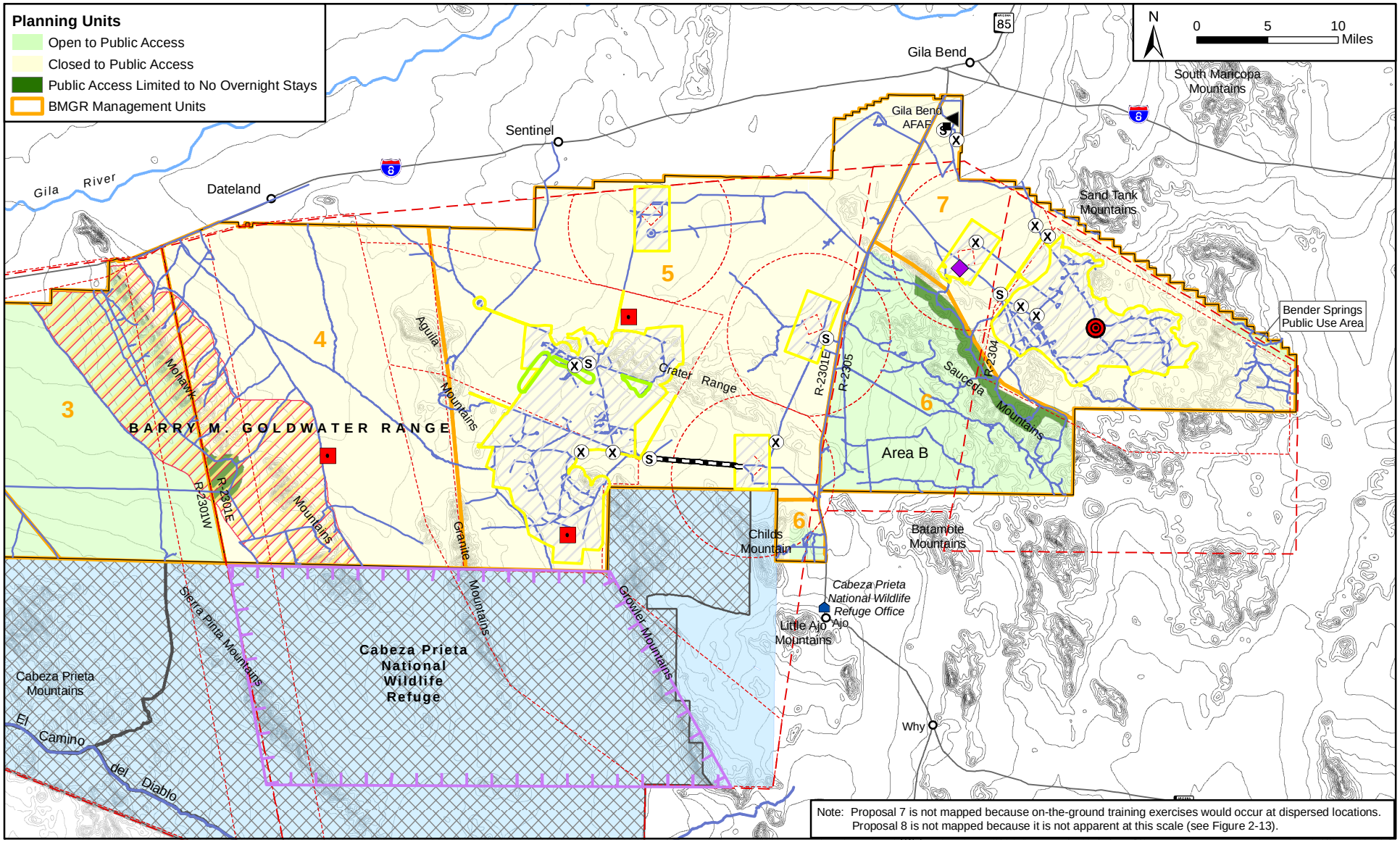


Figure 3-6

BMGR EAST RECREATION

Table 3-4 characterizes the recreational opportunities within each management unit of BMGR East and Management Unit 3 in BMGR West.

Table 3-4
Recreation Opportunities in BMGR Management Units within the Area of Potential Effect

Management Unit	Description of Recreation Opportunities
BMGR West	
3, Mohawk Valley	This management unit is almost entirely open to general public access, except for the northeast corner of the unit east of the Mohawk Mountains. However, this management unit is closed to public access annually from 15 March through 15 July—the fawning period for the endangered Sonoran pronghorn—in compliance with the Biological Opinion issued to the Marine Corps (USFWS 2001). Recreational opportunities within this unit are primarily related to driving (although there are few roads), camping, and hunting. The Mohawk Mountains and Sand Dunes Special Natural/Interest Area is an area of biological and scenic interest. Christmas Pass Road is a point of ingress and egress to the northwestern Cabeza Prieta NWR. Military surface use within this unit is primarily limited to scattered electronic instrumentation sites and five dispersed and infrequently used ground support areas. As recreation use within this portion of the BMGR is also relatively low, there is a sense of wildness within much of the area.
BMGR East	
4, San Cristobal Valley	With the exception of permitting pass-through use of the approximately 5-mile road segment that loops around the southern extent of the Mohawk Dunes, which is integral with the road network from Management Unit 3 (Figure 3-6), Management Unit 4 is closed to general public access. Thus, recreational opportunity within this management unit is limited to driving along this road; no camping is allowed along the segment of the road within Management Unit 4.
5, Crater Range	This management unit is entirely closed to general public access. Thus, there is no recreational opportunity within this management unit.
6, Sauceda Mountains	This management unit is open to general public access, with the exception of small isolated areas in the northernmost portions of this management unit and the run-in lines to Manned Range 1 and Manned Range 2. This management unit offers the full spectrum of BMGR recreational opportunities and is a popular area for recreational driving, camping, hunting, and viewing cultural/natural resource sites of interest. Although similar recreational opportunity exists in the publicly accessible portion of this management unit located west of State Route 85 at the base of Childs Mountain, the primary recreation use that occurs in this location is RV-based camping.
7, Sand Tank Mountains	With the exception of a few small parcels of land contiguous with roadways in Management Unit 6 to the south or Sonoran Desert National Monument to the north and the Gila Bend AFAF, this management unit is closed to general public access. Recreational opportunities within the open areas include recreational driving, hunting, and camping. The area is very scenic and is of interest biologically as it is the only occurrence of the Sand Tank Mountains Uplands Natural Community within the BMGR. The relatively developed setting at the Gila Bend AFAF, with recreation facilities and amenities provided, offers a different recreational experience in comparison to other areas of the BMGR. This installation, which is open to recreational use by military personnel and military retirees, maintains 41 family camping spaces with water and electrical hookups. The Gila Bend AFAF also has basketball courts and a running track with fitness circuit par course stations (e.g., horizontal bar for pull-ups). Personnel deployed or employed at Gila Bend AFAF are the primary users of these facilities.

Source: Departments of the Air Force, Navy, and Interior 2006, Whittle 2008

3.7.3.3 Hunting

The BMGR is within the boundaries of two state game management units (40A and 40B). Unit 40A is situated to the east of State Route 85 and includes additional areas outside the BMGR. Unit 40B lies west of State Route 85 and is primarily comprised of BMGR lands. Within the BMGR portion of game management unit 40A, most hunting occurs in the Sauceda Valley. With the exception of individual permits for bighorn sheep (issued on a case-by-case basis), virtually all hunting activity within game management unit 40B occurs in the Lechuguilla Desert and Mohawk Valley, which are within BMGR West (Departments of the Air Force, Navy, and Interior 2006).

Big game species include javelina, deer, and bighorn sheep. Mule deer and javelina populations generally increase from west to east across the BMGR and are probably most abundant in BMGR East. White-tailed deer are present in limited numbers in the Sand Tank Mountains, which is east of Management Unit 7. Bighorn sheep are most likely to be found on BMGR West in the Mohawk Mountains, Copper Mountains, Gila Mountains north of Cipriano Pass, and the Tinajas Altas Mountains south of Cipriano Pass. Hunting seasons for these species are typically in early November and mid- to late-December for mule deer, all of December for bighorn sheep, and January and mid-February for javelina (Departments of the Air Force, Navy, and Interior 2006).

Small game mammals that inhabit the BMGR include the desert cottontail and black-tailed jackrabbit. The antelope jackrabbit also occurs to a limited extent in the BMGR. The hunting seasons for these species are typically year-round. Game birds present on BMGR include the mourning dove, white-winged dove, and Gambel's quail. Of these, the Gambel's quail is probably the most frequently hunted on BMGR. Mourning doves occur as permanent and wintering populations, while white-winged doves are known only as spring/summer residents. Timing of the white-wing dove arrival coincides with flowering of saguaro cacti, their primary food/foraging source, in early- to mid-April. White-winged doves depart for Mexico and Central America usually by early September. Hunting season takes place in early- to mid-September and late-November through early January for mourning dove, early- to mid-September for white-winged dove, and mid-October through mid-February for Gambel's quail (Departments of the Air Force, Navy, and Interior 2006).

Five species of predators (kit fox, gray fox, coyote, bobcat, and mountain lion) and five furbearer species (spotted skunk, striped skunk, hooded skunk, badger, and ringtail) occur on the BMGR. The hunting season for bobcat, fox, badger, and ringtail is typically August through March, while coyote and skunks may be hunted year-round (Departments of the Air Force, Navy, and Interior 2006).

Any individual is able to request a special use permit to gain access to some BMGR areas (not including the tactical and manned ranges) which are ordinarily off-limits to the public. Per 56 RMO Operating Instruction 1-3 (dated 2007), the use of public access areas (Area B, see Figure 3-6) requires a BMGR special use permit (Whittle 2008). These special use permits, which must be authorized by the AGFD, allow hunting under the Air-to-Air Range in the Mohawk and Granite mountains and San Cristobal Valley. Portions of the Granite Mountains that are within South TAC (Management Unit 5, see Figure 3-6) are not open to bighorn sheep or other types of hunting. The special use permit only allows the individual to access areas and conduct activities specifically authorized in writing. Special use permits are issued on a case-by-case basis.

The Air Force makes every effort to limit BMGR East closures to the minimum necessary areas and times. The scheduling of military activities is dictated by many competing factors affecting opportunities to conduct training or other operations on BMGR East. Minimal flexibility exists in the scheduling process to accommodate public access except to provide access when other operational, safety, or security priorities are not available.

3.7.3.4 BMGR Recreation Use Statistics

Recreational use of BMGR East is tracked by Luke AFB and that of BMGR West is tracked by MCAS Yuma; however, as mentioned above, multiple agencies including the BLM Phoenix Field Office and the Cabeza Prieta NWR can issue permits for range access. Coordination occurs among these agencies to track overall visitation; however, there is no definitive data on how many visitors recreated in any particular portion of the range (e.g., BMGR East versus BMGR West). There were 6,467 range access permits issued in 2007 by the permitting agencies (Whittle 2008).

3.7.4 Outdoor Recreation in the BMGR Vicinity

Major recreation areas in the BMGR vicinity include:

- Cabeza Prieta NWR, managed by the USFWS
- Organ Pipe Cactus National Monument, managed by the National Park Service
- Sonoran Desert National Monument, managed by BLM
- BMGR West, managed by MCAS Yuma
- Kofa NWR, managed by the USFWS
- Imperial Sand Dunes Recreation Area/North Algodones Dunes Wilderness, managed by BLM

- Reserva de la Biosfera de El Pinacate Y El Gran Desierto de Altar in Mexico, managed by the Secretaria del Medio Ambiente, Recursos Naturales y Pesca (serving a similar function in Mexico to the USFWS)

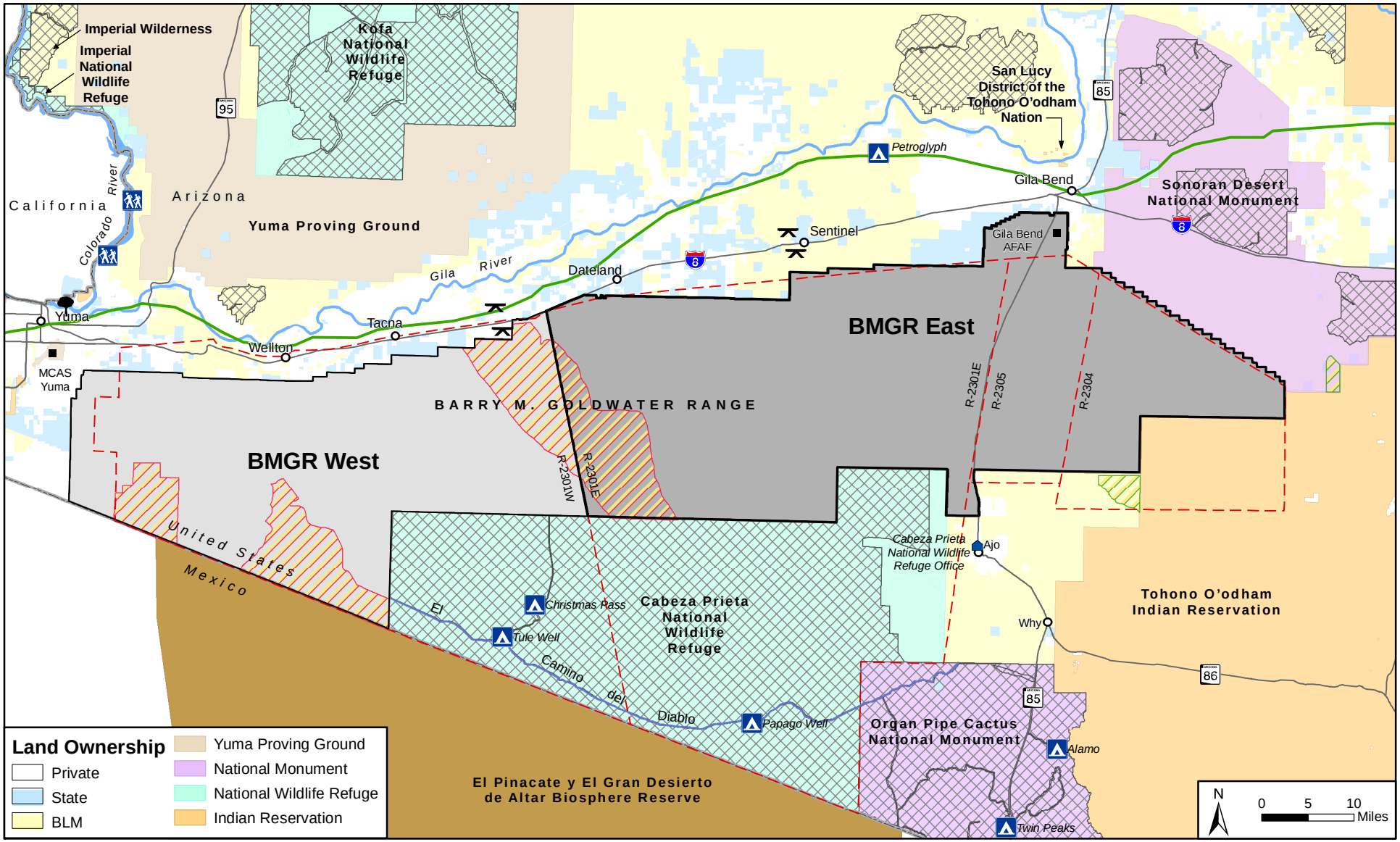
These areas are shown in Figure 3-7. Smaller recreation areas include several camping and recreation areas managed by BLM, five wildlife areas managed by AGFD, a park managed by Arizona State Parks, and rest areas along Interstate 8 managed by the Arizona Department of Transportation (see Figure 3-7). Other recreation sites located outside the study area are shown on Figure 3-7; because they are outside the region of influence, they are not discussed herein, but are depicted for reference (e.g., Imperial NWR, New Water Mountains Wilderness).

3.7.4.1 Cabeza Prieta National Wildlife Refuge and Wilderness

The Cabeza Prieta NWR and Wilderness is located south of the BMGR, where it shares 56 miles of the international border with Mexico (Figure 3-7). Established in 1939, it encompasses 860,010 acres and is the third largest national wildlife refuge in the lower 48 states (USFWS 2008a). More than 90 percent of the refuge was designated as wilderness by the Arizona Desert Wilderness Act of 1990; thus, vehicle traffic is only allowed on designated public use roads.

In 2007, approximately 400 persons visited Cabeza Prieta NWR (Bissell 2008). Recreational opportunities on the Cabeza Prieta NWR include backpacking, hiking, hunting, primitive camping, four-wheel driving (on the three unimproved public use roads in the refuge that are not included in the wilderness designation), mountain biking (on roads open to public use), wildlife observation, photography, and appreciation of wilderness solitude. A visitor center and short interpretive trail are located near the refuge office. Three primitive camping areas—Papago Well, Tule Well, and Christmas Pass—also offer facilities such as tables and barbeque grills.

Most visitors to the Cabeza Prieta NWR take advantage of the opportunity to travel a well-preserved portion of El Camino del Diablo through the refuge (McCasland 2008). The refuge portion of El Camino del Diablo starts in the east in the Growler Valley and extends west to the Lechuguilla Desert in BMGR West, where the roadway forks and turns northwest along two parallel routes towards Wellton and Yuma. Charlie Bell Well in the Growler Mountains is also popular with refuge visitors. Unlike all other refuge roads where a four-wheel drive vehicle is required, high clearance two-wheel drive vehicles may be driven on the road to Charlie Bell (Departments of the Air Force, Navy, and Interior 2006).



BMGR East
BMGR West
Subrange Airspace Boundary
Restricted Airspace Boundary

BLM Recreation Site
Campground
Roadside Rest Area
State Park
Juan Bautista de Anza National Historic Trail

Designated Wilderness
Special Natural/Interest Area
Area of Critical Environmental Concern

Figure 3-7

BMGR EAST
REGIONAL RECREATION

3.7.4.2 Organ Pipe Cactus National Monument and Wilderness

Organ Pipe Cactus National Monument and Wilderness, administered by the National Park Service, is located east of the Cabeza Prieta NWR. The monument encompasses 330,689 acres of which 312,600 acres, or about 94 percent, was designated Wilderness in 1978. Like the Cabeza Prieta NWR, the monument shares a border with Mexico and was established in 1937. Recreational opportunities are also similar to those at the Cabeza Prieta NWR and include auto touring, backpacking, bicycling, bird watching, camping, hiking, horseback riding, nature walks, stargazing, wilderness experiences, and wildlife viewing (National Park Service 2008). There are two designated areas for camping: (1) Alamo Campground—a primitive campground with four tent-only sites and a pit toilet; and (2) Twin Peaks Campground —a more developed campground with water, rest rooms, grills, tables, a dump station, and 208 campsites that accommodate RVs up to 35 feet in length. The monument had 1,635,520 total visitors in 2007, of which 323,512 were recreational visitors (approximately 20 percent) (BLM 2008a).

3.7.4.3 Sonoran Desert National Monument

The Sonoran Desert National Monument encompasses 486,603 acres of BLM administered public land, including 77,957 acres of former BMGR lands not included in the MLWA of 1999 renewal of the land withdrawal for the BMGR. Approximately 157,700 acres within the monument (the North Maricopa Mountains, South Maricopa Mountains, and Table Top) were designated Wilderness by the Arizona Desert Wilderness Act of 1990. The monument also contains a frequently used, 16-mile trail corridor along which several important historic trails are found, including the Juan Bautista de Anza National Historic Trail, Mormon Battalion Trail, and Butterfield Overland Stage Route. In addition, the 3,520-acre Vekol Valley Area of Critical Environmental Concern (ACEC), previously recognized and protected for its desert grasslands habitat, is located in the southern portion of the Sonoran Desert National Monument (BLM 2008b).

Recreational opportunities at the monument include backpacking, hiking, primitive camping, and hunting. Motorized and mechanized vehicular travel off road is prohibited. Visitor use on Sonoran Desert National Monument is approximately 20,000 visitors per year (Departments of the Air Force, Navy, and Interior 2006).

Recreational use is permitted within the southwestern portion of Sonoran Desert National Monument which was formerly part of BMGR East and is still referred to as Area A, its previous BMGR designation. However, a permit is required for entry and visitors must sign a hold harmless agreement. Currently, the permit for Area A is the same as the BMGR permit.

3.7.4.4 Barry M. Goldwater Range West

Approximately 25 percent of BMGR West is regularly restricted from recreational access due to incompatibility with the military mission. The areas of BMGR West which comprise the remaining 75 percent of the western portion of the range generally accommodate public visitation on a regular basis if certain necessary restrictions are observed. Areas open to the public include the eastern portion of Management Unit 1, all of Management Unit 2, and most of Management Unit 3; however, these areas become temporarily unavailable to recreational users to accommodate special training exercises requiring temporary closure to recreation use for safety and security purposes. Without exception, all BMGR West recreation users are required to obtain an access permit for entry to the range.

The recreation opportunities noted for Management Unit 3 in Table 3-4 generally apply to Management Units 1 and 2.

Management Unit 1 covers the Yuma Desert, in the westernmost portion of BMGR West. Only the eastern portion of Management Unit 1 is generally open to public access. This area, which includes the Tinajas Altas Mountains Special Natural/Interest Area and portions of El Camino del Diablo, is popular among recreation users. Recreational opportunities within this management unit are based on the area's scenic, biological, landscape, and cultural qualities. The portion of El Camino del Diablo within this management unit provides ingress-egress to the adjacent Cabeza Prieta NWR and, near the Tinajas Altas high tanks, diverges into an eastern and western route. The western route traverses through Cipriano Pass in the Tinajas Altas Mountains and the eastern route proceeds northward through the Lechuguilla Desert. The western route alignment on the western side of the Tinajas Altas Mountains remains in fairly primitive condition. The eastern route north of Cipriano Pass, on the east side of the Gila Mountains, however, was widened and graded during the 1970s and early 1980s to support Air Force testing operations at the now retired Intercontinental Ballistic Missile Superhardened Silo Testing sites. Vehicle-based and self-contained camping occurs throughout this management unit, subject to visitor use rules. Hiking, camping, and hunting are popular within this unit (Departments of the Air Force, Navy, and Interior 2006).

Management Unit 2 covers the Lechuguilla Desert portion of BMGR West and is the only management unit entirely open to general public access. This management unit also contains the greatest concentration of Marine Corps ground support areas and Tactical Aircrew Combat Training System Range facilities, which affect the character of the recreation setting; manmade modifications are more evident in this unit than in other management units. Popular recreation sites include the Baker Tanks and the historic Fortuna and Betty Lee mine sites. Traveling the eastern El Camino del Diablo is also popular; however, little of the historic character that

remains in other portions of the route remains within this management unit, due to road alterations resulting from military use. Dispersed recreational driving on established roads, camping, and hunting occur throughout the management unit, subject to visitor use rules (Departments of the Air Force, Navy, and Interior 2006).

3.7.4.5 Imperial Sand Dunes Recreation Area and North Algodones Dunes Wilderness

The Imperial Sand Dunes Recreation Area, managed by BLM's El Centro California Office, encompasses portions of a 40-mile-long dune system which extends along the eastern edge of the Imperial Valley and is the largest mass of sand dunes in California. The dune system is divided into three areas. The northernmost area is known as Mammoth Wash. South of Mammoth Wash is the North Algodones Dunes Wilderness established by the 1994 California Desert Protection Act. The largest and most heavily used area, the Imperial Sand Dunes Recreation Area, begins at California State Route 78 and continues south just past Interstate 8 (Departments of the Air Force, Navy, and Interior 2006).

Of all recreation areas in the region surrounding BMGR, the Imperial Sand Dunes Recreation Area is by far the most popular. Recreation use data for 2007 indicate a total of 1,466,929 visitors (Hamada 2008). Most of the use of the dunes is reportedly from Yuma, but users from Phoenix and San Diego are also common. Another trend is that visitors using this recreation area for OHV opportunities are often also boating enthusiasts who enjoy water-based recreational opportunities along the Colorado River, such as the Imperial Dam Recreation Area (Departments of the Air Force, Navy, and Interior 2006).

3.7.4.6 Kofa National Wildlife Refuge and Wilderness

The Kofa NWR, managed by the USFWS, was also established in 1939. This refuge encompasses 665,400 acres, of which 516,300 acres were designated Wilderness by the Arizona Desert Wilderness Act of 1990. Kofa NWR offers recreational opportunities similar to those found within the BMGR. The most popular recreation activities within the refuge include hiking, sightseeing, photography, camping, hunting, limited rockhounding, and observing nature. A half-mile foot trail is available to see Palm Canyon, which is the location of some of the only native palms in Arizona. Hunting for quail, bighorn sheep, deer, cottontail, rabbit, coyote, and fox is allowed with the appropriate hunting permit obtained from AGFD, and in accordance with applicable state and refuge regulations. Dispersed camping is allowed throughout the refuge (as long as it is more than one-quarter mile away from wildlife waters), but vehicle-based camping is required to be within 100 feet of the roadway (USFWS 2008b).

Estimations of visitation to the Kofa NWR show that since 2000 the number of visitors fluctuates between 50,000 and 55,000; there were 54,611 visitors in 2007 (Henry 2008).

3.8 HEALTH AND SAFETY

3.8.1 Definition of Resource

Health and safety includes the evaluation of risks and hazards associated with construction, aircraft operations, munitions use, and ground operations and management mechanisms that minimize these risks and hazards.

3.8.2 Study Area

The ROI for health and safety under the overall proposed action is determined by the geographic extent of the individual proposals described in Section 2.0. In terms of air operations, the study area includes the restricted airspace directly over BMGR East (R-2301E, R-2304, and R-2305). Other adjacent special use airspace units are not involved in the action. In terms of ground operations, the study area includes BMGR East and the highways used by military personnel en route to and from BMGR East.

3.8.3 Introduction

BMGR East has supported years of effective aircrew training without exposing either the public or military personnel to undue hazards resulting from military training activity. Despite the high level of hazards inherent in the training of combat-ready aircrews, the overall health and safety record of the BMGR is excellent. The BMGR was established with safeguards to ensure the health and safety of the public and military personnel to the greatest extent practical. The location of the range is ideal for this purpose because it is relatively remote from major population centers. In addition, the normal weather conditions of the range support safe year-round flying. The range includes a land area of 2,709 square miles. The four contiguous restricted airspace areas associated with the BMGR (R-2301E, R-2304, R-2305, and R-2301W, see Figure 1-1) encompass 4,323 square miles and overlie almost the entire land area of the BMGR and some adjacent lands, including the Cabeza Prieta NWR.

The BMGR was created to provide land and airspace locations where inherently hazardous air warfare training activities can occur while 1) simultaneously protecting public health and safety, 2) minimizing safety risks to military personnel, and 3) preventing interference with military training and support activities. The range accomplishes these missions by excluding land-based public access and civil air travel from land and airspace areas where hazardous activities occur.

Through policies and procedures, the range also minimizes the risks to military personnel. Ground-based troops or aircraft that are not scheduled participants in a training exercise or training support activity are excluded from range areas where such activities are occurring. In turn, personnel participating in a training event can focus their attention on safety and effectively

performing their assigned tasks without concern that their actions will place non-participants at risk. This segregation of military training activities within a designated block of land and airspace also serves to prevent interference with the scheduling or performance of these activities.

By their very nature, military operations associated with BMGR pose some level of hazard to both airspace and ground users. Combat aircrew training necessarily requires the use of aircraft in high performance, high stress maneuvers that pit aircraft against other aircraft or ground-based air defense systems. Training also demands realistic experience in employing air-to-ground bombing, gunnery, and rocket strikes against simulated enemy targets. Most training operations can be effectively performed without live fire or with live fire of inert (non-explosive) practice munitions; however, some use of live (explosive) ordnance is required to produce qualified air combat aircrews.

Examples of ground-based hazards on BMGR from military activities include expended but unexploded ordnance, laser use, poor road conditions, and military vehicle traffic. Non-military hazards such as venomous wildlife and the risks of heat-related illnesses or hypothermia are also present.

3.8.4 Aviation Safety

One of the primary public concerns related to flight safety is the potential for catastrophic aircraft accidents. All military services take aircraft safety very seriously and take all precautions possible to prevent aircraft crashes. However, mishaps can occur due to: mid-air collisions, collisions with manmade structures or terrain, weather-related accidents, mechanical failure, pilot error, or bird-aircraft collisions.

Overall, most aircraft losses in training occur during take-off and landings; therefore areas located near air installations or airfields are subject to the greatest risk for crashes. Accidents are also more likely to occur in restricted airspace or MOAs due to high performance stress (on the aircrew and equipment) missions flown for training in air combat maneuvering (i.e., air-to-air combat) and air-to-ground attack, including actual ordnance delivery. Flight training on MTRs carries some risk, but collisions or crashes are rare (U.S. Department of the Air Force 1999). Bird/wildlife-Aircraft Strike Hazard (BASH) hazards exist in aviation training at BMGR East, but incidences of BASH-related mishaps at BMGR East are rare.

The Air Force defines four major categories of aircraft mishaps: Class A, B, C, and E mishaps and High Accident Potential. Class A mishaps result in a loss of life, permanent total disability, a total cost in excess of $1 million, or destruction of an aircraft. Class B mishaps result in costs of more than $200,000 but less than $1 million; or permanent partial disability or inpatient

hospitalization of three or more personnel. Class C mishaps involve reportable damage of more than $20,000, but less than $200,000; an injury resulting in any loss of time from work beyond the day or shift on which it occurred, or occupational illness that causes loss of time from work at any time; or an occupational injury or illness resulting in permanent change of job. High Accident Potential events are any hazardous occurrence that has a high potential for becoming a mishap. Class E mishaps and High Accident Potential events, the most common accident types, represent relatively benign incidents which generally involve minor damage and injuries, and rarely affect property or the public (U.S. Department of the Air Force 2008a). This discussion will focus on Class A mishaps because of their potentially catastrophic results.

Based on historical data on mishaps at all installations, and under all conditions of flight, the military services calculate Class A mishap rates per 100,000 flying hours for each type of aircraft in the inventory. Notably such mishap rates do not consider combat losses due to enemy action and data presented are only statistically predictive. The actual causes of mishaps are due to many factors, not simply the amount of flying time of the aircraft. The most common aircraft that fly at BMGR East are the F-16 and the A-10.

Table 3-5 provides data on the Class A mishap rates per 100,000 hours of flying for these two aircraft. The mishap rate over the life of the aircraft includes the initial years of aircraft performance, when mishap rates tend to be higher (e.g., the A-10 mishap rate includes data from 1975 and 1976 when the mishap rates were at 621.12 and 442.48 per 100,000 flying hours, respectively). Since 1975, the rate of military crashes has declined by two-thirds.

Table 3-5
Class A Mishap Rates for F-16 and A-10s per 100,000 Flying Hours

	F-16	**A-10**
5-Year Average	2.24	0.87
10-Year Average	2.87	1.21
Life of the Aircraft	3.82	2.21

Source: U.S. Department of the Air Force 2008b

The restricted airspace structure of BMGR East and its sub-ranges was created and functions to provide safe separation between non-participating aircraft. The Air Force has detailed scheduling and operating procedures that provide a second layer of protection against aircraft mishaps. Similarly, in the event of a mishap, the Air Force has plans detailing mishap response procedures. The Luke AFB Supplement AFI 13-212 provides specific safety instructions to users and operators for BMGR East. The RMO at Luke AFB is responsible for scheduling, authorizing, and coordinating all military and non-military air operations and activities on BMGR East. All aircraft must be cleared through the Range Operations Control Center (ROCC) at Luke AFB prior to entering or departing range airspace. Since 1988, there have been 12

aircraft mishaps or incidents within the confines of BMGR East and its associated airspace, resulting in 4 fatalities (Buchanan 2008).

The safety procedures described for the range also apply to air operations occurring over the Cabeza Prieta NWR. Additional procedures to follow in the event of an aircraft crash on the refuge are outlined in a 1994 MOU between the DoD and the Department of the Interior (DOI). The procedures primarily serve to improve coordination and communication between the agencies.

3.8.5 Ground Safety

The 56 FW is the administrative command for controlling all military activities on BMGR East. The personnel of the 56 FW are responsible for determining if non-military activities on or proposed for BMGR East are compatible with military operations and for controlling all surface entry into the area. To satisfy these responsibilities and protect the health and safety of all users, specific procedures for controlled entry have been established. These procedures include a safety briefing and permit system; continuous scheduling and range access control; and gated and locked entry roads, perimeter fencing, and warning signs.

Any individual requiring access to any portion of BMGR East for military or non-military purposes must receive a range safety briefing which includes precautionary guidelines for avoiding ordnance and environmental hazards on the range. All individuals must also complete an application for range entry acknowledging certain responsibilities and liabilities including the need to notify the Range Entry Granting Authority of the location and time of range entrance and exit. The application also acknowledges that each person may be held liable to pay for any or all expenses incurred for any search or other action deemed appropriate. Non-military visitors must sign a hold harmless agreement certifying that the visitor is aware of potential hazards and is responsible for his or her own safety prior to entering the range.

The ROCC maintains a master range schedule for all air and ground military and non-military operations and activities on BMGR East. Authorized access to BMGR East is controlled by the ROCC to minimize safety conflicts among multiple range users. Any military mission with the potential to cause conflict with ground access must be posted on the master range schedule; thereby allowing the ROCC to evaluate safety conflicts.

Public access is prohibited (except by special permit) on approximately 87 percent of BMGR East due to the inherent safety concerns. The principal areas within BMGR East available for general public access are in Management Unit 6 and a small area in the northeast corner of Management Unit 7 known as the Bender Spring Area (see Figure 3-6). Public access is not allowed in many areas within BMGR East except under a special use permit. Special use permits

will not be issued for general recreation purposes, but may cover activities such as Native American access for cultural reasons, bighorn sheep hunting in selected areas, or other special circumstances on a case-by-case basis. All such access is permitted only to the extent that it is compatible with the military mission and military use schedules. The portion of BMGR West adjacent to BMGR East (Management Unit 3) is generally open to public access (see Figure 3-6). The road that enters BMGR East Management Unit 4 from BMGR West Management Unit 3 that is an integral part of the road network for the Mohawk Mountains and Sand Dunes Special Natural/Interest Area is open to drive through public access only. Minimal military hazards exist in BMGR publicly accessible areas; however, within areas previously used as target areas in the 1940s or 1950s there is the potential for contact with unexploded munitions.

Locations for legal entry on to BMGR East are limited. Warning signs in English and Spanish are posted approximately every 300 feet along State Route 85, at access points, and at quarter mile intervals along the south boundary of STAC. At legal entry locations, locked gates are posted with range entrance signs that identify the range, its administering agencies, and contacts for entry procedures and permits. At interior locations in BMGR East, there are also warning signs posted at entrance locations to manned ranges and tactical ranges. Approved entrance locations to TAC ranges can only be encountered after traveling through a manned range.

3.8.5.1 Manned Ranges

At the four manned ranges, safety hazards are associated with the presence of aircraft operations, ordnance contamination, and road use. BMGR East manned ranges are fairly well isolated from the risk of inadvertent entry by unauthorized military personnel or members of the public. Locked gates, fences, and warning signs make accidental vehicular access from State Route 85 an improbable event. However, Manned Range 4 is located near the northern BMGR boundary close to the Sentinel exit from Interstate 8 and the Air Force is taking action to address inadequacies that have been identified with signing and fencing in this area (e.g., inappropriately sited, intermittent, or lacking).

Ordnance use on the manned ranges is limited to training munitions, which do not contain explosive warheads but may contain a small signal cartridge. All ordnance intentionally expended on manned ranges must be delivered at approved targets. However, ordnance may be found on or below the ground surface in off-target locations due to inadvertent releases caused by faulty equipment or aircrew procedures. Additionally, illumination flares, which are typically released from aircraft at above 5,000 feet AGL and are equipped with a parachute to slow descent and prolong illumination of the target, tend to drift from target areas under certain climatic conditions. Low-angle strafe poses a risk that bullets may ricochet from impact with the ground and strike aircraft or ground personnel. To reduce these hazards, BMGR East manned

ranges are in locations where the low-angle strafe targets occur over soft, deep, alluvial soils with a high potential for reducing bullet velocities and trapping them. Adherence to manned range procedures keeps all ground personnel and aircrews out of the potential line of intentional or inadvertent fire.

Manned ranges are littered with expended training practice rockets, bombs, flare canisters, and gunnery bullets, especially near bombing targets and down range of low-angle strafe targets. EOD personnel clear munitions from the surface of target areas on a routine basis, and from a much wider area of the range during the annual clean-up. Munitions that have become buried under the surface are not cleared.

In general, manned range operations on the BMGR are well-controlled and have a favorable safety record.

3.8.5.2 Tactical Ranges

The actions and conditions within BMGR East tactical ranges with implications for the health and safety of ground personnel include air-to-ground live-fire training, munitions delivery, laser use for target designation, surface contamination with expended ordnance, target structures and support facilities, and road use. Live-fire training within the TAC ranges has the most substantial implications for the health and safety of ground personnel. A wide range of training ordnance is authorized for use on the TAC ranges and live munitions are authorized for use on five selected targets—one high explosive (HE) hill within each TAC range and one live air-to-ground missile target in both North TAC and East TAC. The potential for ground personnel casualties by air-to-ground delivery has been minimized by the tight controls placed on aircraft weapons use, range scheduling, and TAC range entry procedures by ground personnel. No public access to the TAC range is authorized. The security of the TAC ranges for live-fire training is enhanced by their relatively isolated location away from uncontrolled public use areas.

3.8.5.3 Air-to-Air Range

The air-to-air combat training range is a composite of four flight training areas with assigned airspace and land. Barring an aircraft crash, the jettisoning of aircraft equipment such as external fuel tanks, or the loss of aircraft structures (such as antennas or access panels), air-to-air training not involving live fire poses no hazard to surface users. Deposition of munitions fired from within the primary air-to-air firing range and target debris affect the underlying land area or nearby BMGR East lands. Military personnel and the public are excluded from the surface area underlying the air-to-air firing range when the area is scheduled for training.

3.8.5.4 Gila Bend AFAF

As shown on Figure 3-8, APZs have been defined for the Gila Bend AFAF, where aircrews are trained for in-flight emergency procedures. APZs identify areas at military airfields where various levels of safety concerns exist. At Gila Bend AFAF, the APZs extend off BMGR East to the northeast over primarily undeveloped land. Most residential and high-intensity land uses are not recommended on lands within the APZs. Ground entry to Gila Bend AFAF is controlled at all times.

Ordnance storage operations at Gila Bend AFAF are conducted in accordance with DoD 6055.9-STD, DoD Ammunition and Explosive Safety Standards and Air Force Manual 91-201, Explosives Safety Standards. One of the principal means of meeting these objectives is through the establishment of Explosive Safety Quantity Distance (ESQD) arcs. ESQD arcs define the minimum permissible distance between a potential explosion site and any inhabited building, public assembly area, and/or the installation boundary. ESQD arcs are determined by the quantity of explosive material and distance separation relationships that provide defined types of protection. As shown on Figure 3-8 an ESQD arc is associated with the munitions storage area located to the west of the runway. The munitions storage area ESQD arc does not overlap with an inhabited building, public assembly area, or cross the Gila Bend AFAF boundary.

3.8.6 Non-military Hazards and Other Safety Issues

3.8.6.1 Environmental Hazards

Various environmental conditions on the range can present serious hazards to military personnel or visitors including: rugged terrain, remoteness, extreme temperatures, intense sunlight, lack of drinking water, flash floods, abandoned mines and wells, and venomous wildlife. BMGR personnel are informed of these conditions via standard safety briefings and BMGR visitors are informed of these hazards in the BMGR permitting process (see Section 3.7 for further discussion). The Air Force has established protocols to minimize risks to personnel and visitors regarding when/how to respond to any incident.

The mountain terrain within BMGR East is virtually impassable to vehicles and can be hazardous to hikers or climbers. Inexperienced or unprepared recreation users can expose themselves to a variety of hazards associated with the terrain such as rock slides and falls. Most of the heavily used ground areas on the range are more than an hour’s travel time (by motor vehicle) to the nearest hospital or medical care center.

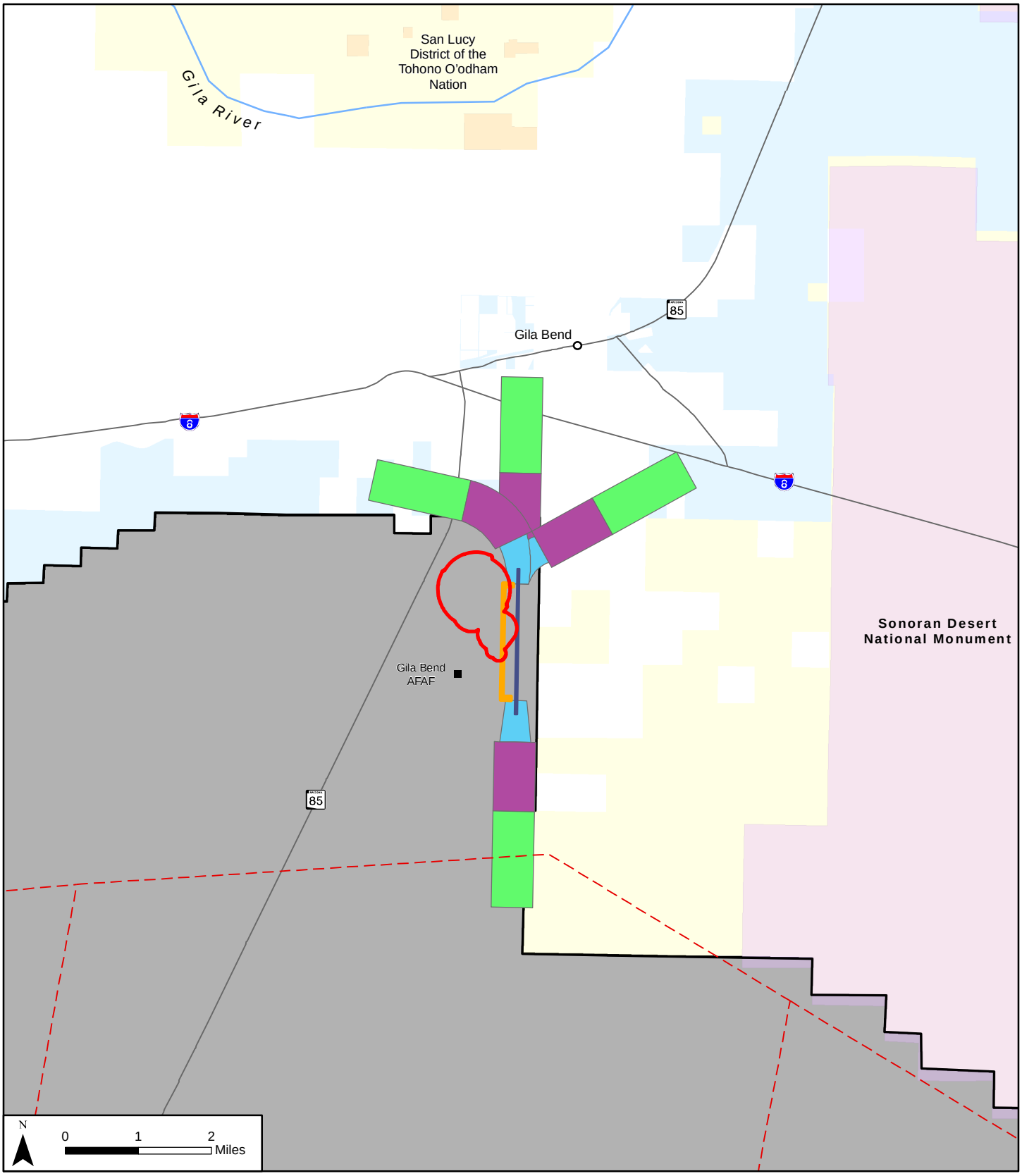


Figure 3-8

APZs AND ESQD ARCS AT THE GILA BEND AFAF

Temperatures in the hottest part of the summer can exceed 120° F (degrees Fahrenheit) during the day and remain in the 90s during the night. A 20 to 30 degree day to night fluctuation in temperature is typical. In the winter, temperatures can drop below freezing. The intense sunlight through the late spring, summer, and early fall can cause sunburn in just 30 minutes; a few hours of exposure can cause severe burns. All degrees of sunburn increase a person's vulnerability to dehydration and heat exhaustion. There are no sources of potable water on BMGR East; therefore, all range visitors and military personnel must provide their own water. One to two gallons of water per day are needed to maintain a normal level of hydration when exposed to temperatures exceeding 90° F; more is necessary with physical exertion. Lack of adequate fluid intake can quickly lead to life-threatening heatstroke and heat exhaustion.

During monsoon season (typically late June to mid September), severe thunderstorms can cause flash flooding on the range resulting in hazardous conditions. Winter storms can also cause flooding. Danger can be avoided if people (and their vehicles) avoid major drainages during flash flood conditions and/or swift moving water.

Abandoned mines and wells scattered throughout the range are remnants from mining and ranching activities which occurred prior to its establishment in 1941. The abandoned wells are typically located on deep alluvial desert plains, and their remnants are unstable, partially collapsed or collapsed vertical shafts. Many of the abandoned mines are located in areas accessible to the public. The Air Force has taken precautions to protect the public from the potentially dangerous conditions at these sites, and to restrict activities away from these sites. Posted signs warn of the dangers of abandoned and inactive mines, such as hidden deep shafts, cave-ins of loose rock or decayed timbers, unsafe or broken ladders, bad air and poisonous gasses, discarded explosives, poisonous snakes, and flooded tunnels. A few of the more hazardous mines have been fenced or gated to discourage or prevent unauthorized human entry and to protect sensitive bat habitat.

There are several venomous reptiles and arthropods (including insects and spiders) on the BMGR including: rattlesnakes, scorpions, spiders, and bees.

3.8.6.2 Road Hazards

With the exception of the Gila Bend AFAF and manned range access roads, almost all roads on BMGR East are unpaved and many are seldom or never maintained. A four-wheel drive vehicle is usually necessary for travel on the range. Upon issuance of an entry permit recreationists are provided a GIS ground-truthed road map; however, there are no available comprehensive, accurate maps of public use roads on the range. There are few road signs and no other developed navigational aids to assist those who are unfamiliar with the area.

Driving on BMGR East is most hazardous after rain, when muddy conditions make many roads impassable, or in very dry conditions, when dust can obscure visibility. Some roads have developed deep ruts into which vehicle tires can fall, leaving the vehicle suspended in the intervening high ground. While infrequent, vehicle collisions caused by dust-obscured visibility have led to major accidents with injuries on the BMGR.

3.8.6.3 International Border Issues

BMGR East borders with Cabeza Prieta NWR, BLM land, and the Tohono O'odham Nation, which all share borders with Mexico. Smuggling of drugs and people is an ongoing issue in the area; therefore, personnel working or visiting the BMGR are instructed to avoid encounters with persons suspected of engaging in such activities. As further detailed in Section 3.6, the Border Patrol, which is responsible for preventing undocumented aliens from entering the United States and for apprehending aliens who have already entered the United States illegally, conducts near-daily reconnaissance by air or ground surveillance on BMGR East.

3.8.6.4 Environmental Health and Safety Risks to Children

Executive Order 13045, Environmental Health Risks and Safety Risks to Children, which was signed by President Clinton on 21 April 1997, addresses the potential for children to suffer disproportionately more environmental health risks and safety risks as compared to adults due to their developing systems; higher proportion of intake of food, fluids, and air in proportion to body weight; standard safety features that may not adjust to size/weight of children; and children's behavior patterns. Therefore, to the extent permitted by law and appropriate and consistent with the agency's mission, the Executive Order directs each federal agency to make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children. All related policies, programs, activities, and standards must address such disproportionate risks accordingly.

3.9 CULTURAL RESOURCES

3.9.1 Definition of Resource

Cultural resources include *historic properties* as defined in the National Historic Preservation Act (NHPA; 16 U.S.C., section 470, *et seq.*); *cultural items* as defined in the Native American Graves Protection and Repatriation Act (25 U.S.C. sections 3001-3013); *archeological resources* as defined in the Archeological Resources Protection Act (16 U.S.C. sections 470aa-470mm); *sacred sites* as defined in Executive Order 13007, *Indian Sacred Sites*, May 24, 1996; and *traditional cultural properties* (TCPs) as defined in National Register Bulletin 38, *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Park Service 2000). Most tribal cultural resource programs use the term *traditional cultural places*, as they consider it more respectful. Cultural resources may be referred to as *heritage resources*, although this term also includes natural resources. Cultural resources consist of prehistoric and historic districts, sites, buildings, structures, objects, artifacts, or other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons.

Archeological resource means any physical evidence of human habitation, occupation, use, or activity (including the site, location, or context in which such evidence is situated) of human life or activities which is at least 100 years of age and which is of archaeological interest (that is, capable of providing scientific or humanistic understandings of past human behavior, cultural adaptation, and related topics through the application of scientific or scholarly techniques).

Historic property means any prehistoric or historic district, site, building, structure, or object included or eligible for inclusion on the NRHP because of its historic or cultural significance. This term includes artifacts, records, and remains that are related to and located within such properties. The term *eligible for inclusion on the NRHP* includes both properties formally determined in accordance with regulations of the Secretary of the Interior and all other properties that meet the criteria for evaluation set forth at 36 CFR 60.4. These criteria include association with important events or broad patterns of history; association with a historically significant person; embodying the characteristics of an important methods, type, or periods of construction, or having high artistic value; or likely to yield information important in history or prehistory. In general, these resources must be more than 50 years old; however, more recent resources may be eligible if they are exceptionally significant.

NRHP Bulletin 38 defines *traditional cultural property*, generally, as one that is eligible for inclusion in the NRHP because of its association with cultural practices or beliefs of a living community that are rooted in that community's history, and are important in maintaining the

continuing cultural identity of the community. TCPs can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans and other groups consider essential for the continuance of traditional cultures.

Section 101(d)(6)(A) of the NHPA states that properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined eligible for inclusion on the NRHP. Within the Section 106 review process, the appropriate terminology for sites of importance to Indian tribes is "historic property of religious and cultural significance to an Indian tribe." Unlike the term TCP, this phrase appears in the NHPA and 36 CFR Part 800, *Protection of Historic Properties*. Thus, it is not necessary to use the term TCP when considering whether a site with significance to a tribe is eligible for listing in the NRHP as part of the Section 106 process.

Executive Order 13007 defines *sacred sites* are identified as any specific, discrete, narrowly delineated location that is identified by an Indian tribe or individual as sacred by virtue of its established religious significance to or ceremonial use by an Indian religion and identified as such to the land managing agency. Such sites are protected by the Executive Order 13007, which requires agencies to accommodate access to and ceremonial use of sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity. MLWA (Section 3031(b)(9)(B)) also defines sacred sites:

> The term "sacred site" means any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or its designee, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion, but only to the extent that the tribe or its designee, has informed the Secretary of the Navy or the Secretary of the Air Force of the existence of such site. Neither the Secretary of the Department of Defense, the Secretary of the Navy, the Secretary of the Air Force, nor the Secretary of the Interior shall be required under section 552 of title 5, United States Code, to make available to the public any information concerning the location, character, or use of any traditional Indian religious or sacred site located on lands withdrawn and reserved by this subsection.

Cultural items includes human remains, associated funerary objects **(**objects believed to have been placed with individual human remains either at the time of death or later), unassociated funerary objects **(**objects placed with individual human remains which have been removed from a burial site), sacred objects (ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions) and cultural patrimony **(**objects

having ongoing historical, traditional, or cultural importance central to the Native American group or culture itself).

3.9.2 Study Area

The affected environment includes the lands and resources potentially affected by the proposed actions, which span the length and breadth ofBMGR East. The number and nature of cultural resources affected by each proposal vary according to which of the alternatives is adopted. The rich history of the area is described briefly below.

3.9.3 Historic Setting

The Papaguería is a unique geographic area in southwestern Arizona and northwestern Sonora, Mexico, which extends from south of the Gila River on the north to the Gulf of California on the south, and from the Colorado River on the west to Three Points (west of Tucson) on the east. This region is subdivided into the eastern and western Papaguería based on cultural and environmental factors: the boundary between two Piman-speaking O'odham groups, and the juncture of two biotic communities coupled with a marked change in annual rainfall. The boundary between these areas is located near and roughly parallels the eastern boundary of BMGR East. The term Western Papaguería is used extensively in archaeological literature, including this EIS, to identify a geographic region, an environment, and a cultural area.

The cultural history of the Western Papaguería can be divided into seven periods as characterized in Table 3-6.

Table 3-6
Western Papaguería Cultural History

Period	***Summary of Characteristics***
Paleo-Indian Period circa 10,000-8,000 B.C.	Characterized by reliance on native plants and animals and mobile settlement systems. Refers to the initial pre-Ceramic period occupation (although some consider the Malpais archaeological complex to be an even earlier occupation). Represented by the San Dieguito and Clovis archaeological complexes, which are each characterized by a distinctive tool kit. Associated with the hunting of now extinct big game species, including mammoths.
Archaic Period 8,000 B.C. – A.D. 200	Represented by two archaeological complexes (Amargosa and Cochise) and chronologically subdivided into Early, Middle and Late periods. Until the very end of the period, Archaic populations collected a broad spectrum of native plant and animal foods with seasonal movements. Agricultural villages were established during the end of this period in the Eastern Papaguería; this pattern is not as apparent in the Western Papaguería which maintained a longer period of pre-ceramic hunter-gatherer cultural continuity.

Table 3-6
Western Papaguería Cultural History

Period	***Summary of Characteristics***
Formative Period circa A.D. 200-1500	The Hohokam (centered in the Gila-Salt Basin to the east) and Patayan (along the lower Colorado River) cultural traditions are represented in the Western Papaguería during this period. Trincheras was centered to the southeast in northern Sonora, and may also be represented on the BMGR. The presence of a fourth archaeological culture, the Arenenos, was first proposed in the 1950s and 1960s. Areneno material culture is an amalgam plain and red ware pottery, Hohokam and Patayan painter pottery, walk-in wells and reservoirs, house-in-pits, and cremation of Hohokam and Patayan traits along with the possible presence of locally made plain ware pottery. Recognized principally on the basis of pottery styles that mirror better-known changes through time in ceramic manufacture in the Gila-Salt and Tucson basins. The question of which subsistence-settlement systems were adopted by Hohokam occupants of the Western Papaguería is of considerable interest, but more excavation data are needed. New data suggests that maize played a role in subsistence at these sites, but the intensity of farming remains a major question. The Patayan cultural tradition is not well understood; the tradition is divided into three phases, defined principally on the basis of changes in the Lower Colorado Buff Ware pottery (which is found throughout the Western Papaguería). Patayan people were present in the Western Papaguería, but patterns of contact and exchange between Patayan and Hohokam groups are unclear. Trincheras purple-on-red pottery also is present on some sites within the Western Papaguería. The Trincheras culture in best known in the Altar Valley. Rather than viewing formative period sites as representing one or the other of the riverine cultures, recent researchers have focused on the inhabitants of the Western Papaguería and their interactions with people in that region and beyond.
Early Historical Period A.D. 1540-1848	Spaniards used the Papaguería principally as a travel corridor, following two primary routes—El Camino del Diablo that runs between Caborca and Yuma, and a north-south route that connected settlements in Mexico with the Gila Bend area. The Spanish missionary Father Eusebio Kino traveled through the area in the late 1600s, and early 1700s noting that the Hia C-ed O'odham people occupied the Western area of the Papaguería. Today O'odham groups claim affinity with the prehistoric Hohokam. The Hopi also claim affinity with the prehistoric Hohokam. The Zuni have similar histories of migrations from southern Arizona. The Cocopah, Quechan, Halchidoma, Cohuana, Halyikwamai, Kaveltcadom, Maricopa, and Mojave occupied various areas along the Lower Colorado and Gila rivers, where they practiced floodwater farming. Internecine warfare led to frequent territorial shifts among these groups. The Yavapai ranged through a vast territory north of the Gila River and probably ventured south of the Gila River into the Western Papaguería at times. Apaches made brief forays to engage in raiding.

Table 3-6
Western Papaguería Cultural History

Period	***Summary of Characteristics***
Late Historical Period A.D. 1848-1941	Characterized by intensifying contact among American Indian groups and Euro-Americans. As a result of the Mexican-American War in 1848, the United States acquired the territory north of the Gila River. The area to the south of the Gila River, which was home to the Hia C-ed and Tohono O'odham, was acquired through the Gadsden Purchase of 1853-1854, which was home to the Hia C-ed and Tohono O'odham. U.S. troops first traveled along the Gila River during the Mexican-American War. The "Forty-Niners" soon followed on their way to the newly discovered gold fields of California. El Camino del Diablo served as an alternate route for some Forty-Niners, and subsequently, various adventurers and scientists. Just the Cocopah and Quechan remained in residence along the lower Colorado River below the confluence with the Gila River, and no native groups resided on the lower Gila River. Remnants of several Yuman speaking people joined the Akimel O'odham (Pima) along the middle Gila River, where they became known as the Maricopa. The transcontinental Southern Pacific Railroad was constructed and copper mining at the New Cornelia Mine near Ajo stimulated construction of a spur line to connect with the Southern Pacific at Gila Bend. Gold was mined at the Fortuna Mine in the BMGR West, and evidence for smaller mining and prospecting endeavors is reported throughout the region. From the late 1800s to the early 1900s, ranching and homesteading also were pursued in the area that was to become the BMGR.
World War II Period A.D. 1941 - 1945	The BMGR of today is the result of a series of land withdrawals initiated during World War II. In May 1941, when Lt. Col. Ennis Whitehead first surveyed the land west of Phoenix for Luke Field, he also noted that public lands south and west of Gila Bend were ideal for a gunnery range, and Luke student pilots began training on the range in September 1941. During World War II, pilots from both Luke Field and Williams Field used BMGR East for gunnery training, and pilots from the Yuma Army Air Base, which was established between 1941 and 1943, trained on BMGR West. After World War II when Luke Field was closed from 1946 to1951, Williams Field personnel managed BMGR East. The Yuma Army Airfield became Vincent AFB in 1956 and then in 1959, MCAS Yuma.
Cold War Period A.D. 1946-1989	The Cold War period is defined as extending from the establishment of the "Iron Curtain" in Europe in 1946 to the fall of the Berlin Wall in 1989. Since 1951, the BMGR has hosted air-to-air and air-to-ground bombing and gunnery training on both manned and tactical ranges as part of the Cold War program of military preparedness that remains in place today.

3.9.4 Native American Consultation

Since 1996, the Air Force has worked with Native American tribes and groups in the BMGR region to establish procedures for meaningful consultation and to identify Native American concerns for places on the range. During preparation of the Legislative EIS that supported the renewal of the BMGR land withdrawal, the Air Force, Marine Corps, and BLM coordinated with representatives of tribes that expressed an interest in federal management of the BMGR or claimed cultural affiliation with the area. A literature search and preliminary archival survey provided ethnohistoric and historic background on the area encompassed today by the BMGR, identified affiliated tribes, and identified some places of known cultural value that might be

TCPs or sacred sites. Published and unpublished documents at libraries and archives throughout the state were consulted, as were knowledgeable individuals.

In late 1996, a team of agency and contractor cultural resource professionals initiated consultation with all federally recognized tribes in Arizona. The Hia C-ed O'odham Alliance, the Pueblo of Zuni, the Campo Band of Mission Indians, the Chemehuevi Tribe, and the Torres Martinez Desert Cahuilla Indians also were initially contacted. This included sending formal consultation letters and making follow-up telephone calls. Ultimately, four of the 26 groups contacted indicated no interest in consulting about the cultural resources of the BMGR; the rest expressed some level of interest—from receiving information to participating in all consultation efforts. The 56 FW/RMO updates its list of tribes and tribal representatives interested in Air Force management of the range continually, as new leaders are elected and newissues emerge, and consults with tribes in accordance witha their preferences, as established through regular contacts.

In addition to identifying archaeological sites as ancestral, Native Americans attach religious and cultural significance to both land and resources on a broad scale. For example, a mountain or a viewshed may be recognized as traditionally important or sacred. Because of the significance of these places, and their importance in maintaining living cultures, tribal cultural experts are concerned about any potential use that would be incompatible with their beliefs and values. Traditional cultural concerns also may focus on discrete locations, access to specific ceremonial places, or the freedom to collect, possess, and use certain resources, such as particular plant and animal species.

All consulted groups have expressed concern forproper treatment of any human remains present in archaeological sites on the BMGR. Some communities consider the aboriginal archaeological sites on the BMGR to have significant traditional cultural values beyond their archaeological information. Some types of sites, such as petroglyphs, pictographs, rock piles, and trails affiliated with places that are identified as shrines or offering places, as well as archaeological sites associated with farming or trading of marine shell, have special traditional cultural values. Some locations are considered significant because of their association with tribal origin accounts or other oral traditions. In addition, springs, other sources of water, and plants or mineral deposits used for ceremonial, medicinal, and subsistence uses are considered traditionally important. Natural water sources, such as tinajas and springs, are considered to be sacred sites by various tribes, but particularly by the O'odham. Many traditional cultural values are not focused solely on individual sites or places, but on more general concerns with entire landscapes.

3.9.5 Inventoried Cultural Resources

Intensive archaeological surveys, archival and oral historical research, and other methods have been usedto locate, record, identify, and evaluate cultural resources. Approximately 196,000 acres (or about 19 percent) of BMGR East has been surveyed and more than 1,200 prehistoric and historical-period cultural resources have been identified and recorded.

Archaeological surveys conducted since 1993 have been intensive pedestrian surveys, with crew members spaced at an interval of no more than 15 to 20 meters. This survey intensity is considered to be a 100 percent survey according to the standards of the Arizona State Museum. These surveys have included recording of limited information about isolated occurrences and detailed recording of cultural resources meeting site definition criteria established by the Arizona State Museum and used throughout the state; surveys completed between 1993 and 1995 recorded basic site condition and surface disturbance. Surveys conducted since 1996 have included a detailed description of site condition/disturbance. This description has focused on the types and degree of disturbance from military operations as well as disturbance by natural forces. Sources of disturbance include: ordnance delivery and clearance, target construction and maintenance, road maintenance, erosion, and rodent burrowing.

Survey reports also include an assessment of the historic significance of the recorded sites and recommendations regarding their eligibility for inclusion on the NRHP. Most recorded resources were recommended eligible by researchers who identified them; however, most have not yet been evaluated by the Air Force.

The 56 FW/RMO has completed more than 30 major cultural resource studies on the BMGR. An overview summarized the results of studies completed through 1995 by the Air Force and toher agencies and organizations during approximately the last half-centry (Ahlstrom 2000). These data sources provide the primary basis for characterizing the cultural resource component of the affected environment in the following sections.

More than 1,200 archaeological sites and other cultural resources have been identified on BMGR East as a result of surveys conducted to date. These include archaeological sites and features such as artifact scatters, roasting pits, hearths, cleared circles, geoglyphs, petroglyphs, rock shelters, trails, cairns, shrines, mines, corrals, wells, tanks, ranch roads, and military training facilities dating back to World War II. The recorded resources are associated with both historical-period Euroamerican activities and a long history of Native American use of the region. Archaeological sites and isolates associated with the latter are by far the most numerous; they also are the most challenging to locate, record, and evaluate. The scientific and cultural importance of the archaeological record within BMGR East is greater than that of any of its

individual features; its true significance lies in the fact that the relatively undisturbed landscape of the range still harbors evidence of the full spectrum of human activities that took place there through time.

Inventory efforts have focused on areas affected by ongoing training and supporting activities—primarily roads, targets, and EOD clearance areas on the manned and tactical ranges. Gila Bend AFAF, an emergency divert airfield and base of range operations, also was surveyed, and all buildings and structures there were evaluated. Targets and other remnants of the history of military aviation training may be considered historically significant and therefore must be identified and evaluated. Some major military facilities on BMGR East dating from World War II through the Cold War era (1941-1989) have been documented, and recommendations regarding their eligibility for inclusion on the National Register have been developed based on a historic context developed for this purpose (Thompson 2004).

Military aviation training on what is now the BMGR began in the 1940s, and training facilities and scenarios have constantly evolved. Airfields, ground ranges, and targets have been built, rebuilt, expanded, and abandoned to meet the training needs of the Air Force for more than 60 years, and remnants of that history are among the many cultural resources preserved on BMGR East. Throughout World War II, student pilots practiced take-offs and landings and flew gunnery missions against targets on the range, learning the basic principles of air-to-air and air-to-ground gunnery and preparing themselves to face the enemy in battle. By the 1950s, training techniques and target arrays had evolved in response to changes in aircraft capabilities and combat tactics. During the Cold War (1946-1991), BMGR East provided a realistic, simulated combat environment. Evidence of this history is preserved throughout the range.

Targets and other facilities associated with military training on BMGR East do not remain untouched over time. Those that remain in use are routinely destroyed and rebuilt or modified to reflect changing combat scenarios. Abandoned targets and ranges deteriorate through time or are dismantled and removed. Despite these changes, the remnants of these places reflect the history of military aviation training and the historic importance of the Air Force and other services. World War II and Cold War sites on BMGR East include AUX-6, six other auxiliary airfields, and inactive targets or range facilities (Luke AFB 2009).

Spanish explorers, soldiers, and missionaries likely traversed the area, but none of the historical period sites recorded on the BMGR East to date have been associated with their activities. Traces of later European and Euroamerican use of the BMGR region may be found throughout the area. Miners and ranchers called the area home, at least for a short time, and evidence of their activities has been recorded by surveys on the BMGR East. These include the Yager Road, a wagon road that stretched from Ajo to Yuma, which was constructed just after the Civil War,

and the Tucson, Cornelia, and Gila Bend Railroad, which was built in 1915-1916 and connected Gila Bend and Ajo. Twenty of 95 sites recorded during a survey of the Growler Wash could be assigned to the historical period, including Euroamerican and Native American habitations, canals, wells, tanks, and corrals. The most commonly recorded sites of this period are small trash deposits, corrals, tanks, and other features associated with ranching activities of the Childs, Stout, Bender, Pettit, and Price families and others.

The vast majority of cultural resources recorded on the BMGR East consist of prehistoric archaeological sites; sites of this type have been identified by every major survey completed to date. Temporally diagnostic artifacts represent a span of about 12,000 years—from the Paleoindian period through the historic period (Table 3-6). Some sites consist of only a few artifacts and a single archaeological feature such as a hearth; others cover a large area and include many different features and artifact types. By far, most recorded archaeological sites are small sites consisting of a small scatter of artifacts, one or more artifacts and a rock cluster (usually fire-affected), or one or more fire-affected rock clusters without associated artifacts, and assigning most of them to a particular time period or culture is not possible given the information at hand.

Archaeological remains recorded as isolated occurrences, or isolates, are much more limited and may consist of only a single artifact; they may be associated with any time period. While isolated occurrences sometimes may be eligible for inclusion on the NRHP, they are generally not considered historically significant. For this reason, isolates are not discussed in detail in this section, although they must be taken into account in complying with Section 106 of the NHPA.

The area of potential effect for the project consists of areas of ground disturbance including grading and construction associated with development of a STA, target reconfiguration including the potential establishment of new target locations, grading and paving roads, construction of a taxiway and air traffic control tower, and sand and gravel excavation and stockpiling. In addition, non-ground disturbing activities such as the lowering of flight altitudes may potentially affect cultural resources that are significant for values other than their information potential (such as TCPs).

The remainder of this section addresses the cultural resources inventory information for each of the ten proposals. In some instances, this analysis was refined between the issuance of the Draft EIS and Final EIS and and factual corrections were made as follows:

- Proposal 1.A–l information added regarding isolated occurrences, clarification regarding eligibility of sites for listing in the NRHP, and additional survey coverage information for Alternative 1.C.

- Proposal 2 – additional analsyis of cultural resource inventory in the various use category areas.
- Proposal 3 – additional information regarding isolated occurrences; for Alternaitve 3.B, additional cultural resource inventory information and addition of one site not identified in the Draft EIS; for Alternative 3.C, additional information regarding cultural resource surveys and identification of three sites not included in the Draft EIS
- Proposal 4 – factual corrections regarding distance between recorded cultural resource sites and the Alternative 4.A location.
- Proposal 5 – factual correction on recorded site numbers.
- Proposal 6 – changes to present cultural resource inventory information for the 400-acre area associated with Proposal 6 (as opposed to the 1,800-acre area as stated in the Draft EIS) and addition of data on isolated occurrences.
- Proposal 7 – additional cultural resource survey information, including increase in number of identified sites in Area B from 56 to 75.
- Proposal 8 – additional cultural resource inventory information, including site eligibility information and iolated occurrences.
- Proposal 9 – additional information regarding isolated occurrences.
- Proposal 10 – factual correction that the site at Manned Range 2 stockpile area of potential effect has been determined eligible for listing in the NRHP and that no site is recorded at the East TAC 4 excavation site, plus additional data on cultural resource survey efforts.

Please note that some of the tables in section 3.9 have been changed to reflect consensus determinations of eligibility made in the process of completing review of some proposals under Section 106 of the NHPA.

3.9.5.1 Proposal 1 – Sensor Training Area

Table 3-7 summarizes the survey coverageand cultural resources recorded at three alternative STA sites and the paragraphs that follow provide additional information.

Alternative 1.A – Air-to-Air Range Site

Intensive archaeological surveys have been completed for the STA/EOD footprint and the entire length of Stoval Road, the currently existing north-south access road through the Air-to-Air Range. Eleven prehistoric and historical-period sites and 109 isolated occurrences were

identifiedduring an archaeological survey of the Alternative 1.A project area and vicinity. None of the recorded isolates is eligible for inclusion on the NRHP. One site is within the STA/EOD footprint and ten sites are along the portion of Stoval Road that would be used to access the STA/EOD project area. The single site within the STA/EOD project area is not eligible for inclusion on the NRHP. Ten sites along Stoval Road, including Stoval Airfield (AZ Y:6:034), have been determined eligible to the NRHP. Sites include an Archaic period lithic scatter; a Ceramic period artifact scatter with and without thermal features; and historic-period features including a ranch, canal segment, road segment, possible railroad camp, and the airfield. The survey documented some disturbance of these sites, largely as a result of off-road driving.

Alternative 1.B – South Tactical Range Site

Eleven isolated occurrence were recorded in the area potentially affected by this alternative, none is eligible for inclusion on the NRHP.

Alternative 1.C – North Tactical Range Site

The North TAC STA alternative site lies north of the Crater Range and south of Manned Range 4, in a broad, relatively flat area that is largely unaffected by training-related activities. Although surveys elsewhere on North TAC—south of the Crater Range, in the mountain passes, and along the northern flank of the mountains—since the mid-1990s have covered more than 43,000 acres and identified 280 prehistoric sites, little archaeological survey has been completed in and near the area potentially affected by Alternative 1.C.

The largest North TAC survey covered 15,813 acres south of the Crater Range and in the mountain passes, and the analysis of the results of that survey introduced a strategy that has been used in subsequent reports to characterize site discovery, distribution, and density (Tucker 2000a). Tucker calculated the numbers of sites found per acre surveyed, or site discovery rate, at 1 site per 165 acres surveyed for all environmental settings combined, but identified several shortcomings of this ratio as a measure of site density. Tucker then compiled the total *site acres* (the combined area within the boundaries of all recorded sites) recorded during the survey and divided that figure by the total acreage surveyed. Using this approach, he derived a percentage of site acres per surveyed acre of 0.93 percent. In other words, less than 1 percent of the acreage surveyed was archaeological "site." This approach has been used by other authors to characterize the results of recent surveys, including several small surveys in the immediate vicinity of the NorthTAC STA alternative.

Archaeological surveys in the area north of the Crater Range on and immediately north of North TAC have been limited to corridors along existing roads and several block areas at the base of the mountains. Three recent surveys have been completed in and near (within two miles of) the

area potentially affected by implementation of Alternative 1.C. One surveyed road corridor crosscuts the Alternative 1.C area and provides the only survey data available about that specific location (Table 3-7). That survey covered about 65 of the roughly 1,200 acres potentially affected by this alternative.

In 2003, SRI surveyed 2,009 acres in 25 discontiguous parcels on North TAC (Tagg and Heilen 2008a). The surveyed areas included small block surveys and corridors along several road segments in diverse environmental and geographic settings. Two of these survey areas (NW-39 and NE-18) were within 2 miles of the Alternative 1.C location.

In analyzing the results of that survey, Tagg and Heilen assigned their survey areas to one of four environmental zones (2008a: 215). Survey areas within these zones also were characterized by topographic settings: valley, valley-edge, mountain-slope, and summit. The two survey parcels near the North TAC STA location were assigned to the Sentinel Plain zone and were located in gently sloping valley-edge settings north of the Crater Range. Roughly 689 acres were surveyed in this zone, and 5 sites were recorded, for a discovery rate of 1 site per approx 138 acres, and a site density of 0.45 percent. Based on their analysis, Tagg and Heilen concluded that, consistent with the results of previous surveys, most sites (and most site area), artifacts, and features on North TAC are found in valley-edge settings in the bajadas and mountain passes of the Crater Range (2008a: 259).

The second of these surveys covered 2,604 acres in 17 small discontiguous areas on North TAC, mostly along roads, in 2004 (Tagg and Heilen 2009). Tagg and Heilen applied the approach used in discussing the results of the 2003 survey to compare and contrast the findings of the 2004 survey, both internally and against the findings of previous surveys. In this case, however, they also noted that conclusions based on linear surveys should be viewed with caution due to the "edge effect" (linear surveys tend to locate more sites, and more relatively larger sites, than surveys with smaller perimeter-to-area ratios).

Tagg and Heilen again examined their findings using geographic zones: Upper Childs Valley, Lower Childs Valley, Lower Tenmile Wash, and Upper Sentinel Plain (2009: 352). The Upper Sentinel Plain area includes the North TAC STA location and all of North TAC north of the Crater Range and east of the North TAC-Range 4 road. A total of 456 acres was surveyed in the Upper Sentinel Plain zone. In contrast to the previous survey, survey areas in this zone included valley flats and nearly level plateaus or terraces. Sites were found at a low density in the Upper Sentinel Plain zone in comparison to those located south and west of the Crater Range. Only two sites and 22 isolates were discovered in the Upper Sentinel Plain survey areas, for a discovery rate of 1 site per approximately 228 acres. A total of 1.5 site acres was recorded, for a site density of 0.34 percent. The location of these surveys areas in valley flats rather than in valley-

edge settings probably accounts for the lower discovery rate relative to the 2003 survey results. Tagg and Heilen concluded that their results supported the finding that most sites, site area, artifacts, and features on North TAC are discovered in valley-edge settings in mountain passes and on bajadas (2009: 410).

The third of these surveys, conducted in 2005, covered a 176-acre parcel at the intersection of two range roads at the north end of West Pass (Tagg and Van Galder 2009). This parcel abuts Survey Area NW-39, one of the two parcels in Tagg and Heilen's 2003 Sentinel Plain zone. This survey of valley-edge settings identified three sites, for a discovery rate of 1 site per approximately 60 acres (site density = 0.71 percent). This relatively higher discovery rate was expected given the location of this small survey block at the mouth of West Pass.

The area potentially affected by implementation of Alternative 1.C is part of the broad alluvial flats of Sentinel Plain. It is environmentally homogeneous and entirely consistent with Tagg and Heilen's Upper Sentinel Plain zone, in which the number of sites per acre, and the number of site acres per acre surveyed, is expected to be relatively low. Based on the figures derived in that 2009 study, five sites might be expected to be found in this roughly 1,200-acre area. Taking into account Tagg and Heilen's caution about the influences of the edge effect, the actual number of sites in the area is probably somewhat lower. Site density measured in site acres per acre surveyed also is likely to be similar to the figure of 0.34 percent derived by Tagg and Heilen (2009). Sites in that area are likely to be similar to recorded sites in the Upper Sentinel Plain zone as described below.

BMGR-04-A-05 was recorded on the broad, alluvial Sentinel Plain, about 3 miles north of the Crater Range and 3 miles west of Midway Wash, roughly 4 miles east of the Alternative 1.C area. The site consists of a small thermal feature and a flaked stone scatter. Twenty artifacts were documented, including 17 flakes (1 modified), 2 cores, and a tested cobble. This site was interpreted as a short-term campsite or resource-processing site associated with Native American use of the area. The thermal feature probably was used for processing plant, animal, or other resources. The cores, tested cobble, and flakes indicate that flaked stone procurement, reduction, maintenance, or tool production occurred at the site, possibly to create expedient tools for processing plant or animal resources. No temporally or culturally diagnostic artifacts were noted (Tagg and Heilen 2009: 155).

BMGR-04-A-11 also was located in the broad alluvial flats of Sentinel Plain, north of the Crater Range, about 1.6 miles northeast of the Alternative 1.C location. The site consists of two thermal features and a sparse scatter of flaked and ground stone artifacts, including one flake and fragments of four metates (1 basin, 4 slab forms). Basin metates are common in the Archaic period, but slab metates are more often associated with Ceramic period groups. BMGR-04-A-11

is interpreted as a short-term campsite or resource-processing locale associated with Native American use of the area. The thermal features probably were used for processing plant or animal, or other resources. The many metate fragments suggest that hard seeds or legumes, likely obtained locally, were processed. Cultural and/or temporal affiliation could not be assigned based on observations made during recording (Tagg and Heilen 2009: 173).

This discussion would be incomplete without mentioning the presence of Lago Seco, one of the largest sites on the BMGR East, roughly 3 miles north of the Crater Range and 2 miles north of the Alternative 1.C area. Lago Seco is located on the alluvial plain in a playa and the dunes which surround it. It was identified and subsequently partially excavated when the road between North TAC and Manned Range 4 was created (Huckell 1979).

Huckell made surface collections and conducted excavations at each of the 10 identified features, which included several rock clusters, thermal features, and trash deposits (1979: 29-35), and he interpreted Lago Seco as a long-term base camp used for broad-spectrum foraging and possibly floodwater farming. Subsequent limited investigations of this site have identified numerous clusters of ceramics, flaked stone, ground stone, marine shell artifacts, and thermal features although only a portion of the site has been recorded. The site probably was occupied repeatedly over a period of about 3,500 years, from the Late Archaic to the early historical period, based on the artifacts present. Although this large and complex site is located relatively near the Alternative 1.C location, its unique environmental setting is not duplicated in that area, and sites of this type are not likely to occur there.

In sum, it is likely that several small archaeological sites, probably small sites including one or more thermal features, may be present in the Alternative 1.C area. A single historic property has been identified along a road that might be used if this alternative were implemented (Table 3-7).

Table 3-7
Cultural Resources in/near the Proposal 1 Action Areas

Alternative	*Survey Coverage*	*Surveys**	*Recorded Sites*	*NRHP Eligibility*
1.A	Surveyed	Bruder *et al.* 1996 Slaughter *et al.* 2000 Tagg *et al.* 2009	Stoval Airfield, AZ Y:6:034 (ASM)	Eligible
		Slaughter *et al.* 2000 Tagg *et al.* 2009	AZ Y:6:024 (ASM) AZ Y:6:048 (ASM) AZ Y:6:070 (ASM) AZ Y:6:071 (ASM) AZ Y:6:072 (ASM)	Eligible Eligible Eligible Eligible Eligible
		Doolittle and LaMotta 2005 Tagg *et al.* 2009	BMGR-00-E-01	Eligible
		Tagg *et al.* 2009	BMGR-08-L-01 BMGR-08-L-02 BMGR-08-L-03 BMGR-09-A-01	Eligible Eligible Eligible Not Eligible
1.B	Surveyed	Duff *et al.* 2006 Tagg and Heilen 2008b Slaughter *et al.* 2000	None	
1.C	5% Surveyed	Tagg and Heilen 2009	BMGR-04-A-11**	Eligible

Source: Luke AFB 56 FW/RMO 2009
*Note: These surveys are referenced in the Luke AFB 56 FW/RMO GIS database noted above.
**Note: This site not located within the STA site. It is located along a currently unused range road that might be used in connection with training at the North TAC STA location.

3.9.5.2 Proposal 2 – Target Reconfiguration

The maximum area in which target reconfigurations would occur encompasses approximately 155,000 acres of BMGR East, which represents the pre-2001 five-year EOD footprint. Approximately 90 to 95 percent of this area has been intensively surveyed and 861 prehistoric and historical-period cultural resources have been recorded. As described in Section 2.3.1, target reconfigurations generally may include:

1. Partially or completely modifying a target simulation in its existing location;
2. Expanding the size or complexity of an existing target;
3. Eliminating an existing target that is no longer relevant to training;
4. Developing a new simulation where a target does not currently exist; or
5. A combination of these or similar actions.

It is likely that most target reconfigurations will be one of the first three types.

The proposed action would establish five levels of environmental assessment and approval necessary before a proposed target reconfiguration could be implemented, based how current and past military uses have affected the proposed target location.

- Active Intensive Use Category – currently active target positions and biennial EOD clearance areas.
- Active Moderate Use Category – those portions of the currently active decennial EOD clearance areas that are within the pre-2007 annual EOD footprint (essentially all of the current decennial clearance area).
- Infrequent Moderate Use Category – the 2001-2006 5-year EOD footprint.
- Reserved Light Use Category – the pre-2001 5-year EOD footprint.
- Negligible Use Category – tactical range locations outside of the pre-2001 5-year EOD footprint.

The specific level of NEPA review proposed for each of these categories is defined in Section 2.3.1. In all cases, Section 106 review would be completed in accordance with 36 CFR 800, Part B, unless otherwise provided for in a programmatic agreement.

Based on the expectation that most target reconfigurations will be Type 1, 2, or 3, most reviews will fall into the Active Intensive Use category. Twenty-two sites have been recorded in currently active target positions and biennial EOD clearance areas on the three tactical ranges (Table 3-8).

Target reconfigurations away from existing target locations are likely to fall within previously surveyed areas that have been disturbed to some extent by past military training and support activities including the Active Moderate Use and Infrequent Moderate Use categories (roughly 122,100 acres). The Active Moderate Use area has been entirely surveyed, and 62 cultural resource sites were recorded; most have not been evaluated. Intensive archaeological surveys of between 90 and 95 percent of the Infrequent Moderate Use and Reserve Light Use areas have been completed. As many as 250 sites have been recorded in the Infrequent Moderate Use area; most have not been evaluated. More than 400 sites have been recorded in the Reserve Light Use areas on the tactical ranges.

Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and if needed, resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA for all of these actions.

Table 3-8 Cultural Resources in/near the Proposal 2 Action Areas, Active Intensive Use Category				
Alternative	**Survey Coverage**	**Surveys***	**Recorded Sites**	**NRHP Eligibility****
2.A and 2.B	Tactical Ranges	Roberts and others 2000	Z:07:126(ASM)	Recommended Eligible/Unevaluated
		Lyon 2000	Z:06:078 (ASM)	Recommended Eligible/Unevaluated
			Z:06:151 (ASM)	Recommended Eligible/Unevaluated
			Z:06:152 (ASM)	Recommended Eligible/Unevaluated
		Ahlstrom and Lyon 2000	Y:08:154 (ASM)	Recommended Eligible/Unevaluated
			Y:12:022 (ASM)	Recommended Eligible/Unevaluated
			Y:12:024 (ASM)	Recommended Eligible/Unevaluated
			Y:12:027 (ASM)	Recommended Eligible/Unevaluated
			Y:12:028 (ASM)	Recommended Eligible/Unevaluated
		Lyon and Tucker 2001	Z:06:192 (ASM)	Recommended Eligible/Unevaluated
			Z:06:214 (ASM)	Recommended Eligible/Unevaluated
		Tagg and others 2008	BMGR-99-A-10	Recommended not Eligible/Unevaluated
		Doolittle and others 2005	BMGR-00-D-01	Recommended not Eligible/Unevaluated
		Tucker 2000a	Y:08:073 (ASM)	Recommended Eligible/Unevaluated
			Y:08:078 (ASM)	Recommended Eligible/Unevaluated
			Y:08:079 (ASM)	Recommended Eligible/Unevaluated
			Y:08:098 (ASM)	Recommended Eligible/Unevaluated
			Y:08:100 (ASM)	Recommended Eligible/Unevaluated
			Y:08:101 (ASM)	Recommended Eligible/Unevaluated
		Thurtle 2001	Y:08:195 (ASM)	Recommended Eligible/Unevaluated
			Y:08:197 (ASM)	Recommended Eligible/Unevaluated
			Y:08:198 (ASM)	Recommended Eligible/Unevaluated

Source: Luke AFB 56 FW/RMO 2009

* These surveys are referenced in the Luke AFB 56 FW/RMO GIS database noted above.

** Recommended Eligible/Unevaluated indicates that the contractor who recorded the site recommended the site as eligible for inclusion on the NRHP; however, no official determination of eligibility has been presented to the SHPO for concurrence.

3.9.5.3 Proposal 3 – Moving Vehicle Target System

Table 3-9 summarizes the survey status and cultural resources recorded, in the three moving vehicle target system areas and additional details for each alternative are presented in the paragraphs that follow.

Alternative 3.A – Proposed Action

The 44-acre Alternative 3.A project area has been entirely surveyed and one prehistoric site–an artifact scatter with thermal features–was identified and recommended eligible for inclusion on the NRHP (Tucker 2000). Eleven isolated occurrences also were recorded; none was recommended eligible for inclusion on the NRHP.

Alternative 3.B

Approximately 70 percent of the 44-acre Alternative 3.B project area has been surveyed. The single recorded archaeological site, AZ Y:8:002 (ASM), was identified and subsequently excavated as a part of the Coronet Real project. This site, which was located at the southwestern corner of what is now Target 104/106, was the smallest of the three sites located in the area and determined eligible for inclusion on the NRHP. It included four discrete concentrations of fire-cracked cobbles and a sparse flaked and ground stone artifact scatter located approximately 45 meters southeast of the rock clusters. A single large basalt projectile point came from this scatter; its stylistic attributes suggested that it, and by extension the site, was most likely of preceramic age. The artifact scatter was found to be entirely surficial; all of the features were mostly or entirely excavated, and the artifact scatter was mapped and entirely collected. In the course of Section 106 review of a recent undertaking, the 56 FW/RMO determined that the site is no longer eligible, and the SHPO concurred with this finding.

Eleven isolated occurrences were recorded in the area as a part of the North TAC 2003 (Tagg and Heilen 2008a). An additional two isolates were recorded in the sample survey block at the southern end of the area of potential effect (Olszewski *et al*. 1995). No sites were identified by either survey, and none of the isolates was recommended eligible for inclusion on the NRHP.

Alternative 3.C

The 33-acre area potentially affected by Alternative 3.C has been entirely surveyed for cultural resources (Lyon and Tucker 2001). Two sites were recorded within the area: AZ Y:8:072 and Y:8:073 (ASM)**.** The former consists of 9 thermal features and a single obsidian flake. The features are small and deflated; however, subsurface remains are likely within one feature and possibly others. AZ Y:8:073 a single thermal feature, possibly including subsurface deposits, and two grinding slab fragments. Although the site is described as in poor condition, the recorders indicated that subsurface remains might be present in the feature. Both were recommended eligible for inclusion on the NRHP. Forty-eight isolated occurrences were recorded in this area; none were recommended eligible for inclusion on the NRHP.

Table 3-9
Cultural Resources in/near Proposal 3 Action Areas

Alternative	*Survey Coverage*	*Surveys**	*Recorded Sites*	*NRHP Eligibility***
3.A	Surveyed	Miller 1978	None	
		Tucker 2000a	AZ Y:08:048 (ASM)	Recommended Eligible/Unevaluated
3.B	~70% Surveyed	Olszewski *et al*. 1995; Doolittle *et al*. 2006	None	
		Miller 1978	AZ Y:8:002 (ASM)	Determined eligible and excavated (Huckell 1979) No longer eligible
3.C	Surveyed	Tucker 2000a	AZ Y:8:072 (ASM) AZ Y:8:073 (ASM)	Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated

Source: Luke AFB 56 FW/RMO 2009
*Note: These surveys are referenced in the Luke AFB 56 FW/RMO GIS database noted above.
**Note: Recommended Eligible/Unevaluated indicates that the contractor who recorded the site recommended the site as eligible for the NRHP; however, no official determination of eligibility has been presented to the SHPO for concurrence.

3.9.5.4 Proposal 4 – New Target for Air-To-Ground Missiles

The Alternative 4.A location was examined as part of the intensive archaeological survey of 7,880 acres in East TAC (Lyon and Tucker 2001). The historical-period Platt Well AZ Z: 6:197 (ASM) is located approximately 0.8 km to the northwest, and AZ Z: 6:198 (ASM), a historic-period O'odham artifact scatter with thermal features and a rock pile, is located about 0.7 km to the northeast.

3.9.5.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

As summarized in Table 3-10, less than 1 percent of the land area underlying the Alternative 5.A and Alternative 5.B airspace areas have been surveyed for cultural resources. Within the Alternative 5.A project area, seven prehistoric and historical-period cultural resources have been recorded during four reconnaissance surveys conducted between the late 1920s and mid-1960s. Lost City, AZ Y: 16:001 (Lost City), located in the Growler Valley, is a large prehistoric village site containing numerous artifact concentrations, thermal features, and a walk-in well. The site has been and continues to be disturbed by vehicle tracks and erosion. Cultural resources recorded along the western edge of the Growler Mountains include the historical-period Charlie Bell Well site which contains a windmill, wooden shack, ramada, and trash. Prehistoric cultural resources include petroglyphs, rock-pile shrines; rock outlined sleeping circles, a possible jacal structure, and four rock shelters containing three to four course stone walls. Disturbance and condition were not recorded for these sites. Only one of these seven sites, AZ Y:12:004 (ASM), a prehistoric Hohokam village site, underlies the Alternative 5.B airspace area.

Table 3-10
Affected Cultural Resources in Proposal 5 Action Area

Alternative	*Survey Coverage*	*Surveys**	*Recorded Sites*	*NRHP Eligibility***
5.A	less than 1% Surveyed	Fontana 1965; Ezell 1954	AZ Y:10:003 (ASM) AZ Y:10:004 (ASM) AZ Y:10:005 (ASM) AZ Y:10:009 (ASM) AZ Y:11:002 (ASM) AZ Y:12:004 AZ Y:16:001 (ASM)	Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated Recommended Eligible/Unevaluated
5.B	less than 1% Surveyed	Ezell 1954	AZ Y:12:004 (ASM)	Recommended Eligible/Unevaluated

Source: Luke AFB 56 FW/RMO 2009

*Note: These surveys are referenced in the Luke AFB 56 FW/RMO GIS database noted above.

**Note: Recommended eligible/Unevaluated indicates that the contractor who recorded the site recommended the site as eligible for the NRHP; however, no official determination of eligibility has been presented to the SHPO for concurrence.

3.9.5.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

No single survey covers the entire 400-acre area associated with Proposal 6; instead, parts of the area were covered by three different surveys. Twenty-eight isolated occurrences were recorded in the area and described in two published reports. An additional three isolated occurrences were located along the boundary of the area by a third, as yet unpublished survey.

3.9.5.7 Proposal 7 – On-the-Ground Training Exercises

Intensive archaeological survey of about 3,800 acres in a few sample survey blocks and along roads in Area B has identified 75 prehistoric and historical-period cultural resource sites (Seymour and Doak 1993; Tagg 2009, Schilz 2009). The majority of sites have been recorded during surveys of 50 meters on either side of existing dirt roads in areas open to public use, in accordance with a programmatic agreement executed to demonstrate compliance with Section 106 of the NHPA for implementing actions described in the INRMP. Most impacts associated with permitted public recreational use are likely to occur within these corridors. Prehistoric cultural resources include artifact scatters with and without features and rock shelter sites. Features included roasting pits/hearths (indicated by the presence of fire-affected rock), trails, linear rock alignments, rock piles, rock rings, circular cleared areas, boulder/bedrock mortars, and petroglyphs. Observed artifacts are associated with Hohokam, Patayan, and indigenous Native American groups. A number of archaeological sites are currently monitored for evidence of disturbance and site damage assessments were conducted at four illegally excavated rock shelters (Doolittle 2004).

Ground-based and combined air-ground training by small teams also may take place on the tactical and manned ranges and may use existing roads throughout BMGR East. Surveys have been completed along most of the regularly maintained roads in these areas. Two sites were

located along the road that provides access between Gila Bend AFAF and East TAC; both are associated with military use of the area.

3.9.5.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

Cultural resource surveys of all of the undeveloped areas on Gila Bend AFAF and a historic building inventory have been completed. In 1994, Dames and Moore completed a building inventory and limited survey at Gila Bend AFAF (Keane and others 1998). One prehistoric site and 34 isolates were recorded in the 627-acre survey, all of which are well outside the area of Alternatives 8.A and 8.B. As part of that project, Dames and Moore compiled an inventory of historical-period buildings and structures on Gila Bend AFAF, including properties dating to the World War II and Cold War eras. Fifteen World War II–era properties and 210 Cold War–era properties were identified. That project included recommendations regarding NRHP eligibility for only the World War II properties (all were considered ineligible due to loss of integrity, including the World War II era runways). Consideration of buildings and structures of the Cold War era was limited to applying the Air Force's *Interim Guidance: Treatment for Cold War Historic Properties for U.S. Air Force Installations* (1993) to divide them into two groups: properties requiring consideration and evaluation as possible historic properties in the near future (as properties of exceptional significance), and those that would not be considered for inclusion on the NRHP until they reached 50 years of age.

A second study, undertaken in 1996 and 1997, focused on evaluating the significance of Cold War properties at Luke AFB and Gila Bend AFAF (Keane and others 1997). The results of that study indicated that none of the properties evaluated should be considered eligible as of the date of the study, and only the range operations building at Gila Bend AFAF (Building 324, constructed in 1968) should be reevaluated when it reaches 50-years of age (in 2018). Based on the results of these two studies, the 56 FW/RMO determined that none of the buildings and structures at Gila Bend AFAF, including the existing control tower, was eligible for inclusion on the NRHP, and the SHPO concurred with this finding.

An intensive archaeological survey completed in 2002 covered the area potentially affected by Alternatives 8.A and 8.B (Ahmet and others 2006). That survey covered all undeveloped portions of Gila Bend AFAF and recorded 10 archaeological sites and 186 isolated occurrences. In 2004, the SHPO concurred with the 56 FW/RMO's determination that all but one of the sites and two of the isolated features were eligible for inclusion on the NRHP. Three isolated occurrences, each consisting of a single flake, were recorded in the area of Alternatives 8.A and 8.B. None is eligible for inclusion on the NRHP.

3.9.5.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

Intensive archaeological survey of a 100-meter wide corridor of the road between the Manned Range 1 main tower and the RMCP and water well has been completed. Eleven isolated occurrences were recorded along the road segment affected by Alternative 9.A; however, all are located well outside the area that would be affected by paving this existing road.

3.9.5.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

As summarized in Table 3-11, intensive archaeological survey has been completed for the ten proposed excavation sites and five proposed stockpile sites. The Manned Range 2 stockpile location lies within BMGR-00-B-99 (Luke AUX-9), which has been determined eligible for inclusion on the NRHP. This and other auxiliary airfields were built to the same blueprint between 1941 and 1943 and served as day-use facilities where pilots could refuel and replenish their ammunition. The macadam surface of the runways is disturbed with vegetation. The interior of the airfield and the area surrounding the runways have been disturbed by vehicle tracks.

Table 3-11 Cultural Resources in/near Proposal 10 Action Areas

Excavation or Stockpile Site	***Affected Area***		***Survey Coverage***	***Surveys****	***Recorded Sites***	***NRHP Eligibility***
	square ft	acres				
North TAC Excavation Site	8,100	0.19	Surveyed	Tucker 2000a	None	
North TAC Stockpile	10,890	0.25	Surveyed	Tucker 2000a	None	
South TAC 1 Excavation Site	11,400	0.26	Surveyed	Vanderpot and Altschul 2004	None	
South TAC 2 Excavation Site	6,000	0.14	Surveyed	Tucker 2000b	None	
South TAC Stockpile	10,890	0.25	Surveyed	Rankin 2010	None	
Manned Range 1 Excavation Site	30,000	0.69	Surveyed	Rankin 2010	None	
Manned Range 2 Stockpile	10,890	0.25	Surveyed	Vanderpot and Altschul 2004	BMGR-00-B-99 (ASM)	Eligible
Manned Range 3 Excavation Site	11,520	0.26	Surveyed	Duff and others 2006	None	
Manned Range 3 Stockpile	10,890	0.25	Surveyed	Vanderpot and Altschul 2004	None	
East TAC 1 Excavation Site	5,250	0.12	Surveyed	Bruder *et al.* 1994	None	
East TAC 2 Excavation Site	12,000	0.28	Surveyed	Tagg and Rockman 2010	None	
East TAC 3 Excavation Site	9,600	0.22	Surveyed	Tagg and Rockman 2010	None	
East TAC 4 Excavation Site	8,050	0.15	Surveyed	Lyon 2000	None	

Table 3-11 Cultural Resources in/near Proposal 10 Action Areas						
Excavation or	***Affected Area***		***Survey***	***Surveys****	***Recorded Sites***	***NRHP Eligibility***
DART Drop Road Excavation Site	15,000	0.34	Surveyed	Rockman 2009 Rankin 2010	None	
DART Drop Road Stockpile	10,890	0.25	Surveyed	Ahmet *et al.* 2006	None	

Source: Luke AFB 56 FW/RMO 2009
*Note: These surveys are referenced in the Luke AFB 56 FW/RMO GIS database noted above.

3.10 HAZARDOUS MATERIALS AND WASTE

3.10.1 Definition of Resource

Hazardous materials are broadly defined as materials of general use containing clearly hazardous properties in commercial, military, or industrial applications. Hazardous materials are chemical substances which pose a substantial threat to human health or the environment. In general, these materials pose hazards due to quantity and concentration, or physical and chemical characteristics.

Hazardous constituents are defined as hazardous materials present at low concentrations in a generally non-hazardous matrix, such that their hazardous properties do not produce acute effects. Component hazardous materials are considered hazardous constituents. Components that contain hazardous constituents include propellants, batteries, flares, igniters, jet fuel, diesel fuel, hydraulic fluid, and explosive warheads. Each of these may potentially affect human health and the environment through direct contact with water, soil, or air.

A hazardous waste may be solid, liquid, semi-solid, or contain gaseous material that alone or in combination may: (1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed, or otherwise managed. The Resource Conservation and Recovery Act, 42 U.S.C. Section 6901 *et seq*., regulates management of solid waste and hazardous waste.

Solid wastes include garbage; refuse; sludge (from a wastewater treatment plant, water supply treatment plant, or air pollution control facility); other discarded material including solid, liquid, semi-solid; and contained gaseous materials resulting from industrial, commercial, mining, and agricultural operations.

3.10.2 Study Area

The ROI for hazardous materials and waste management encompasses the area where hazardous materials and hazardous and solid waste would be stored, transported, and used to implement the ten proposals evaluated in this EIS. The primary affected environment lies within BMGR East;

however, materials are transported to BMGR East from off-range locations and wastes are transported and disposed of at off-range permitted sites in the region.

3.10.3 Air Force Policy Overview

Air Force policies aim to prevent pollution, meet or exceed all regulatory requirements, minimize or eliminate the use of hazardous materials, and prevent the release of hazardous materials into the environment. Hazardous material and waste management for BMGR East is the responsibility of the range operations contractor with program oversight by the environmental flight at Luke AFB. Military personnel are educated about the proper transportation, handling, use, and disposal of hazardous materials and wastes, and pollution prevention. The Air Force management approach emphasizes minimizing or eliminating the release of hazardous materials or wastes into the environment. Personnel training also addresses prevention, control, management, and responses to hazardous material/waste releases. The protocol for responding to an aircraft crash includes multiple considerations for hazardous materials and waste management at a crash site. This includes an estimate of the environmental damage to the site, as compared to the derived benefits from the removal operation or site mitigation measures.

Military munitions differ from other wastes; the rules and regulations regarding the management of military munitions hazards and military munitions waste differ from those regulating other wastes. The Military Munitions Rule (promulgated in Federal Register Volume 62, Number 29, Pages 6621-6657), defines when military munitions become waste and how these waste military munitions will be managed. Military munitions are not a solid waste when used for their intended purposes, which include use in training military personnel in the recovery, collection, and on-range destruction of unexploded ordnance and munitions fragments during range clearance activities. However, used or fired munitions are classified as solid waste when managed off-range or recovered, collected, and subsequently buried/placed in a landfill on the range. In both cases, once the used or fired munition is a solid waste, it is potentially subject to regulation as a hazardous waste.

The state of Arizona has not developed state-specific military munitions regulations; however, it has adopted the federal Munitions Rule by reference. The ADEQ is authorized to administer and enforce the Arizona Hazardous Waste Program, including the Munitions Rule (Department of the Air Force 2006a). During routine military training missions at BMGR East, military munitions are delivered from training aircraft to air-to-ground ranges. Nearly all military munitions used on BMGR East have inert (non-exploding) warheads, with the exception of a small (but still hazardous) spotting charge which produces a puff of smoke to reference the location of a hit. Some training using military munitions with live (exploding) warheads is

necessary, but is tightly limited to five specific targets (one HE hill target in each TAC range and the existing air-to-ground missile targets in North TAC and East TAC).

In accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan, which require DoD components to assess the potential for off-range migration of munitions constituents from their range operations, the Air Force conducted a Qualitative Assessment for BMGR East in 2005 and will reassess at a minimum of every 5 years; or whenever significant changes occur to the range that may affect determinations made during the previous assessment. The Operational Range Assessment Plan calls for the Air Force to report a release or a substantial threat of a release of munitions constituents of concern from a BMGR East operational range to an off-range area that creates an unacceptable risk to human health or the environment. In the event of such an occurrence, the Air Force is required to report to the appropriate regulatory authorities, conduct an assessment of such a release, and make the documentation of findings available to the public.

3.10.4 Hazardous Materials

Hazardous materials such as aircraft, automotive, and generator fuels, oils, lubricants, paints, cleaning solvents, pesticides, and herbicides are currently used at developed range administration and support facilities such as the Gila Bend AFAF. Use of hazardous materials at other dispersed locations, such as manned and tactical ranges, is generally limited to petroleum, oils, and lubricants; however, latex paints used in the construction and repair of simulated targets are also potentially hazardous.

3.10.5 Hazardous and Munitions Constituents

Expended training material such as bombs, missiles, targets, flares, and detonation residues can release contaminants to the environment upon use or leach small amounts of toxic substances as they explode and decompose. The hazardous constituents that may be released upon use are generally referred to as energetic chemicals and are most commonly found in the explosive, propellant, and pyrotechnic elements of munitions. These constituents may also leak from munitions that do not detonate on impact as intended.

Table 3-12
Munitions Elements and Respective Hazardous Constituents

Munitions Element	Energetic Chemicals
Explosives	trinitrotoluene (TNT), Cyclotrimethylenetrinitramine (RDX), hexahydro-trinitro-triazine (HMX)
Propellants	Nitrocellulose (NC), Nitroglycerin (NG), Nitroguanidine (NQ), 2,4-Dinitrotoluene (2,4-DNT), perchlorate

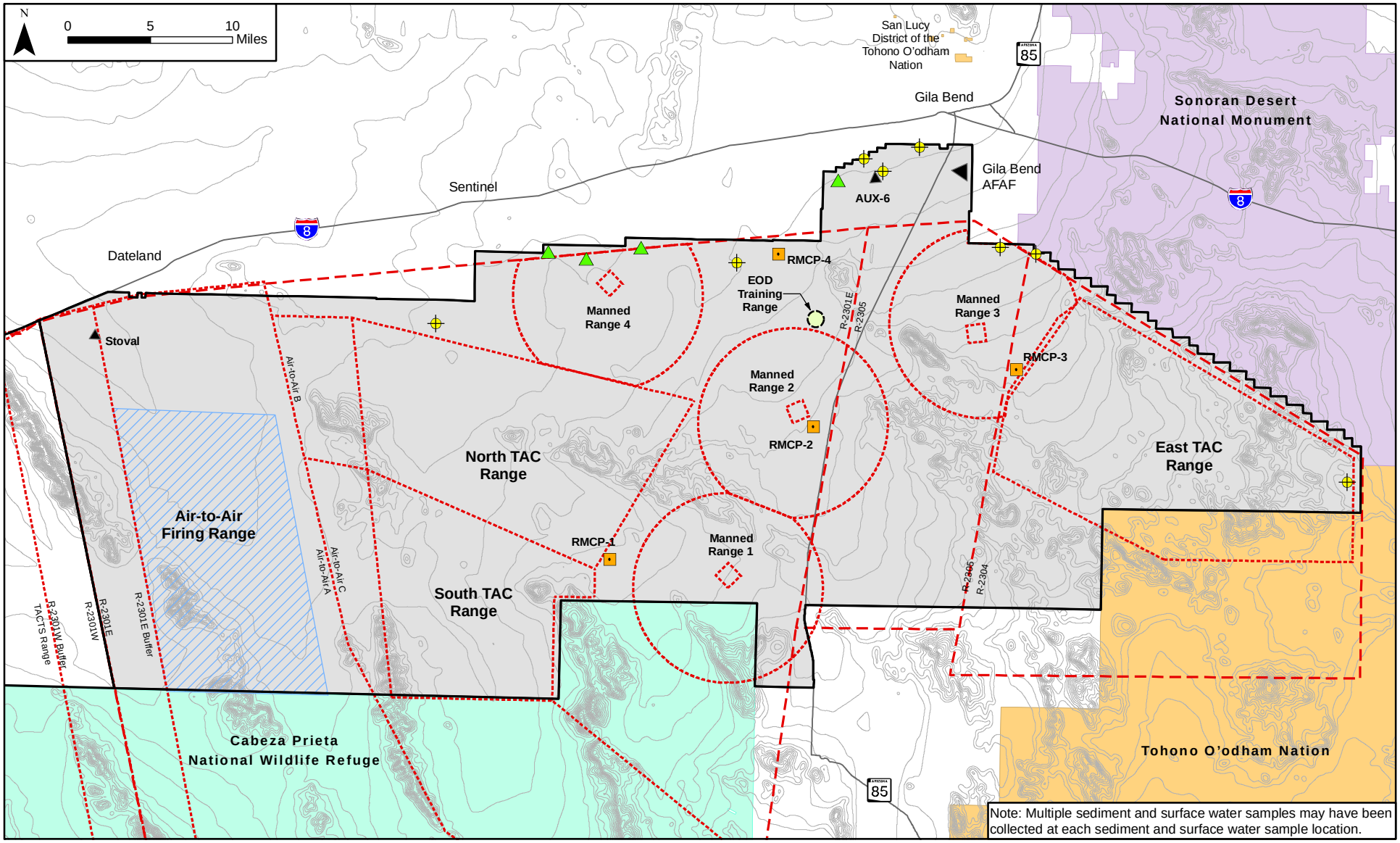
Source: U.S. Army Engineer Research and Development Center 2007

The chemicals listed in Table 3-12 were studied by the U.S. Army Engineer Research and Development Center and are considered primary indicator munitions constituents due to their chemical stability within the environment. They are commonly used in a wide variety of military munitions and have the potential to occur within BMGR East. Over the time in which BMGR East has been used for training, both the volume of expended material decomposing within the ranges and the amounts of toxic substances being potentially released to the environment have gradually increased. Concentrations of some substances in sediments surrounding the expended material may also increase over time. Transport of these substances via winds and erosion may eventually disperse these contaminants outside training areas.

In addition to the hazardous constituents from energetic chemicals, hazardous constituents may also leach from solid components of munitions such as bomb hulls, targets, and small arms ammunition. For bomb construction, the American Society for Testing and Materials standards specify each of the iron bomb bodies or steel fins may contain small percentages (typically less than 1 percent) of any of the following: carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium. The aluminum fins, in addition to the aluminum, may also contain: zinc, magnesium, copper, chromium, manganese, silicon, or titanium (U.S. Department of the Navy 2005).

As noted in Section 3.10.3, the Air Force conducted a Qualitative Assessment for BMGR East in 2005 in accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan to determine if there is a potential for munitions constituents from an operational range to migrate off-range and cause an unacceptable risk to human and/or ecological receptors. The Qualitative Assessment incorporated the information and results from a June 2004 Limited Field Study that evaluated the presence of munitions constituents within surface soils and surface waters/sediments at BMGR East. In the Limited Field Study, the wind dispersion and surface water/stormwater pathways were evaluated as follows:

- Wind Dispersion Pathway: As shown in Figure 3-9, four areas of interest were identified and soil surface soil samples were taken within these areas of interest to evaluate potential migration of munitions constituents from source areas predominantly upwind of the northern boundary of BMGR East. The analytical results indicated no explosives constituents above laboratory sample quantification limits. While limited detections of lead were reported, none were reported above applicable residential human-health screening levels.



BMGR East
Auxiliary Airfield
Range Munitions Consolidation Point
Air-to-Air Firing Range
Restricted Airspace Boundary
Subrange Airspace Boundary
Sediment and/or Surface Water Sample Location (Surface Water/Stormwater Pathway Area of Interest)
Surface Soil Sample Location (Wind Dispersion Pathway Area of Interest)
National Monument
National Wildlife Refuge
Native American Reservation

Figure 3-9

MUNITIONS CONSTITUENT SAMPLING LOCATIONS

- Surface Water/Stormwater Pathway: Eight areas of interest were identified and sampled where the most predominant drainage channels and washes intersect with the BMGR East northern boundary as the general topography is from south to north (see Figure 3-9). . Analytical results indicated that all munitions constituents were below detectable concentrations, laboratory sample quantification limits, or residential human-health screening levels (U.S. Department of the Air Force 2005).

The main migration pathways that were identified and evaluated in the 2005 Qualitative Assessment were surface soil (i.e., wind dispersion), subsurface soil, surface water/sediment (i.e., stormwater), and groundwater. A conceptual site model, based on EPA's Conceptual Site Model and Data Quality Objective processes, was used to evaluate each of these pathways. In conjunction with the Limited Field Study results, it was determined that there are no complete munitions constituent exposure routes to potential receptors in the vicinity of BMGR East. Due to these incomplete source/receptor interaction pathways, the Qualitative Assessment concluded that no Quantitative Assessment was warranted (U.S. Department of the Air Force 2005, 2006b). In accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan, the potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years, or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.

3.10.6 Installation Restoration Program

The DoD established the Installation Restoration Program in 1980 to identify, characterize, and remediate environmental contamination on military installations resulting from hazardous waste management practices. The Installation Restoration Program established a process to evaluate past hazardous waste management and disposal sites on DoD property to control the migration of contaminants and hazards to human health and the environment which may have resulted from past DoD operations and activities. A preliminary assessment (PA) of BMGR East, including Gila Bend AFAF, was conducted by Luke AFB in 1992. The PA originally identified 218 possible Areas of Concern (AOC). Of these 218 AOCs, 130 required no further action and were closed. The remaining 88 sites were determined to be AOCs. At the time the PA was completed, 45 of the 88 AOCs were active operations and were managed under state and federal RCRA regulations. The other 43 sites were declared IRP sites. The EPA requested further inspection at 12 of the IRP sites, which initiated a Site Inspection in October 1995. In October 1997, the EPA completed its review of the Site Investigation Report and no further action was warranted for 11 of the 12 sites. The twelfth site has since been remediated (U.S. Department of the Air Force 1999).

The Site Inspection included further investigation of Range 1 Munitions Burial Area within Manned Range 1. This single munitions burial area was chosen as a representative munitions burial site for the entire BMGR East, as munitions burial areas are found throughout the range (North, South, and East TAC Ranges and Manned Ranges 1, 2, 3, and 4). Soil sampling and analysis performed at this site identified no evidence of contamination resulting from hazardous material or hazardous waste disposal, and the ADEQ determined that munitions burial areas on the range were solid waste and not hazardous waste sites (U.S. Department of the Air Force 1999).

At Gila Bend AFAF two sites were further investigated under the Site Investigation conducted in 1995; a plumbing/metal shop and a former fire training area. Soil sampling and analysis determined that no further action was necessary for these sites (U.S. Department of the Air Force 1999). Additional investigations identified nine Areas of Concern on Gila Bend AFAF; seven of these are located south of the developed area of Gila Bend AFAF and two are east of the northern end of the runway. No further action determinations have been made for six of these and investigations continue on the three remaining sites, all of which are located south of the developed area of Gila Bend AFAF, well outside the area of potential effect (U.S. Department of the Air Force 2006c).

3.10.7 Solid Waste

Municipal solid wastes are policed and contained daily, and are collected and transported off Gila Bend AFAF and Manned Range towers for disposal by a commercial contractor in accordance with all applicable rules and regulations (Department of the Air Force 2006c). During military troop deployment exercises on BMGR East, all solid waste is collected, contained, transported off-range, and disposed of in accordance with all applicable rules and regulations. Human sewage at base camps and other locations of troop concentrations is contained in portable toilets and removed by a commercial contractor to be placed in approved sewage treatment facilities. All solid waste is policed and contained daily, then transported off-range to approved landfill sites.

3.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.11.1 Definition of Resources

Socioeconomics is defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Economic activity typically encompasses employment, personal income, and industrial growth.

3.11.2 Study Area

The ROI for this EIS includes Maricopa, Pima, and Yuma Counties. The principal military installation that relies on BMGR East for training is Luke AFB, located in Maricopa County. The focused affected environment is comprised of the communities adjacent to BMGR East, including Ajo, Gila Bend, the San Lucy District of the Tohono O'odham Nation, and the unincorporated communities within the seven census tracts that border and encompass BMGR East (Figure 3-10). Census Tract 113 in Yuma County encompasses portions of BMGR East and West and Cabeza Prieta NWR. No residents were recorded for the 2000 Census; therefore, no analysis was conducted for Census Tract 113.

On the range itself, habitation and economic development are not allowed for safety reasons; visitation for recreation purposes is limited to select areas and controlled by a permit system. In the vicinity of the BMGR, commercial and residential development has begun to emerge in recent years. Although population growth in the 2000s declined from that of recent decades, Arizona was ranked as the second fastest growing state in the nation in 2007 and 2008 with annual growth rates of 2.8 and 2.3 percent, respectively (U.S. Census Bureau 2008a). This growth is noticeable in major metropolitan areas like Phoenix, Tucson, and Yuma, as well as outlying communities, including those in the immediate vicinity of the BMGR.

3.11.3 Demographics

3.11.3.1 Population and Population Growth

Tri-County Area

Between 1970 and 2000, population in Arizona increased 189.0 percent. Between 2000 and 2007, Arizona's population increased an estimated 26.7 percent (to 6.5 million). Maricopa County dominated the state's population growth between 1970 and 2000 with a 216.3 percent increase. Between 2000 and 2007, the population of Maricopa County increased by 27.2 percent, Yuma County by 25.8 percent, and Pima County by 18.9 percent.

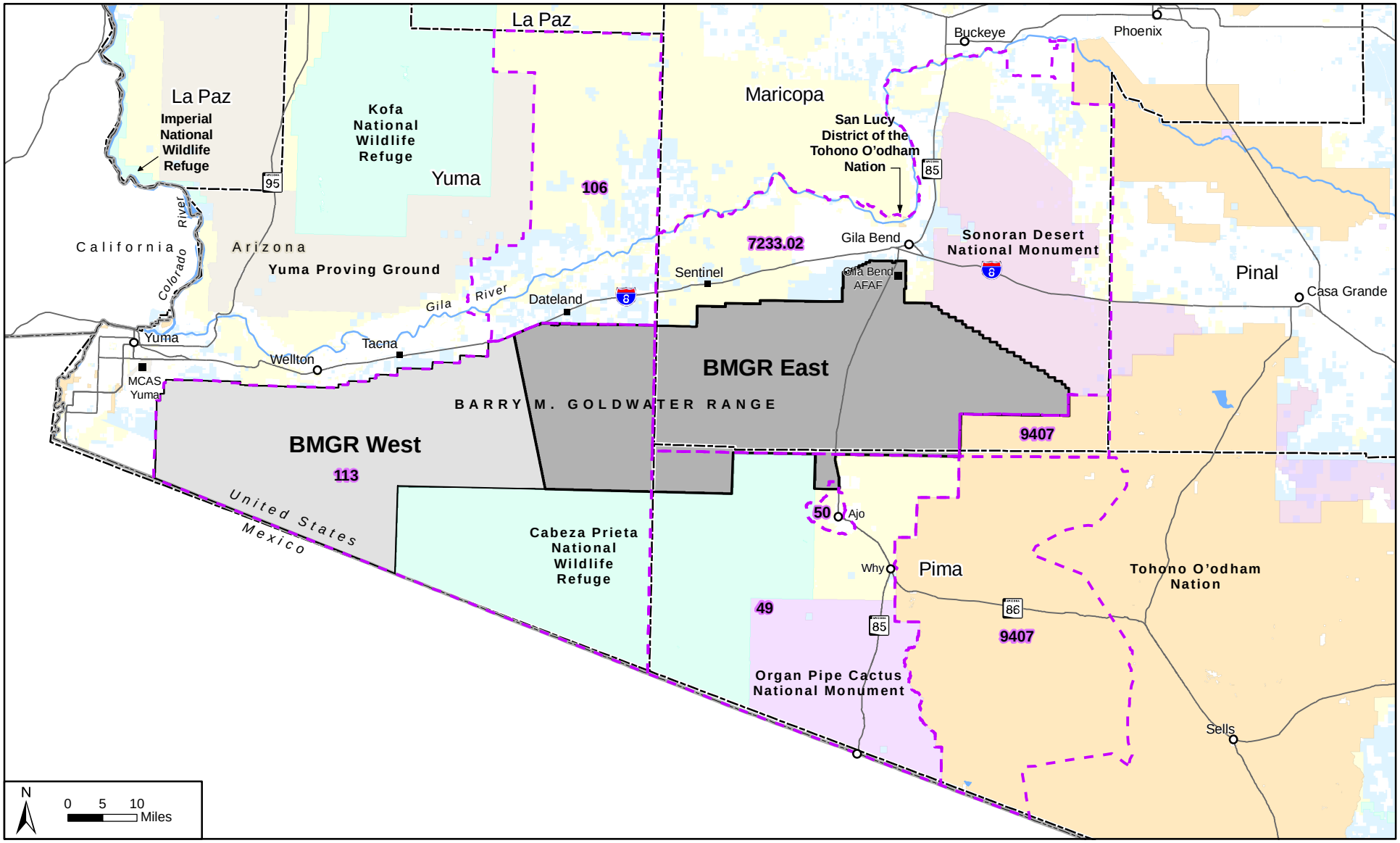


Figure 3-10

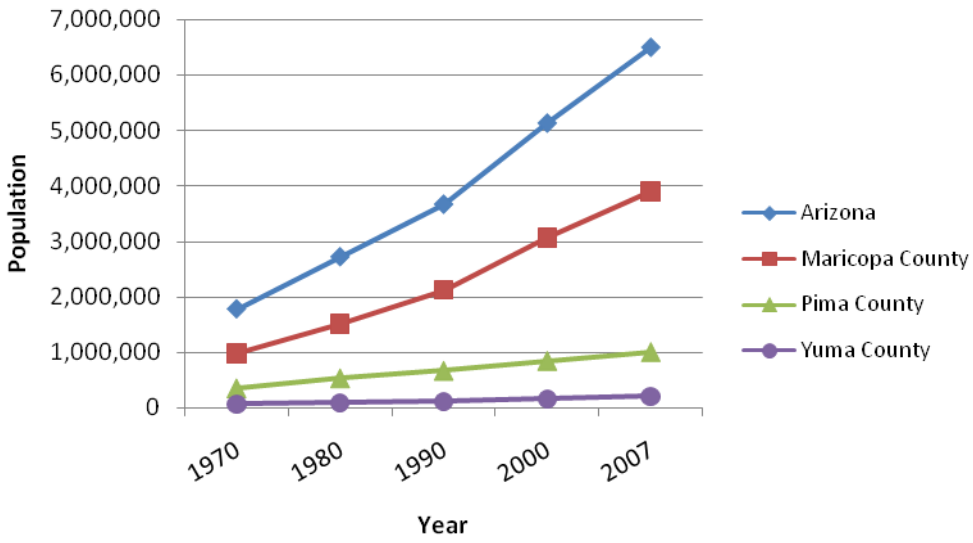
SOCIOECONOMIC STUDY AREA

Table 3-13 displays the population growth trends for the three counties and Arizona. As shown in Table 3-14, population projections throughout the tri-county area, as with the entire state of Arizona, predict a strong, continued increase through 2030. Between 2007 and 2030, it is anticipated that Yuma County will increase by 36.3 percent, Maricopa County will increase by approximately 58.9 percent, and Pima County will increase by 30.4 percent, as compared to the statewide increase of 37.2 percent.

Table 3-13
Population Trends Within the Tri-County Area

	1970	***1980***	***1990***	***2000***	***2007***
Arizona	1,775,399	2,716,546	3,665,228	5,130,632	6,500,194
Maricopa County	971,228	1,509,175	2,122,101	3,072,149	3,907,492
Pima County	531,443	531,443	666,880	843,746	1,003,235
Yuma County	60,827	88,762	106,895	160,026	201,298

Graphical Representation

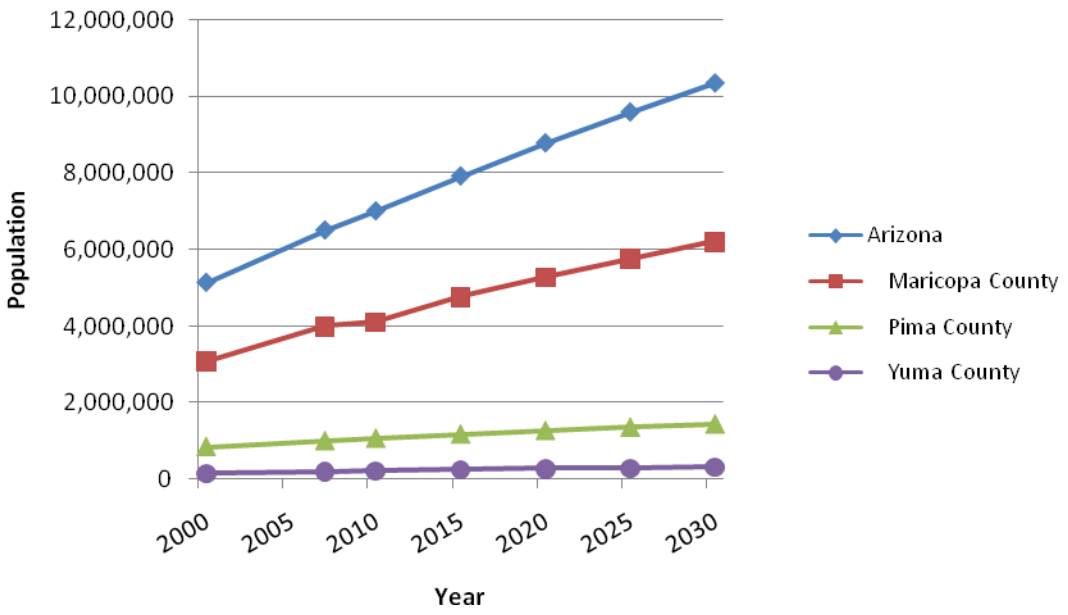


Sources: U.S. Census Bureau 1993 and 2000, Arizona Department of Commerce 2007

Table 3-14
Population and Population Projections Within the Tri-County Area

	2000	*2007*	*2010*	*2015*	*2020*	*2025*	*2030*
Arizona	5,130,632	6,500,194	6,999,810	7,915,629	8,779,567	9,588,745	10,347,543
Maricopa County	3,072,149	3,907,492	4,105,623	4,762,473	5,276,074	5,756,690	6,207,980
Pima County	843,746	1,003,235	1,070,723	1,175,967	1,271,912	1,360,157	1,442,420
Yuma County	160,026	201,298	218,810	246,260	271,361	294,666	316,158

Graphical Representation



Sources: Arizona Department of Economic Security 2006, Arizona Department of Commerce 2007

Surrounding Communities

Table 3-15 provides the 2000 census population for the six census tracts evaluated within the ROI. The 2000 population of Census Tract 7233.02 was 5,417. This census tract occurs northeast of BMGR East to the Gila River including Gila Bend, and parts of Avondale, Buckeye, and the southern portion of Goodyear. Census Tract 9407 consists solely of Tohono O'odham Nation main reservation lands and had a 2000 population of 1,695. The 2000 census population for the San Lucy District of the Tohono O'odham Nation (which occurs primarily within Census Tract 7233.02) was 317 (U.S. Census Bureau 2008b).

Table 3-15
2000 U.S. Census Population for Census Tracts within the ROI

Census Tract	7233.02, Maricopa County	9407, Maricopa County	49, Pima County	50, Pima County	9407, Pima County	106, Yuma County
Population	5,417	176	187	3,720	1,519	1,158

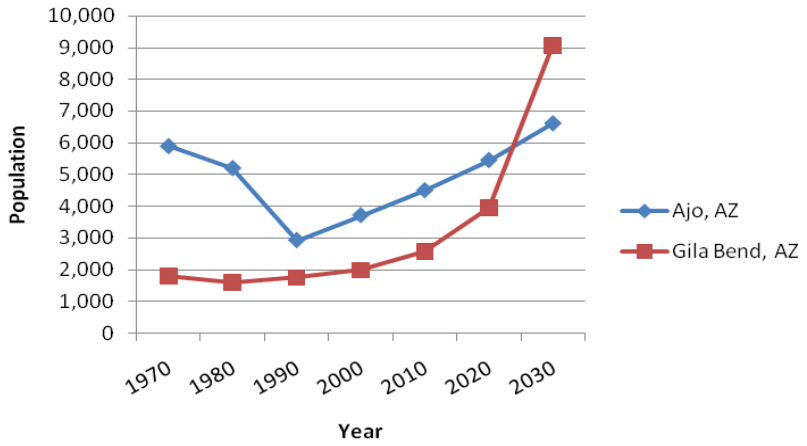
Source: U.S. Census Bureau 2008b

The 2000 population of Gila Bend and Ajo are 1,980 and 3,705, respectively. During the 30-year period from 1970 to 2000, the population of Gila Bend increased by 10 percent, but decreased by 4.7 percent from 2000 to 2007. As shown in Table 3-16, the population of Ajo declined 37 percent from 1970 to 2000 (the population declined 44 percent in the 1980s when the Ajo Mine closed, and grew 27 percent in the 1990s). As shown in Table 3-16, similar to the tri-county area, population projections for Gila Bend and Ajo predict continued significant increase through 2030. Models predicting growth patterns demonstrate that private lands in the Gila Bend and Ajo areas and along the Interstate 8 corridor, north of the BMGR will continue to be developed. The population of Gila Bend, which was at 1,980 persons in 2000, is expected to reach 9,074 by 2030; this marks an increase of approximately 358.3 percent (Blueline Consulting Group 2004). The significant population growth and development within the Phoenix metropolitan area, other areas of Maricopa County, and neighboring Pinal County are a contributing factor to the current growth and anticipated future population boom at Gila Bend (Town of Gila Bend 2006). The population of Ajo is anticipated to increase by approximately 78.1 percent, from 3,705 in 2000 to 6,599 by 2030 (Blueline Consulting Group 2004).

Table 3-16
Population Trends and Projections for Major Communities within the ROI

Community	**1970**	**1980**	**1990**	**2000**	**2010**	**2020**	**2030**
Ajo, AZ	5,881	5,189	2,919	3,705	4,491	5,444	6,599
Gila Bend, AZ	1,795	1,585	1,747	1,980	2,575	3,950	9,074

Graphical Presentation



Sources: U.S. Census Bureau 2008c, 2008d, 2008e; Arizona Department of Commerce 2007; Blueline Consulting Group 2004

3.11.3.2 Race and Ethnicity

Tri-County Area

Census data on the racial and ethnic composition of the ROI are summarized in Table 3-17. Similar to the state, the majority of the tri-county area is white—approximately 75 percent or greater in 2000. Maricopa County has a slightly higher percentage of African Americans compared to the state. The American Indian/Alaska Natives comprise a smaller percentage of the tri-county area as compared to Arizona. Approximately 51 percent of Yuma County is comprised of persons of Hispanic or Latino origin, far greater than Maricopa and Pima Counties, and the state.

Surrounding Communities

The communities of Gila Bend and Ajo are comprised similarly of whites and American Indian/Alaska Natives; however, Ajo has a higher percentage of persons of Hispanic or Latino origin (36.9 percent versus 28.7 percent). Compared to Maricopa County, the population of Gila Bend, Census Tracts 7233.02 and 9407, and the San Lucy District of the Tohono O'odham Nation are comprised of a larger percentage of American Indian/Alaska Natives. Most notably in Maricopa County, Census Tract 9407 is comprised solely of American Indian/Alaska Natives and the San Lucy District of the Tohono O'odham Nation is comprised of more than 98 percent American Indians/Alaska Natives and less than 1 percent White. Within Maricopa County, Census Tract 7233.02 has the highest percentage of persons of Hispanic or Latino origin (38.9 percent).

Within Pima County, Census Tract 9407 had the smallest percentage of whites in 2000 (0.8 percent) and the highest percentage of American Indian/Alaska Natives (96.6 percent). Census Tract 9407 (in Maricopa and Pima Counties) lies solely within the Tohono O'odham Nation. Census Tract 50, which includes the town of Ajo, had the highest percentage of persons of Hispanic or Latino origin within Pima County.

In 2000, Census Tract 106 in Yuma County had the highest percentage of persons of Hispanic or Latino origin within the entire ROI, at 74 percent. This census tract includes the unincorporated community of Dateland, located to the north of BMGR East (see Figure 3-10).

Table 3-17
Race and Ethnicity (2000)

Geographic Area	White		Black or African American		American Indian and Alaska Native		Asian		Native Hawaiian, and Other Pacific Islanders		Some Other Race		Two or More Races		Hispanic or Latino (of any race)[1,2]	
	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%	Number	%
State of Arizona	3,272,065	75.1	154,316	3.0	253,542	4.9	91,223	1.8	6,166	0.1	597,173	11.6	156,497	3.1	1,295,317	25.3
Maricopa County	2,033,420	75.5	111,584	3.6	55,177	1.8	66,294	2.2	3,811	0.1	365,320	11.9	94,572	3.1	763,333	24.9
Gila Bend	4,962	68.4	213	2.5	748	8.8	56	0.7	0	0.0	1,481	17.4	264	3.1	2,443	28.7
Census Tract 7233.02	2,607	58.9	71	1.3	536	9.9	24	0.4	0	0.0	1,369	25.3	223	4.1	2,112	38.9
Census Tract 9407	0	0.0	0	0.0	176	100	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Pima County	517,982	77.3	24,460	2.9	27,440	3.3	16,907	2.0	1,084	0.1	111,956	13.3	29,339	3.5	247,861	29.4
Ajo	2,123	67.5	16	0.4	323	8.3	28	0.7	0	0.0	327	8.4	191	4.9	1,443	36.9
Census Tract 49	133	75.9	0	0.0	45	24.1	0	0.0	0	0.0	0	0.0	0	0.0	28	14.9
Census Tract 50	1,990	77.4	16	0.4	278	7.5	28	0.8	0	0.0	327	8.8	191	5.1	1,415	38.0
Census Tract 9407	12	0.8	0	0.0	1,468	96.6	0	0.0	0	0.0	4	0.3	35	2.3	139	9.2
Yuma County	71,130	74.9	3,505	2.2	2,683	1.7	1,345	0.8	163	0.1	38,143	23.8	4,730	2.9	80,828	50.5
Census Tract 106	283	76.1	0	0.0	0	0.0	3	0.3	0	0.0	229	19.8	45	3.9	857	74.0
Native American Reservations																
San Lucy District of the Tohono O'odham Nation	3	0.9	0	0.0	312	98.4	0	0.0	0	0.0	0	0.0	2	0.6	6	1.9

Notes: [1] The Hispanic population is not a racial category and includes components in each of the five racial categories (i.e. Hispanic figures cannot be added to racial categories to reach total population figure; double counting would result).
[2] Race statistics presented in this table will not add to 100 percent for two reasons: 1) a small percentage of the population reported two or more races, and 2) Hispanic or Latino origin statistics represent ethnicity (not race) and include all persons who identify themselves as of Hispanic or Latino origin or decent.
Sources: U.S. Census Bureau, 2008j, 2008k

3.11.3.3 Other Notable Demographic Characteristics

The median age in Ajo more than doubled between 1970 and 2000 from 24.8 years to 51.6 years. This was more than 15 years older than the median age for both Pima County and Arizona. The proportion of working-age residents has decreased, and the proportion of retirement-aged residents has increased. The population in Gila Bend is younger, with a median age of 29 years old, and the majority of residents (55 percent) speak a language other than English at home; and a relatively high percentage (20 percent) speak English less than very well. Educational attainment is low, with only 55 percent of the population completing high school (U.S. Census Bureau 2008f, 2008g).

3.11.4 Economic Characteristics

The population growth in the region is tied to increasing retirement populations. Non-labor sources of income (such as pensions and interest from savings) are becoming increasingly important. Differences between urban and rural areas are evident in economic changes, particularly in employment and income. The economic history of many rural communities is closely linked to natural resources such as soils and water for crop and livestock production; hardrock minerals; and mining. The economies have experienced similar national economic trends with public administration, services, and retail sectors dominating employment, and all have experienced a decline in agriculture and mining sector employment. Small rural communities generally experience changes in their economies more intensely than larger towns (Sonoran Institute 2003).

Employment Sectors

In 2000 and 2006, the largest employment sector in Maricopa County was the *educational services, and health care, and social assistance sector*, which represents 16.1 percent and 16.7 percent, respectively, of the civilian labor force 16 years and older. Similarly, the largest employment sector for Yuma County and Pima County in 2000 and 2006 was also the *educational services, and health care, and social assistance sector.* From 2000 to 2006, the labor for this employment sector increased for Pima County from 21.79 to 22.5 percent and decreased for Yuma County, 19.3 to 17.61 percent. In 2000 and 2006, the labor force 16 years and older within Yuma County had the largest percentage within the Armed Forces, 3 percent and 5.46 percent, respectively. In contrast, Maricopa County had the least at 0.3 percent in 2000 and 0.23 percent in 2006 (U.S. Census Bureau 2008h, 2008i).

The largest employment sector in Gila Bend in 2000 was the *arts, entertainment, recreation, accommodation, and food services sector,* which represented 16.9 percent of the labor force. This employment sector includes many services used by tourists and those visiting the natural

amenities of the region. The sector of *agriculture, forestry, fisheries, and mining* made up a much larger proportion of the labor force in Gila Bend compared to Maricopa County and the state of Arizona. In Gila Bend, 8.7 percent of the labor force was employed in this sector in 2000 compared to 0.6 percent of the county's labor force and 1.5 percent of the state's. After the *arts, entertainment, recreation, accommodation, and food service sector*, the next top three employment sectors in Gila Bend in 2000 were *retail trade* (15.5 percent of the labor force), *education, health and social services* (14.4 percent of the labor force), and *public administration* (11.8 percent of the labor force) (U.S. Census Bureau 2008f). The largest employment sector for the San Lucy District of the Tohono O'odham Nation was the *construction sector* (12.8 percent of the labor force) (U.S. Census Bureau 2008h).

In Ajo, there was a shift in the economy from mining and manufacturing (related to mining) in the 1980s, to a service-dominated economy in the 1990s and 2000. Similar to Pima County, in 2000, the largest employment sector in Ajo was the *educational, health, and social services sector*, which accounted for 16.9 percent of the labor force. The sector of *arts, entertainment, recreation, accommodation and food services* made up the second largest employment sector in Ajo. This employment sector includes many visitor services potentially related to visitation to the Organ Pipe Cactus National Monument, Cabeza Prieta NWR, and other attractions in the Ajo area. The sector of *public administration* made up 13.1 percent of Ajo's labor force, the third largest employment sector in Ajo. This sector includes the workforce that administers and oversees federal, state, and local government agencies, which include the agencies overseeing the federal land in proximity to Ajo. By comparison, the *public administration* sector accounted for 5.8 percent of the state and 5.0 percent of Pima County employment sectors. The third largest employment sector for the county and state was *professional, scientific, management, administrative, and waste management services* at 10.5 percent and 10.3 percent respectively; however, this sector represents 3.8 percent of the labor force in Ajo (U.S. Census Bureau 2008f).

Income and Unemployment

Tri-County Area

In 2000, Arizona had an unemployment rate of 5.6 percent (Table 3-18). From 2000 to 2007, the unemployment rate decreased to 3.8 percent. Of the three counties within the study area, Maricopa County had the lowest 2000 and 2007 unemployment rates equaling 4.7 and 3.2 percent respectively; however, Yuma County had the highest at 12.1 and 13.9 percent, respectively. Unemployment rates in Yuma County have been historically high due to seasonal employment within the agriculture sector. In 2000, the San Lucy District of the Tohono O'odham Nation had the highest unemployment rate within the ROI at 20.4 percent.

Between 1999 and 2006, median household income increased on average by 20.0 percent for Maricopa County (see Table 3-18). Pima County median household income increased by 17.7 percent from 1999 to 2006, whereas Yuma County increased the least at 15.8 percent. For 1999 and 2006, Maricopa County had the highest median household income for the tri-county area ($51,827 and $62,312, respectively).

Table 3-18
Median Household Income and Unemployment Rates

Geographic Area	*Median Family Income in 1999*	*Median Family Income in 2006*	*2000 Unemployment Rate (percent)*	*2006 Unemployment Rate (percent)*	*2007 Unemployment Rate (percent)*
State of Arizona	$46,723	$55,709	5.6	4.9	3.8
Maricopa County	$51,827	$62,312	4.7	4.2	3.2
Gila Bend	$30,403	--	6.7	--	--
Census Tract 7233.02	$36,890	--	7.2	--	--
Census Tract 9407	$7,266	--	71.4	--	--
Pima County	44,446	$52,302	5.3	6.3	3.7
Ajo	$28,783	--	9.4	--	
Census Tract 49	$22,917	--	11.3	--	--
Census Tract 50	$29,310	--	9.3	--	--
Census Tract 9407	$15,781	--	35.9	--	--
Yuma County	$34,659	$40,141	12.1	9.2	13.9
Census Tract 106	$28,359	--	1.2	--	--
Native American Reservations					
San Lucy District of the Tohono O'odham Nation	$20,000	--	20.4	--	--

Source: Arizona Department of Commerce 2008a, 2008b, 2008c; BLS 2008; U.S. Census Bureau 2008f, 2008g, 2008h.

Surrounding Communities

In 1999, median family income for Gila Bend was $30,403 compared to $51,827 for the county and $46,723 for the state (U.S. Census Bureau 2008f). Between 1979 and 1999, median family income in Gila Bend decreased by 17.3 percent, while it increased by 10.3 percent in Maricopa County and 7.1 percent in Arizona (Sonoran Institute 2003). Unemployment in Gila Bend has followed the same trend as for the county and state (an increase in the 1980s and then a decrease in the 1990s), but has remained higher than the county and the state. In 2000, the unemployment rate in Gila Bend was 6.7 percent, which was above the level for the county (4.7 percent) and state (5.6 percent) (Sonoran Institute 2003).

The median family income in Ajo was $28,783 in 1999, which was lower than the state and Pima County. Between 1969 and 1999 median family income (adjusted) decreased by 34.7 percent; however, this indicator increased 12.0 percent in Arizona and 9.5 percent in Pima County. This change relates to the closure of the mine in Ajo, and corresponding decreases in population

demographics, which indicate that working-age families moved out, and retirement-aged people moved in. From 1989 to 1999, Ajo's median family income increased by 13.0 percent, while this demographic increased by 8.1 in Arizona and 6.8 percent in Pima County (U.S. Census Bureau 2008f, Sonoran Institute 2003).

The median family income for Census Tract 7233.02 north of the BMGR, at $36,890 is comparatively higher than the other census tracts adjacent to the BMGR. This is likely driven by the Phoenix metropolitan suburban areas in the northern portion of the census tract. The median income for Census Tract 106, at $28,359 (U.S. Census Bureau 2008f), is probably more representative of the communities in Maricopa County along Interstate 8 north of the BMGR than Census Tract 7233.02. The median family income of the Tohono O'odham Nation, at $7,266 (Census Tract 9407, Maricopa County) and $15,781 (Census Tract 9407, Pima County), is the lowest of the areas evaluated.

In 2000, Census Tract 9407 within Maricopa County had a significantly greater unemployment rate than the rest of the ROI at 71.4 percent. The second highest unemployment rate within the ROI was Census Tract 9407 within Pima County (35.4 percent). This census tract for both counties lies entirely within the Tohono O'odham Nation main reservation. The San Lucy District of the Tohono O'odham Nation had a lower unemployment rate at 20.4 percent. Within the ROI, Census Tract 106 had the lowest unemployment rate at 1.2 percent in 2000.

3.11.5 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed into law on 11 February 1994. The Executive Order establishes environmental justice as a regulatory objective pertaining to the proportional distribution of adverse environmental effects that would be experienced by minority communities and low-income socioeconomic groups. In particular, environmental justice is achieved if low-income and minority communities are not subjected to disproportionately high or adverse environmental effects. In environmental justice analysis, minority populations and low-income populations are defined as follows.

- A minority represents the union between (not the sum of) minority race populations (Black or African American, American Indian and Alaska Native, Asian Alone, Native Hawaiian and Other Pacific Islander) and the Hispanic/Latino population (CEQ 1997). The union includes those that reported some other race and two or more races and Whites of Hispanic/Latino origin.
- Minority populations are identified where either: (a) the minority population of the affected area exceeds 50 percent, or (b) the minority population percentage of the

affected area is meaningfully greater than the minority population percentage in the general population (CEQ 1997).

- Low-income populations are defined as areas where a greater percentage of persons are living below the poverty level than in the comparison population. Poverty statistics presented in U.S. Census Bureau publications use thresholds prescribed for Federal agencies. The official definition uses 48 thresholds that take into account family size and the presence and number of family members under 18 years old. For the 2000 Census (which relies on 1999 income levels), the weighted average poverty threshold for a family of four is $17,029 (U.S. Census Bureau 2008f). In 2006, it was $19,806 (U.S. Census Bureau 2007).

For the purpose of this analysis, the tri-county area consisting of Maricopa, Pima, and Yuma Counties serves as the community of comparison since it is the next largest geographic area that encompasses the ROI. In the tri-county area, the total minority population is 35.7 percent and the total percent of individuals living below the poverty line is 12.6 percent. These are the minority/low-income population thresholds for the purposes of this EIS.

As shown in Table 3-19, all areas within the ROI, except Census Tract 49, meet the criteria for minority and low-income populations. The highest percentage of minorities and low-income populations was reported on the San Lucy District of the Tohono O'odham Nation and Census Tracts 9407 in Maricopa and Pima County. Both census tracts are comprised solely of the Tohono O'odham Nation. Gila Bend, Ajo, and Census Tracts 7233.02, 50, and 106 are all characterized as minority populations based on the prevalence of Hispanics.

Table 3-19
Minority and Low-Income Populations

Geographic Area	Minority Population		Low-Income Population	
	Percent Minority (2000)	Exceeds Community of Comparison Threshold (35.7 Percent)	2000 Percent Below the Poverty Line	Exceeds Community of Comparison Threshold (12.6 Percent)
Maricopa County				
Gila Bend, AZ	41.7	✔	14.25	✔
Census Tract 7233.02	51.9	✔	19.4	✔
Census Tract 9407	100	✔	71.6	✔
Pima County				
Ajo, AZ	45.7	✔	21.6	✔
Census Tract 49	28.9		6.9	
Census Tract 50	46.5	✔	22.3	✔
Census Tract 9407	99.2	✔	59.5	✔
Yuma County				
Census Tract 106	75.6	✔	34.3	✔
Native American Reservations				
San Lucy District of the Tohono O'odham Nation	99.1	✔	58.9	✔

Source: U.S. Census Bureau. 2008k, 2008l

3.12 NOISE

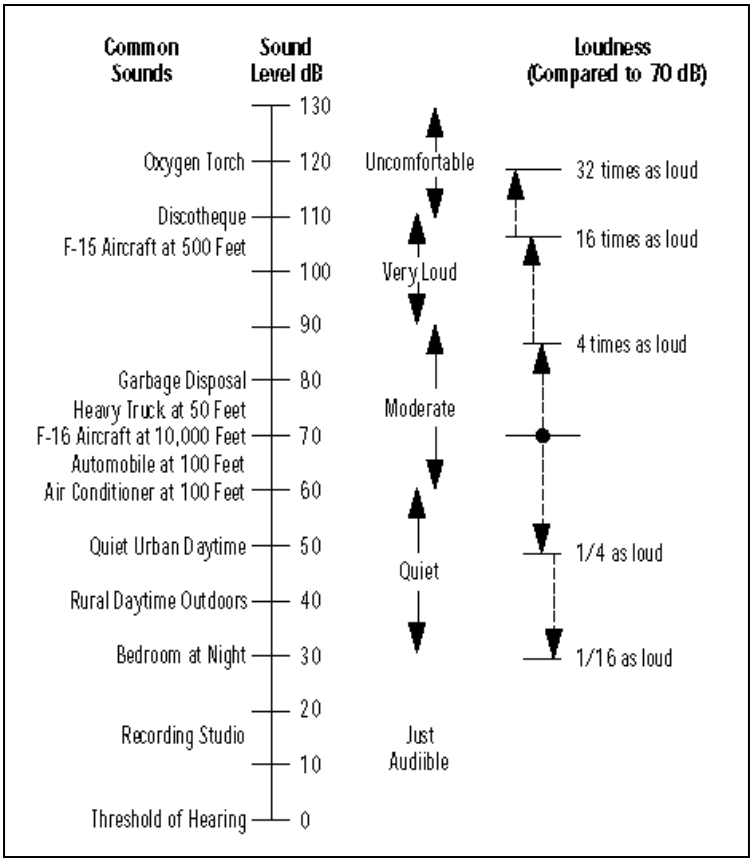
3.12.1 Definition of Resource

Noise is often defined as any undesirable sound that interferes with communication; is intense enough to damage hearing; diminishes the quality of the environment; or is otherwise annoying. Response to noise varies by the type and characteristics of the source; distance between source and receptor; receptor sensitivity; and time of day. Noise may be intermittent or continuous, steady or impulsive, and may be generated by stationary or mobile sources. Personal opinions on noise vary widely. For example, one person might consider rock music as pleasing but opera music as offensive. A second person may perceive just the opposite.

The most readily identifiable sources of noise on BMGR East are aircraft operations and explosive ordnance operations. The most familiar form of aircraft noise is subsonic and generated by an aircraft's engines. Supersonic operations (i.e., when an aircraft flies faster than the speed of sound) generate brief impulsive sounds, or sonic booms. Blast noise is primarily associated with the detonation of "live" weapons composed of high explosive materials. This typically occurs when training aircrews deliver ordnance to established targets, but also occurs during EOD operations.

An assessment of aircraft and blast noise requires a general understanding of sound measurement and noise effects on people and animals. Figure 3-11 shows typical maximum sound measurements in decibels (dB) and the relationship of those measurements to common sounds.

Figure 3-11
Typical Maximum A-Weighted Common Sounds



Source: Adapted from Harris, 1979

Noise levels are measured in dBs on a logarithmic scale, which means an increase in sound level of about 10 dB is usually perceived as doubling the sound's loudness. Most conversations would

measure between 50 and 60 dB, depending on how close the people are standing to one another. The sound of a ringing alarm clock at a distance of about 2 feet is about 80 dB.

Noise is represented by a variety of metrics (quantities) developed to account for the type of noise and the nature of what may be exposed to the noise (i.e., receptor). Human hearing is more sensitive to medium and high frequencies than to low and very high frequencies; therefore, it is common to use "A-weighted" metrics, which account for this sensitivity. "C-weighted" noise is used for high-energy impulsive sounds, such as sonic booms and high explosive bomb bursts. The low-frequency noise component of "C-weighted" noise is frequently heard as a rumble.

Different time periods also play a role with regard to noise. People hear a sound that occurs at a given time and intuitively perceive it as an instantaneous noise level, such as the maximum level that occurs during an aircraft flyover. However, the effects of noise depend on total exposure over extended time periods. Furthermore, cumulative noise metrics are used to assess the impact of ongoing activities such as those which occur at BMGR East.

Appendix C provides additional definitions of noise and a detailed discussion of its effects on people and the environment; the primary information needed to understand the noise analysis is summarized below.

3.12.2 Study Area

Within the BMGR region, noise is generated by various military and non-military sources. While the predominant source of noise on or in the vicinity of the range comes from military training activities (e.g., aircraft operations and munitions training), noise is also generated by other military operations such as movement of vehicles on land or by rail and delivery of inert ordnance. Civilian actions, such as movement of vehicles on public roads or railways, construction operations, and overflight by commercial aircraft, also contribute to noise in the region.

The noise study area, or ROI, is focused on BMGR East and noise generated by ongoing military training activities, along with that generated from the military operations and construction activities associated with the ten proposal actions addressed in this EIS. Noise from other military sources and civilian actions are relatively constant and insignificant components of average annual noise levels, and are not quantitatively assessed.

Therefore, the study area is defined by the following operating areas as listed in Table 3-20: Gila Bend AFAF, restricted airspace R-2301E, R-2304, and R-2305; MTRs terminating within BMGR East restricted airspace; and the Marine Corps low-level fixed- and rotary-wing WTI flight corridors.

Table 3-20
Noise Study Area

Area/Airspace	Sub-area	Noise-generating Activity
Gila Bend AFAF	Gila Bend AFAF	Some fixed-wing aircraft and helicopter training operations and emergency or precautionary recovery for aircraft that experience malfunctions or damage while operating on the BMGR
R-2301E	Manned Ranges 1, 2, and 4	Bombing and strafing by aircraft flying prescribed patterns against standardized targets
	North and South TAC	Bombing and strafing of targets that simulate a realistic battlefield using realistic avenues of attack and escape for each target; delivery of high explosive ordnance to established targets
	Air-to-Air High and Low	Simulated and live-fire training in air-to-air gunnery
R-2304	East TAC	Bombing and strafing of targets that simulate a realistic battlefield using realistic avenues of attack and escape for each target; delivery of high explosive ordnance to established targets
R-2304/2305	Manned Range 3	Bombing and strafing by aircraft flying prescribed patterns against standardized targets
R-2301E/W Cabeza Prieta NWR Flight Corridors	Fixed-Wing 1	Low-level overflight (floor of 200 feet AGL for fixed-wing aircraft and 50 feet AGL for helicopters) in support of Marine Corps WTI
	Fixed-Wing 2	
	Rotary-Wing 1	
	Rotary-Wing 2	
	Rotary-Wing 3	
MTRs	VR-223, VR-231, VR-239, VR-241, VR-242, VR-243, VR-244, VR-245, VR-259, VR-260, VR-263, VR-267, VR-268, and VR-269	Low-level overflight (floor of 500 feet AGL) to an attack on a ground target at manned and TAC ranges

A comprehensive analysis of noise exposure levels from military activities at BMGR East was conducted with the legislative EIS for the Renewal of the BMGR Land Withdrawal (U.S. Department of the Air Force 1999, Wyle Laboratories 1997). Although this analysis was completed in 1999, it remains representative of the maximum baseline annual sorties flown and high explosive ordnance delivered within the study area. Therefore, the baseline noise environment presented here, unless otherwise referenced, is derived from that analysis.

3.12.3 Primary Noise Metrics

Three metrics are instrumental in assessing noise effects associated with aircraft operations and blast noise from explosive ordnance in the study area. Each metric has a different physical meaning or interpretation, and attempts to represent the effects of noise on the environment. The following three noise metrics describe the noise environment in this EIS:

"A-weighted" Day-Night Average Sound Level (abbreviated L_{dn}): This noise metric is utilized for military aircraft operating at a fixed location, such as an airfield. Based on decades of research on the effects of noise on communities, L_{dn} has become the most widely accepted noise metric for aircraft noise. L_{dn} correlates well with community response and is consistent with controlled laboratory studies of people's perception of noise. While originally developed for major noise sources, such as highways and airports in populated areas, L_{dn} is also applicable to infrequent events and rural populations exposed to sporadic military aircraft noise. This noise metric has been used for assessing noise at the Gila Bend AFAF.

"A-weighted" Onset Rate Adjusted Monthly Day-Night Average Sound Level (abbreviated L_{dnmr}): This noise metric, derived from the L_{dn}, is utilized for military aircraft operating in airspace such as ranges and MTRs, and accounts for the surprise or startle effect that results from a high-speed aircraft overflight by adding from 0 to 11 dB penalty for the event, depending on the rate at which noise from the approaching aircraft increases. Further, an additional 10 dB is added to sound levels from nighttime aircraft operations (occurring between 10 p.m. and 7 a.m.) to take into account reduced background noise levels and increased sensitivity to noise at night. L_{dnmr} is also based on operations during the busiest month of the year (when available) so that predictions are not diluted by seasonal periods of low flight activity.

"C-Weighted" Day-Night Average Sound Level (abbreviated CDNL): This metric is used for high-energy impulsive sounds, such as those produced by supersonic aircraft operations and high-explosive bomb bursts; thereby capturing higher energy created at low frequencies by these noises. Compared to that generated by typical aircraft operations, this low-frequency component (frequently heard as a rumble), can induce structural vibrations generating additional annoyance to people beyond the audibility of the sound created by the blast.

Both L_{dn} and L_{dnmr} sum the individual noise events and average the resulting level over a specified length of time. Thus, they are composite metrics representing the maximum noise levels, duration of the events, and number of events. Neither cumulative metric represents the variations in the perceived sound level; however, they both provide an excellent measure for comparing noise exposure of multiple aircraft noise events.

3.12.4 Methodologies for Predicting Noise

Computer programs are widely used in the assessment of environmental noise exposure. Models generate predictions of noise exposure levels and potential changes to such levels prior to implementation of actions such as those considered in this EIS. Four primary models (NOISEMAP, MR_NMAP, MOABOOM, & BNOISE) assess noise from military activity on BMGR East.

NOISEMAP: This group of computer-based programs, collectively called NOISEMAP, is used to analyze aircraft noise exposures around airfield facilities. The NOISEMAP program incorporates the number of daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) operations, flight paths, and flight profiles (power settings, altitudes, and speeds) to calculate the noise exposure at many points on the ground around the facility. This model was used in assessing noise exposure associated with aircraft operations at Gila Bend AFAF.

MR_NMAP: The Air Force developed the MR_NMAP (MOA-Route NOISEMAP) computer program to calculate subsonic aircraft noise in MOAs and along MTRs. MR_NMAP calculates noise for both random operations and those channeled into MTRs. For range areas with no preferred flight tracks, MR_NMAP computes noise based on a uniform distribution of sorties within the airspace. For MTRs/low-level flight corridors, MR_NMAP calculates noise levels based on centerline of the route navigation points. Aircraft operational data used for calculating noise levels include aircraft, hours of operation, power settings, speeds, duration, altitude profiles, and sorties. This approach results in the presentation of the highest L_{dnmr} values expected. This model was used in assessing noise exposure within restricted airspace and along MTRs and operations on the WTI flight corridors.

MOABOOM: This model is used to predict a total boom exposure from multiple operations. The program plots elliptical CDNL to represent noise exposure levels and assess supersonic operations at BMGR East. Input data is the same as noted above for the MR_NMAP model.

BNOISE: This model is used to analyze blast noise exposure created from activities such as the use of high explosive materials in "live" weapons. BNOISE produces CDNL contours for military operations with impulsive noise sources. Input data required for modeling this activity includes the type of ordnance, the trinitrotoluene (TNT) equivalent of explosive charge, location of the detonation, and number of daytime and nighttime events occurring per year. This model assesses high explosive ordnance delivery to the HE Hill targets in North, South, and East TAC.

3.12.5 Baseline Noise Exposure Levels from Aircraft Operations at Gila Bend AFAF

Aircraft operations at Gila Bend AFAF include daily overhead approaches and pattern operations by F-16 and A-10 aircrews from Luke and Davis-Monthan AFBs; routine support of WAATS and the Army National Guard 1/258th Attack Helicopter Battalion who use Gila Bend AFAF to support live-fire training within North and East TAC ranges; use by Arizona Air National Guard as an outlying field for practicing traffic pattern and emergency simulated flameout (engine power loss) procedures; and emergency or precautionary recoveries of military aircraft that malfunction or are damaged during operations on the BMGR. The highest noise exposure levels at BMGR East occur at the Gila Bend AFAF.

Noise contours representing annual average noise exposure levels for baseline operations at Gila Bend AFAF were prepared in 2004 based upon use of the F-16 and A-10 as primary aircrafts. As shown in Figure 3-12, these L_{dn} noise contours are at 80 dB in the immediate vicinity of the airfield within the boundaries of Gila Bend AFAF and extend to the north and east of the BMGR East boundary at levels below 75 dB (and primarily below levels of 70dB).

3.12.6 Baseline Cumulative Noise Exposure Levels for Non-Gila Bend AFAF Aircraft Operations

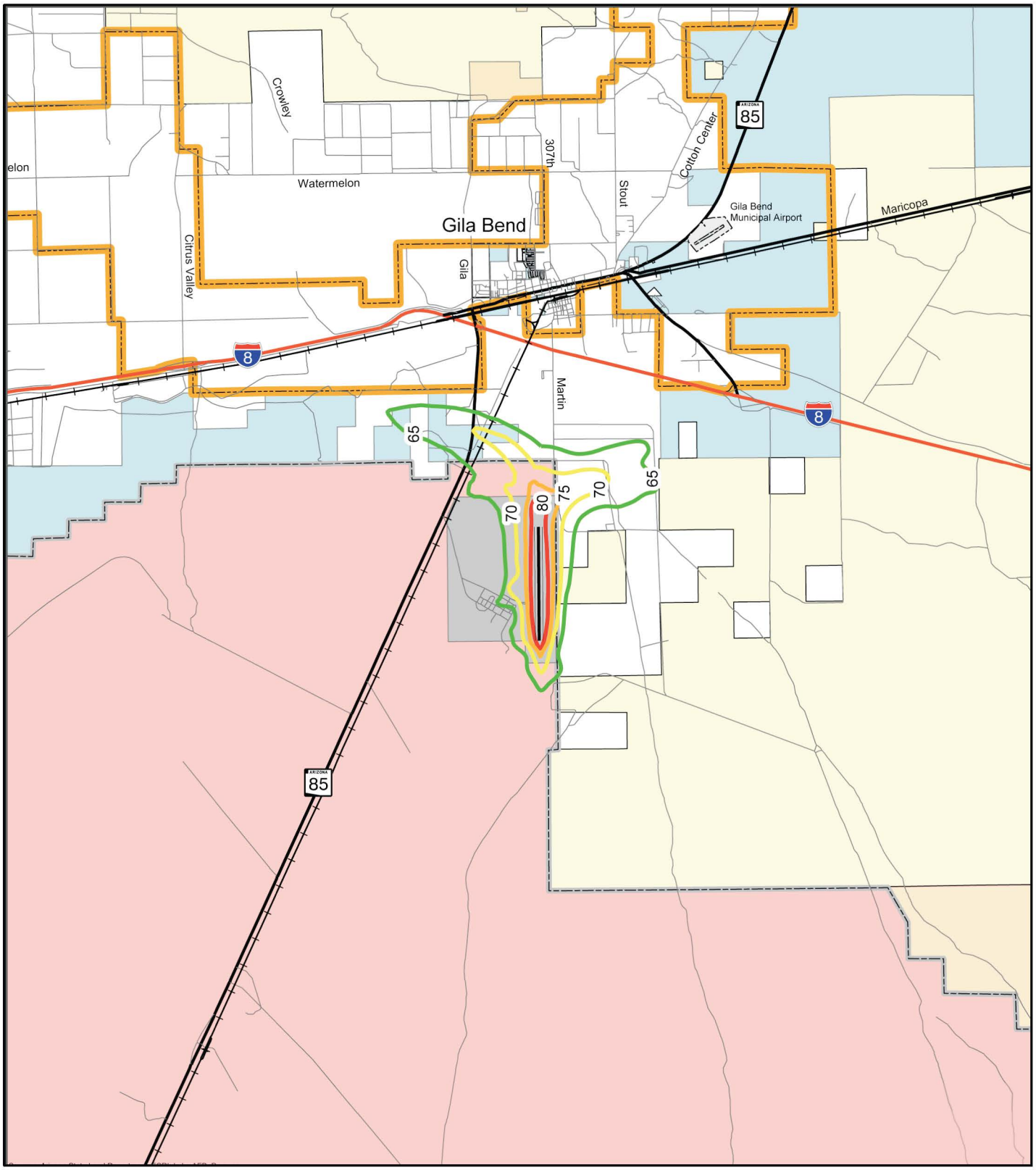
Baseline noise exposure levels were modeled based on data collected in the late 1990s for the analysis of effects associated with the renewal of the BMGR land withdrawal. Modeling was based on a number of data inputs regarding sortie levels, altitude distribution during aviation, time of day, and other factors. As previously noted, sortie numbers and altitude distribution for flight operations fluctuate routinely from year to year based on training needs. Notably, since flight data were collected the total number of sorties flown has decreased, but about 30 to 40 percent more of the current sorties are being flown at the lower altitudes. Fluctuations are also likely to occur in the future, but the type of change cannot be predicted.

With the exception of Gila Bend AFAF, cumulative L_{dnmr} contours of 55 dB and greater from aircraft operations at BMGR East are illustrated in Figure 3-13. These contours depict the baseline noise exposure levels associated with all military flight activity in the study area. Cumulative noise contours only occur in areas with a relatively large concentration of flight activity, and such noise levels are comparatively low (less than 65 dB).

North, South, and East TAC constitute the only areas within the BMGR where the annual average noise contours exceed 60 dB. The L_{dnmr} levels for Ranges 1, 2, 3, and 4, where concentrated flight activities occur against numerous tactical targets spread over relatively small areas, constitute the only other areas on the BMGR where annual noise contours of 55 dB and higher exist. These tactical and manned ranges may individually and cumulatively reach levels of up to 65 dB.

There are no cumulative noise contours of 55 dB or greater associated with any of the WTI corridors or MTRs, due primarily to infrequent operations in such airspace units on an annual basis.

Further description is provided below for the noise exposure levels associated with subsonic aircraft operations and WTI and MTR operations. Separate discussions of noise exposure levels from supersonic aircraft and explosive ordnance operations follow.



BMGR-003-022309

Noise Contours

- 65 Ldn
- 70 Ldn
- 75 Ldn
- 80 Ldn

Land Ownership

- BLM
- State Trust Lands
- Indian Reservation
- Military
- Private
- Town Limits
- Gila Bend Air Force Auxiliary Field
- Vicinity Box

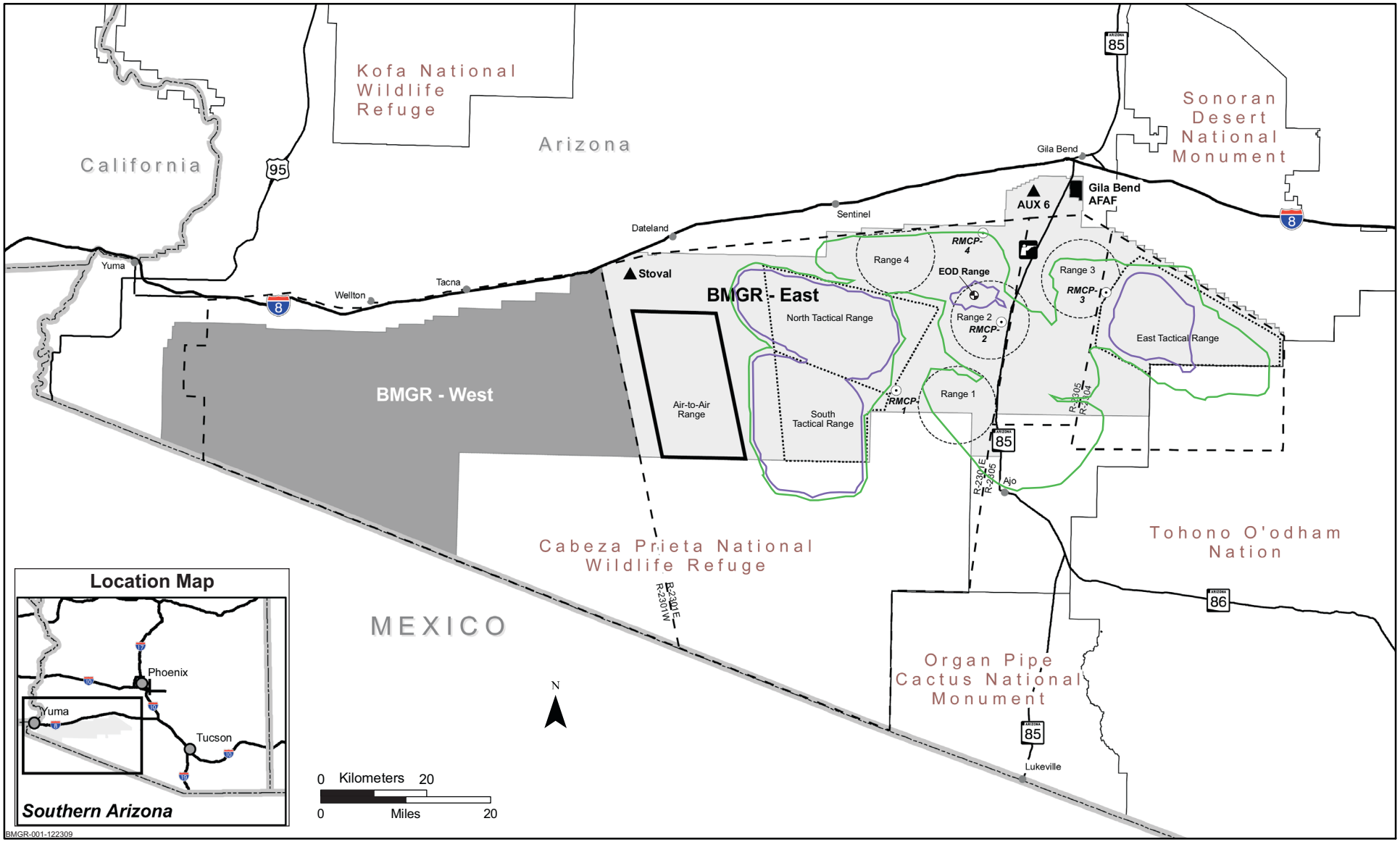
N

0 Kilometers 2

0 Miles 2

Figure 3-12

NOISE CONTOUR LEVELS AT THE GILA BEND AFAF



Legend

- Small Arms Range
- Range Munitions Consolidation Point
- Tactical Range Boundary
- Restricted Airspace Boundary
- Manned Subrange Airspace Boundary

Barry M. Goldwater Range

- BMGR East
- BMGR West

Noise Contours

- 55 dB
- 60 dB

Figure 3-13

NOISE CONTOUR LEVELS WITHIN BMGR EAST AND VICINITY

3.12.6.1 Subsonic Aircraft Operations

Noise levels associated with these subsonic aircraft operations on the BMGR by individual area are summarized in Table 3-21. Aircraft operations within R-2301E, R-2304, and R-2305 consist of flight activities primarily involving F-16s and A-10s flying at altitudes as low as 100 feet AGL up to altitudes over 45,000 feet MSL and at airspeeds sometimes over 500 knots (nautical miles per hour) indicated airspeed (KIAS). Examples of specific flight activities conducted on these ranges include air combat maneuvering at altitudes above 25,000 feet AGL between similar and dissimilar aircraft; flights of two or four aircraft flying low-altitude (200 to 5,000 feet AGL) bombing operations delivering inert weapons on tactical and conventional targets; and helicopters flying "nap of the earth" profiles (i.e., training in low-level type tactical navigation and avoidance of detection by enemy ground radar). While several rotary-wing aircraft models utilize the range, they account for less than 2 percent of the total range sorties.

Table 3-21
Maximum L_{dnmr} Levels for Aircraft Operations in Study Area

Airspace Area	Sub-Area	Maximum L_{dnmr} Level, dB
R-2301E	Range 1	58
	Range 2	59
	Range 4	59
	North TAC	62
	South TAC	62
	Air-to-Air High	<45
	Air-to-Air Low	49
R-2304	East TAC	58
R-2304/2305	Range 3	54
R-2301E/W Cabeza Prieta NWR Flight Corridors	Fixed-Wing 1	48
	Fixed-Wing 2	48
	Rotary-Wing 1	<45
	Rotary-Wing 2	<45
	Rotary-Wing 3	<45
MTRs	VR-223	54
	VR-231	50
	VR-239	<45
	VR-241	46
	VR-242	<45
	VR-243	<45
	VR-244	<45
	VR-245	52
	VR-259	50
	VR-260	48
	VR-263	48
	VR-267	<45
	VR-268	<45
	VR-269	<45

Note: All noise levels calculated to be less than 45 dB, are given the annotation "<45." Time-average outdoor sound levels less than 45 dB are well below any currently accepted guidelines for aircraft noise incompatibility. Noise resulting from these subsonic aircraft operations is relatively low and insignificant in comparison to the size of airspace available and used.

3.12.6.2 Weapons Tactics Instructor Flight Corridor and Military Training Route Operations

Flight operations within the 5 WTI flight corridors and 14 MTRs in the study area occur at various altitudes, airspeeds, locations, and frequencies depending on the kind of training that is being conducted and the airspace available in which to conduct that training. The large majority of the aircraft utilizing WTI flight corridors and MTRs are fighter type aircraft, which generally utilize the airspace from 300 feet to 5,000 feet AGL for the majority of their flight activities. Within the WTI flight corridors, helicopters fly as low as 50 feet AGL. The majority of the airspeeds along these routes are in excess of 250 KIAS, with some ranging up to 550 KIAS. Under these flight conditions, none of the MTRs or WTI flight corridors analyzed had noise levels above an L_{dnmr} value of 55 dB, and approximately half of the operations resulted in levels below 45 dB.

3.12.6.3 Supersonic Operations

During normal air-to-air engagements in R-2301E, aircraft generally remain subsonic; however they may create sonic booms by exceeding the speed of sound for short bursts of time during some engagements. Approximately 5 percent of F-16 sorties in R-2301E exceed the speed of sound. Although sustained supersonic speeds in excess of an average of 50 seconds per sortie do occur during maintenance functional check flights, such flights occur above 30,000 feet MSL and do not typically propagate to the ground.

Noise resulting from supersonic aircraft operations is minimal for aircraft operations associated with the BMGR. Supersonic flight information associated with F-16 air combat maneuvering activities in the Air-to-Air High area of R-2301E is incomplete, but is thought to average less than one flight per day on an annual basis. Although each supersonic flight could result in multiple sonic booms, this level of supersonic flight would result in an average of less than ten sonic booms per day in these areas. Under these flight conditions and due to the relatively low number of operations, the CDNL contour levels resulting from these operations would be less than 45 dB in R-2301E.

Impacts at ground level from supersonic flight activities can also be expressed in pounds per square foot (psf) of overpressure of a single event. For example, an F-16 flying at 10,000 feet AGL at Mach 1.3 creates an overpressure of 4.59 psf, which is considerably less than the overpressure experienced at a large-scale public fireworks display.

3.12.6.4 Explosive Ordnance Operations

Explosive ordnance operations take place within East, North, and South TAC ranges on HE hills. Ordnance delivery to these three HE hills is dropped exclusively during the period of 7 a.m. to

10 p.m. The most frequently used ordnance at these targets includes MK-82s (500-pound bombs) and MK-84s (2,000-pound bombs). Detonation of an MK-82 bomb releases less energy and makes less noise than an MK-84; however, MK-82s are used more than twice as frequently.

Noise as a result of explosive ordnance activities on North, East, and South TAC ranges was calculated to have CDNL levels of 88, 93, and 85 dB, respectively, at the center of each of these areas. The noise levels rapidly diminish with increasing distance. For example, within 0.5-mile, the levels are reduced by approximately 6 dB and within a mile they are further reduced a total of 15 dB. The area exposed to these levels of noise within the 62 dB CDNL contour for East TAC is about 6,917 acres, with South and North TAC ranges exposing a smaller area.

Approximately 100 live missiles are delivered annually to the air-to-ground targets. The level of noise generated by this activity is insufficient to generate CDNL noise exposures that were above 45 dB.

4 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter contains the potential environmental consequences of the ten proposed actions, action alternatives (where applicable), the ten no-action alternatives, and the scientific and analytical basis for the predicted impacts. Environmental impacts, or modifications to the environment that are brought about by an outside action, can be beneficial or adverse. Impacts can be described as direct (effects that are caused by the action or occur at the same time and place) or indirect (effects that are caused by the action and occur later in time or are farther removed in distance, but are still reasonably foreseeable). The significance of the impact is evaluated in consideration of both context and intensity as required by CEQ regulations (40 CFR 1508.27).

The resources are addressed in the same order as they were presented in Chapter 3. The environmental effects of implementing each of the ten proposed actions and alternatives to each resource area are evaluated in subsections sequentially numbered to correspond with each of the proposal numbers. The eleventh subsection presents the aggregate effects wherein the environmental consequences of all the proposed actions combined are evaluated for each resource. The analysis of aggregate effects focuses on the identification of the combined additive or interactive effects. Aggregate effects should not be confused with cumulative effects, which are evaluated separately in Chapter 5. Aggregate impacts pertain to the proposed and alternative actions only, while cumulative impacts pertain to the additive or interactive effects that would result from the incremental impact of the proposed action and alternatives when added to other past, present, and reasonably foreseeable future actions.

4.2 EARTH RESOURCES

Impacts to soils could result if an action increases the levels of contaminants in those soils or increases the potential for soil erosion. Contamination effects would be significant if the action causes the level of a contaminant to exceed federal or state standards for that substance in the soil. Soil erosion impacts are considered significant if the project action results in accelerated erosion with a resulting loss of vegetation beyond the immediate area of disturbance.

4.2.1 Proposal 1 - Sensor Training Area

4.2.1.1 Alternative 1.A - Air to Air Range Site

Earth resources affected by implementation of Alternative 1.A would relate primarily to initial short-term ground disturbing activities associated with establishment of the STA. Soils in the area are the Coolidge soil unit, which is moderately erodible (see Figure 3-1). This impact analysis assumes the entire 640-acre footprint for these activities would be disturbed, although it is likely that there would be limited or no disturbance in portions of the STA away from roads, infrastructure, and equipment, or where vegetation is retained. Most disturbances are expected to be within approximately 400 acres within the 640-acre STA site and to a lesser extent in the EOD clearance areas, which would initially include the 640-acre site and a 1,000 foot buffer, and a 300-foot radius around targets on an annual basis. No severe water erosion hazards have been identified in the ROI; however, wind erosion hazards could be severe based on soil types. Erosion from wind and water could result in sedimentation in the ephemeral washes.

Over the long term, soils on the roads that would be established or existing roads that would be used more regularly under Alternative 1.A may be most affected by erosion. Although also dependant on soil types and drainage patterns relative to roads, routine road use prevents vegetation growth and other natural soil stabilization. The proposed installation of culverts in roadway trouble spots and the use of gravel on the portions of the road with the most unstable soils would help to minimize erosion. Disturbance of cryptogamic soils and desert pavements would result in long-term loss of these surfaces due to the nature of these soils and time and conditions needed to form them. There could be localized high impacts to these desert surfaces. On a regional scale, the impact would be minimal because cryptogamic soils and desert pavements are more widespread than the Alternative 1.A site. Whenever possible, infrastructure and equipment would be located to minimize disturbance to ephemeral washes, vegetation, cryptogamic soils, and desert pavements. BMPs such as proper grading, stabilization, and culverts to channel storm water runoff would also help minimize soil erosion. Fugitive dust would be reduced during construction through techniques that may include soil watering, placing

gravel over fine soils, and proper grading. The arid climate found at BMGR East, as well as the phased distribution of activities, would further minimize erosion impacts.

The implementation of Alternative 1.A would be subject to conditions of the AZPDES CGP program (see Section 3.3.8) because the area of disturbance would be greater than 1 acre. The required SWPPP would note specifics with regard to changes to existing contours and drainage patterns, BMPs including soil stabilization efforts and locations, detailed drawings, and a timeline or construction schedule for implementation of prevention and response measures that are required during construction activities. These measures will be in place to prevent and/or minimize spills/releases from hazardous materials onto ground surfaces and help minimize the effects from construction activities. Some post-construction earth disturbance could occur due to maintenance of urban infrastructure, roads, and equipment during EOD clearance.

The munitions constituents in the flares and Smokey SAMs that would be used at the STA would be similar to those already delivered to BMGR East. There would not be increases in the existing allocations that BMGR users have for these munitions. Although perchlorate is used in the propellants for Smokey SAMs and is one of the more mobile munitions constituents in the environment, sampling at BMGR East indicates that perchlorate would not migrate to off-range locations (see Section 3.10.5 for more detail). Therefore, there would be no increased potential for munitions constituents to be transported off-range.

Overall, implementation of Alternative 1.A would not result in soil contamination that would exceed federal or state standards and the accelerated erosion that may occur with implementation of Alternative 1.A would not result in loss of vegetation beyond the immediate area of disturbance. Therefore, potential impacts to earth resources would not be significant.

4.2.1.2 Alternative 1.B - South Tactical Range Site

The impacts of implementation of Alternative 1.B would be similar to those of implementing Alternative 1.A, although impacts would likely be reduced by comparison due to the following factors.

- There is a greater comparative level of previous disturbance at the Alternative 1.B site as compared to the Alternative 1.A site, so there would be fewer erosion impacts associated with disturbance of intact soil associations, desert pavements, and biological soil crusts.
- EOD clearance footprints in this area would not be increased because these processes and associated disturbances occur under current maintenance activities.

Therefore, as with Alternative 1.A, implementation of Alternative 1.B would not exceed a federal or state standard or in loss of vegetation beyond the immediate area of disturbance and, therefore, would not be significant.

4.2.1.3 Alternative 1.C - North Tactical Range Site

Implementation of Alternative 1.C would pose the same potential for impacts as Alternative 1.A, with the following distinctions.

- Existing levels of disturbance at the site are likely to be similar to those of Alternative 1.A, as there are some impacts to soils from past training activities at the Alternative 1.C site. However, the dominant soil unit at the proposed site (the Rillito unit) is slightly more erodible than the Coolidge unit at the Alternative 1.A (both fall within the moderate range of K values, see Table 3-1).
- In comparison to Alternative 1.A, approximately 2.5 acres of additional land would be disturbed for the development of a new road. Accelerated wind and water erosion would be expected during the construction phase and, to a lesser degree, over time with continual disturbance from repeated use and maintenance of the road.
- The proposed upgrade to approximately 4 miles of the existing but not currently open or used Malpias Hill road. This stretch of road traverses a wide valley area that contains fine, silty alluvial material that has accumulated in some areas, particularly where the alluvial basin drainage is somewhat closed where the Mohall unit abuts the Cherioni unit associated with the Sentinel Plain Lava Flow (see Figure 3-1). Although the Mohall unit has moderate erodibility, the area exhibits higher rates of erodibility, such as occurs at the nearby Glenbar unit. During the construction phase (involving trucking in, leveling, and compacting gravel surfaces), there would be some erosion, particularly where there is storm water runoff. In the long term, these upgrades would reduce erosion that otherwise would occur with the increased use of this existing road.

The overall conclusion with regard to significance of impacts under Alternative 1.C would be the same as under Alternatives 1.A and 1.B. Implementation of Alternative 1.C would not exceed a federal or state standard or loss of vegetation beyond the immediate area of disturbance and, therefore, would not be significant.

4.2.1.4 Alternative 1.D – No-Action Alternative

With implementation of Alternative 1.D, the no-action alternative for this proposal, there would be no impacts to earth resources. Existing roads within the alternative sites would continue to be

used in support of ongoing range operations without proposed upgrades and ongoing accelerated erosion associated with use of these roads would continue.

4.2.2 Proposal 2 – Target Reconfiguration

4.2.2.1 Alternative 2.A - Proposed Action

Implementation of Alternative 2.A would result in potential for localized increased rates of erosion that would occur with earth moving activities associated with target reconfiguration. Elimination of targets would result in minor localized increased disturbance during the removal process, but soils would be expected to recover and reform to be more resistant to erosion over time. Depending on the location of the eliminated target, the EOD footprint could be reduced with commensurate decreases in soil disturbance. Where existing targets are updated without relocation, the increased soil disturbance would be limited to the construction period, as disturbance from maintenance and use at the sites is ongoing. Expanding the size of an existing target would increase both the primary disturbance area associated with individual targets as well as the associated EOD clearance area. Development of new targets, especially where located in areas that have lower levels of previous disturbance would correlate to increased rates of soil erosion associated with the initial disturbance during construction of the target as well as the ongoing disturbance of maintenance and EOD clearance for the new targets.

Site-specific and project-specific impacts would be evaluated on a case-by-case basis, and subjected to AZPDES CGP requirements if greater than 1 acre is disturbed (see Section 3.3.8) including a SWPP with BMPs to address erosion control and spill prevention and response. Although there is a diverse mix of soil units throughout the maximum target reconfiguration footprint (see Figure 3-1), the K-factors for these soil units is within the low range of moderate erodibility (K values of 0.24 to 0.28, see Table 3-1). Generally, soils on bajada areas are less susceptible to erosion than the silty and sandy soils in valley floors. However, the site-specific erosion hazards would more likely be affected by localized topographical and drainage conditions at the sites than the soil types.

Overall, implementation of Alternative 2.A would result in similar levels and types of disturbance as currently occur with the target areas of the BMGR East tactical ranges. Although there would be localized areas of increased erosion due to disturbance, the erosion would be localized and would not result in loss of vegetation beyond the immediate area of disturbance and, therefore, would not be significant. Federal and state standards would not be exceeded as there would be adherence to spill response protocols and no change in the types of munitions delivered to the ranges and, therefore, no increased potential for transport of munitions constituents off-range.

4.2.2.2 Alternative 2.B - No-Action Alternative

Under Alternative 2.B, the no-action alternative for this proposal, there is a potential for localized increased rates of erosion with land disturbance activities that may occur with ongoing routine target maintenance.

4.2.3 Proposal 3 – Moving Vehicle Target System

4.2.3.1 Alternative 3.A - Proposed Action

Implementing Alternative 3.A, co-locating the proposed moving vehicle target system with the existing North TAC Target 104/106 complex, would result in approximately 44 acres of disturbance at this site, which is previously/currently disturbed by target infrastructure, munitions delivery, and EOD clearance. The dominant soils are of the Growler unit (see Figure 3-1), which with a K-value of 0.32, is in the low range of moderate erodibility, but that value is slightly higher than the 0.24-0.28 K-value that is associated with most soil units at BMGR East (see Table 3-1). During construction, surface grading for the track would loosen soils and potentially cause higher rates of erosion during storms if the resurfacing causes runoff to channelize. There is also the potential for soil contamination from spills of materials used in construction equipment. These potential impacts would be minimized through adherence to the required AZPDES CGP program and associated BMPs (see Section 3.3.8).

Increased rates of erosion over the long term would be minimized through design features for the moving target. Grading activities that include placing a layer of gravel on the road would serve to stabilize the soils beneath the road and decrease wind and water driven soil loss.

Operating the 4x4 vehicle, which serves to pull the moving target, would concentrate soil degradation to areas where the 4x4 was operated and would cause some ongoing surface soil erosion. The erosion risk would be highest in areas where the target is predicted to move between 45 and 60 mph. When operational, the target would be driven at 45 mph most of the time, at which speeds there would be decreased erosion. Gravel layers on the road and grading would decrease the erosion risk and potentially reinforce the soil structure.

With implementation of proper design and adherence to AZPDES CGP requirements, areas of increased erosion due to disturbance would be localized and would not result in loss of vegetation beyond the immediate area of disturbance. The munitions that would potentially be authorized for use at the target would not differ from those currently delivered to BMGR East and there would not be any increase in overall munitions delivery quantities; therefore, there would not be any increased potential for munitions constituents to be transported off-range. Therefore, implementation of Alternative 3.A would not result in significant impacts to earth resources.

4.2.3.2 Alternative 3.B

Implementing Alternative 3.B would result in very similar potential impacts to soil resources as assessed for Alternative 3.A. However, about half of the approximately 44-acre area of potential development for Alternative 3.B falls outside of the existing and pre-2001 historical EOD footprint and, therefore, is less disturbed than the Alternative 3.A site. The impacts of the proposed installation of the moving target and ongoing operation of the moving target would be as described for Alternative 1.A, but the impact would be that the overall footprint of military use would be expanded. This impact would include the disturbance from the establishment of the track itself, ongoing operation of the moving vehicle target system, as well as potential disturbance from EOD clearance activities (if BDUs, rockets, and missiles are used on the moving target). Soil unit data indicates that, like the Alternative 3.A site, the Alternative 3.B site is located entirely within the Growler soil unit (see Figure 3-1), which has moderate erodibility (a 0.32 K-value).

As with Alternative 3.A, with implementation of proper design and adherence to AZPDES CGP requirements (see Section 3.3.8), areas of increased erosion due to disturbance would be localized and would not result in loss of vegetation beyond the immediate area of disturbance. The munitions that would potentially be authorized for use at the target would not differ from those currently delivered to BMGR East and there would not be any increase in overall munitions delivery quantities; therefore, there would not be any increased potential for munitions constituents to be transported off-range. Therefore, implementation of Alternative 3.B would not result in significant impacts to earth resources.

4.2.3.3 Alternative 3.C

Potential impacts to earth resources with implementation of Alternative 3.C would also be similar to those of Alternative 3.A. However, despite the fact that the track would encompass 33 acres as compared to 44 acres, there would be increased potential for erosion impacts under this alternative. This increased erosion potential is primarily associated with the topography of the site as opposed to the soil characteristics. Approximately half of the project area is located in Momoli soil and half is located in the vicinity of Coolidge soils (see Figure 3-1). Erosion factors for both Momoli and Coolidge units are 0.24, which is the least erodible K-value at BMGR East. The location of this alternative at the base of the Crater Range, however, would be subject to runoff and, in some cases, flash flooding following heavy rain events. As compared to the Alternative 3.A and Alternative 3.B sites, there is less potential for design elements for the track to effectively reduce accelerated water erosion. Additionally, the Alternative 3.C site has not previously been impacted by target activities and is not within existing EOD clearance areas.

Therefore, as compared to Alternative 3.A, implementation of Alternative 3.C would increase the overall footprint of military disturbance.

As with Alternatives 3.A and 3.B, with implementation of proper design and adherence to AZPDES CGP requirements (see Section 3.3.8), areas of increased erosion due to disturbance would be localized and would not result in loss of vegetation beyond the immediate area of disturbance. The munitions that would potentially be authorized for use at the target would not differ from those currently delivered to BMGR East and there would not be any increase in overall munitions delivery quantities; therefore, there would not be any increased potential for munitions constituents to be transported off-range. Therefore, implementation of Alternative 3.C would not result in significant impacts to earth resources.

4.2.3.4 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, there would be no impacts to earth resources.

4.2.4 Proposal 4 – New Target for Air-to-Ground Missiles

4.2.4.1 Alternative 4.A – Proposed Action

Implementation of Alternative 4.A would result in an increased level of disturbance within an area that has been disturbed by previous target infrastructure and EOD activities. During the construction phase, there would be localized disturbances to soils that would be subject to AZPDES CGP requirements (see Section 3.3.8). The delivery of live air-to-ground missiles results in a notable larger surface disturbance footprint as compared to inert munitions, even heavy (500- to 2,000-pound inert bombs). It is estimated that the total disturbed area associated with this new target would be 75 acres. The establishment and ongoing use of this target for air-to-ground missile training would result in frequent mixing of soil layers due to explosions of the missiles on impact and small craters would form. Accelerated wind driven erosion and rain-driven erosion would occur in the area. Ongoing target maintenance activities would result in localized impacts associated with earth moving and target construction activities. Spill response protocols would apply to vehicles used in construction and maintenance activities. The air-to-ground missiles that would be delivered to the proposed target would not differ from those currently delivered to existing air-to-ground missile targets at BMGR East nor would there be increased quantities of air-to-ground missiles delivered to BMGR East. Surface soil, subsurface soil, and surface water/sediment (i.e., stormwater) potential munitions transport pathways associated with delivery of munitions to this air-to-ground missile target would shift from the existing site located near Sauceda Wash to the proposed site located near Quilotosa Wash. At the proposed target site, there would be the potential for elevated concentrations of these constituents

to occur; however, as indicated by soil sampling conducted at BMGR East, dispersion of these constituents from the target site is limited and migration to off-range locations has not occurred with past and ongoing use of BMGR East. The Alternative 4.A site is located approximately 5 miles from the BMGR East boundary; the conceptual site model used in evaluating the potential migration of munitions constituents off-range via the wind dispersion pathway uses a 200-foot threshold. (See Section 3.10.5 for more detail on past efforts and reassessment protocols for evaluation of the potential for munitions constituents to migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors and Section 4.3.4.1 for a discussion of potential effects to the stormwater/groundwater pathways associated with implementation of Alternative 4.A.)

Overall, implementation of Alternative 4.A would not result in soil contamination that would exceed federal or state standards and the accelerated erosion that may occur with implementation of Alternative 4.A would not result in loss of vegetation beyond the immediate area of disturbance. Therefore, the impacts to earth resources would not be significant.

4.2.4.2 Alternative 4.B – No-Action Alternative

Under Alternative 4.B, the no-action alternative for this proposal, there would not be any impacts to earth resources.

4.2.5 Proposal 5 – Lowering Flight Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.2.5.1 Alternative 5.A – Proposed Alternative

Under Alternative 5.A, there would be no impacts on soils due to lowering flight altitudes over the Cabeza Prieta NWR.

4.2.5.2 Alternative 5.B – Alternative Action

Under Alternative 5.B, there would be no impacts on soils due to lowering flight altitudes over the Cabeza Prieta NWR.

4.2.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, there would not be any impacts to earth resources.

4.2.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.2.6.1 Alternative 6.A – Proposed Action

Implementation of Alternative 6.A would result in disturbance during the construction phase and from use of the reconfigured target for helicopter gunnery training. This site is previously

disturbed to varying degrees, with high levels of disturbance at the left conventional target and low levels of disturbance in the Sauceda Mountain foothills within the proposed restricted access area (see Figure 2-12). Prior to construction, there would be minor localized disturbance from EOD clearance activities that would be conducted prior to establishing the targets. During the construction phase, approximately 15 to 25 small pop-up structures would be installed at dispersed locations within a 400-acre area. The area of disturbance associated with the targets would vary from the 160 square foot containers, to static vehicle, to near-scale human facades. Disturbance would include earth moving activities and construction vehicle transports. The collective area of disturbance associated with the establishment of the target would exceed 1 acre and, therefore, would require an AZPDES CGP and associated BMPs to reduce erosion and prevent/respond to spills (see Section 3.3.8). Such measures would lessen the impact. The dominant soil type within the area to be potentially developed for the targetry are in the Coolidge unit (see Figure 3-1), which is in the low range of moderately erodible. The topography of the site would result in accelerated water erosion potential with runoff from the foothills. Impacts would be minor and localized.

Training activities would involve strafing with small arms munitions that would not differ from those delivered to BMGR East and Manned Range 3. Although there would be a localized increase in these munitions at the proposed site, there would not be increases in munitions delivery quantities at the BMGR East as a whole. The strafing activity would disturb soils in the target area and throughout the restricted access area (see Figure 2-12). The low-aspect Sauceda Mountain foothills at the site would act as a backdrop and be subject to disturbance from strafing. Soils in this area include both the Rillito and Coolidge units (see Figure 3-1), which have moderate erodibility, with K-values of 0.28 and 0.24, respectively. Downwash from helicopter rotary blades also creates dust and increases aeolian erosion potential and this potential would be expected to increase in the proposed reconfigured target area with increased helicopter training use. Once targets are established, disturbance to soils as a result of EOD clearance activity would be minimal as it would typically consist of clearing the roads as part of routine maintenance.

Overall, the implementation of Alternative 6.A would result in a varied level of disturbance to soils and likely result in localized accelerated erosion, particularly near target sites. Federal or state standards for hazardous substances or munitions constituents would not be exceeded and the accelerated erosion that may occur with implementation of Alternative 6.A would not result in loss of vegetation beyond the immediate area of disturbance. Therefore, the impacts to earth resources would not be significant.

4.2.6.2 Alternative 6.B – No-Action Alternative

Implementation of Alternative 6.B, the no-action alternative for this proposal, would not result in impacts to earth resources.

4.2.7 Proposal 7 - On-the-Ground Training Exercises

4.2.7.1 Alternative 7.A – Proposed Action

Implementation of Alternative 7.A would increase vehicle use on existing roads and military foot traffic by small teams of up to ten troops in areas throughout BMGR East. Erosion associated with small team foot traffic would be minimal and occur in localized areas consisting of trails used during training. There may be some soil disturbances during construction of small targets for these ground based training activities along existing roads on tactical ranges, but no appreciable or long-term impacts. The large team exercises of up to 100 troops two to three times annually would involve more intense levels of disturbance from foot traffic as compared to the small team exercises. However, these effects would occur at more localized sites within the areas of previous military ground disturbance in the tactical ranges with land maneuvers remaining within approximately 3 miles. All vehicle use associated with on-the-ground training exercises would cause erosion along existing roads and where vehicles are parked within 50 feet of established roads (in accordance with existing policy for all range users). The implementation of Alternative 7.A would not be expected to notably increase overall vehicle miles traveled and associated erosion; vehicle miles traveled on BMGR East roads vary over time with changing ground access needs for military and other state and federal agencies and fluctuations in levels of recreation use. The disturbance would represent a minor contribution to the cumulative use of existing roads by military, other state and federal agencies, and BMGR East visitors. Points of insertion/extraction would be subject to erosion from dust generated from helicopter blade wash down and troop drops; however, these points would be at previously disturbed locations. Standard protocols for vehicle maintenance and responding to leaks and spills would apply. Munitions used in training would not differ from those currently used in training at BMGR East.

Overall, implementation of Alternative 7.A would result in minor increased erosion rates in dispersed areas of BMGR East used for small team exercises and short-term, infrequent, more intense increased erosion in localized areas used for large team exercises. The disturbance associated with the proposed on-the-ground training exercises would represent a minor contribution to the cumulative use military surface disturbance footprint within BMGR East. Federal or state standards for hazardous substances or munitions constituents would not be exceeded and there would be no anticipated loss of vegetation beyond the immediate area of

disturbance. Therefore, the impacts of implementing Alternative 7.A to earth resources would not be significant.

4.2.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would be no impact to earth resources.

4.2.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.2.8.1 Alternative 8.A - Proposed Action

Taxiway. Development of a new taxiway under Alternative 8.A would disrupt 42 acres of soils in the Rillito soil unit that were previously impacted by clearing and grading associated with the existing runway (see Figure 2-13). The Rillito soil unit is moderately susceptible to erosion (0.28 K-value) and the site is previously graded, diverting existing minor natural drainage courses over this area of potential effect. At the proposed site, the implementation of the proposed action would result in short-term adverse, but long-term beneficial impacts. The short-term adverse impacts would occur during the construction phase as earth moving activity and heavy equipment disturb soils. There would also be the potential for soil contamination from leaks or spills from fuels and lubricants used in construction equipment. Increased rates of erosion offsite and spill prevention and countermeasure controls would be managed through adherence to the required AZPDES CGP process (see Section 3.3.8).

Over the long term, the proposed tarmac and asphalt surfaces would serve as reinforcement of the existing disturbed surface and reduce wind and water erosion within the footprint of the taxiway. The taxiway would be designed to channel runoff in a controlled manner in much the same manner as the existing runway. The impervious surface would result in greater accumulation of runoff and flow rates within drains or culverts, which would be designed to manage velocity so that sediment suspended in the runoff would not be transported beyond the area of potential development. The modification would be reflected in the base's general storm water AZPDES permit and associated SWPPP, which addresses ongoing storm water management at Gila Bend AFAF.

Air Traffic Control Tower. The proposed site for construction of the air traffic control tower is previously disturbed by existing airfield infrastructure (see Figure 2-13) and is also within the Rillito soil unit. During construction, soils at the proposed site would incur some minimal amount of erosion, but would be minimized by implementation of BMPs during construction and for storm water management. If the disturbance disturbs more than 1 acre, these measures would be formalized through adherence to the AZPDES CGP process (see Section 3.3.8). Following

construction, existing storm water controls would control erosion from storm water runoff. As with the proposed taxiway, the modification would be reflected in the base's general storm water AZPDES permit and associated SWPPP.

In summary, while implementation of Alternative 8.A would result in localized disturbances, such disturbed areas would be managed so that no federal or state standards would be exceeded and there would be no loss of vegetation beyond the immediate area of disturbance. Therefore, the impacts of implementing Alternative 8.A to earth resources would not be significant.

4.2.8.2 Alternative 8.B – Alternative Tower Site B

With Alternative 8.B, soil impacts associated with the taxiway and air traffic control tower would be the same as those described for Alternative 8.A.

4.2.8.3 Alternative 8.C – No-Action Alternative

Under Alternative 8.C, the no-action alternative for this proposal, there would be no impact to earth resources. The existing disturbed surface at the proposed site would continue to be permeable and subject to some wind and water erosion, but controlled through existing storm water culverts and controls at the airfield.

4.2.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.2.9.1 Alternative 9.A – Proposed Action

Implementation of Alternative 9.A would result in the paving of 7 miles of road and the disturbance and/or alteration of 13.5 acres of soils. The construction phase presents similar risks to soil integrity as those presented in previous proposals. Although the site is previously disturbed, heavy equipment would cause soil to be displaced while the road is being paved. An AZPDES CGP would be required and would address potential contamination from leaks or spills from construction equipment and minimizing the transport of sediment beyond the construction site. Over the long term, pavement would stabilize the road surface to a greater extent than gravel or grading. Soils within the roadbed would not be subject to natural wind-driven erosion where pavement is installed; however, the impervious surface would increase storm water runoff amounts and velocity of flow, which would be expected to result in increased erosion within the ditches that line the roadbed. Minimal and localized accelerated erosion beyond these ditches is possible in areas where drainages are cross-directional to the roadway. If erosion issues arise, they would be addressed through engineering controls at the problem areas.

With the management controls presented, implementation of Alternative 9.A would not exceed federal or state standards for hazardous substances or loss of vegetation beyond the immediate

area of disturbance. Therefore, the impacts of implementing Alternative 9.A to earth resources would not be significant.

4.2.9.2 Alternative 9.B – No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, there would continue to be wind erosion from frequent use and ongoing periodic grading of this 7-mile unpaved road. Most of the suspended sediment from both the vehicle and naturally caused wind and water erosion would continue to primarily accumulate in the roadside ditches and not affect nearby areas, with the exception of minor impacts in drainages that are cross-sectional in flow. Impacts would be localized and minor, and unlikely to result in loss of vegetation beyond the roadway.

4.2.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling and Use on BMGR East

4.2.10.1 .Alternative 10.A - Proposed Action

With implementation of Alternative 10.A, 10 sites would be established to excavate a total of 12,990 cubic yards of sand and gravel annually (assuming that the sites are fully replenished by natural processes on an annual basis). As indicated in Table 2-2, the proposed excavation sites vary in size and annual extraction volumes. These proposed volumes are based on the properties of each of the ephemeral washes. While greater volumes would be extracted from wide wash-bed sites such as the Manned Range 1 site, lesser volumes would be extracted from the relatively narrow wash bed sites such as the East TAC 1 site. Therefore, the impacts to earth resource would be similar by relative scale at each site. When water flows through these ephemeral washes after a heavy rain event, it is highly turbid and carries a high sediment load. Sand and gravel excavated from the washes would be permanently and irreversibly relocated to other areas for maintenance purposes, but the wash system would be expected to return to pre-excavation conditions over time as storm events wash materials downstream and fill the excavated areas. As excavations would occur periodically, this replenish-excavation cycle would likely result in less sand and gravel at the excavation site at most times than is present under the existing condition. However, the natural dynamic redistribution of silty, sandy, and gravely materials with storm water runoff would predominate and no accelerated erosion is expected due to the activity. When the Air Force ceases excavation activities, natural horizons and material composition may take substantial time to return. The equipment used for the excavation would be maintained in proper condition to lessen the potential for leaks and standard spill response protocols would be implemented in the event of a release of fuels or lubricants into soils during the course of the proposed activities.

The stockpiling of excavated materials would result in localized disturbance at stockpile sites. Runoff from stockpiles could carry fine silts and sands integrated with the sand and gravel

material beyond the stockpile site and result in erosion in nearby areas. These impacts would be minimal and localized. Stockpiling areas are not predicted to have any impact on soils.

The use of the excavated materials for range maintenance activities would reinforce surfaces susceptible to erosion due to repeated use. This would slow accelerated erosion associated with ongoing land disturbing activity and result in a beneficial impact to soils in these localized areas. Where gravel is tightly compacted, there could be decreased permeability and, thereby, increased runoff, but this would not be expected with most intended uses for the excavated materials.

Because the Air Force would no longer need to transport sand and gravel from off-range sources under this action, there would be decreased offsite impacts at supply sites. Because the distance traveled for transport of materials would be decreased, vehicle trips on range roads would be expected to decrease slightly (even with the range road use by equipment used for excavation, stockpile, and use of sand and gravel materials).

Overall, implementation of Alternative 10.A would not exceed federal or state standards for hazardous substances or loss of vegetation beyond the immediate area of disturbance. Therefore, the impacts of implementing Alternative 10.A to earth resources would not be significant.

4.2.10.2 .Alternative 10.B – No-Action Alternative

Under Alternative 10.B, the no-action alternative for this proposal, there would continue to be impacts at off-range source sites where sand and gravel materials are excavated. In comparison to Alternative 10.A, heavy vehicle travel on range and other roads would be greater and result in minimally greater levels of erosion. These impacts would be minor and would not be significant as there would be no exceedence of a federal or state standard for hazardous constituents or loss of vegetation beyond the immediate area of disturbance.

4.2.11 Aggregate Impacts to Earth Resources

For the most part, the ten proposed actions would occur at dispersed locations throughout BMGR East. Because, as assessed above, potential impacts would be minimal and localized (with implementation of management measures and BMPs), there is little potential for additive or interactive impacts to earth resources with implementation of all ten proposals. However, the following proposed and/or alternative sites occur in close enough proximity that the wind and water driven erosion that would potentially be accelerated with these disturbances would potentially be greater in combination than on an individual basis.

- The Alternative 1.C STA site, Alternative 2.A North TAC target reconfiguration, any of the Alternative 3.A moving target sites, and the Alternative 10.A North TAC excavation site and stockpile site, which are all located in North TAC.

- The Alternative 1.B STA site, Alternative 2.A South TAC target reconfiguration, Alternative 10.A South TAC excavation sites, Alternative 9.A Manned Range 1 to RMCP 1 road paving, which are all located in or near South TAC.
- Alternative 6.A new air-to-ground missile site, Alternative 2.A East TAC target reconfiguration, and Alternative 10.A East TAC sand and gravel excavation, which are located in East TAC.

The aggregate area of disturbance associated with implementation of two or more proposals would be greater than that from any individual proposal. Table 4-1 provides a summary of the area of disturbance associated with the proposed actions and alternatives.

Table 4-1
Summary of Areas of Disturbance Associated with All BMGR East Enhancement Proposals

Proposal	Area of Disturbance
Proposal 1 – Sensor Training Area	640 acres
Proposal 2 – Target Reconfiguration	Site-by-site locations within the maximum combined footprint of approximately 155,200 acres
Proposal 3 – Moving Vehicle Target System	44 acres with Alternatives 3.A and 3.B and 33 acres with Alternative 3.C
Proposal 4 – New Air-to-Ground Missile Target	Approximately 75 acres
Proposal 5 – Lowering Flight Floor over Cabeza Prieta NWR	No ground disturbance associated with this proposal (the area underlying the area of proposed modification is 292,722 acres)
Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training	Target sites consisting of small areas dispersed within 400-acre area
Proposal 7 – On-the-Ground Training	Widely dispersed unquantified areas typical of disturbance caused by existing range uses
Proposal 8 – New Taxiway and Air Traffic Control Tower at Gila Bend AFAF	42 acres for taxiway and less than 1 acre for the air traffic control tower
Proposal 9 – Pave Road from Manned Range 1 to RMCP 1	23 acres
Proposal 10 – Sand and Gravel Extraction, Stockpiling, and Use	2.68 acres

4.3 WATER RESOURCES

A water resource impact is significant if an action causes the concentration of a pollutant in surface or ground water to exceed federal or state water quality standards. For all proposals potentially affecting any jurisdictional water of the U.S., the Air Force would coordinate with the U.S. Army Corps of Engineers and obtain necessary permits from appropriate agencies as required prior to implementing any ground-disturbing or construction activities. Best management practices would be used in all proposed and ongoing ground-disturbing,

construction, and operation activities to minimize the potential for fuels and other fluids used in vehicles and equipment to contaminate water resources. Due to depth to groundwater, limited groundwater use, and other factors, potential impacts to groundwater resources would be discountable with all proposals.

4.3.1 Proposal 1 - Sensor Training Area

4.3.1.1 Alternative 1.A – Air to Air Range Site

Construction of the urban complex infrastructure and road widening under Alternative 1.A could create potential temporary minor adverse effects to water quality, primarily due to potential sedimentation of ephemeral surface drainage ways with increased erosion/deposition resulting from vegetation removal, grading, and construction activities. Disturbance of cryptogrammic soils and desert pavements could also lead to longer-term sedimentation impacts. Waterways that have the most potential to be affected by this proposal include the ephemeral San Cristobal Wash and minor tributaries down gradient from the proposed site. Similarly, EOD clearance and associated disturbance of surface soils could potentially increase sediment load in runoff water; however, it is unlikely given the climate of the region. EOD clearance is not a highly invasive process and could not predictably cause great impacts on surrounding washes.

Runoff could carry increased suspended sediment load as a result of physical surface disturbance during construction or operations; however, because of the low slopes found in the area and the typically very high infiltration and percolation capacities of the alluvial soils and drainages, impacts would be limited in scope and duration. In addition, adherence to the CGP process noted in Section 3.3.8 would address the capture of waterborne sediment unavoidably released from uncovered or disturbed soils and protection of water quality from onsite pollutant sources through the planning, implementation, and maintenance of BMPs. Use of BMPs such as proper grading, stabilization, and culverts to channel storm water runoff would also help minimize soil erosion both during the construction phase and during the long-term operation of the STA.

No groundwater wells, springs, seeps, or natural or artificial surface water catchments are located in the area that would be disturbed by the development of the STA under Alternative 1.A.

Based on the above analysis, implementation of Alternative 1.A would not exceed federal or state water quality standards and, therefore, impacts to water resources would not be significant. Localized minor impacts of increased sedimentation in the ephemeral flow of wash systems near the Alternative 1.A site would be minimal in terms of the quality of receiving waters and the health and overall function of the watershed.

4.3.1.2 Alternative 1.B - South Tactical Range Site

The Alternative 1.B STA site is previously disturbed and, as such, poses a potentially higher risk of additional erosion and associated sedimentation due to runoff events. The potential risks to water quality under Alternative 1.B would initially be somewhat higher in comparison to Alternative 1.A; however, through time, the impacts would be predictably similar to other alternatives. The impact of EOD clearance practices on surrounding ephemeral washes would not be expected to increase, as this area is already within an EOD footprint. The only waterway that is potentially impacted by Alternative 1.B is Growler Wash, an ephemeral stream.

In the event that actions taken include grading, culvert installation, and adding gravel to the surface of the access roads, erosion would occur during the construction phase of those projects. Culverts should assist in maintaining the integrity of surrounding washes and lessen the risk that sedimentation would occur though some increased runoff may occur during construction phase rainfall events.

While past activities may have caused increased disturbance to vegetation, cryptogrammic soils, and desert pavements leading to sedimentation in runoff in some areas, no severe areas of erosion have been identified. Adherence to AZPDES CGP permitting requirements and implementation of BMPs as described under Alternative 1.A would reduce any potential effects on water resources to non-significant levels.

No groundwater wells or springs, seeps, or natural or artificial surface water catchments are located in the area that would be disturbed by the development of the STA under Alternative 1.A.

As with Alternative 1.A, implementation of Alternative 1.B would not exceed federal or state water quality standards and, therefore, impacts to water resources would not be significant. Localized minor impacts of increased sedimentation in the ephemeral flow of wash systems near the Alternative 1.B site would be minimal in terms of the quality of receiving waters and the health and overall function of the watershed.

4.3.1.3 Alternative 1.C – North Tactical Range Site

The potential for impacts to water quality with implementation of Alternative 1.C would be similar to those described for Alternative 1.A. The area of disturbance would be nearly the same as with Alternative 1.C and the area is not within the current or pre-2001 EOD clearance footprint. Drainage in the area consists of a combination of sheet flow in a playa like feature that is located along and east of the existing road between North TAC and Manned Range 4, which would provide access to the site. Surface water drains westward from the site to highly braided system of tributaries associated with Tenmile Wash. These tributaries join with a channelized

portion of Tenmile Wash, located approximately 8 miles west of the Alternative 1.C site, which in turn drains to agricultural lands located south of Interstate 8 between Aztec and Sentinel.

Potential impacts of increased sedimentation in receiving waters as a result of disturbance would be greatest during the establishment of the STA at this site and during rainfall events, but minimized through the use of BMPs. There would be potential for increased disturbance and sedimentation in surface waters during times when the playa-like area located to the east of the Alternative 1.C. STA site is inundated. Over the long term, upgrades to 4 miles of the existing but currently unused Malpias Hill road would reinforce/stabilize these soils that are generally susceptible to alluvial and aeolian erosion and would minimize these impacts.

No groundwater wells or springs, seeps, or natural or artificial surface water catchments are located in the area that would be disturbed by the development of the STA under Alternative 1.C.

As with Alternative 1.A and Alternative 1.B, Alternative 1.C would not exceed federal or state water quality standards and, therefore, impacts to water resources would not be significant. Localized minor impacts of increased sedimentation in the ephemeral flow of wash systems near the Alternative 1.C site would be minimal in terms of the quality of receiving waters and the health and overall function of the watershed.

4.3.1.4 Alternative 1.D – No-Action Alternative

There would be no change in existing impacts to water resources if the Alternative 1.D, the no-action alternative, were selected.

4.3.2 Proposal 2 – Target Reconfiguration

4.3.2.1 Alternative 2.A - Proposed Action

With implementation of Alternative 2.A, specific water resource impacts would be evaluated on a case-by-case basis under the environmental review parameters outlined in Section 2.3.1 as well as with adherence to the AZPDES general storm water permit and the AZPDES CGP program when greater than 1 acre is to be disturbed by construction activities. At a programmatic level of analysis, with adherence to these parameters and regulatory requirements, modifying target simulations in their current locations would have very minimal effects on water resources. These areas, which include the Tenmile Wash system in North TAC, the Growler Wash/Daniels Arroyo Wash system in South TAC, and the Quilotosa Wash and Sauceda Wash systems in East TAC, incur minor disturbance and increased sedimentation loads due to ongoing operations at the tactical ranges. As noted in Section 3.3.4, these drainage systems are both unaltered and unregulated in any substantial way and lack impediments to natural surface water flows. Under Alternative 2.A, there would be the potential for increased sedimentation in runoff as targets are

reconfigured and/or expanded in a manner that disturbs soils, particularly those actions that affect areas that are currently relatively undisturbed. Within the potential target reconfiguration footprint, the risk of highly turbid runoff would be minimal in most areas where proposed development is on sands (though the erosion risk is higher). Eliminating targets would have the benefit of decreasing sedimentation in ephemeral washes in the long term.

4.3.2.2 Alternative 2.B – No-Action Alternative

With implementation of Alternative 2.B, there would be potential for localized increased rates of sedimentation in runoff from land disturbance that may occur with ongoing routine target maintenance.

4.3.3 Proposal 3 – Moving Vehicle Target System

4.3.3.1 Alternative 3.A – Proposed Action

Although Tenmile Wash is located approximately 1 mile east of the Alternative 3.A site, drainage from the site is to a tributary located to the northeast which joins Tenmile Wash approximately 10 miles to the northeast of the site (see Figure 2-9). The area is previously disturbed and falls within a current EOD clearance footprint. Additional impacts in previously disturbed areas are not predicted to cause substantial water resources impacts.

During the construction phase, there would be potential for increased sedimentation to affect tributaries to Tenmile Wash; however, due to the size of the proposed construction, an AZPDES CGP would be required. The CGP would address SWPPP/BMP requirements to minimize potential impacts that construction activities could have on water quality and ensure adherence to federal or state water quality standards. Over the long term, there could be minimal changes to runoff flow from the site during rain events and, in some cases, this could cause erosion or sedimentation in ephemeral washes. The ongoing operation of the moving vehicle target system would result in an ongoing source of disturbance similar to existing roads at BMGR East, although the vehicle would be driven at speeds greater than 45 miles per hour during 15 percent of its operation. Maintaining the road and conducting EOD clearance operations on a periodic basis also pose some ongoing minimal and localized potential for increased sedimentation within the Tenmile Wash tributary. However, with the low amount of annual rainfall and current condition of the soils in this area, such impacts would not be significant.

The types and quantities of munitions that would be delivered to the moving target would be the same as those historically delivered at this target site. Based on evaluations of munitions constituents at the BMGR (see Section 3.10.5), no contamination of water resources would occur with implementation of Alternative 3.A.

4.3.3.2 Alternative 3.B

Potential impacts to water resources under Alternative 3.B would be the same as those described for Alternative 3.A with the following exceptions.

- There is a lower level of previous disturbance at and munitions delivery to this site, as the Alternative 3.A site incorporates a former main airfield target and a smaller SAM target at the north end and the existing roadbed.
- Ephemeral washes that dissect the southern portion of the site are tributaries to the San Cristobal Wash, draining west-northwest around the northern tip of the Aguilla Mountains (see Figure 2-9).
- Because cultural surveys have not been conducted for the entire Alternative 3.B site, there would be the potential for a small amount of additional disturbance and associated potential for sedimentation to be transported into ephemeral washes.
- This area lies outside of a current EOD footprint on its western side. If EOD clearance becomes necessary, heavy equipment in areas without historic disturbances will cause eroded sediment to wash into areas during rain events.

Because of these distinctions, as compared to Alternative 3.A, there would be the potential for slightly greater, but still minimal and localized, sedimentation in receiving ephemeral washes potentially affecting tributaries to both the Tenmile and San Cristobal wash systems.

4.3.3.3 Alternative 3.C

Potential impacts to water resources under Alternative 3.C would be the same as those described for Alternative 3.A with the following exceptions.

- Alternative 3.C, located at the base of the Crater Range just west of East Pass and Tenmile Wash (see Figure 2-9), is highly susceptible to flash flooding as rainfall runs off of the Crater Range to the wash.
- Drainage is directly to the main channel of Tenmile Wash, rather than first being transported in tributaries where sedimentation can be deposited and not result in increased sedimentation levels in the main wash system.
- The track would be somewhat shorter than the Alternative 3.A and 3.B tracks, therefore, resulting in an approximately 10-acre or smaller area of potential disturbance.
- This site has not been previously disturbed for simulated target infrastructure or specifically designated for munitions delivery and is not within the current EOD clearance area.

Given these above factors, over the long term, increased sedimentation affecting Tenmile Wash is highest under this action alternative. Even with this increased potential for impacts, impacts would be localized and would not be expected to exceed federal or state water quality standards or affect the overall function of the watershed drainage system. Therefore, implementation of Alternative 3.C would not have significant impacts to water resources.

4.3.3.4 Alternative 3.D – No-Action Alternative

Alternative 3.D, the no-action alternative for this proposal, would have no impact to water resources.

4.3.4 Proposal 4 – New Target for Air-to-Ground Missiles

4.3.4.1 Alternative 4.A – Proposed Action

Implementation of Alternative 4.A would shift potential impacts associated with increased sedimentation levels and munitions constituent surface/water sediment (i.e., stormwater) and groundwater pathways from future delivery of air-to-ground missiles to this target from the existing site near Sauceda Wash to the proposed site near Quilotosa Wash. The main channel of this wash runs adjacent to the Alternative 4.A site. While the target would not be located within the wash, it could be located in close proximity to the wash. As evidenced by the level of disturbance at existing air-to-ground missile sites within BMGR East, repeated delivery of live missiles to the proposed new target would destabilize soils in that area, resulting in increased levels of suspended material in runoff during rain events. Although EOD clearance is already practiced in this area, requirements and associated disturbance may increase slightly depending on target configuration and potentially result in minor increased potential for sedimentation in Quilotosa Wash. Quilotosa Wash would receive all discharged sediment, which could be at high enough levels to locally alter the natural flow of the channel. There is a low increased probability that future delivery of munitions to the proposed air-to-ground missile target would increase the potential for munitions constituents to migrate off-range and cause an unacceptable risk to human and/or ecological receptors due to the comparative proximity of the proposed Alternative 4.A air-to-ground target site and Quilotosa Wash pathway to the existing air-to-ground target site and Sauceda Wash pathway. Although the Alternative 4.A site would be approximately 2.5 miles closer to the BMGR East boundary, there would be no increase in human receptors within the 15 mile distance threshold used in the conceptual site model for evaluation of munitions constituent migration via stormwater. Similarly, no active groundwater wells are located within 4 miles of the BMGR East boundary, which is the threshold for the evaluation of munitions constituent migration via groundwater. As noted in Section 3.10.5, in accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan, the potential for munitions constituents to

migrate off BMGR East and cause an unacceptable risk to human and/or ecological receptors will be reassessed at a minimum of every 5 years; or whenever significant changes occur at BMGR East that may affect determinations made during the previous assessment.

No federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the Quilotosa Wash drainage system or watershed quality. Therefore, these impacts would not be considered significant.

4.3.4.2 Alternative 4.B - No-Action Alternative

Alternative 4.B, the no-action alternative for this proposal, would not result in impacts to water resources.

4.3.5 Proposal 5 – Lowering Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge

4.3.5.1 Alternative 5.A – Proposed Action

Implementation of Alternative 5.A, lowering the flight training altitude of aircraft over the Cabeza Prieta NWR, would have no appreciable impact to water resources.

4.3.5.2 Alternative 5.B – Alternative Action

Implementation of Alternative 5.B, lowering the flight training altitude of aircraft over the Cabeza Prieta NWR, would have no appreciable impact to water resources.

4.3.5.3 Alternative 5.C – No-Action Alternative

Implementation of Alternative 5.C, the no-action alternative for this proposal, would have no impact to water resources.

4.3.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.3.6.1 Alternative 6.A – Proposed Action

With implementation of Alternative 6.A, installation of 15 to 25 pop-up systems would cause erosion at and near the installation sites during the installation phase. The targets would be dispersed throughout an approximately 400-acre area; the largest area that would be disturbed would be for the four proposed 8 foot by 20 foot container targets. Installation of these training components would result in isolated disturbances of soil that can result in sediments being suspended and transported during heavy rain events to tributaries of Sauceda Wash. The footprint of construction would be expected to exceed the 1-acre disturbance threshold and thus require an AZPDES CGP. The CGP would address SWPPP/BMP requirements to minimize potential impacts of construction activities on water quality and ensure adherence to federal or state water quality standards.

Over the long term, there could be minimal changes to runoff flow from the site during rain events and, in some cases, this could cause erosion or sedimentation in ephemeral washes. No federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the drainage system watershed quality. Therefore, neither the potential short- or long-term impacts to water resources would be considered significant.

4.3.6.2 Alternative 6.B – No-Action Alternative

Under Alternative 6.B, the no-action alternative for this proposal, training at Manned Range 3 would continue with the existing configuration and no additional impacts on water resources would occur.

4.3.7 Proposal 7 – On-the-Ground Training Exercises

4.3.7.1 Alternative 7.A – Proposed Action

As noted in Section 4.2.7.1, implementation of Alternative 7.A would result in increased disturbance from small team training exercises throughout BMGR East (but primarily in Area B and the target areas of East TAC) as well as at previously disturbed sites in tactical ranges used in large team (approximately 100 troop) training exercises. Potential for increased sedimentation would be greatest when the ground-based training activities occur during or following a rain event and in areas where there are semi-erodible and highly erodible soils in close proximity to wash areas. Prior to each bi- or tri-annual large troop training exercise event, 56 RMO would consider soil conditions at potential previously disturbed sites in tactical ranges when selecting the site to be used for the training exercise. Training at targets that would be placed along tactical range roads would have no discernible impact to water resources. Potable water for troop consumption would be obtained from existing vendors that serve the ground troop units. Overall, no federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the drainage system watershed quality. Therefore, impacts of implementing Alternative 7.A would not be significant.

4.3.7.2 Alternative 7.B - No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would not be any water resource impacts.

4.3.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field

4.3.8.1 Alternative 8.A - Proposed Action

Taxiway. Installing a taxiway adjacent to the existing runway would disturb 42 acres of land. The existing runway environment, including the area where the taxiway is proposed, has been

previously disturbed and graded. The disturbed area of the runway, at its southern point, is approximately 1,200 feet east of Quilotosa Wash. Numerous smaller, unnamed drainages found near the northern end of the runway trend north-south and drain from the south to the north. Although this area has a moderate degree of erodibility in soil composition, existing controls such as low-aspect berms and ditches reduce the amount of sediment transport to washes during rain events. During the construction phase, there is the potential for increased sedimentation in surface waters due to earth disturbing activity and the increase in impervious surface could impact waters in the long term. The proposed taxiway, at its closest point, is approximately 1,500 feet from Quilotosa Wash (see Figure 2-13). During the construction phase, soils would be disturbed such that subsequent rainfall would carry it to the wash. An AZPDES CGP would be required and would address SWPPP/BMP requirements to minimize potential impacts that construction activities could have to water quality and ensure adherence to federal or state water quality standards.

In the long term, there would be increased impervious surface of 42 acres within the watershed. Impervious surfaces preclude natural percolation of water into soils and alter the location and velocity of flow. Without proper design considerations, runoff from the asphalt and tarmac portions of the taxiway can cause erosion that would persist through time. However, the proposed action would include measures such as those in UFC 3-210-10, *Low Impact Development*, which is a storm water management strategy that employs a variety of natural and built features to reduce the rate of runoff, filter out pollutants, and facilitate the infiltration of water into the ground (DoD 2004). Therefore, surface water impacts would be reduced to a minimal level.

Control Tower. Under Alternative 8.A, a new control tower would be constructed on disturbed land where existing storm water controls are present. Wastewater service for the control tower would be integrated with the existing Gila Bend AFAF wastewater service; there would be no discernible impact to function or capacity nor any change to the regulatory status of the system. Drinking water would be provided via connection to the existing potable water service and supplemented with a point-of-use filter. The construction activity could potentially exceed the 1-acre threshold and thus require an AZPDES CGP, which would address SWPPP/BMP requirements as above. Without an AZPDES CGP, existing controls and employment of BMP practices would minimize sedimentation and contaminants during construction. There would be no additional long-term impacts to water resources as the site is previously disturbed and the foot print of the tower would be discrete and confined.

Overall, with implementation of Alternative 8.A, no federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the drainage system watershed quality. Therefore, impacts would not be significant.

4.3.8.2 Alternative 8.B

Taxiway. The impacts to water resources from construction of the taxiway under Alternative 8.B would be same as discussed under Alternative 8.A.

Control Tower. Construction of the control tower at the Alternative 8.B site would have the same impacts to water resources as described for Alternative 8.A.

4.3.8.3 Alternative 8.C – No-Action Alternative

Under Alternative 8.C, the no-action alternative for this proposal, there would be no impact to water resources.

4.3.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.3.9.1 Alternative 9.A - Proposed Action

The proposed paving of the approximately 7-mile road segment under Alternative 9.A would require an AZPDES CGP, which would address SWPPP/BMP requirements to minimize potential impacts that construction activities could have on water quality and ensure adherence to federal or state water quality standards. Drainage at the site is via multiple cross-flow braided drainages to Tenmile Wash, which are most concentrated in the western portion of the road segment near RMCP 1 and the water well. The existing frequently used road interrupts the natural surface water drainage courses at the project sites and results in increased sediment loads in some of these drainages. As described in Section 3.2.5, the soil units (Growler and Mohall) upon which the road would be paved are moderately erodible. Paving the road would lessen erosion impacts to the affected drainages caused by the continual disturbance of roadbed soils from frequent use and periodic maintenance activities. However, the installed pavement would also reduce permeability of the road as compared with unpaved surfaces, resulting in greater surface water runoff from the paved surfaces during heavy rainfall events. Should drainage problems emerge, engineering services could be employed to change culvert and roadside areas to accommodate any additional runoff requirements. No federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the drainage system watershed quality. Therefore, no significant impact to water resources would occur with implementation of Alternative 9.A.

4.3.9.2 Alternative 9.B - No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, there would be ongoing minor and localized impacts to water quality at BMGR East associated with accelerated erosion from frequent use and maintenance of this 7-mile road segment, particularly increased sediment loads at the cross- natural surface water drainage courses.

4.3.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.3.10.1 Alternative 10.A - Proposed Action

With implementation of Alternative 10.A, ten sites would be established for excavation of sand and gravel from wash beds at a depth not to exceed 3 feet from the pre-excavation grade of the wash. As detailed in Table 4-2, a combined area of 2.68 acres would be disturbed in sites ranging from 0.12 to 0.69 acres in size located throughout BMGR East (see Figure 3-2). The areas most affected would be Tenmile Wash (0.88 acre), Quilotosa Wash (0.84 acre), Daniels Arroyo (0.4 acre), Sauceda Wash (0.3 acre) and Midway Wash (0.26 acre). As noted in Section 2.11.1, the sand and gravel excavation contractor would operate under established guidelines and be subject to period monitoring to ensure excavation does not exceed 3 feet in depth and that other standard protocols for environmental protection (e.g., stormwater, spill response, dust control, etc.) are being implemented.

Table 4-2
Sand and Gravel Excavation Sites, Wash Bed and Disturbed Area

Source Site	Wash Bed	Area acreage)	Approximate Width of Wash Bed at Proposed Excavation Site (feet)
East TAC 1	Sauceda Wash	0.12	100
East TAC 2	Quilotosa Wash	0.28	100
East TAC 3	Quilotosa Wash	0.22	50
East TAC 4	Sauceda Wash	0.18	75
South TAC 1	Daniels Arroyo	0.26	75
South TAC 2	Daniels Arroyo	0.14	<50
North TAC	Tenmile Wash	0.19	100
Manned Range 1	Tenmile Wash	0.69	200
Manned Range 3	Midway Wash	0.26	100
DART Drop Road	Quilotosa Wash	0.34	75

The 56 RMO would obtain an AZPDES Multi-Sector General Permit under the industrial sector of sand and gravel operations for BMGR East. ADEQ Aquifer Protection Permit requirements would not apply, as no discharge of wash water would occur with implementation of this proposed action. As noted in Section 3.3.3, wash beds are dry the majority of the year, as rain

events are both seasonal and limited at BMGR East. When heavy rainfall events occur, washes are conduits for highly turbid waters, and the contours of the wash beds are dynamic, changing naturally with each rainfall event and more so with monsoon rain/flash flooding events. Excavation activities would alter the natural hydrology of each wash to a depth of 3 feet over an area ranging from 0.12 to 0.69 acres. This type of localized and limited change in the depth of the wash would vary depending on the site-specific hydrodynamics at each of the proposed excavation sites.

Each of the sites is located where a road intersects an existing wash and some sites, such as the Manned Range 3 site, have been previously disturbed. A change in depth of 3 feet would have localized impacts to the hydrology of washes. Additional sedimentation may be suspended in runoff resulting in localized increases in turbidity. The excavations would act as stilling basins, where the velocities of runoff water would be decreased and sediments carried by the runoff would be deposited, prematurely. The velocities, volumes, and patterns of flow would be altered downstream of the excavations until the excavations are filled with sediments. The duration of this impact would depend on the rate at which wash beds would be replenished based on rainfall and wash morphology. After the excavations are filled with sediments, the flows in the drainages would resume normal patterns and there would be negligible long-term alterations.

The equipment that would be used to excavate sand and gravel from wash beds would include fuels, oils, coolants, etc. that could potentially be harmful to water quality if a release or spill were to occur. This potential impact would be minimized with the ongoing implementation of standard protocols for vehicle maintenance (i.e., to replace worn parts and check for and correct leaks or potential leaks), spill response (e.g., expedient containment, removal of and proper disposal of contaminated soil, and requisite notifications), and contractor monitoring. Therefore, water quality would not be diminished as a result of the proposed excavation activity. Stockpiles would be sited away from ephemeral washes, as described in Section 2.11.1. Runoff from stockpiles would likely have high sediment loads and could potentially increase sedimentation in nearby drainages. However, such impacts would be minimal and highly localized.

The U.S. Army Corps of Engineers has determined that the proposed sand and gravel excavation would not be subject to the Corps' jurisdiction under Section 404 of the Clean Water Act and would not require a Section 404 permit. Although the proposed excavation activities would include jurisdictional waters, there would be no discharge of dredged or fill material into a water of the U.S. or an adjacent wetland aside from incidental fallback (i.e., the redeposit of small volumes of sand and gravel incidental to the excavation activity to approximately the same place as the initial removal) (Lester 2001 and Brooks 2009). Section 401 State Water Quality Certification also would not be required.

The Sand and Gravel Management branch of the Regulatory Division of the Flood Control District regulates sand and gravel operations within watercourses in accordance with the Floodplain Regulations of Maricopa County. A Floodplain Use Permit is required for every prospective sand and gravel operation. This permit is issued when a sand and gravel operation can prove their facility will not obstruct the natural flow of the watercourse, will not cause damage to adjacent structures or properties, will maintain the continuity of flows and sediment, and will preserve the natural and beneficial function of the watercourse (Flood Control District of Maricopa County 2008). However, because floodplains have not been delineated at BMGR East, they are exempt from these permitting requirements (Wergen 2008).

Overall, the impacts of implementing Alternative 10.A would be minor impacts to BMGR wash morphology affecting localized areas of the drainages. No federal or state water quality standards would be exceeded and impacts would be localized, not affecting overall functionality of the drainage system watershed quality. Therefore, no significant impact to water resources would occur with implementation of Alternative 10.A.

4.3.10.2 Alternative 10.B – No-Action Alternative

There would be no impacts to water resources within BMGR East from excavation and stockpiling activities if Alternative 10.B, the no-action alternative for this proposal, is carried forward. Sand and gravel would continue to be transported to BMGR East from off-range sources, where excavation potentially has impact to water resources at the source sites.

4.3.11 Aggregate Impacts

Because potential impacts to water resources would be highly localized and minimized by controls to be implemented with all ten proposed actions, there are few aggregate impacts. There could potentially be increased local impacts at Tenmile Wash, in particular, as a result of implementation of Alternative 3.A and the North TAC excavation site, given their close proximity. Minor additive impacts to Tenmile Wash would potentially occur with North TAC target reconfiguration, development of the Alternative 1.C STA site, and any of the moving target alternatives. Similarly, development of the Alternative 1.B STA site, South TAC excavation sites, South TAC target reconfiguration, and Manned Range 1 to RMCP 1 road paving could have minor additive impacts to the Daniels Arroyo/Growler Wash system. Lastly, the proposed air-to-ground missile site, East TAC target reconfiguration, and sand and gravel excavation could have additive impacts to the Sauceda and Quilotosa washes.

4.4 AIR QUALITY

The assessment of impacts to air quality is based on comparing existing use and conditions to the proposed changes to range design, use, and management. Because, for most of the proposed action scenarios, the air emissions would not change from alternative to alternative, this analysis is focused on the impacts from implementation of each of the ten proposed actions. For those alternatives that have more than one action alternative and there is a difference in the air emissions associated amongst the action alternative, the worst case scenario was calculated and all others are noted as generating a smaller quantity of emissions.

The analysis compares baseline air emissions with projected future emissions, including construction and operations, to determine potential impacts. Air quality impacts would be significant if emissions associated with the proposed actions would: (1) increase ambient air pollution concentrations above the National Ambient Air Quality Standards, (2) contribute to an existing violation of the National Ambient Air Quality Standards, (3) interfere with, or delay timely attainment of the National Ambient Air Quality Standards, (4) impair visibility within federally-mandated Prevention of Significant Deterioration Class I areas, (5) result in the potential for any stationary source to be considered a major source of emissions as defined in 40 CFR Part 52.21 (total emissions of any pollutant subject to regulation under the CAA that is greater than 250 tons per year for attainment areas), or (6) for mobile source emissions, result in an increase in emissions to exceed 250 tons per year for any pollutant.

Pollutants considered in this EIS analysis include the criteria pollutants, excluding lead, and HAPs measured by Federal and State standards. Airborne emissions of lead are not included because there are no known significant lead emission sources in the region or associated with the proposed actions.

Pollutants are generated by numerous sources, including diesel exhaust from construction equipment and operations such as aircraft operations and range maintenance activities. In general, VOC, CO, NO_x, and SO_2 emissions are primarily generated by diesel-fueled heavy equipment operating in construction areas. Particulate matter emissions, in the form of PM_{10} and $PM_{2.5}$ are primarily due to fugitive dust created by land disturbance activities, which include land clearing; soil excavation, cutting, and filling; trenching; and grading. The fugitive dust emission factor for PM_{10}, which is used as part of the $PM_{2.5}$ calculation (Midwest Research Institute 2005), is assumed to include the effects of typical control measures such as routine site watering for dust control. A dust control effectiveness of 50 percent is assumed, based on the estimated control effectiveness of watering (Western Regional Air Partnership 2004). Other sources of PM_{10} and $PM_{2.5}$ include diesel emissions from heavy construction equipment and tailpipe

emissions from construction worker personally owned vehicles operating within the BMGR East boundaries (see Appendix B for further discussion of the technical approach and assumptions).

Air emissions were analyzed, where applicable, based on construction activities that would be required in order to implement the proposed action and/or the implementation of the proposed action itself.

4.4.1 Proposal 1 – Sensor Training Area

Construction of the STA is essentially the same for all of the alternatives, with Alternative 1.A, the proposed action, containing the largest amount of road construction (grading and widening of up to 20 miles of existing dirt roads).

All of the alternatives would require the following activities that produce air emissions:

- pre-development EOD clearance of 1,217 acres;
- establishment of one UMTE site, two LSTSS sites, and a power source for the STA lights (each would involve the installation and ongoing use of a 20 kW generator and 500-gallon above ground diesel fuel tank);
- construction of simulated targets (buildings, graded areas) on up to 400 acres; and
- road grading and widening (amount of grading and widening varies by alternative).

Construction calculations were therefore performed based on the criteria for implementing Alternative 1.A. Construction for any other alternative would produce fewer emissions due to the smaller footprint required for road construction. Therefore, the quantitative analysis of Alternative 1.A is the worst-case scenario of any of the alternatives for this proposal.

4.4.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Construction. Under Alternative 1.A, the largest improvements to dirt roads in the range area would occur – up to 20 miles of dirt roads would be graded and widened. The construction of the entire STA was projected to occur over portions of 2 years, 2010 and 2011. Assumptions made for the analysis of this alternative include:

- unstable areas requiring gravel would involve 30 percent of the road area;
- construction of residential, commercial, industrial, public service, and other types of buildings would result in a foot print of approximately 500,000 square feet of shell construction;
- approximately 36 construction workers would commute as much as 40 miles per round trip within BMGR East;

- diesel truck traffic would traverse an average of 20 roundtrip miles within BMGR East (some truck traffic would operate within the range area, some would enter and exit the range); and
- diesel truck traffic would spend approximately 30 percent of the drive time within BMGR East on unpaved roads.

Table 4-3 presents the emission estimates for the STA development under Alternative 1.A.

Table 4-3
Construction Emission Estimates for Development of Sensor Target Area, Air-to-Air Range Site

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons	1.46	10.26	10.95	1.12	126.05	13.10

Fugitive dust from land disturbance activities is estimated to cause a release of approximately 126 tons of PM_{10}, which would be generated over the course of 2 years. This quantity of PM_{10} has been estimated using the control of wetting to reduce dust release by 50 percent. In Maricopa County, an earthmoving permit is required before construction activities can begin. The permit is required under Air Pollution Control Regulations Rule 200, Section 305. The permit is required for any earthmoving operation disturbing more than 0.1 acre and is required from initial ground breaking through final stabilization and is valid for one year from the date of issue. An application must be submitted at least 14 calendar days prior to the expiration date of the original permit if more than 0.1 acres remain disturbed at the expiration of the original permit.

Additionally, Rule 310, Fugitive Dust from Dust Generating Operations, requires that prior to commencing construction of, operating or modifying a dust-generating operation, a dust control permit be obtained. The dust control permit includes requirements for submittal of a dust control plan to the county regulatory authorities. At least one primary control measure (in this case, watering) and one contingency control measure must be identified in the Dust Control Plan for all dust generating sources.

Operations. There would be no differences between Alternatives 1.A, 1.B, and 1.C in air emissions associated with operation of the STA site, once it is developed. Assumptions used in the analysis of operational emissions for Proposal 1 are:

- each of the generators would run 40 hours per week, excluding 7 weeks per year when range maintenance occurs; and
- the generators run at 50 percent load.

Table 4-4 presents the emission estimates for the STA operations (e.g. generator emissions) for any of the alternatives.

Table 4-4
Operational Emission Estimates for Sensor Target Area, Any Action Alternative[a]

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.12	0.32	1.50	0.10	0.11	<0.11 [b]

[a] Factual corrections made to this table between the Draft EIS and Final EIS
[b] $PM_{2.5}$ was not calculated; $PM_{2.5}$ emissions would be less than PM_{10} emissions.

The 20 kW generators are expected to produce only a small quantity of emissions on an annual basis.

4.4.1.2 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, the STA site would not be developed; therefore, none of the construction or operational emissions would occur. Emissions would remain the same as they are currently.

4.4.2 Proposal 2 – Target Reconfiguration

The proposed target reconfiguration action would not produce any changes in air emissions produced at BMGR East. The intent of the proposed action is to establish environmental review and approval parameters that would allow most target reconfigurations needed to update BMGR East tactical ranges in a timely and efficient manner.

4.4.2.1 Alternative 2.A - Proposed Action

Because there could be air emissions associated with construction specific to new target sites, or earthwork within an existing target site, follow-on documentation would be prepared as necessary to comply with NEPA when specific target locations and configurations are determined.

4.4.2.2 Alternative 2.B – No-Action Alternative

Under Alternative 2.B, the no-action alternative for this proposal, ongoing routine target maintenance activities would continue to result in some minor, short-term, localized air emissions.

4.4.3 Proposal 3 – Moving Vehicle Target System

4.4.3.1 Alternative 3.A – Proposed Action

With implementation of Alternative 3.A, air emissions would be generated by construction of the road network necessary to provide a path for the tow vehicle and the target vehicle. Air

emissions would be generated once the target became operational as a result of the tow vehicle and the target vehicle moving on dirt tracks.

Construction. Alternative 3.A is the proposed action, and would require construction of the longest road. Air emissions have been calculated based on 7.75 miles of surface clearing, widening and grading to augment the existing unimproved road and provide a complete track system for operation of the moving target. The air emissions analysis for this alternative assumed:

- construction of an additional 7.75 miles of unpaved road;
- ten construction workers onsite on average, commuting 40 miles per day, roundtrip, within BMGR East;
- diesel truck traffic would traverse an average of 16 round trip miles within BMGR East; and
- diesel truck traffic would spend approximately 30 percent of the drive time within BMGR East on unpaved roads.

Table 4-5 presents the emission estimates for the unimproved road expansion for Alternative 3.A.

Table 4-5
Maximum Construction Emission Estimates for Moving Vehicle Target System, Alternative 3.A

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.02	0.15	0.13	0.01	5.15	0.52

Emissions from the road construction are negligible, with the exception of PM_{10}, generated primarily as a result of the earthmoving activities required to construct the 7.75-mile unpaved road. As indicated in Section 4.4.1.1, an earthmoving permit and dust control plan would be required because the area to be disturbed exceeds 0.1 acre.

Operations. The moving target operation would produce emissions, primarily fugitive dust from the movement of the target vehicle and tow vehicle on the unimproved road. Based on use estimates of 16,100 miles of road traveled per year by the vehicles, operational air emission estimates were calculated. Operational air emissions would be the same, regardless of the alternative chosen, and are presented in Table 4-6.

Table 4-6
Operational Emission Estimates for Moving Vehicle Target System, Any Action Alternative

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.02	0.20	0.01	0.00	26.47	2.64

4.4.3.2 Alternative 3.D – No-Action Alternative

With Alternative 3.D, the no-action alternative for this proposal, no moving vehicle target system would be introduced at BMGR East. Existing roads within North TAC would not be modified to form tracks for moving vehicle operations, so air emissions would not be expected to change.

4.4.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.4.4.1 Alternative 4.A – Proposed Action

Under Alternative 4.A, Maverick missiles would be used at this location instead of the existing target that is used for both Maverick and Hellfire missiles. No increase in ordnance use is proposed and construction activities associated with establishing the new target would not differ appreciably from those associated with periodic range maintenance. Therefore, air emissions would be unaffected by institution of the new target.

4.4.4.2 Alternative 4.B – No-Action Alternative

Under Alternative 4.B, the no-action alternative for this proposal, there would be no impact to air emissions.

4.4.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.4.5.1 Alternative 5.A – Proposed Action

Operations. The proposed action is to lower the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL. While there would be no net increase in emissions produced from the action, the emissions would be emitted from aircraft at a much lower altitude. Although both altitudes (500 feet and 1,500 feet AGL) are below the most common mixing height ceiling used (3,000 feet), the seasonal and diurnal variations in mixing height can actually reduce the ceiling to as low as 900 feet (Luke AFB, 56 FW/RMO 1997). When the mixing height ceiling is low, emissions are diffused less and local impacts are higher. Coupled with a reduction in flight altitude to 500 feet, it can be expected that a major portion of the aircraft emissions would be dispersed in a fairly localized area, principally the surface area of Cabeza Prieta NWR that underlies the flight paths. To estimate the quantity of emissions that may impact the Cabeza Prieta NWR locale at greater levels than if the aircraft were flying at higher altitudes, baseline data (U.S. Department of the Air Force 1999) were used to identify that portion of the total emissions that were associated with the number of proposed sorties (5,850) that would use the lower altitude. Additionally, calculations were performed using the approach power setting on F-16 aircraft (Luke AFB, 56 FW/RMO 1997) as this is the most predominant aircraft to be affected by the proposed change (U.S. Department of the Air Force 1999). The

approach power setting was used because this most accurately reflects the mode the aircraft would be in, as they are flying at low altitude in order to access a target. Table 4-7 present the estimated emissions associated with the lower altitude flights over Cabeza Prieta NWR.

Table 4-7
Operational Emission Estimates for 500 Feet AGL Flights over Cabeza Prieta NWR

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.35	1.76	6.47	0.00	0.20	<0.15

Based on the assumptions indicated above, the amount of pollutant emissions that would be increased over a more localized area of the Cabeza Prieta NWR are negligible to small, with oxides of nitrogen estimated at the highest quantity, in excess of 6 tons per year. The actual increase would be some fraction thereof, as the locality is already affected to some degree by aircraft traveling at 1,500 feet AGL.

4.4.5.2 Alternative 5.B – Alternative Action

Under Alternative 5.B, lowering the altitude from 1,500 feet AGL to 500 feet AGL would be the same as proposed under Alternative 5.A. For air quality, the lower altitude could potentially result in more localized impacts. However, as analyzed under Alternative 5.A, the operational emission estimates would be negligible to small.

4.4.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, military aircraft would continue to fly at altitudes of 1,500 feet AGL or higher when in the airspace overlying the Cabeza Prieta NWR except for those authorized flights along mutually designated low-level corridors. Therefore, no changes in air emission impacts would be expected.

4.4.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.4.6.1 Alternative 6.A – Proposed Action

The small-scale nature of construction activities proposed with implementation of Alternative 6.A precludes quantification of air emissions. Any impacts are expected to be extremely short-term and of negligible impact. An earthmoving permit and dust control plan, as described in Section 4.4.1.1, would be required.

4.4.6.2 Alternative 6.B – No-Action Alternative

No changes in air emissions would be anticipated under Alternative 6.B, the no-action alternative for this proposal.

4.4.7 Proposal 7 – On-the-Ground Training Exercises

4.4.7.1 Alternative 7.A – Proposed Action

CSAR teams, and potentially other small teams of approximately ten troops, would use BMGR East for ground-based training activities and larger teams of approximately 100 troops would use BMGR East for ground-based training activities two to three times annually. Implementation of Alternative 7.A would have negligible air emission impacts as a result of increased dust in localized areas associated with helicopter operations for insertion and extraction. The overall vehicle miles traveled on BMGR East roads is not expected to notably increase with implementation of Alternative 7.A.

4.4.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would be no impacts on air emissions.

4.4.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.4.8.1 Alternative 8.A – Proposed Action

The first improvement associated with implementation of Alternative 8.A would be to construct a taxiway parallel to the airfield runway. The second improvement would construct a new air traffic control tower in an appropriate location that has the height needed to provide adequate observation of aircraft movements on the runway and taxiways and sufficient interior space to house needed equipment. Air emissions would be generated from construction of the taxiway and the control tower. The exact location of the tower site, however, would not have any impact on emissions. Therefore, air emissions were calculated based on Alternative 8.A. The air emissions analysis was performed using the following assumptions and the air emissions presented in Table 4-8.

- Land disturbance would involve approximately 42 acres.
- A six-story (five floors and the control tower cab), 4,800 square foot air traffic control tower would be constructed.
- On average, 20 construction workers would be onsite daily, and would drive 15 miles roundtrip within BMGR East daily as part of their commute.
- Diesel truck traffic would traverse an average of 16 round trip miles within BMGR East.
- Diesel truck traffic would spend approximately 30 percent of the drive time within the BMGR on unpaved roads.

- A mobile asphalt batch plant would be brought onsite.
- Construction would be completed within 12 months.

Table 4-8
Emission Estimates for Construction of Taxiway and Control Tower, Gila Bend AFAF

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	2.60	2.09	4.26	0.48	15.60	1.77

The construction of a new taxiway and control tower at Gila Bend AFAF would result in short-term air emissions. The primary contributor to air emissions is 15.6 tons of PM_{10}, which is primarily the result of earth moving operations. As indicated in Section 4.4.1.1, because greater than 0.1 acre would be disturbed, a dust control permit and associated dust control plan would be required. In addition, the use of an asphalt batch plant may require a permit by either Maricopa County or ADEQ.

There would be no notable difference in operational aircraft emissions under the proposed action or any other action alternative.

4.4.8.2 Alternative 8.B – No-Action Alternative

Under Alternative 8.B, the no-action alternative for this proposal, there would be no air emission impacts.

4.4.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.4.9.1 Alternative 9.A – Proposed Action

Construction. The Alternative 9.A proposed action would pave approximately 7 miles of the road covering approximately 13.5 acres of BMGR East. Air emission estimates for the construction activity were calculated based on the following assumptions and are presented in Table 4-9.

- Approximately 13.5 acres would be paved.
- Forty loads of asphalt would be trucked in to the site, with each truck bearing 180 cubic yards of asphalt.
- On average, 20 construction workers would be onsite daily, and would drive 60 miles roundtrip within BMGR East daily as part of their commute.
- Diesel truck traffic would traverse an average of 16 round trip miles within BMGR East.
- Diesel truck traffic would spend approximately 30 percent of the drive time within BMGR East on unpaved roads.
- Construction would occur over 3 to 4 months.

Table 4-9
Construction Emission Estimates for Paving Road from Manned Range 1 to RMCP 1

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.46	1.20	1.17	0.11	6.87	0.74

Emission from the construction activity would be very short-term and have a minimal impact on the local air quality. As discussed in Section 4.4.1.1, the activity would require a dust control permit and dust control plan due to the size of the disturbance area.

Operations. Implementation of Alternative 9.A would result in a net reduction in air emissions compared to current operations. This is due to the paving of a currently unpaved road, leading to a reduction in fugitive dust emissions when the road is used. Maintenance would be required on the road, but those activities would only be required every few years and would be of smaller scale than the activities required to maintain the unpaved road as it is currently used.

Table 4-10 indicates the results of calculations of the reduction in fugitive particulate dust emissions from paving the road.

Table 4-10
Projected Annual Reduction in Fugitive Dust Emissions Due to Proposed Paving of Road from Manned Range 1 to RMCP 1

Pollutant	PM_{10}	$PM_{2.5}$
Tons/year	18.82	1.87

4.4.9.2 Alternative 9.B – No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, the ongoing practice of using the unpaved road in its current condition would continue. Dust generated from use of the unpaved road (see Table 4-10) would not be controlled. In addition, dust would be generated with periodic grading and associated road maintenance activities.

4.4.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.4.10.1 Alternative 10.A – Proposed Action

Operations. Under Alternative 10.A, sand and gravel would be extracted from ten sites within BMGR East, transported to five stockpile sites, and used in range maintenance. The annual operational emissions for this activity were calculated using the following assumptions and are presented in Table 4-11.

- Excavation activities would primarily occur during three 6-week periods of range maintenance throughout the year, a total timeframe of 18 weeks.
- 12,990 cubic yards of material would be excavated annually.

- 10,423 cubic yards would be transported to offsite storage and the average distance to storage would be 3.3 miles (or 6.6 miles roundtrip).

Table 4-11
Annual Operational Emission Estimates for Onsite Sand and Gravel Extraction and Storage

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.04	0.15	0.42	0.04	6.04	0.62

Annual emissions are negligible with the exception of PM_{10}, which is primarily generated by the movement of dump trucks on unpaved roads as they travel to and from the storage locations. As indicated in section 4.4.1.1, a dust control permit and dust control plan are likely needed for the sand and gravel extraction and storage activity, given that the area to be disturbed in all of the proposed locations exceeds 0.1 acre. Additional controls to reduce PM_{10} emissions could include combinations of the following:

- Stabilizing open storage piles and disturbed areas by covering and/or applying water or chemical/organic dust palliative (where appropriate) to both inactive and active sites, during workdays, weekends, holidays, and windy conditions;
- Installing wind fencing and phasing grading operations (where appropriate); operating water trucks for surface stabilization under windy conditions; preventing spillage; and limiting vehicle speed to 15 miles per hour when hauling material and operating non-earthmoving equipment;
- Limiting the speed of earth-moving equipment to 10 miles per hour;
- Covering vehicles hauling soil or other loose materials;
- Watering active construction sites as needed or applying a non-toxic soil stabilizer;
- Covering or applying soil stabilizers to disturbed areas within five days of completion of the activity at each site; and
- Reclaiming and revegetating disturbed areas as soon as practicable after completion of activity at each site.

4.4.10.2 Alternative 10.B – No-Action Alternative

Under Alternative 10.B, the no-action alternative for this proposal, the existing practice of conducting maintenance would continue without the benefit of additional on-range sand and gravel resources. The 56 RMO would continue to purchase materials from approved, outside, commercial sources that have the desired material composition and have them delivered to BMGR East for needed maintenance. The commercial sources, which are located in the Phoenix

area, must travel an average of 170 miles per round trip to deliver materials. Assuming the same volume of material would be purchased to continue to properly maintain the range roads, 13,000 cubic yards of material would result in 1,083 trips made in 12 cubic yard capacity dump trucks. Once the supplier trucks reach the range area, they must travel over range roads to the areas where the material is needed. Assuming that on each round trip a truck must traverse on average 10 miles of unpaved range road, then the majority of PM_{10} and $PM_{2.5}$ contributions are roughly twice what they would be from using materials excavated onsite. The total emissions associated with having materials delivered onsite to various locations on the range from a Phoenix-based supplier are presented in Table 4-12.

Table 4-12
Annual Operational Emission Estimates for Onsite Sand and Gravel Deliveries from Phoenix-based Supplier

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	0.08	0.36	1.39	0.00	10.96	1.13

4.4.11 Aggregate Impacts

The aggregate impacts of all relevant proposals have been evaluated for short-term construction emissions, long-term operational emissions, and Green House Gas (GHG) emissions. The analysis of the GHG emissions was added to the Final EIS; it did not appear in the Draft EIS.

Construction. Proposals 1, 3, 8 and 9 were evaluated for construction emission impacts. The total emissions resulting from all four proposals and from the proposals all occurring during the same time period of 2010 to 2011 are presented in Table 4-13.

Table 4-13
Total Aggregate Construction Emissions (STA Site, Moving Vehicle Target System, Taxiway and Control Tower, Road Paving from Manned Range 1 to RMCP 1)

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
2010	3.03	9.14	11.01	1.15	102.49	10.76
2011	1.51	4.56	5.50	0.57	51.17	5.37
Total	4.54	13.70	16.51	1.72	153.66	16.13

Construction is expected to generate low to moderate emissions, with the bulk of emissions associated with land disturbance activities and the resultant production of PM_{10}. As has been indicated previously, the emissions analysis assumes that wetting would be used as a control method for all land disturbance activities. One or more dust control permits and dust control plans would be required along with additional contingencies identified to support the primary control of dust suppression using water. Construction emissions are short-term, and are never

expected to exceed more than 15 months, which is the estimated time frame for the largest scale construction project (Alternative 1.A – STA Development).

Operations. Implementation of Proposals 1, 3, 5, and 10 would result in ongoing and/or recurring air emissions. The total emissions estimate is provided in Table 4-14.

Table 4-14
Total Aggregate Operational Emission Estimates (STA Site, Moving Vehicle Target System, Lowered Flight Training Altitude Over Cabeza Prieta NWR, Paved Road from Manned Range 1 to RMCP 1, and Sand and Gravel Extraction and Stockpiling)

Pollutant	VOC	CO	NO_x	SO_2	PM_{10}	$PM_{2.5}$
Tons/year	3.00	2.43	6.98	0.23	33.56	4.32

Proposal 5, which would reduce the flying altitude of aircraft over Cabeza Prieta NWR, would not actually generate any additional emissions, but the emissions from the aircraft would impact a more localized area due to the reduced altitude. Proposal 10, Sand and Gravel Extraction and Stockpiling, is the operational activity that would generate nearly all of the PM_{10} emissions.

A dust control permit and plan are likely needed for the sand and gravel extraction and storage activity, given that the area to be disturbed in all of the proposed locations exceeds 0.1 acre. Additional controls to reduce PM_{10} emissions can also be implemented, as described in Section 4.4.10. These are the only requirements that would be expected as a result of any of the anticipated operational emissions.

Green House Gas emissions. Individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, a measurable impact on global climate change may only potentially exist when GHG emissions from all proposals are combined.

The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane, and nitrous oxide, and combustive emission sources are a prime source of these GHG emissions. Examples of GHGs created and emitted primarily through human activities include fluorinated gases (hydrofluorocarbons and perfluorocarbons) and sulfur hexafluoride.

EPA signed the Final *Mandatory Reporting of Greenhouse Gases Rule* on September 22, 2009. The Rule requires reporting of GHG emissions from large sources and suppliers in the United States, and is intended to collect accurate and timely emissions data to inform future policy decisions. Under this Rule, suppliers of fossil fuels or industrial greenhouse gases, manufacturers of mobile sources and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions are required to submit annual reports to EPA. The gases covered by the Rule are

CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers.

On October 5, 2009, Executive Order 13514 was signed by President Obama. This Order directs and specifies timelines for Federal agencies to report, inventory, and reduce GHG emissions; improve water use efficiency and management; promote pollution prevention and eliminate waste; advance regional and local integrated planning; implement high performance sustainable Federal building design, construction, operation and management, maintenance, and demolition; advance sustainable systems acquisition; promote electronic stewardship; and sustain environmental management (74 Federal Register 52117).

Currently, there are no formally adopted or published NEPA thresholds of significance for GHG emissions stemming from proposed actions. On February 11, 2010, the Council on Environmental Quality released *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions.* This document suggests that while there is no significance threshold for NEPA analysis of GHG emissions, that the "25,000 metric tons may provide a useful, presumptive threshold for discussion and disclosure of GHG emissions" and that "This rationale is pertinent to the presentation of NEPA analysis as well". Thus, a review of the GHG emissions from the proposed BMGR operation actions, as compared to the 25,000 metric ton per year threshold provides a context for discussion. Aggregate GHG emissions were calculated and are provided in Table 4-15 (also see Appendix B). These emissions only achieve approximately 0.08 percent of the 25,000 metric tons discussion threshold and therefore can be construed as negligible.

Table 4-15
Total Aggregate GHG Emissions

	Proposal 1 (lbs/year)	**Proposal 3 (lbs/year)**	**Proposal 10 (lbs/year)**	**Total (tons/year)**	**Total (metric tons)**
CO_2	55	15,014	29,522	22.30	20.23

In summary, the air emissions associated with the proposed action are not considered significant because:

1. ambient air pollution concentrations would not increase above the National Ambient Air Quality Standards as a result of the proposed actions;
2. emissions from the proposed action would not contribute to an existing violation of the National Ambient Air Quality Standards because the actions are located in unclassified/attainment areas;

3. the proposed actions would not interfere with, or delay timely attainment of the National Ambient Air Quality Standards because the actions are located in unclassified/attainment areas;
4. the proposed actions would not impair visibility within federally-mandated Prevention of Significant Deterioration Class I areas because they are located at a distance greater than 50 kilometers and have a quantity/distance ratio of 0.1;
5. the proposed actions would not result in the potential for any stationary source to be considered a major source of emissions as defined in 40 CFR Part 52.21 (total emissions of any pollutant subject to regulation under the CAA that is greater than 250 tons per year for attainment areas); and
6. for mobile source emissions, there would not be an increase in emissions to exceed 250 tons per year for any pollutant.

4.5 BIOLOGICAL RESOURCES

This section analyzes the project's potential impacts to plant and wildlife resources. Both the direct impacts associated with project implementation and the indirect impacts to wildlife species that may occur off site or later in time are addressed. There are specific criteria to determine if the actions associated with a project will have a significant effect on biological resources; an action will have a significant effect if it will:

- substantially degrade environmental quality;
- substantially reduce wildlife habitat such that the distribution or abundance of a plant or animal species is altered on the landscape;
- interfere substantially with the movement of any wildlife species across the landscape, or impede the use of traditional wildlife breeding, nursery, or feeding sites;
- threaten to eliminate a plant or animal community;
- have an adverse effect, either directly or through habitat modifications, on a local population of any plant or animal species designated as a special status species by the USFWS (for ESA candidate, proposed, or conservation agreement species), AGFD (for state wildlife), Arizona Department of Agriculture (for state plants and insects), or as recognized in the BMGR INRMP; or
- have an adverse effect, either directly or through habitat modifications, on individuals of any plant or animal species listed as threatened or endangered under the ESA, or otherwise result in take of a listed wildlife species.

Some of the proposed actions or the action alternatives may have the potential to affect a special status species should the species occur within the area where activity would occur. In these cases, required special status species surveys would be conducted prior to ground-disturbing or construction activities associated with implementation of the proposed action or the selected action alternative.

To address potential affects to species listed under the ESA, consultation with the USFWS is required. Based on ESA regulations the consulted action is limited to the preferred alternative; in this situation consultation with USFWS was completed under a programmatic consultation which addressed the sum of actions conducted by the Air Force on BMGR East that may affect listed species (including, but not limited to the 10 proposed actions). Consultation was conducted for two species: Sonoran pronghorn and lesser long-nosed bat. This programmatic consultation was initiated by the submittal of a Biological Assessment on 10 December 2009 and was completed with the issuance of a Final Biological Opinion by the USFWS on May 4, 2010. (The results of the consultation efforts occurred following the issuance of the Draft EIS in July 2009.) The Biological Opinion provided specific terms and conditions for implementation to minimize the potential of incidental take of listed species. These terms and conditions are binding on the part of the action agency.

Sonoran Pronghorn ESA Consultation

The Biological Assessment provided a programmatic analysis of the sum of actions conducted by the Air Force on BMGR East that may affect the Sonoran pronghorn. This analysis included the consideration of the implementation of actions proposed by the Air Force for the conservation of the species. This included the establishment of criteria for target closures to preclude Air Force operations and protect Sonoran pronghorn. These target closures would include North TAC, South TAC, and Manned Range 1. East TAC and Manned Ranges 2, 3, and 4 are currently outside of occupied Sonoran pronghorn habitat, but if Sonoran pronghorn are observed within these ranges, the same target closure procedures would be implemented as applicable to the type of range (i.e., tactical or manned range). Target closures are based on the type of ordnance delivery. The distances for these closures were determined using Weapons Danger Zone – an application developed by the Department of Defense to determine the safety footprint of aircraft-delivered weapons. The Air Force also factored into consideration that the probability of a Sonoran pronghorn being struck by an errant weapon decreases asymptotically with distance from the target. The Weapons Danger Zone analysis, which investigated the radius of the area where specific munitions ultimately fall using a 99 percent confidence level, showed that inert munitions will fall 99 percent of the time within a 500 meter radius of the specified target; strafe will strike 99 percent of the time within a 1,000 meter radius of the specified target;

and live explosive and shrapnel will fall 99 percent of the time within a 1,500 meter radius of the specified target. In addition, as part of Air Force EOD operations, detonations of unexploded ordnance may not occur within a 1,500 meter radius of any Sonoran pronghorn.

Table 4-16 details the activity and the target closure radius for both the tactical ranges and Manned Range 1.

Table 4-16
Target Closure Distance Based on Ordnance Delivery or Military Activity

Activity/ Ordnance Delivery	North TAC and South TAC Target Closures	Manned Range 1 Target Closures	Comments
High explosive (HE) ordnance	1.5 km radius	Not applicable, no HE at Manned Ranges	Includes HE hills (North TAC and South TAC) and Maverick target on North TAC
Strafe of non-HE targets	1.0 km radius	0.5 km up range and laterally from the target 1.0 km downrange of the target	
Dropping of inert munitions on non-HE targets	0.5 km radius	0.5 km radius	Non-exploding training ordnance
EOD detonations	1.5 km radius	1.5 km radius	Controlled Detonation

Additional mitigation actions for the Sonoran pronghorn proposed by the Air Force through the programmatic consultation included the following language:

> The USAF [U.S. Air Force] has been funding and/or actively working on Sonoran pronghorn recovery projects since before 1996. Specifically the USAF has obligated over $5 million to support recovery actions and research studies for Sonoran pronghorn and fund the team of biologists who monitor for the presence of Sonoran pronghorn on the BMGR-East. Furthermore, about half of the time of one full-time employee of the Luke AFB Environmental Science Management section is dedicated to working on Sonoran pronghorn issues. Sonoran pronghorn recovery actions supported (i.e., contributing funds and/or personnel hours) annually by the USAF include radio collaring; aerial telemetry flights; studies of Sonoran pronghorn diet, habitat use and genetics; tactical range monitoring before flights; forage enhancement; and the captive breeding project. Luke AFB continues to actively support priority recovery actions established by the Sonoran Pronghorn Recovery Team, including directly funding the breeding pen, forage

plots, artificial water sources, biennial surveys of the U.S. and Mexico Sonoran pronghorn populations, and a portion of the Environmental Assessment for establishing a second herd in a new geographic location. The USAF proposes to implement or continue implementation of the following conservation measures:

1. The annual range maintenance schedule will continue to be implemented to reduce potential effects to Sonoran pronghorn as follows: East TAC – 15 April to 15 June; NTAC- 1 January to 28 February; STAC – 1 October to 15 December. These dates are subject to scheduling changes which may move the starting and ending dates by two weeks.

2. All BMGR-East ground personnel are briefed on the Sonoran pronghorn. The briefings cover the status of the species, the importance in reducing impacts to the species, and any mitigation measures the users must comply with while on the range, specifically OI [Operating Instruction] 13-01.

3. All vehicles are restricted to designated roads except as required by EOD, maintenance, emergency response, and environmental sciences personnel including authorized contractors while conducting required mission support activities.

4. When actions require new surface disturbance in current Sonoran pronghorn habitat, every effort will be made to minimize the extent of surface disturbance and to restore the area to the previous grade when such work is practicable. Most actions will be conducted on the existing road system but there will be a few cases where that cannot be done, such as during annual EOD clearances. The USAF will make every effort to minimize the impacts of operations to vegetation and friable soils, and for operations to be consistent with the conservation measures and terms and conditions of this biological opinion.

5. Low speed limits on roadways will continue to be enforced to ensure that no Sonoran pronghorn are injured due to vehicles. The 56th RMO OI 13-01 specifies that vehicle speed limits for all ground personnel will be reduced when approaching known Sonoran pronghorn locations. OI 13-01 speed limits on BMGR-East within SPH [Sonoran pronghorn] habitat are 45 mph on paved roads, 35 mph on major graded roads, and 25 mph on all other roads. The speed limit on the 7-mile road segment proposed for paving will remain at 35 mph and additional speed limit signs will be posted to encourage compliance.

6. The USAF will continue to revise OI 13-01, Sonoran Pronghorn Monitoring, from monitoring data collected by the Sonoran pronghorn monitors and input provided by the Sonoran Pronghorn Recovery Team. Luke AFB will use the biennial internal reviews of 56th RMO OI 13-01 to assess and adjust the guidelines to support military training operations and further the recovery of the Sonoran Pronghorn.

7. The USAF funded and installed two forage enhancement plots on BMGR-East. One forage enhancement plot is operational and the other has been completed but is not yet in use. Continued funding will be required to

maintain and operate those forage enhancement plots in the future for as long as they are needed. The USAF proposes working with the Sonoran Pronghorn Recovery Team to estimate operational costs for all forage enhancement plots and determine how to best cost-share that undertaking among the interested agencies. The USAF will contribute to the operation of these forage enhancement plots if the Sonoran Pronghorn Recovery Team determines this to be a priority use of USAF Sonoran pronghorn recovery action funding (see conservation measure 14).

8. The USAF supported new feed and water stations placed on BMGR-East's STAC [South TAC] (see the "Environmental Baseline" for Sonoran pronghorn [in the Biological Assessment] for a description of this action). The USAF, along with others, spent numerous hours monitoring these three sites for use patterns, moving them to new locations when use was low, as well as moving them further away from the targets when use was high, and restocking water and alfalfa feed. The USAF will continue to support the development and implementation of food and water stations as determined necessary by the Sonoran Pronghorn Recovery Team.

9. In accordance with its responsibilities under the MLWA of 1999 and the Sikes Act, Luke AFB will continue to work with its agency partners - the USMC [U.S. Marine Corps], the USFWS, BLM, and AGFD - to implement the Integrated Natural Resources Management Plan (INRMP) for the BMGR. The INRMP, which incorporates ecosystem management principles, is designed to establish a long-term resource stewardship program for the BMGR that provides for protection, conservation, and rehabilitation of natural resources, including Sonoran pronghorn and their habitat. The INRMP also provides for sustained public use of the range consistent with its military purposes and will undergo a review every five years. The INRMP fully supports the requirements of the Sonoran Pronghorn Recovery Plan and the actions of the Sonoran Pronghorn Recovery Team. The Record of Decision for the INRMP EIS was signed in March 2007.

10. The USAF produces and will continue to produce an annual report, which is provided to the USFWS-AESO [Arizona Ecological Services Office], that summarizes the results of all monitoring efforts (including the Sonoran pronghorn monitors annual report), the Range Use annual report, all range incidents, and a brief summary of all contract and construction work in Sonoran pronghorn habitat. The report includes the date and location of any Sonoran pronghorn observed by USAF personnel and contractors, including observations of injured or dead Sonoran pronghorn. This report describes in detail how each of the conservation measures was implemented. Reports that may be produced in association with implementation of the conservation measures or this [biological] opinion will be appended to the annual monitoring report. The annual report will be submitted in the spring of each year. Incidents of dead or injured Sonoran pronghorn will be reported within 24 hours to the Recovery Lead at CPNWR [Cabeza Prieta NWR] and to this office.

11. The San Cristobal Valley is closed to public use with access limited to authorized federal and state personnel and individuals holding a special use permit issued by 56th RMO. Special use permits for San Cristobal Valley are generally not issued for the time period beginning 15 March through 15 July to protect Sonoran pronghorn during the fawning period. Special use permits will only be issued during this period on an extremely limited basis and only if the proposed activity is not in conflict with pronghorn. These dates may be adjusted as recommended by the Recovery Lead at CPNWR.
12. The USAF removed several kilometers of barbed wire fencing from Sonoran pronghorn habitat. Fencing is a known deterrent to Sonoran pronghorn foraging and movement and poses a potential tangle hazard. The USAF will continue to remove unnecessary fencing as it is identified.
13. The USAF will continue to coordinate and share data with the CPNWR and the Arizona Ecological Services Office on all Sonoran pronghorn studies and monitoring efforts.
14. The USAF will continue to support priority recovery actions for Sonoran pronghorn as established by the Sonoran Pronghorn Recovery Team. This support has been in the form of providing 1) funding to AGFD and CPNWR to plan and implement recovery actions and 2) USAF staff time to assist in the planning and implementation of recovery actions identified by the Sonoran Pronghorn Recovery Team. Among other actions, last year [in 2008] USAF contributed funding to develop the Environmental Assessment (EA) for establishing a second pronghorn population in Arizona and more recently, they have committed to providing funding to develop the EA for a Sonoran Pronghorn Habitat Management Plan which is needed to coordinate pronghorn recovery actions range wide in Arizona (i.e., forage enhancements, water redevelopments, habitat manipulation, etc.). Luke AFB staff has contributed funding and dedicated numerous hours to the successful development and operation of the semi-captive breeding pen. USAF support of Sonoran pronghorn recovery actions will be continued at levels comparable to that provided since the issuance of the 2003 biological opinion (annual funding since 2003 has been approximately $210,000).
15. The USAF will continue to maintain the Sonoran pronghorn GIS database of all historical sightings in USAF files and support an annual program of documenting Sonoran pronghorn sightings by employees and other agencies throughout range. These files will be made available to the CPNWR, AGFD, and USFWS Tucson office upon request.
16. The USAF will continue efforts to implement the use of electronic scoring systems to reduce the number of air-to-ground weapons deliveries in pronghorn habitat. Development of the proposed STA was specifically designed to meet this goal, allowing pilots to practice delivery of precision-guided munitions on no-drop, electronically scored, targets.

Incidental Take – Within the Final Biological Opinion, authorization of incidental take was provided for the Sonoran pronghorn, and it was determined that this incidental take will not result in jeopardizing the continued existences of the species. It was determined that incidental take was warranted because:

> 1) the behavior of pen-raised animals is generally more erratic and less predictable than that of the wild animals; 2) more males are being released from the semi-captive breeding pen than females; and 3) males tend to make greater movements than females.

The USFWS anticipates the incidental take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury. In addition, the USFWS anticipates the incidental take of one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment.

Terms and Conditions – With the authorization of incidental take for Sonoran pronghorn, the Air Force is required to implement the following reasonable and prudent measures in additional to all mitigation actions proposed by the Air Force as part of the programmatic consultation:

> USAF shall monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring.
>
> If mortality or injury of Sonoran pronghorn is detected, the instructions provided below under "Disposition of Dead or Injured Listed Species" [in the Biological Opinion] will be followed. In addition, however, the USAF shall update the existing "Critical Incident Team Response" document. USAF shall ensure the document is reviewed and approved by CPNWR, AGFD, and AESO, and shall submit it to CPNWR, AGFD, and AESO within 90 days of the issuance of the final biological opinion. This protocol will be reviewed by USAF, AGFD, and AESO on an annual basis to ensure it is kept up to date. Among other items, the document will describe the manner in which the sex and origin of dead or injured pronghorn will be determined. To assist USAF in identifying animals, AGFD will tag all pen-raised pronghorn on both ears when they are released from the pen.

Conservation Recommendations – In addition to the Air Force's mitigation actions and required reasonable and prudent measures, the USFWS Biological Opinion included the following discretionary conservation recommendations for Sonoran pronghorn:

> Measures incorporated into the project will significantly help minimize project impacts to Sonoran pronghorn and their habitat. For example, 1) implementing the monitoring and target closure protocol (including modifying OI-13-01 to include the target closure protocols for the Manned Ranges 1, 2, and 4) greatly diminishes the risk that a pronghorn may be killed or injured due to ordnance delivery; 2) implementing the use of electronic scoring systems to reduce the

> number of air-to-ground weapons deliveries in pronghorn habitat reduces disturbance and the risk of death or injury due to ordnance deliveries; 3) conducting EOD activities on NTAC [North TAC] and STAC [South TAC] outside of the critical period for fawns and their mothers reduces the adverse effects of these activities on pronghorn; 4) limiting vehicles to designated routes and implementing low speed limits reduce disturbance and the risk of death or injury to pronghorn from vehicle collisions; 5) limiting surface disturbance minimizes habitat degradation and loss; and conducting sensitive species' briefings helps to decrease potential impacts to pronghorn and their habitat; and 6) scheduling small tactical team training in a manner that considers pronghorn locations reduces disturbance to pronghorn. Because, however, many significant adverse effects cannot be avoided or sufficiently minimized and because Sonoran pronghorn remain critically endangered, it is imperative that adverse effects are offset to the greatest extent possible. Accordingly, Luke AFB has been and will continue to make considerable contributions to fund and implement priority recovery actions identified by the Sonoran Pronghorn Recovery Team to ensure the continued survival of pronghorn. The implementation of recovery projects, such as forage enhancement plots, permanent waters, and temporary food and water stations, help improve pronghorn fitness, which should help them better withstand the effects of drought and human disturbance.

Lesser Long-nosed Bat ESA Consultation

The Biological Assessment provided a programmatic analysis of the sum of actions conducted by the Air Force on BMGR East that may affect the lesser long-nosed bat. Based on determinations made within the Biological Opinion, the USFWS anticipates incidental take of 10 lesser long-nosed bats every 10 years in the form of direct mortality or injury as a result of collision with aircraft or downward rotor wash from helicopters. The USFWS determined that there were no reasonable and prudent measures or terms and conditions that were necessary to minimize incidental take of lesser long-nosed bats. The USFWS included one discretionary Conservation Recommendation – the participation in the implementation of, including providing financial support to agencies to implement, the lesser long-nosed bat recovery plan.

4.5.1 Proposal 1 – Sensor Training Area

4.5.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Alternative 1.A would develop and operate the proposed STA at a site located within the San Cristobal Valley and underlying the Air-to-Air Range. This is the location for the proposed action because it provides optimum airspace for target ingress and egress as well as defensive maneuvering, acceptable communication with the existing microwave telemetry system, and a location that would not unduly conflict with ongoing training operations at either North or South TAC ranges. The proposed site is outside of the existing tactical ranges. Development of the STA would entail construction of the target facilities on up to 400 acres of the 640-acre site. The

facilities would include generators, microwave communications antenna, targets, night time lighting on poles (simulated street lights), and a fenced safety perimeter around unmanned threat emitters. Periodic maintenance may include up to twice weekly site visits by BMGR personnel; every 10 years, EOD clearances of areas including a 1,000-foot buffer around the outer perimeter of the target area (which could consist of portions of the 640-acre site or could extend beyond the 640-acre boundary of the STA to a maximum of 1,217 acres, depending on the final configuration of the targets); and every other year, EOD clearance of a 300-foot radius from the targets. Both day-time and night-time training flights would be scheduled. No explosive ordnance would be dropped though flares, illumination rockets, and simulated surface to air missiles would be employed onsite. Aircrews would use targeting lasers, which are not eye safe, to hit targets within the STA. Generally, four aircraft would use the airspace associated with the STA in a given block of time, which would typically equate to a daily maximum of 96 sorties when the STA is fully scheduled. Approximately 60 to 70 percent of the targeting flights are at medium altitudes (6,000 feet AGL to 30,000 feet MSL), a small percentage of the fixed-wing operations would occur above 30,000 feet MSL, and the balance would occur at less than 6,000 feet AGL. Most helicopter training at the STA would normally be conducted at low altitudes (50 feet AGL or less), and would be greatest in number during the Marine Corps' semi-annual WTI course (which may last up to six weeks). While helicopter missions at the STA would generally not include landings, some landings may occur, particularly during the Marine Corps exercises.

Vegetation and General Wildlife – The Alternative 1.A project site occurs within a largely pristine area within the mostly undisturbed San Cristobal Valley. The project site is located in the valley bottom between the Mohawk Mountains to the west and the Granite Mountains to the east. Topography is flat, and creosotebush is the dominant vegetation. A dry wash channel, often indistinct on the landscape, passes through the area. A few scattered ironwood and mesquite trees, with stands of big galleta grow along the wash. Soils are generally very fine textured. No unique vegetative community is found within the project area; the habitat present in the project area is generally representative of much of the San Cristobal Valley. An unpaved road parallels the west side of the project area. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas in the San Cristobal Valley. The construction and operation of the STA may frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.

Acuña Cactus – There is no suitable habitat for acuña cactus at the STA Alternative 1.A site in San Cristobal Valley. This site is located within creosotebush flats where the alluvial soils are generally fine textured, rather than the well-drained knolls and gravel ridges of granitic soils and

limestone hills and flats occupied by this cactus in the Sand Tank, Sauceda, and Little Ajo mountains, and in Organ Pipe Cactus National Monument. No impacts to the species would be anticipated from Alternative 1.A.

Crested (Fan-topped) Saguaro – The Alternative 1.A site is primarily composed of creosotebush flats. A shallow wash channel bisects most of the area, where a few ironwood and mesquite trees occur with stands of big galleta. The fine textured soils within this area are not preferred by saguaro; saguaros are extremely uncommon or absent entirely from this site. Crested saguaro, a rare and aberrant form, would not be expected on this site; therefore no impacts to the species would be anticipated from Alternative 1.A.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. Also, this lizard is occasionally found on semi-stabilized dunes and in small, fragmented patches of habitat. The nearest fringe-toed lizard habitat area to the Alternative 1.A site is likely several miles to the northwest in the vicinity of Mohawk Pass. No dune habitat occurs within the Alternative 1.A site though there are areas of very fine, silty to sandy soils. However, no fine, windblown sand habitat suitable for the fringe-toed lizard is expected in the project area. No impacts to the species would be anticipated from Alternative 1.A.

Desert Tortoise – The fine textured soils and flat relief of the San Cristobal Valley does not support the presence of burrows as constructed and used by desert tortoises. Even the wash that passes through the site is not sufficient for the formation of cut banks and shallow caves. On the BMGR, the tortoise generally occurs on rocky slopes and bajadas, becoming increasingly rare from east to west. In recent surveys on the BMGR, no tortoise sign was found in the Aguila Mountains located to the northeast of the Alternative 1.A site. Based on surveys conducted in the Mohawk Mountains west of San Cristobal Valley, the tortoise occurs in extremely low numbers in these mountains, as well as in the Granite and Growler mountains to the east. No impacts to the species would be anticipated from Alternative 1.A.

Cactus Ferruginous Pygmy-owl – The Alternative 1.A project site does not provide any potentially suitable habitat for the cactus ferruginous pygmy-owl. These owls prefer Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. Documented or suspected cactus ferruginous pygmy-owls and potentially suitable habitat in the vicinity of BMGR East have been reported from Organ Pipe Cactus National Monument and east of State Route 85. The Alternative 1.A project vicinity has a very simple vegetative structure (primarily creosotebush flats) and the few ironwood and mesquite trees that are found on the site occur in small clumps that are widely scattered along the shallow wash that runs through the area. No impacts to the species would be anticipated from Alternative 1.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed in the San Cristobal Valley and therefore is expected to occur within the Alternative 1.A project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The construction of the STA target site and periodic EOD clearance activities could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present in San Cristobal Valley). Because the Alternative 1.A site is in a remote and relatively pristine location, birds in the vicinity may not be as habituated to human-based activities as in areas more actively used for military training; therefore, activities associated with Alternative 1.A may result in disturbance to the bird. Proposed Alternative 1.A could result in localized impacts to the Le Conte's thrasher but would not be expected to impact the distribution or overall abundance of the species in the San Cristobal Valley.

Peregrine Falcon – The peregrine falcon generally does not breed in southwestern Arizona; however, they have been known to occur as migrants in southern Arizona. Based on a few observations during the spring, the possibility that they may occasionally nest on BMGR East has been suggested, but surveys have not located any nesting sites. Nesting sites are associated with steep cliffs and canyons. While there is some potential that peregrines may fly over the Alternative 1.A project site, the area does not provide appropriate perch sites or an adequate prey base (e.g., waterfowl, swifts, and swallows) for the peregrine to seek out or otherwise use the area. The closest potential nesting area to the project site is the Mohawk Mountains, for which the area would only be considered marginally suitable, at best. No impacts to the species would be anticipated from Alternative 1.A.

Western Burrowing Owl – Having been reported from several locations within the San Cristobal Valley, the burrowing owl is expected to occur within the Alternative 1.A project area, though there is little site-specific data available on this species as it has recently emerged as a species of interest. Burrowing owls prefer flat, open, low-stature grasslands, and sparsely vegetated desertscrub with perch locations that offer unobstructed views of the area. They make their home in the burrows of small mammals, particularly the burrows of desert kangaroo rats that also inhabit San Cristobal Valley. Therefore, the construction of the STA target site and periodic EOD clearance activities could impact the burrowing owl due to loss of habitat (a fraction of a percent of similar habitat present in San Cristobal Valley); possible displacement of birds; or collapsing of occupied burrows, if present. Prior to construction of the STA target site, surveys for western burrowing owls would be conducted to determine the presence or absence of burrowing owls within the target area. Following completion of construction activities, burrowing owls could potentially use the target facilities as perch sites. Because the Alternative

1.A site is in a remote and relatively pristine location, birds in the vicinity may not be as habituated to human-based activities as in areas more actively used for military training; therefore, they may respond negatively to the activities associated with Alternative 1.A. Vehicle access to the site for regular maintenance activities could result in temporary disturbance to birds using burrows at the site and along access roads. Medium- and high-altitude overflights would not be expected to impact the birds. Low-level flights and other project-related activities (e.g., rocket launching and use of illumination devices) could result in disturbance to individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the San Cristobal Valley.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR. They have been documented throughout the entire BMGR and are year round residents. A recent survey of mines and caves on the BMGR found California leaf-nosed bats roosting at two locations within the Mohawk Mountains, west of the Alternative 1.A project site. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters. The bat forages at night, typically along desert washes as well as over valley floors and along slopes and ridges. No potential California leaf-nosed bat roost sites occur in the Alternative 1.A project area; potential foraging habitat is present. Night time low level overflights by fixed-wing aircraft or helicopters, and use of illumination devices could cause the bats to avoid the area. Though insect prey may be found throughout the Alternative 1.A area, the overall sparse vegetation would not support resources for the bat to seek out or otherwise make special use of the area. No impacts to the species would be anticipated from Alternative 1.A.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known on the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. The fine textured soils in the Alternative 1.A area are not preferred by saguaro; saguaros are extremely rare or absent from this site. In addition, the surrounding mountains offer only limited foraging opportunities for the bat. It is expected that these bats fly each night to other areas (probably east and south) where there are greater foraging opportunities. No impacts to the species would be anticipated from Alternative 1.A.

Sonoran Pronghorn – The San Cristobal Valley is in near pristine natural condition, with several unpaved roads passing through the valley. Sonoran pronghorn are regularly present throughout the valley (see Figure 3-4) and would be expected to occur in the Alternative 1.A project area, though based on recent radio-telemetry data this area is not frequently used by

them. The construction of the STA target site and periodic EOD clearance activities could impact the Sonoran pronghorn due to loss of habitat (up to 400 acres, a fraction of a percent of similar habitat present in the San Cristobal Valley) and possible displacement of animals, if present. Following construction, the presence of target facilities would not appear to influence how pronghorn use an unmanned target area; in South TAC there are numerous targets and the animals are regularly observed in the area. Fencing the unmanned threat emitter(s) would preclude the animals from harmful exposure to radio frequency energy, though they would remain potentially exposed to the aircraft targeting laser (rated as not eye safe). However, this targeting laser is only activated in "combat" mode (the not eye safe mode) for approximately the last eight seconds after the target has been identified, therefore the potential for Sonoran pronghorn exposure would be minimized. Vehicle access to the STA target site for regular maintenance activities and EOD clearance could result in temporary disturbance to pronghorn present in the vicinity of the targets and the access roads. Pronghorn are particularly sensitive to disturbance during the fawning season. The low statured vegetation throughout the valleys of BMGR allows for long-range visibility by pronghorn of human-based activities. Compliance with *Operating Instruction 13-01* requires all vehicles to adhere to a maximum speed between 15 mph and 45 mph while in pronghorn habitat, depending on the situation, to minimize the possibility of collisions with pronghorn.

Though the project vicinity has not been previously used for ground-based military training, it is within an existing air-to-air training area where aircraft are often present. With implementation of Alternative 1.A, there would likely be an increase in aircraft presence in this airspace, and personnel and traffic on the ground. Though pronghorn throughout BMGR are likely habituated to noise from aircraft overflights (Krausman et. al 2001), pronghorn could experience some level of additional disturbance due to low-level aircraft associated with the STA and the presence of helicopters, including helicopter landings. However, Krausman *et al.* (2001) did not detect changes in pronghorn behavior that may influence animals in a detrimental manner due to military overflights (noting that this study evaluated effects to pronghorn from only six flights below 1,000 feet AGL and did not include helicopters). Night-time activities and the use of illumination devices could also startle the animals, especially if they are bedded in the area. The animals may have developed some level of habituation due to the use of illumination devices elsewhere on the BMGR. Night-time lighting at the facility (mock street lights) as well as aerial illumination devices may also cause pronghorn in the area to be more susceptible to predation. Due to the possibility of disturbance, the implementation of Alternative 1.A could result in adverse effects to individual Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require

consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 1.A may result in adverse effects to Sonoran pronghorn; however this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn. Within the Biological Assessment the USAF proposed 16 Conservation Measures including:

> The USAF will continue efforts to implement the use of electronic scoring systems to reduce the number of air-to-ground weapons deliveries in pronghorn habitat. Development of the proposed STA was specifically designed to meet this goal, allowing pilots to practice delivery of precision-guided munitions on no-drop, electronically scored, targets.

The USFWS agreed and noted within the Biological Opinion's conservation recommendations that:

> Implementing the use of electronic scoring systems to reduce the number of air-to-ground weapons deliveries in pronghorn habitat reduces disturbance and the risk of death or injury due to ordnance deliveries.

In addition, to reduce adverse effects to Sonoran pronghorn, access road improvements, and EOD clearance will occur outside the fawning season to the degree possible. To minimize disturbance to Sonoran pronghorn associated with maintenance and use of the improved road, *Operating Instruction 13-01* will be enforced. To minimize ground disturbance, STA EOD clearance will be completed with the fewest and lightest trucks possible.

4.5.1.2 Alternative 1.B – South Tactical Range Site

With Alternative 1.B, the STA would be constructed and operated at the Target 220 site within South TAC, in the Growler Valley between the Granite and Growler mountains. This alternative would offer adequate airspace that would not constrain maneuverability, would provide a secluded area for laser operations, and would be in an existing target area that has been previously disturbed. Since this site is within South TAC, training missions could employ live round fire at other nearby targets in South TAC as part of a training mission employing STA use. However, use of the Alternative 1.B site would result in schedule conflicts between use of the STA and South TAC operations.

Vegetation and General Wildlife – The Alternative 1.B project area occurs within the existing South TAC range. The alternative 1.B STA site has been previously disturbed by live fire missions at existing targets and the entire area is subject to EOD clearance operations. Unpaved roads are present throughout South TAC to provide access for target maintenance. The project

site is located in the valley bottom between the Granite Mountains to the west and the Growler Mountains to the east. Topography is flat and soils are generally very fine textured. Minor dry wash channels drain to Growler Wash about 1 mile to the west. Creosotebush is the dominant vegetation with some scattered ironwood and mesquite trees, which increase in density along Growler Wash. No unique vegetative community is found within the project area; the habitat present in the project area is generally representative of much of the Growler Valley. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas in the Growler Valley, though Growler Wash may function as a movement corridor for a range of wildlife species. With implementation of Alternative 1.B, the construction and operation of the STA could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.

Acuña Cactus – There is no suitable habitat for acuña cactus at the STA Alternative 1.B site in Growler Valley. This site is located within creosotebush flats where the alluvial soils are generally fine textured, rather than the well-drained knolls and gravel ridges of granitic soils and limestone hills and flats occupied by this cactus elsewhere in the region. No impacts to the species would be anticipated from Alternative 1.B.

Crested (Fan-topped) Saguaro – The Alternative 1.B site is primarily composed of creosotebush flats with some scattered ironwood and mesquite trees. The fine textured soils within this area are not preferred by saguaro; saguaros are extremely uncommon or absent entirely from this site. Crested saguaro, a rare and aberrant form, would not be expected on this site; therefore no impacts to the species would be anticipated from Alternative 1.B.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. Also, this lizard is occasionally found on semi-stabilized dunes and in small, fragmented patches of habitat. The nearest fringe-toed lizard habitat area to the Alternative 1.B site is likely in the vicinity of Mohawk Pass. No dune habitat occurs within the Alternative 1.B site though there are areas of very fine soils. However, no windblown sand habitat suitable for the fringe-toed lizard is expected in the project area. No impacts to the species would be anticipated from Alternative 1.B.

Desert Tortoise – The fine textured soils and flat relief of the Growler Valley does not support the presence of burrows as constructed and used by desert tortoises. In recent surveys on the BMGR, no tortoise sign was found in the Aguila Mountains located to the north of the Alternative 1.B site, though tortoises are expected to occur in extremely low numbers in the Granite Mountains on the west side of Growler Valley, and in the Growler Mountains to the east. No impacts to the species would be anticipated from Alternative 1.B.

Cactus Ferruginous Pygmy-owl – The simple vegetation structure of the Alternative 1.B project site (primarily creosotebush flats with a few widely scattered, small clumps of ironwood and mesquite trees) does not provide any potentially suitable habitat for the cactus ferruginous pygmy-owl. Potentially suitable habitat may be found associated with Growler Wash where there is increased tree density, though the portion of Growler Wash closest to the Alternative 1.B site is likely of marginal habitat quality. No impacts to the species would be anticipated from Alternative 1.B.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed in the Childs Valley between the Growler and Granite Mountains and therefore is expected to occur within the Alternative 1.B project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The construction of the STA target site and periodic EOD clearance activities could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present within the Childs Valley), and maintenance activities could result in disturbance to the thrasher. Proposed Alternative 1.B could result in localized impacts to the Le Conte's thrasher but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – The peregrine falcon has been known to occur as a fall or winter migrant in southern Arizona, and may occasionally nest on BMGR East in areas with steep cliffs and canyons. While there is some potential that peregrines may fly over the Alternative 1.B project site, the area does not provide appropriate perch sites or an adequate prey base for the peregrine to seek out or otherwise use the area. The closest potential nesting areas to the project site are the Granite and Growler mountains, which would only be considered marginally suitable, at best. No impacts to the species would be anticipated from Alternative 1.B.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations within the Growler Valley, but there is little site-specific data available on this species as it has recently emerged as a species of interest. Suitable habitat is likely within the Alternative 1.B project area. Burrowing owls prefer flat, open, low-stature grasslands, and sparsely vegetated desertscrub with perch locations that offer unobstructed views of the area. They make their home in the burrows of small mammals, particularly the burrows of desert kangaroo rats that also inhabit the Growler Valley. Therefore, the construction of the STA target site and additional periodic EOD clearance activities could impact the burrowing owl due to loss of habitat (a fraction of a percent of similar habitat present in the Growler Valley); possible displacement of birds; or collapsing of occupied burrows, if present. Prior to construction of the STA target site, surveys for western burrowing owls would be conducted to determine the presence or absence of burrowing owls within the target area. With implementation of Alternative 1.B, burrowing owls could use the target

facilities as perch sites. Vehicle access to the site for regular maintenance activities may result in temporary disturbance to birds using burrows at the site and along access roads. Medium- and high-altitude overflights are not expected to impact the birds. Low-level fixed-wing and helicopter flights and other project-related activities (e.g., rocket launching and use of illumination devices) could result in disturbance to individual burrowing owls but would not be expected to impact the distribution or overall abundance of the species in the Growler Valley.

California Leaf-nosed Bat – The nearest potential roost sites to the Alternative 1.B project area for the California leaf-nosed bat would be in both the Granite and Growler mountains. The bat forages at night, typically along desert washes as well as over valley floors and along slopes and ridges; potential foraging habitat is present in the Alternative 1.B project area, especially along Growler Wash approximately 1 mile west of the project site. Night time low level over-flights by fixed-winged aircraft and helicopters and use of illumination devices could cause the bats to avoid the area. Though insect prey may be found throughout the Alternative 1.B area, the overall sparse vegetation would not support resources for the bat to seek out or otherwise make special use of the area. No impacts to the species would be anticipated from Alternative 1.B.

Lesser Long-nosed Bat – Lesser long-nosed bats feed primarily on nectar and pollen of columnar cacti and agave flowers. Because the Alternative 1.B area has fine textured soils, saguaros are extremely rare or absent from this site. In addition, the surrounding mountains offer only limited foraging opportunities for the bat. It is expected that these bats fly each night to other areas (probably east and south) where there are greater foraging opportunities. The Growler Mountains are a minimum of 5 miles to the east of the Alternative 1.B project area, and overflights associated with the STA would not be expected to disturb bat roosts. No impacts to the species would be anticipated from Alternative 1.B.

Sonoran Pronghorn – Sonoran pronghorn are regularly present throughout the Growler Valley (see Figure 3-4) and are regularly reported from the South TAC area, including the Alternative 1.B project area. The construction of the STA target site and periodic EOD clearance activities could impact the Sonoran pronghorn due to loss of habitat (up to 400 acres, a fraction of a percent of similar habitat present in the Growler Valley) and possible displacement of animals. Following construction, the presence of target facilities would not appear to influence how pronghorn use an unmanned target area. There are numerous targets present in South TAC and the animals are regularly observed in the area, even among the various targets. Fencing the unmanned threat emitter(s) would preclude the animals from harmful exposure to radio frequency energy, though they would remain potentially exposed to the aircraft targeting laser (rated as not eye safe). Vehicle access to the STA target site for regular maintenance activities and EOD clearance could result in temporary disturbance to pronghorn present in the vicinity of

the targets and the access roads. Pronghorn appear to be particularly sensitive to disturbance during the fawning season (Krausman *et al.* 2001). The low statured vegetation throughout the valleys of BMGR provides pronghorn with long-range visibility of human-based activities. Compliance with *Operating Instruction 13-01* requires all vehicles to adhere to a maximum speed between 15 mph and 45 mph while in pronghorn habitat, depending on the situation, to minimize the possibility of collisions with pronghorn.

The Alternative 1.B project area is located within South TAC, which is consistently used for training missions that include overflights with live fire, and periodic EOD clearance activities. No notable increase in the use of this airspace would be expected with implementation of Alternative 1.B because of the scheduling conflicts between STA and South TAC operations, though there may be an increase in ground-based maintenance activities in the area. Pronghorn throughout BMGR are likely habituated to some level of noise from aircraft overflights (Krausman et. al 2001), and pronghorn using South TAC would likely not experience additional disturbance due to aircraft associated with the STA than would otherwise occur in the area. However, the presence of helicopters, including landings by helicopters may disturb pronghorn. Night-time activities and the use of illumination devices could also startle the animals, especially if bedded in the area. The animals may have developed some level of habituation due to the use of illumination devices elsewhere on the BMGR. Night-time lighting at the facility (mock street lights) as well as aerial illumination devices may also cause pronghorn in the area to be more susceptible to predation. Due to the possibility of disturbance, the implementation of Alternative 1.B could result in adverse effects to individual Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion. No mitigation or conservation measures specific to Alternative 1.B were developed because the Biological Assessment and consultation with the USFWS only regarded the preferred alternative (Alternative 1.A). General conservation measures for Sonoran pronghorn would apply and are included above in Section 4.5.1.

4.5.1.3 Alternative 1.C – North Tactical Range Site

The Alternative 1.C site for the STA in North TAC would be constructed and operated within the tactical range near its contiguous airspace boundary with the Manned Range 4 airspace. This alternative offers adequate airspace that would not constrain maneuverability, and would provide a secluded area for laser operations. However, due to airspace required for targeting maneuvers, Alternative 1.C may interfere with simultaneous use of Manned Range 4 and Manned Range 2.

The Alternative 1.C area is located near the west extent of the Crater Range, in the southern portion of the Sentinel Plain.

Vegetation and General Wildlife – The Alternative 1.C project area occurs within the existing North TAC range but outside of existing target complexes located within a few miles of the site. The area has not been previously disturbed by live fire missions or EOD clearance operations. Unpaved roads are present in the area though approximately 4 miles of existing road would need to be upgraded and approximately 1 mile of a new unpaved road would need to be constructed to provide access to the ground forward air controller point. The project site is located in the valley bottom where topography is generally flat, and soils are mostly fine textured. Minor dry wash channels drain to the north. Creosotebush is the dominant vegetation with some scattered ironwood and mesquite trees. No unique vegetation community is found within the project area; the habitat present in the project area is generally representative of much of the Sentinel Plain. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas. The construction and operation of the STA could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.

Acuña Cactus – There is no suitable habitat for acuña cactus at the STA Alternative 1.C site in Sentinel Plain. This site is located within creosotebush flats where the alluvial soils are mostly fine textured, though it may tend to be somewhat gravelly due to proximity to the Crater Range. Acuña cactus in the region prefers well-drained knolls and gravel ridges of granitic soils and limestone hills and flats. No impacts to the species would be anticipated from Alternative 1.C.

Crested (Fan-topped) Saguaro – The Alternative 1.C site is primarily composed of creosotebush flats with some scattered ironwood and mesquite trees. The fine textured soils within this area are not preferred by saguaro, though some saguaro may occur on more well drained sites. Crested saguaro, a rare and aberrant form, would not be expected on this site. If saguaro is present in the target construction area, they would be avoided. Therefore, no impacts to the species would be anticipated from Alternative 1.C.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. Also, this lizard is occasionally found on semi-stabilized dunes and in small, fragmented patches of habitat. The nearest fringe-toed lizard habitat area to the Alternative 1.C site is likely in the vicinity of Mohawk Pass or in isolated habitat patches on the BMGR south of Dateland. No dune habitat occurs within the Alternative 1.C site. No impacts to the species would be anticipated from Alternative 1.C.

Desert Tortoise – The flat relief of the Sentinel Plain does not support the presence of burrows as constructed and used by desert tortoises. In recent surveys on the BMGR, no tortoise sign was found in the Aguila Mountains located to the west of the Alternative 1.C site, though tortoises are expected to occur in extremely low numbers in the Crater Range. Even though the project area is in close proximity (about 1 mile from the lower slopes and foothills), tortoises are not expected in the valley bottom due to the absence of suitable cover sites. No impacts to the species would be anticipated from Alternative 1.C.

Cactus Ferruginous Pygmy-owl – The Alternative 1.C project site does not provide any potentially suitable habitat for the cactus ferruginous pygmy-owl. These owls prefer Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. The Alternative 1.C project vicinity has a very simple vegetative structure (primarily creosotebush flats) and the few ironwood, paloverde, and mesquite trees that are found on the site occur in small clumps that are widely scattered. No impacts to the species would be anticipated from Alternative 1.C.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed north of the Crater Range and therefore is expected to occur within the Alternative 1.C project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The construction of the STA target site and periodic EOD clearance activities could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present north of the Crater Range), and maintenance activities could result in disturbance to the species. Proposed Alternative 1.C could result in localized impacts to the Le Conte's thrasher, but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – The peregrine falcon generally does not breed in southwestern Arizona, but has been observed as a migrant species. Nesting sites are associated with steep cliffs and canyons. While there is some potential that peregrines may fly over the Alternative 1.C project site, the area does not provide appropriate perch sites or an adequate prey base for the peregrine to seek out or otherwise use the area. The closest potential nesting areas to the project site are in the Crater Range, which would only be considered marginally suitable, at best. No impacts to the species would be anticipated from Alternative 1.C.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations within the Sentinel Plain, but there is little site-specific data available on this species as it has recently emerged as a species of interest. Suitable habitat may occur within the Alternative 1.C project area. Burrowing owls prefer flat, open, low-stature grasslands, and sparsely vegetated desertscrub with perch locations that offer unobstructed views of the area. They make their home

in the burrows of small mammals. The construction of the STA target site, new road, and periodic EOD clearance activities may impact the burrowing owl due to loss of habitat (a fraction of a percent of similar habitat present in the Sentinel Plain) and possible displacement of birds and collapsing of occupied burrows, if present. Prior to construction of the STA target site, surveys for western burrowing owls would be conducted to determine the presence or absence of burrowing owls within the target area. Following completion of construction activities, it is possible that burrowing owls may use the target facilities as perch sites. Vehicle access to the site for regular maintenance activities may result in temporary disturbance to birds using burrows at the site and along access roads. Medium- and high-altitude overflights would not be expected to impact the birds. Low-level flights by fixed-winged aircraft and helicopters and other project-related activities (e.g., rocket launching and use of illumination devices) could result in disturbance to individual burrowing owls, but would not be expected to impact the distribution or overall abundance of the species in the Sentinel Plain.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR. They have been documented throughout the entire BMGR and are year round residents. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters. Roost sites may occur in the Crater Range. The bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges. No potential California leaf-nosed bat roost sites occur in the Alternative 1.C project area; potential foraging habitat is present. Night time low-level overflights by fixed-winged aircraft and helicopters and use of illumination devices may cause the bats to avoid the area. Though insect prey may be found throughout the Alternative 1.C area, the overall sparse vegetation would not support resources for the bat to seek out or otherwise make special use of the area. No impacts to the species would be anticipated from Alternative 1.C.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaro occurs at very low density in the project vicinity, although the number of individual saguaros increases closer to the Crater Range where they may provide limited foraging habitat for the bat. It is expected that these bats would be more likely to fly to other areas (probably east and south of the Alternative 1.C site) where there are greater foraging opportunities. No impacts to the species would be anticipated from Alternative 1.C.

Sonoran Pronghorn – The Alternative 1.C project area is within North TAC, which is consistently used for training missions that include overflights with live-fire targets located a few miles away. EOD clearance activities have not previously been conducted in the Alternative 1.C project area. With Alternative 1.C, training exercises using the STA and other North TAC exercises would generally not be scheduled simultaneously, so there would be little, if any, increase in aircraft presence in this airspace, though STA training activities would shift the operations closer to the Crater Range.

Based on almost two decades of AGFD telemetry data on the Sonoran pronghorn, the Sentinel Plain has been considered to be outside the regularly occupied range of the animal. However, in 2008 pronghorn were sporadically documented northeast of the Crater Range toward Interstate 8 and Gila Bend, extending east almost to State Route 85 (see Figure 3-4). The unexpected presence of pronghorn in this area has been attributed to long-distance movement associated with extreme drought, and the release of naive animals from the semi-captive breeding facility, resulting in three animals being drowned in a canal near Gila Bend. The regular movement patterns of pronghorn do not indicate recurrent use of this area and it appears unlikely, but uncertain, that pronghorn will continue to move north of the Crater Range. Because past data indicate that this area is outside the regularly occupied range of the animal, the probability that pronghorn may occur in this area is considered insignificant. The Sentinel Plain is considered suitable though unoccupied habitat. However, if pronghorn do occur in the area, no matter how unlikely, they would be exposed to similar disturbance impacts as described for Alternative 1.B (no additional disturbance due to overflights; new disturbances due to low-level helicopter overflights and helicopter landings), though the frequency of disturbance would only be in proportion to the limited time an animal may pass through the area. Therefore, the implementation of Alternative 1.C is not considered to result in adverse effects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS; if the USFWS does not concur with the determination, a biological opinion may be issued with mandatory terms and conditions to minimize incidental take of the species. No mitigation or conservation measures specific to Alternative 1.C were developed because the Biological Assessment and consultation with the USFWS only regarded the preferred alternative (Alternative 1.A). General conservation measures for Sonoran pronghorn would apply and are included above in Section 4.5.1.

4.5.1.4 Alternative 1.D – No-Action Alternative

The no-action alternative would be to not construct or operate the STA within BMGR East. The current environmental condition at each of the three alternative locations would not change;

operations at North and South TAC would continue. The baseline condition for the Alternative 1.A area is generally undisturbed Sonoran desertscrub uplands consisting primarily of creosotebush flats. Both Alternatives 1.B and 1.C have been previously used for tactical maneuvers, though only site 1.B has been subjected to ordnance delivery and EOD clearance operations. The Alternative 1.C site is proposed outside of the existing North TAC target complexes and has not been previously used as a target impact area for air-to-ground attack training; however, current or previous targets authorized for attack with air-to-ground ordnance are located within a few miles of the site. The Alternative 1.A project location has had virtually no ground disturbance activities; the Alternative 1.C project location has had minor ground disturbances with active overflights; and the Alternative 1.B location has had ground disturbance due to air-to-ground ordnance delivery and EOD clearance activities.

4.5.2 Proposal 2 – Target Reconfiguration

4.5.2.1 Alternative 2.A – Proposed Action

The Alternative 2.A proposed action is to establish environmental review and approval procedures that would allow most target reconfigurations needed to update BMGR East tactical ranges in a timely and streamlined manner. These procedures are proposed based on the degree at which reconfigured targets would not be expected to be distinguishable from the long-term prevailing environmental conditions established by their predecessor targets.

From a perspective of providing sufficient analysis and disclosure of potential impacts to biological resources, there is a direct relationship to previous evaluations of project-specific impacts. For each target reconfiguration, this would require a review of the past analysis of potential effects to identify the parameters that were assessed in comparison to the changed conditions brought about by the reconfiguration of a target. Generally, this is captured within the standards for analysis of target reconfiguration based on EOD clearance areas; in a large part because the environmental effects of the clearance activities are intimately tied to the effects of the target itself, and that EOD clearance areas effectively demarcate both the principle military surface footprint and the physical extent to which military use affects biological resources.

The environmental effects of long-term military training uses have been addressed in detail in the *Legislative Environmental Impact Statement for the Renewal of the Barry M. Goldwater Range* (U.S. Department of the Air Force 1999). These effects are most readily characterized by the degree to which authorized military use of the tactical ranges has resulted in physical disturbance to the ground surface and vegetation. The above-referenced range renewal EIS documents authorized land use in conjunction with a biological opinion issued by USFWS to address the project-related effects to species listed under the ESA. In compliance with the reinitiation

requirements of a biological opinion, reinitiation of consultation would be required "if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion." Therefore, it is not the modification of the project *per se* that triggers reinitiation, but a change in the magnitude or type of effects to the listed species.

The implementation of Alternative 2.A would have the functional result of establishing that the impact assessment of a specific action would be conducted such that the environmental effects of each type of target configuration would be captured in the effects analysis; and that all past assessments were completed consistent with this approach. The internal verification that all appropriate effects of target reconfiguration have been addressed would include the following components.

1. The compliance documents relevant to the targets in question would be identified.
2. If ESA-listed species were considered in the assessment, the conditions of any biological opinion would be verified.
3. For ESA-listed species, a determination would be made if the target reconfiguration would result in effects to the species that were not considered in the biological opinion.
4. An updated list of ESA-listed species for the county would be consulted to determine if any newly listed species must now be considered.
5. The results of this reassessment would be documented by memorandum in the project administrative record, and if the reassessment includes ESA-listed species, a copy of the compliance memorandum would be provided to USFWS for informational purposes. If these conditions are not met, consultation procedures with USFWS would be followed.

4.5.2.2 Alternative 2.B – No-Action Alternative

With the no-action alternative, aircrews would continue to use the existing targets within BMGR East and no targets would be reconfigured by enlarging existing targets or moving targets to new locations within current or former EOD clearance areas. Therefore, there would be no change in effects to biological resources from the current condition.

4.5.3 Proposal 3 – Moving Vehicle Target System

4.5.3.1 Alternatives 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C

The moving vehicle target track would be located within North TAC and would be approximately oval in shape, consisting of an unpaved road about 50 feet wide and roughly 6- to 7.5-miles in length. A remotely operated vehicle would tow a target by a 250-foot cable at speeds up to 60 mph to be targeted by aircraft using inert ammunition for strafing, live fire rocket and

missiles, and inert bombs. Approximately 85 percent of the time, the vehicle towing the target would be driven at speeds up to 45 mph. About 15 percent of the time, the vehicle would travel at speeds between 45 mph and 60 mph. It is estimated that the moving vehicle target system would be used in 30-minute blocks approximately 4 times per day, 5 days per week, and 46 weeks per year. Annually, it is estimated that the system may be driven up to 20,000 miles per year, although the average is likely to be about 11,500 miles a year. EOD clearance within 50 feet of the track would be required on an annual basis and within 300 feet of the track every other year. Road maintenance would be required on a recurring basis (approximately once a month) to remove munitions impact scars so that vehicle damage would be minimized and the desired target system speed could be achieved.

Four alternatives (including the no-action alternative) are being considered. The three action alternatives are located within 10 miles of each other in the Childs Valley adjacent to and southwest of the northwest end of the Crater Range. Because of their close proximity to each other, and similarity in topography and vegetation, potential biological impacts for each of the three action alternatives are evaluated concurrently.

With the implementation of any of the three action alternatives, an amendment to the Air Force's *Operating Instruction 13-01* would be needed. This amendment would increase the speed limit associated with the track to 60 mph, but only for the purposes of the moving vehicle target training exercises. The current speed limits for the existing roads were put into place to help mitigate the potential for striking wildlife, particularly Sonoran pronghorn, which may be crossing roads.

Location of Alternative 3.A – Proposed Action

Alternative 3.A is within the active target areas of North TAC being co-located with Target 104/106 (the old main airfield). Most of the area has been previously disturbed by access roads, target features, ordnance impacts, and EOD operations associated with the target complex. Topography is generally flat and vegetation includes sparse desertscrub with scattered stands of mesquite.

Location of Alternative 3.B

Alternative 3.B is located west of and adjacent to one of the roads that provide primary ground access to interior locations in North TAC, including the Target 104/106 complex. This area has not been previously disturbed by target infrastructure or EOD clearance activities. Topography is mostly flat and vegetation includes sparse desertscrub with scattered stands of mesquite.

Location of Alternative 3.C

Alternative 3.C is located southeast of the North TAC simulated rail yard and just west of East Pass in the Crater Range. This area has not been previously disturbed by target infrastructure or EOD clearance activities. Topography slopes somewhat to the southwest on the alluvial fan from the nearby mountain slope, and vegetation includes desertscrub with patches of mesquite, paloverde, and likely saguaro. This area includes several defined wash channels and is highly susceptible to flash flooding and erosion. The proposed track closely parallels Tenmile Wash for a distance of about 2 miles.

Vegetation and General Wildlife – All three proposed action alternatives occur within the existing North TAC Range. Alternative 3.A is the only location where live fire and EOD clearance have previously occurred. Existing unpaved roads would be bladed and widened to 50 feet to provide for about half the distance for each track; new roadway will be constructed for the remainder of each track. Located in the Childs Valley southwest of the northwest end of the Crater Range, the topography is generally flat and soils are often silty and finely textured. However, the Alternative 3.C site is located higher on the alluvial deposits of the Crater Range and the soils are expected to include more gravel. Overall, creosotebush is the dominant vegetation with some scattered ironwood, mesquite, and paloverde trees, which increase in density higher on the alluvial slopes and along Tenmile Wash. No unique vegetative community is found within the project area; the habitat present in the project area is generally representative of much of the Childs Valley. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas in the Childs Valley. However, Tenmile Wash is an important area for wildlife, providing habitat for much of the breeding bird diversity on BMGR, and providing critical habitat components (i.e., food, water, and shelter) for an array of mammals, reptiles, amphibians, and insects. Project activities at each alternative location may frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area except for Alternative 3.C where activities adjacent to Tenmile Wash could disrupt the ability of wildlife to effectively use this important habitat area to safely move across the landscape.

Acuña Cactus – There is no suitable habitat for acuña cactus at any of the alternative locations in the Childs Valley. Soils are primarily derived from alluvium outwash from the Crater Range, being more fine textured in the valley bottom and more gravelly closer to the mountains, as in the location of Alternative 3.C. Acuña cactus occur on well-drained knolls and gravel ridges of granitic soils and limestone hills and flats in the Sand Tank, Sauceda, and Little Ajo mountains, and in Organ Pipe Cactus National Monument. The species is not expected to occur in this

location and no impacts would be anticipated from implementation of Alternative 3.A, 3.B, or 3.C.

Crested (Fan-topped) Saguaro – Saguaro occur in scattered locations throughout the area, with increased density on the higher alluvial fans where the soils are well-drained. Crested saguaro, a rare and aberrant form, has not been documented in the immediate area, but its presence is possible. Saguaros are most likely to be found on the Alternative 3.C site; much of the Alternative 3.A site has been impacted by weapons training and limited numbers of saguaro are expected to be present; and the Alternative 3.B site is primarily in the valley bottom where saguaro would normally occur in very low numbers. No impacts to crested saguaro would be anticipated from implementation of Alternative 3.A and 3.B; however Alternative 3.C has the potential to impact crested saguaro.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. Also, this lizard is occasionally found on semi-stabilized dunes and in small, fragmented patches of habitat. The nearest fringe-toed lizard habitat area to any of the action alternatives sites is likely in the vicinity of Mohawk Pass or in isolated habitat patches on the BMGR East south of Dateland. No dune habitat occurs within Alternative 3.A, 3.B, or 3.C project areas and no impacts to the species would be anticipated.

Desert Tortoise – On the BMGR, the desert tortoise has been recorded in low numbers from many of the mountain ranges, including the Crater Range, occurring on rocky mountain slopes and alluvial fans (bajadas) where there are appropriate cover sites and burrow locations. The generally flat relief and sandy washes in the Alternative 3.B project area in Childs Valley strongly limit tortoise habitat suitability. The Alternative 3.A site also includes valley bottom and an alluvial fan that are not expected to serve as tortoise habitat. However, the relatively undisturbed Alternative 3.C project location includes bajadas habitat that may support desert tortoises in extremely low numbers; therefore, prior to construction of the moving vehicle target system, surveys for desert tortoise would be conducted to determine the presence or absence of desert tortoise and to move them out of harms way. No impacts to the species would be anticipated from Alternative 3.A or 3.B; however, Alternative 3.C could contribute to degradation of desert tortoise habitat and impact individual animals.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl is not expected to occur in association with any of the project alternative sites. These owls prefer Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. Perhaps marginally suitable habitat occurs within Tenmile Wash near Alternative 3.C. However, the vegetation is likely not sufficiently dense or found in large enough patches to provide nesting

habitat. No impacts to the species would be anticipated from implementation of any project alternative.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout BMGR East and therefore could potentially occur within any of the project alternative sites. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The construction of a moving target facility could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present within the Childs Valley). The potential for collision between the target vehicle and individual Le Conte's thrashers is possible, but not considered likely due to the noise associated with both the moving vehicle target system and incoming ordnance. Proposed Alternatives 3.A, 3.B, or 3.C could result in minor, localized impacts to the Le Conte's thrasher, but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – The peregrine falcon generally does not breed in southwestern Arizona; however they have been known to occur as migrants in southern Arizona, and based on a few observations during the spring, the possibility that they may occasionally nest on BMGR East has been suggested, but surveys have not located any nesting sites. Nesting sites are associated with steep cliffs and canyons. While there is some potential that peregrines may fly over any of the project alternative sites, the Alternative 3.B area does not provide appropriate perch sites or an adequate prey base (e.g., waterfowl, swifts, and swallows) for the peregrine to seek out or otherwise use the area. The area around Alternative 3.A, though close to steep cliffs of the Crater Range, is frequently disturbed by on-going military activity in North TAC. However, steep cliffs of the Crater Range are almost adjacent to the Alternate 3.C area. These cliffs may be considered marginally suitable nesting habitat, and if peregrines are present, they may forage over Tenmile Wash, also adjacent to the Alternative 3.C project site. No impacts to the species would be anticipated from Alternative 3.A or 3.B; however, project activities could result in disturbance to individual peregrine falcons possibly associated with the area adjacent to Alternative 3.C.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations within the Childs Valley, but there is little site-specific data available on this species as it has recently emerged as a species of interest. Suitable habitat is likely to occur within the project area for each of the three alternatives. Burrowing owls prefer flat, open, low-stature grasslands, and sparsely vegetated desertscrub with perch locations that offer unobstructed views of the area. They make their home in the burrows of small mammals. Road construction for the target track and periodic EOD clearance activities could impact the burrowing owl due to loss of habitat and possible displacement of birds and collapsing of occupied burrows, if present. Prior to construction of the moving vehicle target system, surveys for western burrowing owls would be

conducted to determine the presence or absence of burrowing owls within the target area. Vehicle access to the site for regular maintenance activities and operation of the moving target at speeds up to 60 mph may result in temporary disturbance to birds using burrows close to the project area. The potential for collision between the target vehicle target system and individual burrowing owls is possible, but not considered likely due to the noise associated with both the moving vehicle and incoming ordnance. Project activities at all three alternative sites could result in disturbance to individual burrowing owls but would not be expected to impact the distribution or overall abundance of the species in the Childs Valley.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR. They have been documented throughout the entire BMGR and are year round residents. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters. Roost sites may occur in the Crater Range. The bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges. Potential foraging habitat may be found in association with each project alternative area. However, the Tenmile Wash xeroriparian corridor would provide abundant insect prey that may attract the California leaf-nosed bat. Project Alternative 3.C parallels Tenmile Wash, and activities associated with targeting and EOD clearance may impact the overall habitat quality of Tenmile Wash. Though insect prey may be found throughout the Alternative 3.A and 3.B areas, the overall sparse vegetation would not support resources for the bat to seek out or otherwise make special use of those areas, and no impacts to the species would be anticipated from these two alternatives. However, activities associated with the Alternative 3.C area could result in disturbance to California leaf-nosed bats through modification of suitable foraging habitat.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaro occurs at very low to moderate densities across the area of Childs Valley where the three project alternatives are located. Saguaro would tend to increase in the number of individuals closer to the Crater Range where they may provide limited foraging habitat for the bat. It is expected that these bats fly each night to other areas (probably east and south) where there are greater foraging opportunities. No impacts to the species would be anticipated due to implementation of Alternative 3.A, 3.B, or 3.C.

Sonoran Pronghorn – Sonoran pronghorn have been documented throughout most of North TAC Range, although they rarely occur northwest of the Crater Range. These animals use both

valley bottom and bajadas habitats. Road construction for any of the three alternatives could impact Sonoran pronghorn due to loss of habitat and possible displacement of animals due to disturbance. Following construction, the presence of target facilities does not appear to influence how pronghorn use an unmanned target area; in both North and South TAC there are numerous targets and the animals are regularly observed in these areas. The Alternative 3.A project area occurs within active targeting areas on North TAC, where habitat has been degraded by consistent use for training missions that include over-flights and live fire targets. EOD clearance activities have been on-going. Neither live fire nor EOD clearances are known to have previously been conducted within Alternatives 3.B or 3.C project areas.

Due to scheduling conflicts between moving vehicle target system and North TAC operations, use of the moving vehicle target track at any of the alternative locations would not likely result in increases in airspace use of the North TAC, but could result in the more frequent overflights in the project area being considered for Proposed Action 3. Implementation of any of the moving target action alternatives would, however, result in additional ground based disturbance. Target vehicle speeds would be from 35 mph to 45 mph for the majority of the use; however, this speed could increase to 60 mph for approximately 15 percent of the tracks operations. To minimize potential impacts to Sonoran pronghorn, spotters would be stationed at look-out points to ensure no pronghorn are in the vicinity of the moving vehicle target track (generally within 5 km) prior to any operation that could potentially impact the animals. If Sonoran pronghorn are present, the mission would be rescheduled or cancelled. This system is currently in place at North TAC and South TAC and Sonoran pronghorn continue to use the area. In addition, remote control cameras would be installed to visually verify that no people or large animals are present on or near the track prior to live fire. Because Sonoran pronghorn throughout the BMGR are likely habituated to noise from aircraft overflights (Krausman *et al.* 2001), and the number of sorties within North TAC would not substantively increase, and pronghorn spotters would observe the area prior to operations, no additional impact to Sonoran pronghorn would be expected due to disturbance from aircraft associated with live fire.

However, the presence of the moving vehicle and target at speeds up to 60 mph could result in new disturbances to pronghorn. The low statured vegetation throughout the valleys of BMGR provides Sonoran pronghorn with long-range visibility of human-based activities, thus impacting pronghorn access to habitat over a greater area than the footprint of the activity. Krausman *et al.* (2005) found that Sonoran pronghorn sightings were biased toward areas where military activities resulted in ground disturbance that provided conditions for more favorable forage. Sonoran pronghorn regularly are found within North TAC, especially the areas identified for Alternatives 3.A and 3.B where past activities have resulted in ground disturbances. Habitat in

the vicinity of Alternative 3.C is relatively undisturbed and few pronghorn sightings have been recorded from this area.

Due to the possibility of additional disturbance, the implementation of any of the three project alternatives could result in adverse effects to individual Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 3.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn. Within the Biological Opinion it was noted that:

> To minimize adverse effects to pronghorn, road construction for the moving vehicle target will be done during the NTAC maintenance closure period which is outside of the fawning season.
>
> To minimize the risk of the target vehicle colliding with or causing disturbance to pronghorn, target closure standards will be enforced such that if pronghorn are detected within the target closure radius, the mission will be cancelled or rescheduled. In addition to standard monitoring, remote control cameras will be used to ensure no pronghorn are present on or near the track prior to live fire.
>
> To minimize adverse effects to pronghorn, EOD clearances for the moving vehicle target system will be scheduled with other NTAC clearances (outside of the fawning season).

The USFWS included within the Biological Opinion:

> Implementing the monitoring and target closure protocol greatly diminishes the risk that a pronghorn may be killed or injured due to ordnance delivery.

No mitigation or conservation measures specific to Alternative 3.B or 3.C were developed because the Biological Assessment and consultation with the USFWS only regarded the preferred alternative (Alternative 3.A). General conservation measures for Sonoran pronghorn would apply and are included above in Section 4.5.1.

4.5.3.2 Alternative 3.D – No-Action Alternative

With Alternative 3.D, the no-action alternative, no moving vehicle target system would be introduced at BMGR East. Existing roads within North TAC would not be modified to form tracks for moving vehicle operations, but these existing roads would continue to be used for other military operations and support functions, as would the continued use of live fire at North TAC.

4.5.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.5.4.1 Alternative 4.A – Proposed Action

The proposed action is to develop a second live missile target in East TAC in a location that would be more centrally positioned to allow attacks with Maverick missiles from multiple directions and optimal altitudes. The proposed target location is within prior EOD clearance areas. This new target would be used for both Hellfire (helicopter launched) and Maverick air-to ground-missiles. The existing air-to-ground missile target would be retained for Hellfire or other munitions training, but would be retired from live Maverick use.

Vegetation and General Wildlife – The Alternative 4.A project area is located in East TAC along Quilotosa Wash near Platt Well, between the Sauceda and Sand Tank mountains. The site is located off Quilotosa Wash between widely spaced drainage channels in a lightly vegetated area of desert pavement with creosotebush, bursage, other small shrubs; and scattered saguaro, ironwood, and paloverde trees. The wash includes dense stringers of paloverde, ironwood, and mesquite, which form a particularly dense stand at Platt Well. The site is within a prior EOD clearance area, but is not known to have been used previously as a live fire target area. No unique vegetation community is found within the project area; the habitat present in the project area is generally representative of much of the area. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas. However, Quilotosa Wash is an important area for wildlife, providing habitat for much of the breeding bird diversity on BMGR, and providing critical habitat components (i.e., food, water, and shelter) for an array of mammals, reptiles, amphibians, and insects. Live fire activity could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife safely across the landscape.

Acuña Cactus – Suitable habitat for acuña cactus is likely not present at the Alternative 4.A project site. Soils are primarily derived from alluvium outwash from the Sauceda and Sand Tank mountains. Acuña cactus occur on well-drained knolls and gravel ridges of granitic soils and limestone hills and flats at two sites in the Sauceda Mountains (one on BMGR East, the other on BLM lands), and one site in the Sand Tank Mountains (on BLM lands). The species is not expected to occur in the proposed target location and no impacts would be anticipated from implementation of Alternative 4.A.

Crested (Fan-topped) Saguaro – Saguaro occur in scattered locations throughout the area, with increased density on the higher alluvial fans where the soils are well-drained and on mountain slopes. Crested saguaro, a rare and aberrant form, has not been documented in the immediate

area, but its presence is possible. Alternative 4.A would have the potential to impact individual crested saguaro.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard has not been recorded east of State Route 85 and the project area may be considered outside of the species distribution. No impacts to the species would be anticipated.

Desert Tortoise – On the BMGR, desert tortoise has been recorded in low numbers from many of the mountain ranges, including the Sauceda and Sand Tank mountains, occurring on rocky mountain slopes and alluvial fans (bajadas) where there are appropriate cover sites and burrow locations. Though there is a remote possibility that tortoises may occur on the alluvial fan due to proximity to occupied habitat in the adjacent mountains, it is considered highly unlikely to occur in the vicinity of Alternative 4.A because of the lack of cover sites and appropriate burrow locations. No impacts to the species would be anticipated from implementation of Alternative 4.A.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl prefers Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. Perhaps suitable habitat occurs in the Sand Tank and Sauceda mountains, and along portions of Quilotosa and Sauceda washes. However, in the vicinity of the Alternative 4.A site, vegetation is not sufficiently dense or forming large enough patches to provide nesting habitat, though a very dense stand of mesquite is found at Platt Well. No impacts to the species would be anticipated from implementation of Alternative 4.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout BMGR East and therefore could potentially occur within the Alternative 4.A project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The construction of a new live missile target could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present within Sauceda Wash). Alternative 4.A could result in minor, localized disturbance to the Le Conte's thrasher, but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – The peregrine falcon generally does not breed in southwestern Arizona; however, they have been known to occur as fall and winter migrants in southern Arizona, and based on a few observations during the spring, the possibility that they may occasionally nest on the BMGR East has been suggested. Nesting sites are associated with steep cliffs and canyons. The closest potential nesting areas to the project site are in the Sauceda and Sand Tank mountains, though this would be considered very marginal. There is some potential that

peregrines may fly over the Alternative 4.A project site, and there are reasonably suitable perches in the area with a diverse bird community that provides a potential prey base (though not necessarily its preferred prey of waterfowl, swifts, and swallows). There are no special features in the project area that would attract the bird to the project area. No impacts to the species would be anticipated from implementation of Alternative 4.A.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations in desertscrub habitat on BMGR East lands east of State Route 85. However, areas of suitable habitat are limited to flat, open, low-stature and sparsely vegetated desertscrub where they make their home in the burrows of small mammals. The vegetation in the Alternative 4.A project area includes a variety of shrubs and patches of fairly dense growth that would tend to obstruct the open views of the landscape required by this owl. The implementation of Alternative 4.A would not be expected to impact this species.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters. Roost sites have been documented in the Sand Tank and Sauceda mountains. The bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges. Xeroriparian corridors are important foraging areas that provide abundant insect prey for the bat. California leaf-nosed bats and their foraging habitats are likely to occur within the Alternative 4.A project area, primarily in association with Quilotosa and Sauceda washes. Because the target area is located outside of the main wash, limited habitat destruction is expected due to munitions delivery, though some impacts to the wash system potentially could occur from EOD clearance activities but not at the level to harm insect populations. If the target is used during the nighttime when this bat forages, there could be disturbance to the bats during their foraging activities. Therefore, impacts to the California leaf-nosed bat would be a potential result of implementing Alternative 4.A.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaros occur at low to moderately-low densities in the Alternative 4.A project area. Higher numbers of saguaro are found on the slopes of the Sand Tank and Sauceda mountains than on the valley floor where Alternative 4.A is proposed. Limited impacts to saguaro are expected due to munitions delivery or from EOD clearance activities. Light-tracking studies following lesser long-nosed bats from known roost sites documented minimal foraging activity in the Sand Tank Mountains to the

north of the project area. The majority of training flights would occur between 1,000 feet and 1,500 feet AGL; however some flights may occur as low as 100 feet AGL to as high as 5,000 feet AGL. Because these bats forage at night, they may be susceptible to collisions with both fixed-winged aircraft and helicopters that are training at night at low altitudes. Foraging bats may also be disturbed by the noise and downward rotor-wash associated with nighttime helicopter overflights, although only a small percentage of sorties would occur at night and fewer at low altitudes. Lesser long-nosed bats and their foraging habitats could occur within the Alternative 4.A project area. Therefore, there would be potential for disturbance and mortality to the lesser long-nosed bat as a result of implementation of Alternative 4.A. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect a listed species would require consultation with the USFWS, and if the project results in adverse effects, the USFWS would issue a biological opinion with mandatory terms and conditions for the minimization of incidental take.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 4.A may result in adverse effects to the lesser long-nosed bat; however, it is not likely to jeopardize the continued existence of the bat. The Biological Opinion notes that Proposed Action 4.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. No proposed action-specific conservation or mitigation measures were included in the Biological Assessment and none were noted by the USFWS within the Biological Opinion for lesser long-nosed bats. The Biological Opinion's Conservation Recommendation included "participate in the implementation of, including providing financial support to agencies to implement, the lesser long-nosed bat recovery plan."

Sonoran Pronghorn – Sonoran pronghorn does not occur on the BMGR east of State Route 85; the area is considered outside the range of the species. Therefore, there would be no potential impacts to the Sonoran pronghorn under Alternative 4.A.

4.5.4.2 Alternative 4.B – No-Action Alternative

With the no-action alternative, the existing live air-to-ground missile target in East TAC would continue to be used for both Hellfire and Maverick missiles and an additional air-to-ground missile target for live air-to-ground missile use would not be developed. Munitions delivery to the proposed target site would not occur and therefore would avoid resulting habitat destruction.

4.5.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.5.5.1 Alternative 5.A – Proposed Action and Alternative 5.B

The proposed action (Alternative 5.A) is to renegotiate a 1994 MOU with the USFWS to provide for lowering the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL. The area that would be affected by Alternative 5.A would be entirely within R-2301E and would extend from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary, and south of the South TAC boundary to a distance of 15 NM.

Alternative 5.B would also involve the renegotiation of the 1994 MOU to provide for lowering the flight training altitude floor over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL, but the area proposed in Alternative 5.B would be reduced from that proposed with Alternative 5.A. The east-west dimension would be from the west side of the Growler Mountains west to the R-2301E and R-2301W airspace boundary (as with Alternative 5.A), and south of the South TAC boundary to a distance of 8 NM (as opposed to 15 NM to the south as in Alternative 5A).The entire Cabeza Prieta NWR is overlain by the R-2301E and R-2301W restricted airspaces from the surface to 80,000 feet MSL. However, the general operating floor for military aircraft overflying the refuge was set at 1,500 feet AGL and above in a 1951 agreement between the Air Force and the Department of the Interior. This general operating floor has remained in effect from 1951 to the present. However, in 1975, three low-level MTRs, with floors of 500 feet AGL, were subsequently designated across the northeastern portion of the refuge to support Air Force training missions. In addition, a mix of low-level east-west corridors with floors of 200 feet AGL for fixed-wing aircraft and 50 feet AGL for helicopters were eventually established to accommodate Marine Corps training needs. Both the Air Force MTRs and the Marine Corps low-level corridors continue to be in effect. The current 1994 MOU reaffirms the basic low-level flight provisions of the 1975 MOU regarding use of the airspace over the Cabeza Prieta NWR. Under Alternative 5.A or 5.B, the flight floor for airspace over a portion of the Cabeza Prieta NWR would be lowered from 1,500 feet AGL to 500 feet AGL and could be used by fixed-wing aircraft or, much more rarely, by helicopters for either day or night missions. It is anticipated that approximately 4,200 to 6,200 sorties would use this low-level airspace annually with implementation of Alternative 5.A or 5.B.

Vegetation and General Wildlife – Overflights by themselves do not cause habitat degradation, but wildlife, especially larger mammals such as mule deer, bighorn sheep, and pronghorn may have behavioral and physiological responses to these types of disturbance, often similar to ground-based stimuli that may influence survival and reproduction (Krausman *et al.* 2001).

Ungulates may react more to low-level helicopter flights than fixed-wing overflights; however, the magnitude of these effects to wildlife is not always clear, and reflects individual animal's experiences and habituation to similar events.

Noise may impact different animals in different ways. Krausman *et al.* (2004) determined that desert ungulates do not hear sound pressure levels generated from aircraft as well as humans do. Though overflights resulted in short-term increases in the heart rate of bighorn sheep (Krausman *et al.* 1993), Krausman *et al.* (1986) concluded that desert mule deer habituated to low flying, fixed-wing, single-engine aircraft. Bighorn sheep have been reported by Bleich *et al.* (1990, in Krausman 2001) to be more sensitive to helicopter overflights, and in 1998 Krausman *et al.* reported that desert bighorn sheep females with lambs were more likely to be vigilant than does without young in response to military overflights.

Despite the number of studies conducted on large mammals, relatively little is known about the effects of noise on small mammals, reptiles, and birds. The impact of excessive noise in the environment may have profound consequences to some animals. For example, the roar of a dune-buggy engine was reported by Immel (1995, in Radle 2007) to temporarily disable the reflexive defense of the desert kangaroo rat against the sidewinder rattlesnake by eliminating the rat's defensive hearing. The diversity of effects that noise may have among and between species complicates the interpretation of the effects of noise for wildlife in general (Radle 2007). Though some individuals of various species may be disturbed by low-level overflights, these activities are not expected to result in impacts to the distribution or abundance of wildlife.

Acuña Cactus – Neither the acuña cactus nor its habitat would be expected to be impacted by low-level overflights. No impacts to this species would be expected as a result of implementation of Alternative 5.A or 5.B.

Crested (Fan-topped) Saguaro – Neither the crested saguaro nor its habitat would be expected to be impacted by low-level overflights. No impacts to this species would be expected as a result of implementation of Alternative 5.A or 5.B.

Colorado Desert Fringe-toed Lizard – Neither the Colorado Desert fringe-toed lizard nor its habitat would be expected to be impacted by low-level overflights. No impacts to this species would be expected as a result of implementation of Alternative 5.A or 5.B.

Desert Tortoise – Neither the desert tortoise nor its habitat would be expected to be impacted by low-level overflights. No impacts to this species would be expected as a result of implementation of Alternative 5.A or 5.B.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl prefers dense vegetation within Arizona Upland Sonoran desertscrub and xeroriparian washes. Potentially suitable habitat,

generally in small patches, may be present across the Cabeza Prieta NWR. Disturbance from low-level overflights may cause the bird to flush from cover. The implementation of Alternative 5.A or 5.B potentially could impact individuals of this species but would not be expected to alter the local distribution or abundance of the bird. Because Alternative 5.B covers approximately half the north-south distance of Alternative 5.A, potentially fewer individual cactus ferruginous pygmy-owls would be disturbed by these low level flights; therefore Alternative 5.B could have fewer impacts on cactus ferruginous pygmy-owls than Alternative 5.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout the BMGR and therefore is expected to occur within the Alternative 5.A and 5.B project areas. Disturbance from low-level overflights may cause the bird to flush from cover. The implementation of Alternative 5.A or 5.B potentially could impact individuals of this species but would not be expected to alter the local distribution or abundance of the bird. Because Alternative 5.B covers approximately half the north-south distance of Alternative 5.A, potentially fewer individual Le Conte's thrashers would be disturbed by these low level flights; therefore Alternative 5.B could have fewer impacts on Le Conte's thrashers than Alternative 5.A.

Peregrine Falcon – Peregrine falcons nest in association with steep cliffs and canyons. The bird forages on the wing and will soar to high altitudes. Low-level overflights may cause the bird to flush from its cliff nest or perch, and collision with the speeding aircraft is possible. Though peregrines are not known from the project vicinity, the implementation of Alternative 5.A or 5.B potentially could impact individuals of this species (if present) but would not be expected to alter the local distribution or abundance of the bird. Because Alternative 5.B covers approximately half the north-south distance of Alternative 5.A, potentially fewer individual peregrine falcons would be disturbed by these low level flights; therefore Alternative 5.B could have fewer impacts on peregrine falcons than Alternative 5.A.

Western Burrowing Owl – Low-level overflights over occupied burrowing owl habitat could cause disturbance to the owl that may result in the bird crouching low, seeking refuge in its burrow, or taking flight. The implementation of Alternative 5.A or 5.B potentially could impact individuals of this species but would not be expected to alter the local distribution or abundance of the bird. Because Alternative 5.B covers approximately half the north-south distance of Alternative 5.A, potentially fewer individual burrowing owls would be disturbed by these low level flights; therefore Alternative 5.B could have fewer impacts on burrowing owls than Alternative 5.A.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR and within the surrounding vicinity. The bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges.

Xeroriparian corridors are important foraging areas that provide abundant insect prey for the bat. Because these bats forage at night, they may be susceptible to collisions with both fixed-winged aircraft and helicopters that are training at night. There is little potential for fixed-winged aircraft noise to impact these bats. The noise and downward rotor-wash associated with helicopters overflights have potential to disturb foraging bats, although only a small percentage of the sorties would be with helicopters at night. California leaf-nosed bats and their foraging habitats are likely to occur within the Alternative 5.A and 5.B project areas. Therefore, there would be potential for impacts to the California leaf-nosed bat as a result of implementation of Alternative 5.A or 5.B. Because Alternative 5.B covers approximately half the north-south distance of Alternative 5.A, potentially fewer individual California leaf-nosed bats would be disturbed by these low level flights; therefore Alternative 5.B could have fewer impacts on California leaf nosed-bats than Alternative 5.A.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). It is not likely that the lower flight floor would disturb the roost site within the Growler Mountains because the lower level flights generally would not occur over the mountainous topography.

These bats are known to fly long distances between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. It is expected that these bats fly each night to other areas (probably east and south) where there are greater foraging opportunities. Because these bats forage at night they may be susceptible to collisions with both fixed-winged aircraft and helicopters that are training at night at low altitudes. There is little potential for fixed-winged aircraft noise to impact these bats. The noise and downward rotor-wash associated with helicopters overflights have potential to disturb and possibly kill foraging bats, although only a small percentage of the nighttime sorties would be with helicopters. Lesser long-nosed bats and their foraging habitats are likely to occur within the Alternative 5.A and 5.B project areas. Therefore, there would be potential for disturbance and mortality to the lesser long-nosed bat while foraging as a result of implementation of Alternative 5.A or 5.B. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect a listed species would require consultation with the USFWS, and if the project results in adverse effects, the USFWS would issue a biological opinion with mandatory terms and conditions for the minimization of incidental take.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 5.A may result in adverse effects to the lesser long-nosed bat; however, it is not likely to jeopardize the continued existence of the bat. The Biological Opinion

notes that Proposed Action 5.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. No proposed action-specific conservation or mitigation measures were included in the Biological Assessment and none were noted by the USFWS within the Biological Opinion for lesser long-nosed bats. The Biological Opinion's Conservation Recommendation included "participate in the implementation of, including providing financial support to agencies to implement, the lesser long-nosed bat recovery plan."

Sonoran Pronghorn – Sonoran pronghorn occur on the valley bottoms and alluvial slopes throughout the area identified for low-level flights on the Cabeza Prieta NWR. Low-level overflights have been consistently conducted on BMGR East over occupied pronghorn habitat for many decades. Krausman *et al.* (2001) presented the only comprehensive evaluation of effects of military overflights on the Sonoran pronghorn. Military overflights were associated with changes in pronghorn behavior, but these changes did not likely influence animals in a detrimental manner (Krausman *et al.* 2001). Pronghorn changed their behavior 40 percent of the time when they were exposed to overflights, though most of these behavioral changes were attributed to regular behavioral changes. Females with fawns responded to direct overflights on two of the six recorded events when pronghorn moved greater than 10 meters in response to an overflight, suggesting mothers and/or fawns may be more sensitive to these stimuli than other pronghorn (note, few of these overflights were less than 1,000 feet AGL and no night-time overflights were observed).

However, studies by Landon *et al.* (2003) concluded that pronghorn used areas with lower levels of noise more than expected and areas with higher levels less than expected. Areas with the highest sound pressure levels are also the areas with the highest levels of military activity (Landon *et al.* 2003). Krausman *et al.* (2005) found that Sonoran pronghorn sightings were biased toward areas where military activities resulted in ground disturbance that provided conditions for more favorable forage. Many factors may be involved in determining Sonoran pronghorn distribution and responses to various stimuli. Krausman *et al.* (2001) concludes that Sonoran pronghorn have habituated to their exposure to military activity. However, the long-term ramification of increased numbers of overflights, especially at low altitudes, has not been assessed.

Studies of the effects of low-level helicopter flights on other ungulates suggest pronghorn may react more to this type of stimulus than other types of overflights, and pronghorn are less likely to habituate to helicopter overflights (Workman *et al.* 1992). Sonoran pronghorn would be expected to move greater distances and respond for a longer period of time to helicopters than to fixed-wing aircraft, though the magnitude of these potential effects and the biological significance to the animals are not able to be determined.

The implementation of the Alternative 5.A or 5.B may result in adverse effects to Sonoran pronghorn due to disturbance associated with low-level military overflights and helicopter activity. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 5.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn.

Sonoran pronghorn may be affected by noise from and visual impacts of aircraft overflights associated with the lowered flight altitude over CPNWR with Proposed Action 5.A. However, it was noted in the Biological Opinion that "Low-level overflights (down to 500 feet AGL for F-16s and 200 feet AGL for A-10s) have been consistently conducted on BMGR-East over occupied Sonoran pronghorn habitat for many decades" and that Sonoran pronghorn have likely habituated to some military overflights. No proposed action-specific conservation or mitigation measures were included in the Biological Assessment and none were noted by the USFWS within the Biological Opinion for Proposed Action 5.A. General conservation measures for Sonoran pronghorn were provided in the Biological Assessment and are included above in Section 4.5.1.

No mitigation or conservation measures specific to Alternative 5.B or 5.C were developed because the Biological Assessment and consultation with the USFWS only regarded the preferred alternative (Alternative 5.A). General conservation measures for Sonoran pronghorn would apply and are included above in Section 4.5.1.

4.5.5.2 Alternative 5.C – No-Action Alternative

With the no-action alternative, the 1994 MOU would not be renegotiated and military aircraft would continue to fly at altitudes of 1,500 feet AGL or higher when in the airspace overlying the Cabeza Prieta NWR except for those authorized flights along mutually designated low-level corridors. There would be no change in biological effects from existing conditions with Alternative 5.C

4.5.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.5.6.1 Alternative 6.A – Proposed Action

With Alternative 6.A, the southern portion of Manned Range 3, including the left conventional target south of the manned tower, would be converted into a helicopter gunnery range with fixed,

moving, and pop-up targets for rotary-wing units that train at BMGR East, east of State Route 85. It is anticipated that the target array would consist of about 75 total silhouettes of pop-up targets, armored personnel carriers or human facade targets, along with about eight static vehicles and four containers (8-feet wide by 20-feet long by 8-feet high), encompassing an area of approximately 400 acres. Installation of the targets would require some ground disturbance in specific areas, and periodic EOD clearance activities. This area has been used previously for target training for both fixed- and rotary-winged aircraft within Manned Range 3.

Vegetation and General Wildlife – The Alternative 6.A project area is located east of State Route 85 in Manned Range 3 on the bajadas northeast of the Sauceda Mountains, southeast of Lookout Well. Numerous drainage channels are incised into the bajadas where a variety of desert shrubs, paloverde, and scattered ironwood occur. Separating the drainage channels are areas of desert pavement and sparse vegetation, including small areas of desertscrub vegetation. The area has been used previously as a live-fire target area and is within a prior EOD clearance area. While the habitat present in the project area is generally representative of much of the area, there is potential for minimal impacts to xeroriparian habitats by vehicle traffic in the area and maintenance activities at the targets, as well as minimal impacts to vegetation adjacent to wash channels in the vicinity of the new targets. There are no unique habitat features associated with the project area, and wildlife appears to utilize the project area consistent with other areas. Wildlife potentially using the area includes kit fox, black-tailed jackrabbit, and various birds, lizards, snakes, and small mammals. Live fire activity may frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife across the landscape.

Acuña Cactus – Suitable habitat for acuña cactus is likely not present at the Alternative 6.A project site. Soils are primarily derived from alluvium outwash from the Sauceda Mountains. Acuña cactus occur on well-drained knolls and gravel ridges of granitic soils and limestone hills and flats at two sites in the Sauceda Mountains (one on BMGR East and the other on BLM lands), and one site in the Sand Tank Mountains (on BLM lands). The species is not expected to occur in this location and no impacts would be anticipated from implementation of Alternative 6.A.

Crested (Fan-topped) Saguaro – Saguaro occur in scattered locations throughout the area, with increased density offsite on the higher alluvial fans where the soils are well-drained, and on mountain slopes. Crested saguaro has not been documented in the immediate area and would not be expected, in part, because this area has been used previously for aircraft target training. Implementation of Alternative 6.A would not be expected to result in additional impacts to crested saguaro.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard has not been recorded east of State Route 85 and the project area may be considered outside of the species distribution. No impacts to the species would be anticipated.

Desert Tortoise – On the BMGR, desert tortoise has been recorded in many of the mountain ranges, including the Sauceda and Sand Tank mountains, occurring on rocky mountain slopes and alluvial fans (bajadas) where there are appropriate cover sites and burrow locations. Though there is a remote possibility that tortoises may occur on the alluvial fan due to proximity to occupied habitat in the adjacent Sauceda Mountains, it is considered highly unlikely to occur in the vicinity of Alternative 6.A because of the lack of cover sites and appropriate burrow locations, and impacts due to past live fire training. No impacts to the species would be anticipated from implementation of Alternative 6.A.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl prefers Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. Vegetation in the vicinity of Alternative 6.A is not sufficiently dense or does not form large enough patches to provide nesting habitat for the bird. No impacts to the species would be anticipated from implementation of Alternative 6.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout BMGR East and therefore could potentially occur within the Alternative 6.A project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The reconfiguration of Manned Range 3 could impact the Le Conte's thrasher due to loss of habitat (a fraction of a percent of similar habitat present within Sauceda Wash). Proposed Alternative 6.A could result in minor, localized disturbance or displacement to the Le Conte's thrasher by live-fire training or EOD clearance activities, but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – The peregrine falcon generally does not breed in southwestern Arizona; however they have been known to occur as fall and winter migrants in southern Arizona, and based on a few observations during the spring, the possibility that they may occasionally nest on the BMGR East has been suggested. Nesting sites are associated with steep cliffs and canyons. The closest potential nesting areas to the project site are in the Sauceda and Sand Tank mountains, though this would be considered very marginal. While there is some potential that peregrines may fly over any part of Manned Range 3, the project area does not provide appropriate perch sites or an adequate prey base (e.g., waterfowl, swifts, and swallows) for the peregrine to seek out or otherwise use the area. There are no special features in the project area

that would attract the bird to the project area. No impacts to the species would be anticipated from implementation of Alternative 6.A.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations in desertscrub habitat on BMGR East lands located east of State Route 85. However, areas of suitable habitat are limited to flat, open, low-stature and sparsely vegetated desertscrub where they make their home in the burrows of small mammals. The vegetation in the Alternative 6.A project area includes a variety of shrubs and patches of fairly dense growth that would tend to obstruct the open views of the landscape required by the birds. However, there may be some locations in the project area that provide suitable burrowing owl habitat. If present, these birds may be disturbed or displaced by live-fire training or EOD clearance activities. The implementation of Alternative 6.A could impact individuals of this species but would not be expected to alter the local distribution or abundance of the bird.

California Leaf-nosed Bat – The California leaf-nosed bat is suspected to be the most common bat found on the BMGR. They have been documented throughout the entire BMGR and are year round residents. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters. Roost sites have been documented in the adjacent Sand Tank and Sauceda mountains. The bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges. Though insect prey may be found throughout the Alternative 6.A area, the overall vegetation would not support sufficient resources for the bat to seek out or otherwise make special use of the area. Therefore, no impacts to the California leaf-nosed bat would be expected as a result of implementation of Alternative 6.A.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though large maternity roosts have been documented at Organ Pipe Cactus National Monument (in the Copper Mountains) and Cabeza Prieta NWR (in the Growler Mountains). These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaros occur at low densities in the Alternative 6.A project area. Higher numbers of saguaro are found on the slopes of the Sand Tank and Sauceda mountains than on the valley floor where Alternative 6.A is proposed. Light-tracking studies following lesser long-nosed bats from the known roost sites documented minimal foraging activity in the Sand Tank Mountains to the northeast of the project area. The majority of training flights would occur between 300 feet and 1,000 feet AGL; however, some flights may occur as low as 100 feet AGL to as high as 3,000 feet AGL. Because these bats forage at night they may be susceptible to collisions with helicopters training at night. These bats may also be disturbed or possibly killed during foraging activities by the noise and downward rotor-wash associated with nighttime helicopter overflights, although only

approximately 40 sorties per year would occur at night. Lesser long-nosed bats and their foraging habitats could occur within the Alternative 6.A project area. Therefore, there would be potential for disturbance and mortality to the lesser long-nosed bat as a result of implementation of Alternative 6.A. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect a listed species would require consultation with the USFWS, and if the project results in adverse effects, the USFWS would issue a biological opinion with mandatory terms and conditions for the minimization of incidental take.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 6.A may result in adverse effects to the lesser long-nosed bat; however, it is not likely to jeopardize the continued existence of the bat. The Biological Opinion notes that Proposed Action 6.A may adversely impact lesser long-nosed bat foraging habitat and could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. No proposed action-specific conservation or mitigation measures were included in the Biological Assessment and none were noted by the USFWS within the Biological Opinion for lesser long-nosed bats. The Biological Opinion's Conservation Recommendation included "participate in the implementation of, including providing financial support to agencies to implement, the lesser long-nosed bat recovery plan."

Sonoran Pronghorn – Sonoran pronghorn does not occur on the BMGR east of State Route 85; the area is considered outside the range of the species. Therefore, there would be no potential impacts to the Sonoran pronghorn under Alternative 6.A.

4.5.6.2 Alternative 6.B – No-Action Alternative

Manned Range 3 would not be reconfigured with Alternative 6.B. Targets would not be added or removed and the range would continue to be used by fixed- and rotary-wing aircraft. There would be no change in effects to biological resources with Alternative 6.B.

4.5.7 Proposal 7 – On-the-Ground Training Exercises

4.5.7.1 Alternative 7.A – Proposed Action

With Alternative 7.A, CSAR teams, and potentially other small teams of approximately 10 troops, would use BMGR East for ground-based training activities. Training for small team missions would involve clandestine insertions and extractions from helicopters, or vehicles driven on existing range roads; and performance of cross-country land navigation and other on-the-ground exercises, such as shooting at targets, while traveling on foot. Teams could also travel using all terrain vehicles, although vehicle use would be limited to existing open roads.

The destination of these cross-country patrols could be anywhere within BMGR East, but the principal areas of insertion and extraction would be in Area B with teams moving into the military target areas of East TAC. Area B is the Sauceda Mountains area of BMGR East (located southwest of East TAC and east of State Route 85) that is open to the general public with a BMGR permit. Most of the maneuvers would occur in mountainous areas, such as the Sauceda Mountains west of East TAC. The duration of these training missions would typically be one to several days. Units conducting this type of training would be self-contained and would carry out all trash or other items that they brought into the range.

Certain events, including the WTI course, could include up to 100 troops. These events would be infrequent (typically no more than two or three events per year) and would generally occur within the tactical ranges in areas of previous military ground disturbance. These larger-scale events would be less likely to involve land maneuvers that exceed about 3 miles.

Vegetation and General Wildlife – The Alternative 7.A project area is considered to include all of BMGR East. Included in the project area are mountain ranges, bajadas, xeroriparian washes, and valley flats. The mountain ranges within BMGR East, especially east of State Route 85, provide for a wide diversity of desert vegetation and wildlife habitats, likely representing some of the highest biodiversity on BMGR East. The mountains and associated bajadas provide habitat for mule deer, coyote, mountain lion, bobcat, javelina, and a wide array of rodents, bats, lizards, snakes, and insects. The xeroriparian washes are also an important area for wildlife, providing habitat for much of the breeding bird diversity on the BMGR, and providing critical habitat components (i.e., food, water, and shelter) for an array of mammals, reptiles, amphibians, and insects. The creosote dominated valley bottoms provide habitat for the Sonoran pronghorn, as well as small mammals, birds, and reptiles. Helicopter insertion of troops and clandestine activities by troops on foot would only be expected to minimally disturb wildlife or vegetation; however, there is potential for minimal damage to vegetation associated with vehicle parking for troop insertion or extraction. Troops camping in a fixed location may temporarily impact individual wildlife movements, but no lasting impacts are anticipated; no long-term change in movement patterns or habitat use is anticipated. Ground personnel would be directed to avoid certain maneuvers in specific areas that may be sensitive to wildlife, such as desert bighorn sheep habitat during lambing season and hunting season.

Acuña Cactus – Suitable habitat for acuña cactus is present in the Sauceda Mountains; two occupied sites are known (one on BMGR East and the other on BLM lands just south of the BMGR East border). The plants require special soil conditions that include well-drained knolls and gravel ridges of granitic soils, or limestone hills and flats. The likelihood that small groups of troops on foot would encounter this fairly small globular cactus or damage its habitat is

extremely remote. The species would not be expected to be impacted due to implementation of Alternative 7.A.

Crested (Fan-topped) Saguaro – Saguaro occur in scattered locations throughout BMGR East, but are most commonly found on the slopes of mountains. Crested saguaro, a rare and aberrant form, may be encountered by ground-based troops. However, as vegetation would not serve as targets for the training exercises, activities associated with Alternative 7.A would not impact crested saguaro.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is primarily found in and adjacent to the Mohawk and Yuma dunes. It also occurs in scattered locations in the San Cristobal Valley where pockets of sand dunes, including partially stabilized dunes, are found. The likelihood that small groups of troops on foot would encounter this lizard is extremely remote. In addition, ground troops would be provided with pre-coordinated locations, access, and allowable operations during maneuvers (such as walking, camping, length of time on the Range, etc.) to further limit the potential for maneuvers within known habitat for the Colorado Desert fringe-toed lizard. The species would not be expected to be impacted due to implementation of Alternative 7.A.

Desert Tortoise – On BMGR East, desert tortoise has been recorded in many of the mountain ranges, including the Sauceda and Sand Tank mountains, and the Crater Range occurring on rocky mountain slopes and alluvial fans (bajadas) where there are appropriate cover sites and burrow locations. Individual tortoises may be encountered by troops moving through the mountain ranges. If, counter to regulations, animals are picked up, kicked, or otherwise disturbed, it may result in injury or death of the animal. The implementation of Alternative 7.A could impact individuals of this species, but would not be expected to alter the local distribution or abundance of the tortoise.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl prefers Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. This vegetation community may be encountered by troops on foot. The level of potential disturbance to the bird would be considered inconsequential. The implementation of Alternative 7.A would not be expected to impact this species.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout the entire BMGR East and therefore is expected to occur within the Alternative 7.A project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. Troop insertions and extractions by helicopter and vehicle, and troop movements and associated on-the-ground

activities could impact individual Le Conte's thrashers. However, Alternative 7.A is not expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – Potential nesting habitat for the peregrine falcon would be in association with steep cliffs and canyons, generally in locations that would be inaccessible to troops on foot. The presence of troops on foot temporarily in the vicinity of peregrine falcon nesting or foraging habitat would be considered inconsequential. No impacts to the species would be anticipated from implementation of Alternative 7.A.

Western Burrowing Owl – The burrowing owl is expected to occur at scattered locations in the open valleys and desertscrub habitat on BMGR East, though there is little site-specific data available on this species as it has only recently emerged as a species of interest. Troop insertions and extractions by helicopter and vehicle, and troop movements and associated on-the-ground activities through the valley bottom habitats where this owl may occur could impact individual burrowing owls. However, Alternative 7.A is not to be expected to impact the distribution or overall abundance of the species.

California Leaf-nosed Bat – Roosting colonies of the California leaf-nosed bat have been located in the Mohawk, Sand Tank, Sauceda, Gila, and Copper Mountains; and Wellton Hills. This species is restricted to roosting in particular mines and caves that meet specific temperature parameters, and is very susceptible to disturbances at the roost. If, counter to regulations, troops moving through the mountains encounter a mine or cave used by these bats and enter the roost site or otherwise create a disturbance, it may result in injury or death of the bats. However, ground personnel would be provided with pre-coordinated locations, access, and allowable operations during maneuvers. Encounters with California leaf-nosed bat would be inadvertent as ground personnel would be directed to avoid known roosting sites.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though two large maternity roosts have been documented nearby. The activities of ground-based troops would not be expected to disrupt bats that may be foraging on cactus flowers. However, if troops are inserted or extracted by helicopter at night in areas of potential lesser long-nosed bat foraging habitats, there could be disturbance or possibly mortality to individual lesser long-nosed bat that are foraging. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect a listed species would require consultation with the USFWS, and if the project results in adverse effects, the USFWS would issue a biological opinion with mandatory terms and conditions for the minimization of incidental take.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 7.A may result in adverse effects to the lesser long-nosed bat;

however, it is not likely to jeopardize the continued existence of the bat. The Biological Opinion notes that Proposed Action 7.A could result in disturbance, injury, or mortality to foraging lesser long-nosed bats. No proposed action-specific conservation or mitigation measures were included in the Biological Assessment and none were noted by the USFWS within the Biological Opinion for lesser long-nosed bats. The Biological Opinion's Conservation Recommendation included "participate in the implementation of, including providing financial support to agencies to implement, the lesser long-nosed bat recovery plan."

Sonoran Pronghorn –Sonoran pronghorn are generally found west of Manned Range 1, including the area from the BMGR East southern border to North TAC in the north, and are regularly reported throughout the South TAC area. However, they are not found east of State Route 85. If any ground troops were inserted into, extracted from, or traveled through this occupied western portion of the BMGR East, there could be potential for disturbance to Sonoran pronghorn in these areas. While some training could be within habitat suitable for Sonoran pronghorn, the Air Force monitors the locations of Sonoran pronghorn, and tactical teams would be directed to avoid areas in which Sonoran pronghorn have been observed to minimize the potential for encounters with pronghorn. However, because the Sonoran pronghorn and the ground troops are mobile, the potential for encounters cannot be fully eliminated. The low statured vegetation throughout the valleys of BMGR provides Sonoran pronghorn with long-range visibility of human-based activities. As troops travel cross country during these ground exercises, Sonoran pronghorn could be startled or kept on the move. Vehicle and/or helicopter use for insertion or extraction could result in temporary disturbance to pronghorn present in the vicinity of the drop locations and the access roads. Krausman *et al.* (2004) reported that Sonoran pronghorn often moved greater than 10 meters when ground stimuli were present. All vehicles are required to adhere to a maximum speed between 15 mph and 45 mph in Sonoran pronghorn habitat, depending on the situation (*Operating Instruction 13-01*), to minimize the possibility of collisions with pronghorn. The implementation of Alternative 7.A could result in adverse effects to individual Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 7.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn.

Ground based military activities, including some of those associated with Proposed Action 7.A, that occur throughout BMGR East within the Sonoran pronghorn range, could disturb, injure, or kill Sonoran pronghorn. The Biological Opinion notes that:

Human presence, vehicles, and helicopters associated with training activities may cause pronghorn to startle or flee or may temporarily exclude pronghorn use of areas where these training activities occur. Because the training patrols could be anywhere within BMGR-East, it is difficult to predict where and how frequently troops may encounter pronghorn. However, the principal areas of insertion and extraction will be in Area B with teams moving into the military target areas of ETAC. Because both Areas B and ETAC are outside of the current Sonoran pronghorn range, we anticipate the majority of the proposed training activities will not result in disturbance to pronghorn. Training activities in general will be short in duration (one to several days) and sporadic (there will be about 30 events per year lasting up to one day and four events per year that will include an overnight component). To minimize impacts to Sonoran pronghorn, the USAF will consider data from the ongoing Sonoran monitoring program and attempt to schedule the small tactical team training exercises in a manner that minimizes impacts to Sonoran pronghorn to the extent possible. Ground troops will be provided with pre-coordinated locations, access, and allowable operations during maneuvers (such as walking, camping, length of time on the Range, etc.). All vehicular activity associated with on-the-ground training will only occur on authorized roads and will comply with speed limits described in OI-13-01. In addition, all ground troops will be provided with training regarding their environmental responsibilities including those related to avoiding and minimizing impacts to pronghorn.

4.5.7.2 Alternative 7.B – No-Action Alternative

No new ground training exercises by CSAR or other units would occur with Alternative 7.B. Existing ground navigation and reconnaissance activities conducted by the Marine Corps and Navy Sea, Air, and Land Commandos in BMGR East for the WTI course or other operations would continue, but no new training would be added.

4.5.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.5.8.1 Alternative 8.A – Proposed Action and Alternative 8.B – Alternative Tower Site B

The proposed action area for Alternative 8.A falls primarily within the developed Gila Bend AFAF; therefore, few of the protected species would occur within the action area. In addition, due to the disturbed nature of the developed areas, little, if any, suitable habitat would be available for wildlife. Because of their close proximity to each other, and similarity in

topography and vegetation, potential biological impacts for each of the two action alternatives are evaluated concurrently.

The proposed actions at the Gila Bend AFAF involve two key improvements to support airfield operations. One improvement would be to construct a taxiway parallel to the airfield runway to increase the safety and capacity of the airfield by eliminating the need for aircraft to taxi on the runway. The second improvement would be to construct a new air traffic control tower in an appropriate location that has the height needed to provide adequate observation of aircraft movements on the runway and taxiways and sufficient interior space to house the needed equipment. Alternatives 8.A and 8.B both include construction of the taxiway, but the alternatives differ in the location of the proposed air traffic control tower.

Vegetation and General Wildlife – The Alternative 8.A and 8.B project area is within the developed Gila Bend AFAF. Vegetation is extremely limited, consisting primarily of non-native forbs and grasses. Wildlife species that may be found in the area are very limited; some species such as coyotes and jackrabbits persist on the edges of developed areas. Other smaller species such as lizards, some rodents, and a few species of birds may find suitable habitat for nesting and/or foraging. To accommodate the new taxiway configuration, BASH survey protocols would be modified to minimize risk to pilots, aircraft, and wildlife. Overall, the project area does not provide any substantial wildlife habitat.

Acuña Cactus – Suitable habitat for acuña cactus requires special soil conditions that are not present in the project area. The species would not be expected to be impacted due to implementation of Alternative 8.A or 8.B.

Crested (Fan-topped) Saguaro – No saguaro occur in the project area. No impacts to crested saguaro would be anticipated with implementation of Alternative 8.A or 8.B.

Colorado Desert Fringe-toed Lizard – The project area may be considered outside of the species distribution. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Desert Tortoise – No desert tortoise habitat occurs in the project area. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Cactus Ferruginous Pygmy-owl – No suitable habitat for cactus ferruginous pygmy-owl occurs in the project area. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Le Conte's Thrasher – No suitable habitat for Le Conte's thrashers occurs in the project area. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Peregrine Falcon – No suitable habitat for peregrine falcons occurs in the project area. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Western Burrowing Owl – The burrowing owl could potentially occur within the proposed action area of Alternative 8.A or 8.B. Burrowing owls prefer flat, open, low-stature habitat and are often found within close proximity to human development, (e.g. agricultural lands, airports, and golf courses). Potential impacts to both individual burrowing owls as well as burrowing owl habitat are possible due to the construction of the additional taxiway. Prior to construction of the new taxiway, surveys for western burrowing owls would be conducted to determine the presence or absence of burrowing owls within the area. Therefore, the implementation of Alternative 8.A or 8.B could result in impacts to individuals of this species but would not be expected to alter the local distribution or abundance of the burrowing owl.

California Leaf-nosed Bat – The California leaf-nosed bat may forage at night for insects drawn to lights at the airport facilities. No potential roost sites occur in the area. Project-related construction activities would not be expected to impact the bat. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Lesser Long-nosed Bat – No suitable roosting or foraging habitat for lesser long-nosed bats occurs in the project area. No impacts to the species would be anticipated with implementation of Alternative 8.A or 8.B.

Sonoran Pronghorn – Sonoran pronghorn does not occur on the BMGR lands located east of State Route 85; the area is considered outside the range of the species. Therefore, there would be no potential impacts to the Sonoran pronghorn under Alternatives 8.A or 8.B.

4.5.8.2 Alternative 8.C – No-Action Alternative

With the no-action alternative, no taxiway would be constructed parallel to the runway and the existing control tower would continue to be used. Aircraft would continue to use the runway for taxiing. There would be no change in effects to biological resources with Alternative 8.C.

4.5.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.5.9.1 Alternative 9.A – Proposed Action

The Alternative 9.A proposed action is to pave approximately 7 miles of the road from the main tower within Manned Range 1 to the water well and adjacent RMCP 1 located near the boundary of the North and South TAC ranges to the west of Manned Range 1. The current roadbed and drainage way is approximately 30 feet wide; however, only the center 16 feet would be paved. The total area to be paved would cover approximately 13.5 acres.

Vegetation and General Wildlife – The Alternative 9.A project area includes an existing road that crosses the Childs Valley north of the Childs Mountains. The roadway is located on the valley plain and is generally flat with soils composed of alluvium. Many minor dry wash channels cross the roadway, as do several larger wash channels. The drainages are often vegetated with mesquite, paloverde, and ironwood trees, as well as a variety of shrubs. Between the wash channels, vegetation is often sparse and creosotebush is the dominant vegetation with some scattered trees and saguaros. The construction and use of the road could frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.

Acuña Cactus – Suitable habitat for acuña cactus requires special soil conditions that are not present in the project area. The species would not be expected to be impacted due to implementation of Alternative 9.A.

Crested (Fan-topped) Saguaro – Saguaro occur in scattered locations throughout the area. It is very unlikely that crested saguaro, a rare and aberrant form, would be encountered in the project area. In addition, since the road construction is limited to the existing unpaved road surface, no saguaro would be impacted by project activities. The species would not be expected to be impacted due to implementation of Alternative 9.A.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. This habitat does not occur in the project area. No impacts to the species would be anticipated with the implementation of Alternative 9.A.

Desert Tortoise – On the BMGR, desert tortoise occur on rocky mountain slopes and alluvial fans (bajadas) where there are appropriate cover sites and burrow locations. The valley plain does not support the presence of burrows as constructed and used by desert tortoises. The desert tortoise is not expected to be present in the area. No impacts to the species would be anticipated with the implementation of Alternative 9.A.

Cactus Ferruginous Pygmy-owl – The cactus ferruginous pygmy-owl prefers Arizona Upland Sonoran desertscrub and xeroriparian washes with dense vegetation and complex structure. Components of this vegetation may be encountered along the subject roadway, especially where major wash channels cross the road. However, this vegetation is not sufficiently dense or does not form large enough patches to provide nesting habitat for the bird. No impacts to the species would be anticipated with the implementation of Alternative 9.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed south of the Crater Range and therefore is expected to occur within the Alternative 9.A project area. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to

breed in areas with isolated but densely vegetated shrubs and trees. The road pavement project could disturb individual Le Conte's thrashers during the pavement process; however Alternative 9.A is not expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – Potential nesting habitat for the peregrine falcon is generally in association with steep cliffs and canyons. This habitat is not present in the project area. While there is some potential that peregrines may fly over the site, the project area does not provide appropriate perch sites or an adequate prey base (e.g., waterfowl, swifts, and swallows) for the peregrine to seek out or otherwise use the area. No impacts to the species would be anticipated with the implementation of Alternative 9.A.

Western Burrowing Owl – The burrowing owl could potentially occur within the Alternative 9.A project area, though there is little site-specific data available on this species as it has only recently emerged as a species of interest. Burrowing owls prefer flat, open, low-stature habitat, and are often found in sparsely vegetated desertscrub where they make their home in the burrows of small mammals. Though much of the project is too shrubby to serve as burrowing owl habitat, other areas are more open and potentially suitable. The desert kangaroo rat also occurs in the area, providing potential burrows for the bird. Construction activities could disturb and displace owls if their burrows are located near to the road. These impacts would only occur during the construction phase. . Prior to paving of the road, surveys for western burrowing owls would be conducted to determine the presence or absence of burrowing owls within the construction area. Given the traffic volume on this road, owls may likely become habituated to the presence of vehicles. The implementation of Alternative 9.A could impact individuals of this species, but would not be expected to alter the local distribution or abundance of the bird.

California Leaf-nosed Bat – The California leaf-nosed bat forages at night for insects, typically along desert washes as well as over valley floors and along slopes and ridges. Xeroriparian corridors are important foraging areas that provide abundant insect prey for the bat. Suitable foraging habitat for the bat occurs primarily in association with the vegetated wash channels. However, since construction is a daytime activity and bats are active at night, and there are no potential roosts in the area, the implementation of Alternative 9.A would not be expected to impact the species.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though two large maternity roosts have been documented in the region. These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaros occur at low densities in the project area and it is expected that these bats fly each night to other areas (probably east and

south) where there are greater foraging opportunities. Therefore, no impacts to the species would be anticipated due to implementation of Alternative 9.A.

Sonoran Pronghorn – Sonoran pronghorn occur within Childs Valley and may pass through the Alternative 9.A project area. Construction activities could cause the animals to avoid the area, but these potential impacts would be temporary. Paving the road could result in higher vehicle speeds and possibly the greater incidence of pronghorn/vehicle accidents. The speed limit for this road would remain at 35 mph, and there would be increased signage to encourage compliance. Therefore, based on the potential for disturbance to pronghorn during construction, and the possibility that paving could increase the potential for pronghorn/vehicle collisions, the implementation of Alternative 9.A could result in adverse effects to the Sonoran Pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may adversely affect a listed species would require consultation with the USFWS and adherence to mandatory terms and conditions issued as part of the USFWS biological opinion.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 9.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn.

Ground based military activities, including Proposed Action 9.A, paving 7 miles of road, could disturb, injure, or kill Sonoran pronghorn. The Biological Opinion notes that:

> Collisions appear to be most possible on the road out to Manned Range 1, which is staffed on weekdays throughout the year except for times when the range is closed. The 35 mph speed limit and the openness of the terrain reduce the likelihood of collision, but do not eliminate it. Paving 7 miles of an existing graded road from the main tower within Manned Range 1 to the water well and adjacent RMCP 1 located near the boundary of the NTAC and STAC ranges could result in higher vehicle speeds due to improved driving conditions (for all users, including USBP [U.S. Border Patrol]) and possibly an increased likelihood of collisions with Sonoran pronghorn. To reduce this risk, the speed limit on the newly paved access road will remain at 35 mph (as opposed to being increased to 45 mph as is allowed on other paved roads leading to manned ranges) and additional speed limit signs will be posted to encourage compliance.

To reduce the risk of vehicular collisions with Sonoran pronghorn, Luke AFB implements OI-13-01, which among other restrictions, includes the following: 1) vehicle speed limits are 45 mph on paved roads leading to manned ranges, 35 mph on maintained dirt roads, and 25 mph on all other roads; 2) if a vehicle is 1-2 km from a Sonoran pronghorn, the speed limit is 15 mph; 3) if a vehicle is less than 1 km from a Sonoran pronghorn, every effort is made to use an alternate route; if none are available and movement is essential, then the speed limit is 15 mph; and 4) if

Sonoran pronghorn are observed running due to ground disturbance, vehicles near Sonoran pronghorn locations stop until animals have stopped running. Additionally, to minimize the adverse effects of any potential disturbance, road paving will be conducted outside of the Sonoran pronghorn fawning season.

4.5.9.2 Alternative 9.B – No-Action Alternative

The no-action alternative would continue the ongoing practice of using the unpaved road in its current condition. Dust generated from use of the unpaved road would not be controlled. There would be no change in effects to biological resources with Alternative 9.B.

4.5.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.5.10.1 Alternative 10.A – Proposed Action

The Alternative 10.A proposed action is to excavate sand and gravel from 10 sites within BMGR East to be used for on-range road maintenance, target reconstruction, and target maintenance. The proposed material source sites are all located in highly ephemeral washes located adjacent to existing roads. The proposed action would also include transporting the material to four new stockpile sites on BMGR East and to one existing site at the Gila Bend AFAF where the materials could be accessed as needed. Five of these excavation sites occur within previously (2005) burned areas and two others are near the burned areas. Stock piles are assumed to be placed in already disturbed sites.

Vegetation and General Wildlife – The Alternative 10.A project area includes 10 large washes where borrow materials would be excavated. These washes are distributed widely on the BMGR. There could be potential for disturbance to xeroriparian vegetation at the excavation site and downstream of the site, as well as to associated floral and faunal communities.

Wash habitat is very important for wildlife, and most of the biodiversity of the BMGR uses resources associated with washes. Washes are especially important in that they provide hiding cover for animals moving through open desert. Excavation is conducted adjacent to existing roads, and is a short duration activity; consequently, no vegetation removal would be required to provide access for equipment used to extract and move the sand and gravel resources. Since some of the excavation sites occur within areas that have recently burned on BMGR East, there may be less potential to disturb wildlife due to the lack of forage and cover until the areas become fully revegetated. The excavation and use of roads by heavy equipment could temporarily frighten animals away from the site, but would not be expected to inhibit or preclude movements of wildlife through the general area.

Acuña Cactus – The acuña cactus is only found in certain sites where special soil conditions are met. The plant does not occur within gravelly washes. Therefore, no impacts to the species would be anticipated upon implementation of Alternative 10.A.

Crested (Fan-topped) Saguaro – Though crested saguaro could potentially occur in the vicinity of gravel excavations, all saguaro would be completely avoided during these activities. Therefore, no impacts to the species would be anticipated upon implementation of Alternative 10.A.

Colorado Desert Fringe-toed Lizard – The Colorado Desert fringe-toed lizard is typically found in association with sand dunes. This habitat does not occur in washes where materials would be extracted. No impacts to the species would be anticipated with the implementation of Alternative 10.A.

Desert Tortoise – Desert tortoises occur primarily on rocky slopes and bajadas and not within ephemeral washes in lower valleys. Therefore, no impacts to the species would be anticipated upon implementation of Alternative 10.A.

Cactus Ferruginous Pygmy-owl – Cactus ferruginous pygmy-owls occur in dense stands of Arizona Upland Sonoran desertscrub and xeroriparian washes. The proposed excavation sites of Alternative 10.A occur within ephemeral washes that are not expected to include cactus ferruginous pygmy-owl habitat. Excavation activities would not remove vegetation, and any potential disturbance due to excavation would be temporary. Therefore, no impacts to the species would be anticipated upon implementation of Alternative 10.A.

Le Conte's Thrasher – The Le Conte's thrasher is known to breed throughout BMGR East and therefore could potentially occur within any of the proposed Alternative 10.A project sites. Le Conte's thrashers are found in open areas with flat to gently rolling hills and shallow braided washes, and prefer to breed in areas with isolated but densely vegetated shrubs and trees. The sand and gravel operations could disturb the Le Conte's thrasher using nearby habitat. Proposed Alternative 10.A could result in minor, localized disturbances to the Le Conte's thrasher, but would not be expected to impact the distribution or overall abundance of the species.

Peregrine Falcon – Potential nesting habitat for the peregrine falcon is not present in the project area. While there is some potential that peregrines may fly over any of the sites, excavation activities would be a temporary disturbance. No impacts to the species would be anticipated with the implementation of Alternative 10.A.

Western Burrowing Owl – The burrowing owl prefers flat, open areas with sparse vegetation. They do not occur in association with gravelly washes. However, the sand and gravel operations could disturb the burrowing owl using nearby habitat. Proposed Alternative 10.A could result in

minor, localized disturbances to the burrowing owl, but would not be expected to impact the distribution or overall abundance of the species.

California Leaf-nosed Bat – Xeroriparian corridors are important foraging areas that provide abundant insect prey for the California leaf-nosed bat. This species may forage at night for insects along the washes where borrow material would be excavated. However, no potential roost sites are found in the area, excavation activities occur during the day when bats are not present, and removal of vegetation would be minimal. No impacts to the species would be anticipated with implementation of Alternative 10.A.

Lesser Long-nosed Bat – Lesser long-nosed bat roost sites are not known from the BMGR, though two large maternity roosts have been documented in the region. These bats are known to fly long distances (up to 75 miles) between roosting and foraging sites where they feed primarily on nectar and pollen of columnar cacti and agave flowers. Saguaros generally occur at low densities along the washes where borrow material would be excavated, and saguaros would not be removed. It is expected that these bats fly each night to other areas where there are greater foraging opportunities, and excavation activities would occur during the day when bats are not present. Therefore, no impacts to the species would be anticipated due to implementation of Alternative 10.A.

Sonoran Pronghorn – Sonoran pronghorn may be present at 4 of the 10 washes where borrow material would be excavated and 3 of 5 stockpile sites where borrow material would be deposited. Excavation activities are of short duration and adjacent to existing roads. However, if pronghorn were to be in the area during excavation or stockpile activities, they would likely move elsewhere. This level of disturbance is within normal behavior patterns consistent with the animal's reactions to other vehicles on the roads, and so is considered insignificant. Therefore, the probability that impacts to the species would occur due to implementation of Alternative 10.A would be considered discountable and would not result in adverse affects to Sonoran pronghorn. In accordance with ESA Section 7 regulations, a determination that a proposed action may affect, but is not likely to adversely affect a listed species would require informal consultation with the USFWS; if the USFWS does not concur with the determination, a biological opinion may be issued with mandatory terms and conditions to minimize incidental take of the species.

Based on formal consultation with the USFWS that occurred in the spring of 2010, it was determined that Alternative 10.A may result in adverse effects to Sonoran pronghorn; however, this action, as part of the programmatic consultation, was determined to not likely jeopardize the continued existence of the Sonoran pronghorn. The Biological Opinion notes that:

Sand and gravel excavation, stockpiling, and use on BMGR-East may disturb pronghorn. Sonoran pronghorn have previously been observed in the areas of four of the 10 washes where borrow material will be excavated and three of five stockpile sites where borrow material will be deposited. Excavation and stockpiling activities may cause pronghorn to flee or may temporarily prevent pronghorn from using or moving through the area. The excavation activities, however, will be of short duration and adjacent to existing roads.

4.5.10.2 Alternative 10.B – No-Action Alternative

The no-action alternative would continue the ongoing practice of conducting maintenance without the benefit of additional on-range sand and gravel resources to repair eroded and displaced materials from roads and strafe pits. When funds are available, the 56 RMO would continue to purchase materials from approved, outside, commercial sources that have the desired material composition and have them delivered to BMGR East for needed maintenance. The use of commercial sources also may potentially introduce noxious weed seeds that are not native to BMGR East if such seeds are in the sand and gravel materials. There would be no change in effects to biological resources with Alternative 10.B.

4.5.11 Aggregate Impacts

Of the 10 proposed actions, 9 of the preferred alternatives would be expected to result in impacts to at least 1 of the 12 evaluated special status species. Eight actions could impact the Le Conte's thrasher, six actions could impact the burrowing owl, six actions could impact the Sonoran pronghorn, and four actions could impact the lesser long-nosed bat. Only proposed Alternative 2.A (programmatic target reconfiguration) would not result in impacts to special status species. However, the implementation of Alternative 2.A for site-specific target reconfigurations could have an effect on special status species. No impacts due to proposed actions were identified for acuña cactus and the Colorado Desert fringe-toed lizard. Proposed Alternative 5.A (low-level overflight over portions of the Cabeza Prieta NWR) was identified as contributing to impacts to the greatest number of special status species (7 of 12 species).

Many of the adverse impacts to special status species that may be attributed to the proposed alternatives would be expected to be relatively minor and very site-specific; these include minor habitat loss, disturbance of an individual, and, only in minor instances, mortality. This possible mortality is due to the potential interaction of bats and helicopters flown at low altitudes at night. Even the six projects that may impact the Sonoran pronghorn are based on the inability to state that the animal would not be impacted as opposed to an assessment that the animal would be impacted. Several of the impacts to special status species may be eliminated by inclusion of mitigation actions, such as instruction for troops doing ground training exercises (Alternative

7.A) about environmental awareness and avoiding disturbance to desert tortoise and mines/caves. Impacts associated with all actions proposed within BMGR East and each of the special status species would be of the magnitude, duration, or consequence that would not affect the overall distribution or abundance of any species on BMGR East. Ultimately, an assessment of all actions taken together does not trigger any of the effects criteria beyond those recognized during the analysis of each individual action.

4.6 LAND USE

The primary land use of BMGR East is to support military training operations. Other non-military land uses that are compatible with the military operations may be allowed, including management of wildlife and habitat, international border surveillance activities, and utility rights-of-way. None of the proposed or alternative actions addressed in this EIS would be expected to adversely affect these types of ground-based non-military land uses in any meaningful way. Proposed new uses of some site-specific lands could preclude other uses of that land, but would not be expected to directly or indirectly affect an existing feature, such as a developed wildlife water catchment. Therefore, to avoid repetition, these types of non-military land uses are not discussed in the effects of each alternative. Effects on recreational land uses within BMGR East or adjacent lands are discussed in Section 4.7.

Similarly, none of the proposed or alternative actions addressed in the EIS would be expected to have more than a negligible effect on off-range, ground-based land uses, with the exception of Alternative 5.A, which would lower the flight altitude floor to 500 feet AGL over a portion of the Cabeza Prieta NWR. While an airspace proposal would not directly change the way the underlying lands are used, there could be associated changes in noise, aircraft mishap risks, and airspace availability that could have an effect on non-military users of the land such as recreationists and land management agencies with a mission (such as retaining wilderness values) that may not be fully compatible with such a change in airspace operations. These effects are generally discussed in other sections, although potential competition for use of this airspace is addressed in this section.

None of the alternative actions would affect land status or land management responsibilities.

Land use effects are considered significant if they directly change an existing land use in the long term (considered to be the duration of the current military land withdrawal, or through the year 2024) in a manner that is inconsistent with the existing use of the land. No significant land uses were identified in this analysis.

4.6.1 Proposal 1 - Sensor Training Area

4.6.1.1 Alternative 1.A – Air-to-Air Range Site

Development of the STA in the San Cristobal Valley would result in establishment of a new TAC range and associated airspace boundary within R-2301E and the Air-to-Air range. It would also add ground infrastructure and facilities over a one-square-mile area in a region with minimal development that is currently used for air-to-air firing range target fallout. While providing military aircrews with upgraded training challenges that are as realistic and instructional as possible, Alternative 1.A would not change the way other BMGR lands are used to support that tactical aviation training. There would be no decrease in the availability of existing BMGR subranges for simultaneous training activities with development of a new TAC range.

Off-site features associated with Alternative 1.A include a ground forward air controller point and access roads. A ground forward air controller observation point would be needed near to, but higher than, the STA site so that ground controllers could direct firepower. While the ground controller point itself would be minor and require no more than 0.25 acre, it may be necessary to develop a new access route to the selected location. Finally, approximately 17 miles of existing roads would be widened and subject to related improvements, resulting in a negligible increase in the surface area used for transportation. These land use changes as a result of Alternative 1.A would be compatible with existing uses in the area and would support the military mission of the BMGR, resulting in minimal impacts on land use.

Alternative 1.A would involve a minor increase in the use of roads leading to the STA site to accommodate STA development, training, and maintenance activities. An increase of approximately 200 to 300 truck trips per year (into and out of the STA site along the 17-mile-long access road) is estimated for EOD clearance, routine equipment maintenance, generator refueling, non-routine maintenance, and potential ground training activities. The potential increase in traffic associated with initial EOD clearance of DARTs and tow cables; widening of the access road; completion of cultural resource surveys; construction of the MOUT infrastructure complex; and installation of the UMTE, two LSTSS sites, and Smokey SAM Launcher System would also be realized, but only during the period prior to construction and during construction and equipment placement. Overall impacts on ground transportation within the BMGR would be minimal.

No public utilities would be affected with the implementation of Alternative 1.A, but military utility services would be connected to one of the generators to power lights within the MOUT complex.

Alternative 1.A does not constitute a major change in existing activities conducted at BMGR East; the number of sorties and aircraft types would remain similar to current use, and activities conducted with implementation of Alternative 1.A would be similar to those currently conducted in the nearby North TAC and South TAC.

4.6.1.2 Alternative 1.B - South Tactical Range Site

With Alternative 1.B, ground infrastructure and facilities for the STA would be added within a one-square-mile area in South TAC at the previously disturbed Target 220, which is minimally developed. Implementation of Alternative 1.B would not change the way other BMGR lands are used to support tactical aviation training; however, adding a new use to the existing South TAC range would limit its availability for other simultaneous training activities, which may result in minor adverse impacts on land use in South TAC. A new microwave link would be established with Alternative 1.B, although existing roads and TOSS towers would be used, if practicable, resulting in minimal change in existing land uses at the new microwave link site. The existing RMCP would be used, and no access road improvements are necessary under Alternative 1.B. Overall, land use changes as a result of this alternative would be minimal.

Compared to Alternative 1.A, ground transportation impacts would be slightly less with Alternative 1.B because no new EOD clearance areas would need to be established; EOD clearance would occur under the existing clearance schedule for South TAC. Therefore, about half as many trips as identified for Alternative 1.A would be needed for routine equipment maintenance, generator refueling, and non-routine maintenance. The potential for increased pre-operation traffic would also be less than with Alternative 1.A because access road widening would not be necessary and cultural resource surveys, which have been completed for most of the affected area, would be minimal.

Alternative 1.B would not affect public utilities within or adjacent to the BMGR, although there would be the need for some minor military service upgrades to power lights within the MOUT complex.

4.6.1.3 Alternative 1.C – North Tactical Range Site

Alternative 1.C would be located within North TAC, but outside of the existing target complex. Implementation of Alternative 1.C would not change the way other BMGR lands are used to support tactical aviation training; however, adding a new use to North TAC would limit its availability for other simultaneous training activities, which may result in minor adverse impacts on land use in North TAC. With Alternative 1.C, the airspace needed for maneuvers in attacking the STA would likely interfere with the simultaneous use of both Manned Range 4 and Manned

Range 2 and would reduce the training capacity of those ranges. Because the primary use of BMGR East is for military aerial training, this would be an adverse effect.

No new microwave communications system would be required, but about 4 miles of existing road would need to be upgraded to support construction and operations. A ground forward air controller observation point would be established on Malpais Hill; the land used for the observation point would be less than 0.25 acre, but it may be necessary to develop a new access route to the forward air controller point.

The number of trips to the STA site would be expected to be comparable to Alternative 1.A. While Alternative 1.C is within an existing tactical range, the proposed site is beyond the current EOD clearance area, so EOD operations would need to be extended to address STA operations. However, there may be less ground transportation activity during construction of Alternative 1.C compared to Alternative 1.A because fewer miles of road improvements would be required.

As with Alternatives 1.A and 1.B, public utilities would be unaffected, but some minor military service upgrades would be needed for lighting.

4.6.1.4 Alternative 1.D – No-Action Alternative

Under the no-action alternative, neither the STA nor the associated infrastructure and equipment would be developed. Thus, land management and use at BMGR East and adjacent areas would remain unchanged.

4.6.2 Proposal 2 – Target Reconfiguration

4.6.2.1 Alternative 2.A - Proposed Action

With the proposed action, a procedure would be established outlining the environmental review and approval required for situations in which existing targets may be configured in their current location, expanded in size, or retired from use. The parameters would also address the establishment of new targets within areas with varying degrees of prior disturbance.

Modifying an existing target so that it better simulates targets seen in current combat scenarios would be a land use benefit because this would enable better aircrew training and further the military mission for which BMGR East was established. Similarly, expanding the size or complexity of an existing target or replacing an existing target with a more realistic simulation in a different location would also be expected to further the military mission, particularly if the enhanced complexity or new location offered varied terrain scenarios to present different challenges that would enhance training. Creating new targets in previously disturbed areas would also enhance the training mission, but could reduce the amount of land available for other types of military use. However, considering that only about 10 percent of the entire BMGR has been

disturbed for military purposes, a slight consumption of land for new targets would have a negligible effect on land use.

From a land use perspective, it would be appropriate to establish a process that requires relatively little review for approval of target reconfigurations within areas that have been exposed to more extensive prior military land use because the change in land use would be minimal. In many cases, current EOD clearance areas may not change because the new target area may already be subject to EOD clearance. If a target is proposed in an area with negligible or no prior military disturbance, it would be appropriate to require more extensive NEPA documentation for the environmental review and approval process because this could signal the potential for an increase in the amount of land used for military purposes at the potential expense of meeting the BMGR INRMP goals for managing natural and cultural resources.

4.6.2.2 Alternative 2.B – No-Action Alternative

With Alternative 2.B, no review and approval parameters would be established for environmental clearance of target reconfiguration proposals. While this would not preclude opportunities to propose reconfiguration or enhancement of existing targets or replacement of a target in a new location, the process for accomplishing this would likely take longer, thus postponing the training value that could be gained with targets that better simulate today's combat scenarios.

Existing land use and use of the associated airspace would remain unchanged with Alternative 2.B. The effects of any new proposals for target reconfiguration would be addressed in separate NEPA documentation that would not tier from this EIS.

4.6.3 Proposal 3 – Moving Vehicle Target System

4.6.3.1 Alternative 3.A – Proposed Action

Alternative 3.A would use portions of an existing road within North TAC to develop a track on which a vehicle could tow a target. The road was selected based on its location within an existing tactical range where air-to-ground fire upon the target could be safely conducted. The selected road is not critical to day-to-day range operations and maintenance, so it would not conflict with other needs for the road when training with the moving vehicle target system is scheduled. The infrequent use of the road also means that maintenance to regrade the road to repair damage caused by munitions impacts would not need to be scheduled as frequently as with the use of a busier road.

Some new roadway would be required to complete the track. In total, the track would cover approximately 44 acres. The existing road segment that would be part of the track would

continue to be used for range access when target training is not scheduled, so there would be no long-term land use effects. When moving vehicle target system training is scheduled, personnel not directly involved in the training exercise would not be able to access this part of the range because of the safety risks. This may pose a minor inconvenience to persons who are not currently restricted from using this road for range access.

4.6.3.2 Alternative 3.B

Like the proposed action, Alternative 3.B also uses portions of an existing road within North TAC to serve as part of the track proposed to support a moving vehicle target. The land use effects are the same as described for Alternative 3.A.

4.6.3.3 Alternative 3.C

Alternative 3.C is much like Alternatives 3.A and 3.B, except that with this alternative the proposed track would cover approximately 33 acres as opposed to 44 acres. The land use effects would be the same as with Alternatives 3.A and 3.B.

4.6.3.4 Alternative 3.D – No-Action Alternative

With Alternative 3.D, no track would be established for a moving vehicle target, and this type of training would not be available at BMGR East. The roads in North TAC would continue to provide access to existing targets. There would be no change in land use.

4.6.4 Proposal 4 – New Target for Air-to-Ground Missiles

4.6.4.1 Alternative 4.A – Proposed Action

Alternative 4.A would provide for the establishment of a new air-to-ground missile target within East TAC in an area that has previously been subject to EOD clearances. The proposed target area is near an existing road so no new access would be required. The development of the target would preclude other potential uses of this land (approximately 75 acres) for the life of the target. Because live explosive ordnance would be used, the future use of this land may be limited with implementation of Alternative 4.A because of the safety hazard that potentially could exist if live ordnance does not detonate upon impact and is buried below the surface so it is not visible or not safe to be removed using standard EOD clearance procedures.

Because East TAC is designed for air-to-ground targets, including live targets, this proposed action is a compatible land use and would enhance military operations and military training, which is the primary purpose of BMGR East.

4.6.4.2 Alternative 4.B - No-Action Alternative

With Alternative 4.B, no new target would be established in East TAC for air-to-ground missile training. The existing targets would continue to be used, and aircraft approaches to the target would continue to be constrained. The land within East TAC would be available for other future land uses that are compatible with the types of military operations conducted within East TAC.

4.6.5 Proposal 5 – Lowering Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge

4.6.5.1 Alternative 5.A – Proposed Action

Alternative 5.A is an airspace proposal to lower the flight altitude floor within R-2301E over a portion of the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL for certain new military flight training operations that would be scheduled on a regular basis. There would be no direct effect on the land surface and therefore no direct effect on land use. The Cabeza Prieta NWR in this area is designated wilderness so motorized vehicles are not allowed, but the area is accessible for non-motorized recreational purposes, with travel primarily on foot. See Section 4.7 for a discussion of the recreational use effects.

Alternative 5.A is the only proposed action that would have an effect on the restricted airspace associated with BMGR East. The current FAA-authorized lateral and altitude dimensions of R-2301E are fully adequate to support the lowered floor and military flight operations. No new air traffic control or surveillance procedures would be necessary other than establishing procedures for the routine scheduling of all users of the airspace from 500 to 1,500 feet AGL over the Cabeza Prieta NWR. Scheduling procedures would be designed so that authorized military and non-military aircraft do not simultaneously use this airspace as is currently done for all other airspace areas of the BMGR. The proposed action is not expected to change the hours of operations for R-2301E from those currently authorized by the FAA or from current use patterns. No effects on scheduled airline flights or commercial or private civil aviation would occur as a result of implementing Alternative 5.A.

Most of the Cabeza Prieta NWR was designated Wilderness by the 1990 Wilderness Act. Ongoing military use of this airspace and changes to the interagency agreements are allowed per the 1990 Wilderness Act, which states:

> *Nothing in this title including the designation as wilderness of lands within the Cabeza Prieta National Wildlife Refuge, shall be construed as—*
>
> *(1) precluding or otherwise affecting continued low-level overflights by military aircraft over such refuge or the maintenance of existing associated ground*

> *instrumentation, in accordance with any applicable interagency agreements in effect on the date of enactment of this Act; or*
>
> *(2) precluding the Secretary of Defense from entering into new or renewed agreements with the Secretary concerning use by military aircraft of airspace over such refuge or the maintenance of existing associated ground instrumentation, consistent with management of the refuge for the purpose for which such refuge was established and in accordance with laws applicable to the National Wildlife Refuge System*

The need to more closely schedule the airspace from 500 to 1,500 feet AGL over the Cabeza Prieta NWR may result in minor inconvenience for those authorized to fly in this airspace (for example for wildlife or illegal immigration surveillance). For example, agencies such as AGFD may have to be more flexible about the dates and times scheduled for flights over the Cabeza Prieta NWR. Most of the aerial surveillance of the international border occurs south of the affected area, but surveillance within the affected airspace would need to be scheduled so that authorized military and non-military aircraft do not simultaneously use this airspace. The Air Force coordinated with the Border Patrol regarding the potential for indirect effects to Border Patrol airspace or land operations associated with the proposed lowered flight floor over the Cabeza Prieta NWR. It was determined that implementation of Alternative 5.A would not likely result in increases in Border Patrol access within the Cabeza Prieta NWR for ground patrols. Most ground patrol is concentrated along the border, well to the south of the proposed lowered flight training area. However, because helicopter flights enhance the effectiveness and efficiency of Border Patrol operations, the reduced access to the low-level airspace may reduce efficiency. Most early morning Border Patrol flights would not be affected, but later morning flights would be more limited. In the event of a bona fide, time-sensitive apprehension or rescue mission, the Border Patrol would coordinate with the Air Force and the Air Force would temporarily raise the flight floor for military operations so that the Border Patrol could operate in the airspace below 1,500 feet AGL (Buchannan 2009).

As already described in Section 2.6, the provisions of the 1994 MOU, which currently governs military flight operations below 1,500 feet AGL over the Cabeza Prieta NWR, would have to be renegotiated with the Department of the Interior to allow for the proposed military flight training use of the subject airspace. The proposed low-level flight training use of the airspace over the Cabeza Prieta NWR is consistent with the MLWA of 1999 which provides that:

> When determined by the Secretary of the Navy or the Secretary of the Air Force to be essential to support military aviation training, the Secretary of the Navy, the Secretary of the Air Force, and the Secretary of the Interior shall negotiate

> amendments to the memorandum of understanding referred to in subsection (b)(1)(B) in order--
>
> > (i) to revise existing or establish new low-level training routes or to otherwise accommodate low-level overflight… [P.L. 106-65 § 3032(d)(1)(A)]

4.6.5.2 Alternative 5.B – Alternative Action

Alternative 5.B would also lower the airspace floor over the Cabeza Prieta NWR to 500 feet AGL, but the lowered floor would only extend 8 NM south of the BMGR boundary rather than 15 NM as with Alternative 5.A. Similarly, there would be no direct effect on the land surface and therefore no direct effect on land use.

The authority to lower the floor and the scheduling procedures to ensure that military and non-military aircraft are not simultaneously using the low-level airspace would be the same as described with Alternative 5.A. Authorized non-military aircraft would continue to be allowed to use the airspace from 500 feet to 1,500 feet AGL except in the area from 0 NM to 8 NM south of the BMGR boundary. While this alternative would enhance military training when compared to the existing condition, the training scenario would continue to be less realistic than those that would be flown in an actual combat mission.

4.6.5.3 Alternative 5.C – No-Action Alternative

Alternative 5.C has no direct effects on land use. There would be no change in flight scheduling procedures, hours of operation, or numbers of sorties compared to current conditions. The 1994 MOU among the Departments of the Air Force, Navy, and Interior would remain in effect and would not need to be renegotiated.

Military aircrews would continue to approach certain targets at a higher altitude than would realistically occur in combat situations, thereby diminishing the effectiveness of the training mission.

4.6.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.6.6.1 Alternative 6.A – Proposed Action

With Alternative 6.A, the southern portion of Manned Range 3 would be converted into a helicopter gunnery range with fixed, moving, and pop-up targets. Helicopters may currently train at Manned Range 3, but the current configuration of this range is more conducive to fixed-wing aircraft gunnery. Because Manned Range 3 is already a gunnery range, the land use would not change, but targets would be positioned in areas that do not currently contain targets, and these target impact areas would be subject to an increase in impacts from small munitions. Standard

EOD clearance procedures would be applied to the new targets, but based on the types of munitions used for helicopter gunnery training, this would primarily consist of clearing the roads as part of the normal EOD clearance operations conducted at Manned Range 3.

4.6.6.2 Alternative 6.B – No-Action Alternative

With Alternative 6.B, there would be no change in land use and Manned Range 3 would continue to support both fixed-wing and rotary-wing operations. However, the training for rotary-wing aircrews would not be enhanced to support the types of missions for which helicopters are used.

4.6.7 Proposal 7 – On-the-Ground Training Exercises

4.6.7.1 Alternative 7.A – Proposed Action

Alternative 7.A would provide for CSAR teams or other small teams to perform cross-country land navigation and other on-the-ground exercises such as shooting at targets or camping overnight as well as bi- or tri-annual large troop training exercises for approximately 100 troops, including WTI. Because part of CSAR training is to operate undetected by the enemy, the teams work to limit evidence of their presence, so land use effects would be negligible. Large scale exercises would occur at previously disturbed sites within tactical ranges and would be scheduled to not conflict with other range operations. Travel on foot is a minimal impact and is consistent with other range operations such as personnel walking to various range features to conduct maintenance or repairs, or scientists conducting resource surveys.

4.6.7.2 Alternative 7.B - No-Action Alternative

With Alternative 7.B, there would be no change in land use from the existing condition, which already allows for other types of foot traffic for range operations.

4.6.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field

4.6.8.1 Alternative 8.A - Proposed Action

Taxiway. Implementation of Alternative 8.A would result in the construction of a taxiway parallel to the existing runway at Gila Bend AFAF. While this would have a beneficial effect on military operations by enhancing the airfield capacity for aircraft and safety, the proposed taxiway would have an effect on other land uses at Gila Bend AFAF. Per UFC requirements, the taxiway would be constructed at least 1,000 feet from the runway centerline. This would require the removal of the existing air traffic control tower; however, building a new air traffic control tower in another location is a component of Alternative 8.A. To comply with UFC, the proposed taxiway may also require that the existing helicopter landing pads be relocated, although this

cannot be determined with certainty until airfield features are sited and the actual design for the airfield is determined.

Construction of the taxiway is expected to require disturbance of approximately 42 acres, which would then be committed to airfield operations for the operational life of the taxiway and preclude other land uses in this area unless they are compatible with the airfield operations.

Control Tower. Alternative 8.A would include the construction of a new air traffic control tower at a location that would provide air traffic controllers with the required visibility to see the airfield surfaces and provide direction for safe aircraft separation during take-off, landing, and taxi operations. Replacing the tower with one that is adequate to house the equipment and provide office and storage space to meet UFC standards would be a land use benefit because the land would meet the requirements for its intended military purpose.

Once constructed, the land associated with the footprint of the tower would no longer be available for other land uses for the life of the control tower.

4.6.8.2 Alternative 8.B

Taxiway. Alternative 8.B is the same as Alternative 8.A for the taxiway so the effects on land use would be the same.

Control Tower. Like Alternative 8.A, a new control tower would be constructed with the same types of features, but the location of the new tower would be different. The field of view from the tower with Alternative 8.B would be impacted by power lines and other base structures, diminishing the value of the control tower. Because the military value for this land is to provide for an AFAF to support emergency or precautionary recoveries of military aircraft that experience in-flight emergencies, using an air traffic control tower that offers less than the ideal visibility would result in a somewhat adverse land use effect.

4.6.8.3 Alternative 8.C – No-Action Alternative

Taxiway. With Alternative 8.C, no taxiway would be constructed parallel to the existing runway, and aircraft using the Gila Bend AFAF would continue to use the runway for taxiing purposes. In rare emergencies, this alternative may have an adverse effect on the military land use because the existing runway must double as a taxiway.

Control Tower. With Alternative 8.C, the control tower would not be reconstructed in a new location. There would be no change in land use, but this may adversely affect military operations due to the inadequate visibility from the existing tower.

4.6.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.6.9.1 Alternative 9.A - Proposed Action

With Alternative 9.A, the existing dirt road from Manned Range 1 to RMCP 1 would be paved, affecting approximately 23 acres of land. This is a road that is heavily used and requires frequent grading to minimize impacts on vehicle alignment, suspension systems, tire wear, and overall vehicle maintenance costs. With regard to the military use of this road, Alternative 9.A would be beneficial to the existing land use.

Short-term impacts during project implementation, however, would include activities associated with paving the road that would temporarily inconvenience or delay ground users of the affected road.

4.6.9.2 Alternative 9.B - No-Action Alternative

The road would not be paved with Alternative 9.B. The land use would not change and the road would continue to serve its purpose, but the road and vehicle maintenance issues and costs would not be alleviated.

4.6.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.6.10.1 Alternative 10.A - Proposed Action

Alternative 10.A would result in the excavation and stockpiling of sand and gravel near wash areas. The sand and gravel would be obtained from BMGR East lands and would be used exclusively on the BMGR for range maintenance and operations, including maintenance of target areas and roads. The proposed sites for excavation and stockpiling are not used for other military purposes so no land use or ground transportation effects would be anticipated. There are no currently identified planned uses of the excavation and stockpile sites for other military land uses. The anticipated footprint of all the excavation and stockpile sites is collectively expected to affect less than 3 acres of land.

Because sand and gravel would be stockpiled near existing roads to eliminate the need for new access to stockpiled materials, ground users in the area may be temporarily inconvenienced or delayed when vehicles are moving the resources to or from the stockpile sites. This would most frequently occur when the tactical ranges are closed for annual maintenance as this is when these resources would be needed the most.

In the long term, Alternative 10.A may prove to be beneficial to military land uses. Currently, sand and gravel are obtained from off-range locations and transported to BMGR East for range maintenance operations. There are costs associated with the purchase and transport of the materials. Using on-range sand and gravel resources would minimize these expenditures so that

needed target and road maintenance is not delayed because the financial resources were not available to purchase and haul sand and gravel from off-range sites.

4.6.10.2 Alternative 10.B – No-Action Alternative

With the no-action alternative, Alternative 10.B, sand and gravel would continue to be purchased from off-range facilities and hauled to BMGR East sites where the materials are needed for target and road maintenance. This could have negligible effects on the off-range roads and highways used for travel between the source sites and BMGR East as a loaded haul truck may travel at a slower speed. This alternative may also have a greater impact on BMGR East roads on which the materials are hauled because trucks with heavy loads are more likely to impact the unpaved roads and contribute to rutted or "washboard" road surfaces.

4.6.11 Aggregate Impacts

BMGR East lands are made available for military purposes by virtue of the MLWA of 1999 for use as (1) an armament and high-hazard testing area; (2) training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support; and (3) other defense related purposes. Because the 10 proposed actions all further this purpose, each proposed action has a beneficial effect of better meeting these military purposes. Implementing all 10 proposed actions is collectively better for military purposes. This is particularly true in the case of implementing Alternatives 1.A or 1.B (a new STA on land either under the Air-to-Air range or within South TAC) together with Alternative 5.A (lower the flight floor to 500 feet AGL over portions of the Cabeza Prieta NWR). While there is value in implementing these actions independently, the ability to attack the STA targets from low altitudes offers a different type of challenge and thus enhances the training opportunities.

Collectively, implementing all 10 proposed actions (or their action alternatives) would preclude certain uses of the affected lands, but the total acreage affected (roughly 3,000 acres including anticipated target impact areas) is a fraction of a percent of the approximately 1 million acres that constitute BMGR East. In all cases, the proposals are compatible with the intended uses of the land, with the exception of lowering the flight floor over portions of the Cabeza Prieta NWR. The purpose of the Cabeza Prieta NWR lands is not to further the military mission, but the Air Force is fully authorized to use the overlying airspace.

4.7 OUTDOOR RECREATION

Potential impacts to recreation result when the character or opportunity for recreation is altered, or recreation is displaced by an action. The methodology to assess impacts on recreation considers the various effects that the proposed range improvements could have on recreation in

the region, the location of effects relative to recreational uses, and the popularity or value of the affected recreational resource.

Impacts to recreation are generally considered significant if a designated federal, state, regional, or local park or preservation or recreation area is: (1) affected such that the amount of land available for recreation is reduced or increased, and/or (2) the inherent value of that use is diminished or enhanced for the long term.

The military context of BMGR East is directly relevant to determining the significance of impacts to recreation. The BMGR is characterized by a mosaic of lands that provide direct or indirect support to military training. Many of these areas are not regarded as recreational use areas and are closed to recreational use on a continuous basis to protect public safety and prevent interference with training schedules.

4.7.1 Proposal 1 – Sensor Training Area

4.7.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Under this alternative, the proposed STA would be developed and operated at a site located within the San Cristobal Valley underlying the existing Air-to-Air Range within Management Unit 4 (see Figures 2-4 and 3-6). The proposed STA would include ground infrastructure and facilities over a 640 acre square mile area (see Table 2-1) and result in an estimated maximum increase of 96 daily sorties at this location. The laser hazard area for aircraft-mounted systems and the ground-employed lasers (which have a directional hazard that can be as long as 12.4 miles) would be directed to the east from the proposed STA site into the North and South TAC ranges.

While public access is generally prohibited within the potentially affected area of BMGR East, bighorn sheep hunters may apply for BMGR special use permits, and bighorn sheep are often hunted in the Mohawk Mountains (just west of the proposed STA site) during the bighorn sheep hunting season, which is typically during the month of December. Bighorn sheep hunters who obtain special use permits would only be allowed to access areas within the laser safety footprint if laser use ceased. Sizable portions of the Mohawk Mountains, including but not limited to the whole western side, and the Granite Mountains would likely not be affected by the laser hazard area. Additionally, the laser hazard footprint is not expected to extend to include the road along the southern end of the Mohawk Dunes that is now open to the public for drive-through use only or into the adjacent Management Unit 3 portions of R-2301W that are generally open for public recreational use (see Figure 3-6).

Existing recreation use within BMGR would continue with the implementation of this alternative, subject to the existing constraints of the overriding military mission. However, the recreation access closures within the laser safety footprint, whether intermittent or permanent, would result in localized impacts to recreation on BMGR by reducing the amount of land that is available for recreation use. The significance of these impacts would be minimal with the exception of bighorn sheep hunts, given the rare opportunity of this once-in-a-lifetime permit that authorizes a licensed hunter to bag one bighorn sheep within a specific management unit during a specific season. While lands available for bighorn sheep hunts may be reduced, bighorn sheep hunting opportunities would not be precluded given that bighorn sheep occur within the Copper Mountains, in the Gila Mountains north of Cipriano Pass, and in the Tinajas Altas Mountains south of Cipriano Pass, as well as within the Mohawk and Granite Mountains. Therefore, implementation of Alternative 1.A would have no significant impact to recreation on lands adjacent to BMGR.

4.7.1.2 Alternative 1.B – South Tactical Range Site

Under Alternative 1.B, the proposed STA would be constructed and operated at the Target 220 site within South TAC (see Figure 2-5 and Figure 3-6). As with Alternative 1.A, existing recreation use at BMGR would continue with the implementation of this alternative, subject to the existing constraints of the overriding military mission. Recreational opportunities would not likely be affected as public access is generally prohibited within this area of BMGR East. Hunting, even for bighorn sheep, does not occur in this portion of the range.

Impacts to recreation on adjacent lands would not be expected as a result of locating the STA at this site. While this alternative STA site is within approximately 3 miles of the border with Cabeza Prieta NWR, this action is not likely to change or diminish recreation opportunities, patterns, or visitation of facilities on the refuge. The estimated maximum of 96 daily sorties at this location would potentially increase aircraft operations in this area, but this area is already subject to similar operations associated with training in South TAC and the implementation of Alternative 1.B would not result in a change in noise exposure levels. Most visitors to the Cabeza Prieta NWR travel along El Camino del Diablo through the refuge and stop at one of the campgrounds along this roadway (McCasland 2008), which is substantially south of the location of this alternative STA site (see Figure 3-6).

Therefore, implementation of this alternative would have no significant impact on recreation within BMGR East and minimal impact on recreation within the infrequently visited northeastern portion of the Cabeza Prieta NWR, and no impact to other recreation areas in the BMGR region.

4.7.1.3 Alternative 1.C – North Tactical Range Site

The impacts to recreation under Alternative 1.C would be the same as described for Alternative 1.B with the exception that this site is at an interior location of the BMGR that is approximately 10 miles from any area that supports recreation. Therefore, implementation of this alternative would have no significant impact to recreation either within or adjacent to BMGR East.

4.7.1.4 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, there would be no impact to recreation.

4.7.2 Proposal 2 – Target Reconfiguration

4.7.2.1 Alternative 2.A - Proposed Action

With implementation of Alternative 2.A, recreation impacts would not likely occur as public access is prohibited within North, South, and East TAC. Hunting, even for bighorn sheep, does not occur in these portions of the range. Therefore, implementation of this alternative would have no anticipated impacts to recreation either within or adjacent to BMGR East.

4.7.2.2 Alternative 2.B – No-Action Alternative

Under Alternative 2.B, the no-action alternative for this proposal, there would be no impact to recreation.

4.7.3 Proposal 3 – Moving Vehicle Target System

4.7.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C

Under any of the action alternatives for Proposal 3, recreational impacts would not likely occur as public access is prohibited within North TAC. Hunting, even for bighorn sheep, does not occur in this portion of BMGR East. Therefore, implementation of this alternative would have no anticipated impacts on recreation either within or adjacent to BMGR East.

4.7.3.2 Alternative 3.D – No-Action Alternative

Under the no-action alternative for this proposal there would be no impact to recreation.

4.7.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.7.4.1 Alternative 4.A – Proposed Action

Impacts to recreational opportunities under this alternative would not be expected as public access is prohibited within the East TAC. Hunting, even for bighorn sheep, does not occur in this portion of BMGR East. Establishment of this target would not be expected to diminish the quality of the recreational experience on adjacent lands because the proposed target site is

located in the BMGR interior, approximately 4 miles from Sonoran Desert National Monument and the Tohono O'odham Nation and approximately 8 miles from BMGR Area B (see Figure 3-6). Therefore, implementation of this alternative would have no anticipated impacts on recreation either within or adjacent to BMGR East.

4.7.4.2 Alternative 4.B – No-Action Alternative

There would be no impacts to recreation under Alternative 4.B, the no-action alternative for this proposal.

4.7.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.7.5.1 Alternative 5.A – Proposed Action

With implementation of Alternative 5.A, the flight training altitude floor over a portion of the Cabeza Prieta NWR (see Figures 2-11 and 3-6) would be lowered from 1,500 feet AGL to 500 feet AGL and between 4,200 and 6,200 sorties would occur between 500 and 1,500 feet AGL in R-2301E on an annual basis. No recreation areas within BMGR East would be affected. Of recreation areas adjacent to the range, only recreation within the Cabeza Prieta NWR and Wilderness and Organ Pipe Cactus National Monument and Wilderness could potentially be affected.

In 2007, there were approximately 400 recreational visits to the Cabeza Prieta NWR. The refuge is extremely remote and access is challenging, with four-wheel drive vehicle use recommended. Most recreational users on the refuge travel El Camino del Diablo, and visit the campgrounds along this unimproved public use road. These sites are generally south of the southern boundary of the proposed airspace modification (see Figure 3-6). Therefore, recreational users in these areas would not likely be impacted by a lower airspace floor on R-2301E. Additionally, it is important to note that there are existing MTRs over the northeastern corner of the refuge and WTI flight corridors that traverse the airspace over the refuge in a generally east-west pattern. Some of the MTRs are used on a daily basis and the WTI flight corridors are typically used once daily during the twice-a-year WTI training course for a period of about 2 weeks, but they may be activated more frequently. The floor of these corridors is 50 feet AGL for helicopters, and 200-500 feet AGL for fixed wing aircraft, depending on the route. Therefore, while it is unlikely that the proposal to lower a portion of the floor of R-2301E from 1,500 feet AGL to 500 feet AGL would impact most recreational users of the refuge, it would not be something out of the ordinary for these users to experience an overflight by an aircraft at 500 feet AGL. Moreover, impacts within the Cabeza Prieta NWR must be analyzed within the context of the MLWA of 1999 (Section 3032), which states that the Cabeza Prieta NWR is to be managed to support current and

future military aviation training needs consistent with the 1994 Memorandum of Understanding between the Departments of the Interior and the Air Force. As detailed in Section 4.12.5.2, there would be an approximately 5 dB increase in noise levels within the area underlying the lowered flight training area. Recreation users in this Wilderness area are backcountry users that typically expect quiet as part of their recreation experience. Therefore, annoyance levels among this group would likely increase. Noise events would be transitory and levels of annoyance among individuals would be expected to vary widely. The resultant 48 dB noise exposure level is consistent with a Wilderness area and would not be considered a significant impact to recreation.

In 2007, there were more than 323,500 visitors to Organ Pipe Cactus National Monument. The areas of Organ Pipe Cactus National Monument adjacent to proposed airspace modification (see Figure 3-6) are extremely remote and access is challenging. Most visitation at Organ Pipe Cactus National Monument occurs in the campground areas that are south and east of the proposed airspace modification; however, the portion of El Camino del Diablo that traverses the Organ Pipe Cactus National Monument is also popular and is within approximately 1 to 7 miles of the proposed airspace modification. Based on noise modeling results, no noise impacts are expected within Organ Pipe Cactus National Monument

4.7.5.2 Alternative 5.B – Alternative Action

The impacts of Alternative 5.B to recreation would be the same as described for Alternative 5.A, although the extent of the impact would be reduced in comparison as the lowered flight training area covers less area under Alternative 5.B than under Alternative 5.A.

4.7.5.3 Alternative 5.C – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impact to recreation.

4.7.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.7.6.1 Alternative 6.A – Proposed Action

Impacts to recreation at BMGR East under Alternative 6.A would not occur because public access is prohibited within Manned Range 3. Hunting, even for bighorn sheep, does not occur in this portion of BMGR East. The range reconfiguration would occur at an interior location of BMGR East, approximately 7 miles from the Sonoran Desert National Monument. As use of Manned Range 3 would continue much as it has occurred in the past, it is unlikely that this action would change recreational opportunities, patterns, or visitation of recreational facilities in the vicinity of the range. Therefore, implementation of this alternative would have no anticipated impacts on recreation either within or adjacent to BMGR East.

4.7.6.2 Alternative 6.B – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impact to recreation.

4.7.7 Proposal 7 – On-the-Ground Training Exercises

4.7.7.1 Alternative 7.A – Proposed Action

Under Alternative 7.A, the large scale (approximately 100 troop) training exercises would occur at tactical range locations that are interior to BMGR East and would not impact recreation. However, the vast majority of BMGR East recreation occurs within Area B and under Alternative 7.A, CSAR or other small teams of approximately ten troops would be inserted/extracted in Area B with teams moving into the military target areas of East TAC. In 2007, there were 6,467 visitor permits issued from the permitting offices that provide access to BMGR East, BMGR West, Cabeza Prieta NWR, and the Area A portion of the Sonoran Desert National Monument. The intent of troop movement and activity within this area would be to practice clandestine insertions/extractions and other activities such that it is unlikely that the public would observe these troops or their activities on a normal basis. The troops would practice "leave no trace" operations, removing any equipment, tracks, and waste. Any target practice conducted during these exercises would occur only in areas where public access is prohibited. The Air Force would not close Area B off from public access during these activities, but would install signage describing the potential for the public to observe these training activities. Some public recreationists may determine that they do not wish to have an outdoor experience that has the potential to expose them to a military training mission such as this. On the other hand, all permittees are well aware that they are on a military installation, and as such, it is more likely that these recreationists would not be dissuaded by this potential, nor would their experience be marginalized as a result of it. Impacts to recreationists that use Area B as a result of this proposal would be expected to be minimal. No impacts are anticipated within the recreation areas adjacent to BMGR East.

4.7.7.2 Alternative 7.B – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impact to recreation.

4.7.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.7.8.1 Alternative 8.A – Proposed Action and Alternative 8.B

There is no expectation that there would be an increase in sorties as a result of this proposal, rather only a safer airfield environment. Therefore, under both of the action alternatives for this proposal, there would be no impact to off-range recreation. Gila Bend AFAF is not open to

public access and, thus, the proposed improvements would not be likely to have any impact on the general public in terms of recreation. Neither Alternative 8.A nor 8.B would alter the recreation opportunities or experiences of those military personnel who utilize the recreational facilities at Gila Bend AFAF. Therefore, implementation of these alternatives would have no anticipated impacts on recreation either within or adjacent to BMGR East.

4.7.8.2 Alternative 8.C – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impact to recreation.

4.7.9 Proposal 9 – Proposed Paving of Road from Manned Range 1 to RMCP 1

4.7.9.1 Alternative 9.A – Proposed Action

Impacts to recreation under Alternative 9.A would not be expected as public access is prohibited on this portion of BMGR East. Hunting, even for bighorn sheep, does not occur in this portion of the range. Given the location and nature of this proposed action, there would be no impact to recreational opportunities, patterns, or visitation in the vicinity of the range. Therefore, implementation of this alternative would have no anticipated impacts on recreation either within or adjacent to BMGR East.

4.7.9.2 Alternative 9.B – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impact to recreation.

4.7.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.7.10.1 Alternative 10.A – Proposed Action

Under Alternative 10.A, no impacts to recreation would be expected as all proposed excavation and stockpile sites are located in portions of the range that are not open to public access. The small scale activity associated with the excavation, stockpile, and use of materials would not affect adjacent recreation areas. Therefore, implementation of this alternative would have no impacts on recreation either within or adjacent to BMGR East.

4.7.10.2 Alternative 10.B – No-Action Alternative

Under the no-action alternative for this proposal, there would be no impacts to recreation.

4.7.11 Aggregate Impacts

Of the ten proposals that comprise the proposed action, seven (Proposals 2, 3, 4, 6, 8, 9, and 10) would have no foreseeable impacts to recreation within or adjacent to the BMGR. These proposals affect locations that are closed to public access, even bighorn sheep hunting, and are in the interior of BMGR East. This means that these seven proposals would not impact recreation

areas in the vicinity of the BMGR. This is also the case with Alternatives 1.B and 1.C. Due to its location, Alternative 1.A has the potential for aggregate impacts with Proposal 5, which would lower flight training altitude over a portion of the Cabeza Prieta NWR.

Although Proposal 7, on-the-ground training exercises, has the potential for minor, transitory impact to recreation experience within Area B of BMGR East, the impacts would not have additive or interactive impacts with any of the other proposed actions.

4.8 HEALTH AND SAFETY

The impact assessment for health and safety involves assessing impacts based primarily on a comparison of existing conditions with the proposed actions and alternatives. In the following analysis, potential impacts related to health and safety would be considered significant if project implementation would create a situation involving endangerment or unusual risk to military personnel, visitors to the BMGR East, or to residents and visitors of lands adjacent to the range.

With all proposals, the Air Force would (as it does with all operations) comply with applicable U.S. Department of Labor, Occupational Safety and Health Administration regulations and Executive Order 12196, Occupational Safety and Health Programs for Federal Employees as well as applicable DoD and Air Force instructions and policies (which address issues such as traffic safety, occupational and environmental safety, fire prevention and protection, and occupational health). Under all proposals, continued adherence to the Luke AFB Supplement to AFI 13-212, which addresses protocols, procedures, and logistics, would minimize risks to health and safety associated with ongoing range operations. In the assessment that follows, it is noted where proposals would warrant modification of the Luke AFB Supplement to AFI 13-212.

In accordance with Executive Order 13045, the potential for disproportionate environmental health or safety risk to children was evaluated for implementation of any or all of the proposals. However, it was found that there would be no potential for such impact. Children could potentially be found on BMGR East when accompanying adults in recreation on those areas of the BMGR open to public access; however, none of the proposals would result in increased environmental health or safety risks in the range areas generally open to public access. Children also could potentially be found accompanying adults in the vicinity of the Gila Bend AFAF APZs; however, none of the proposed actions would change these APZs and these areas do not include any areas where children would typically be present (e.g., school, daycare center, park, etc.).

4.8.1 Proposal 1 – Sensor Training Area

4.8.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

With implementation of Alternative 1.A, the addition of facilities, associated ground training, and equipment maintenance would increase surface use at this site, resulting in an increased potential for contact with buried munitions, environmental, or other health and safety hazards. In addition, the personnel constructing the urban MOUT complex and installing the UMTE, LSTSSs, and Smokey SAM Launcher System may be exposed to potential short-term, work-related hazards (e.g., equipment operation, noise, and slip and fall hazards, as well as other environmental hazards such as venomous wildlife, exposure to heat). The hazards associated with heavy equipment operation and vehicle use to complete the roadwork, urban complex construction, and equipment placement would not differ substantially from those already encountered during the course of periodic range maintenance. This risk associated with such hazards would be minimized through initial and ongoing EOD clearance efforts biennially and every 10 years (as described in Section 2.2.1), access restrictions, safety precautions, and emergency response plans in place to minimize such incidents. Additionally, application of the various federal, DoD, and Air Force occupational and public health and safety standards mentioned above would further minimize potential impacts to safety and health.

Road widening and other associated improvements to approximately 20 miles of existing roadways under this alternative could result in positive impacts to traffic safety. The likelihood of collisions would be reduced with wider roadways, and drainage improvements would reduce potential road hazards.

Teams of EOD personnel would clear munitions from the proposed STA area prior to site development and routinely once the STA was operational. While the hazards from undetected munitions cannot be completely eliminated, the EOD clearance procedures would minimize the risk. The proposed STA site would be within an area that would be restricted from public access, which would protect public safety. Fences and warning signs marking the boundary of the new hazard areas such as the proposed UMTE site, LSTSS sites, EOD operating areas, and RMCP would be posted and maintained to warn persons working in the area as well as unauthorized persons. Periodic surveys of the area would be conducted to ensure that necessary safety fences, gates, and signs are in place.

The Luke AFB Supplement to AFI 13-212 would be updated to address procedures, protocols, and logistics for the operation of the STA including safe operation of training aircraft, threat emitters, lasers, and deployment flares.

When operational, the threat emitter would produce RF energy that is potentially harmful to humans (or animals) if exposure to the radar emissions occurs either close to the transmitting source where the emissions are at peak strength or for extended duration. Perimeter fencing at the appropriate safety distance (at least 308 feet) and warning signs in English and Spanish would be installed to minimize this safety risk from the UMTE to humans.

Lasers associated with aircraft targeting the sensor nodes at the LSTSSs are a safety hazard. These target lasers have the potential to damage eyesight should a person (or animal) look directly at the laser at the precise moment of firing. To minimize risk associated with this potential, warning signs would be posted in English and Spanish to warn people of this potential hazard. For aircraft-mounted systems, the laser hazard area is less than 1 km around the intended target. All three alternative locations for the proposed STA are in areas that are generally restricted from public access and the laser hazard area would not extend into publicly accessible areas. For ground employed lasers, the laser hazard area is very directional, but can extend as long as 20 km. Many factors influence the hazard risk including the graze angle and terrain that blocks the laser light from traveling farther. Because the hazard can be focused in a particular direction, the hazard area can be directed away from publicly accessible lands, and to some degree, areas most frequently entered by authorized personnel for range operations and maintenance. Laser use could also be restricted when hazard areas are known to be occupied by authorized personnel or trespassers.

While public access is generally prohibited from the proposed Alternative 1.A location, bighorn sheep hunters may apply for special use permits and bighorn sheep are sometimes hunted in the Mohawk Mountains, just west of this site. In accordance with AFI 13-212, reflective surfaces of targets would be removed or painted to minimize risk of reflections to neighboring or distant areas. Therefore, there is little risk that lasers used on the proposed STA could pose a health or safety risk to surrounding areas. Bighorn sheep hunters in the Mohawk Mountains looking directly in the direction of laser at the moment that it is reflecting off a reflective surface could, however, result in eye damage. While the chances of this happening are extremely remote, hunters would only be allowed to access areas within the safety footprint of the STA if laser use ceased during the hunting season, which is typically during the month of December for bighorn sheep.

It is possible that lasers targeted on the STA could reflect into Management Unit 3 of BMGR West and/or the road along the southern Mohawk Dunes that loops into Management Unit 4 and is authorized for drive through use only (see Section 3.7.3.2 and Figure 3-6). In addition, it is possible that lasers targeted on the STA could reflect into the Cabeza Prieta NWR from this alternative STA location; however, these areas of the refuge are wilderness and rarely accessed

by people. Warning signs would be posted along roads before reaching the potential laser hazard areas to warn recreationists, illegal immigrants, or others that there is a hazard area ahead. As noted above, a person on the ground would have to look directly at the laser beam at the precise moment it was fired to be affected which is a very remote possibility. In addition, the laser hazard area for aircraft-mounted systems is less than 1 km and ground-employed lasers, which could have a hazard area as long as 20 km, are directional hazards that can be directed away from publicly accessible areas. While the laser light could be reflected in other direction, reflective surfaces within the established laser hazard area would be minimized to the extent practical.

Infrared rockets and illuminating flares used during nighttime aircraft operations for target illumination could include up to 24 rockets and 24 flares per night. This would result in a minor increase in the use of illuminating rockets and flares on BMGR East, although these would be expected to fall within areas that are closed to public access and would be removed during the periodic EOD clearance procedures, thus minimizing any minor health and safety impacts. The primary potential impact associated with rocket and flare use is the possibility of burning material reaching the ground and igniting a fire, which could create secondary environmental impacts. Target illumination flares are generally released at above 5,000 feet AGL and are designed to burn out before reaching the ground. Because of the limited vegetative fuel in the San Cristobal Valley, rocket and flare-related fires typically do not present a major hazard.

The potential for aircraft mishaps at BMGR East as a result of this alternative would not increase as there would be no appreciable change in the number of operations, including the number of sorties flown and the types of aircraft used.

In general, implementation of this alternative would result in a negligible increase in potential hazards to public health and safety compared to the existing condition, primarily due to the laser hazard area.

4.8.1.2 Alternative 1.B – South Tactical Range Site

Potential impacts to health and safety under Alternative 1.B would be expected to be essentially the same as those described under Alternative 1.A. There could be slightly more potential for laser impacts on the Cabeza Prieta NWR; however, the potential for bighorn sheep hunters and BMGR West recreationists to be impacted would be eliminated as this area is closed to bighorn sheep hunting and far enough east of BMGR West. The same precautions would be taken as described under Alternative 1.A (i.e., posted warning signs along roads before reaching the potential laser hazard areas to warn recreationists, illegal immigrants, or others that there is a

hazard area ahead). In general, implementation of this alternative would result in a negligible impact to public health and safety.

4.8.1.3 Alternative 1.C – North Tactical Range Site

Potential impacts to health and safety under this Alternative 1.C would be expected to be essentially the same as those described under Alternatives 1.A and 1.B. There could be slightly less potential for laser impacts as this location is the most interior to the BMGR, miles from any on- or off-range area generally open to public access; however, warning signs would be posted along roads before reaching the potential laser hazard areas. In general, implementation of this alternative would result in negligible health and safety impacts.

4.8.1.4 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, there would be no impact to health and safety.

4.8.2 Proposal 2 – Target Reconfiguration

4.8.2.1 Alternative 2.A - Proposed Action

Public access to the TAC ranges is prohibited and the hazards associated with heavy equipment operation and vehicle use to complete any construction activities associated with potential target reconfiguration would not differ substantially from those already encountered during the course of periodic range maintenance. As targets are reconfigured, the Luke AFB Supplement to AFI 13-212 would be updated to address procedures, protocols, and logistics for safe use of the reconfigured targets. Therefore, implementation of this alternative would be expected to have negligible impacts to health and safety.

4.8.2.2 Alternative 2.B – No-Action Alternative

Under Alternative 2.B, the no-action alternative for this proposal, there would be no health and safety impacts.

4.8.3 Proposal 3 – Moving Vehicle Target System

4.8.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C

Health and safety implications associated with implementation of any of the action alternatives relate to the installation and operation of the moving vehicle target system. The hazards associated with heavy equipment operation and vehicle use to complete construction activities associated with the moving vehicle target system would not differ substantially from those already encountered during the course of periodic range maintenance. Although it is proposed that the vehicle approach speeds of up to 60 mph during operation, the vehicle would be

remotely operated and cameras would be mounted on towers and utilized to ensure the track is cleared of people, vehicles, and/or wildlife prior to its operation. In addition, training would be scheduled, as with any other training activity on the range and signs would be posted to notify non-participating personnel or any unauthorized persons of the potential hazards. The Luke AFB Supplement to AFI 13-212 would be updated to address protocols, procedures, and logistics associated with training at the moving vehicle target system. An indirect positive effect for overall safety could occur if the cameras provide range managers an opportunity to track activity, such as UDIs. Overall, the impact to health and safety with implementation of any of the action alternatives would be negligible.

4.8.3.2 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, aircrews would need to train at other ranges to establish their proficiency at attacking moving targets. The mounted cameras would not be established, which would eliminate an opportunity to track activity on a small portion of the range. Implementation of the no-action alternative would be expected to have negligible impacts to health and safety.

4.8.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.8.4.1 Alternative 4.A – Proposed Action

Potential health and safety issues associated with the implementation of Alternative 4.A would include construction activities and ongoing operation with the new air-to-ground missile target. Construction activities associated with target establishment would not differ on a discernible level from the activities that typically occur during periodic range clearance and maintenance for East TAC. Air and air-to-ground delivery operations would differ slightly in this localized area, but would not impact air or ground safety. Public access to East TAC is prohibited and the new target would be located at least 5 miles from any portion of the publicly accessible portion of BMGR East or adjacent land that allows public access. The Luke AFB Supplement to AFI 13-212 would be updated to include this activity and address scheduling and other logistics. Therefore, implementation of this alternative would be expected to have negligible impacts to health and safety.

4.8.4.2 Alternative 4.B – No-Action Alternative

Under Alternative 4.B, the no-action alternative for this proposal, there would be no discernible impacts to health and safety.

4.8.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.8.5.1 Alternative 5.A – Proposed Action

Implementation of Alternative 5.A would allow for more realistic attack approaches to targets in South TAC and low-altitude intercepts in the Air-to-Air range. Use of this area with the lower flight training altitude over the Cabeza Prieta NWR would be restricted to missions that specifically require the lower floor for realistic training, estimated at 4,200 and 6,200 sorties on an annual basis. These lower level flight training operations would be in addition to those that occur within the MTR/WTI flight corridors that accommodate both rotary and fixed wing aircraft at altitudes lower than 500 feet AGL in areas overlying the refuge. The type of training to occur in this airspace would not differ from that which currently occurs over BMGR East, which is available from ground level to 80,000 feet AGL. As noted in Section 3.8, since 1988, there have been 12 aircraft mishaps or incidents within the confines of BMGR East and its associated airspace.

However, increased risk of an aircraft mishap can occur with lower flight training altitude. Cabeza Prieta NWR is open to public access and hosted approximately 400 visitors in 2007 (Bissell 2008), with visitation typically being concentrated primarily along El Camino del Diablo, which is south of the southern border of the proposed airspace reconfiguration. Refuge visitors must obtain a valid permit and sign a Hold Harmless Agreement. In the event that an aircraft mishap were to occur, impacts to a refuge visitor would be highly unlikely given the low incidence of recreation use in the area underlying the area proposed for lowered flight altitude.

The Luke AFB supplement to AFI 13-212 would be modified to address the use, scheduling, and other logistics for this airspace, and safety is paramount in such considerations. Because of the high airspeeds and abrupt maneuvers required of the air combat training that would be conducted in this airspace, nonparticipating aircraft (such as surveillance aircraft flown by the Border Patrol) would be restricted from the airspace when it is scheduled for training. Given the low likelihood for a mishap to occur and even lower likelihood for refuge visitors to be impacted, impacts to health and safety as a result of lowering the floor of a portion of R-2301 E over Cabeza Prieta NWR would be expected to be negligible.

4.8.5.2 Alternative 5.B – Alternative Action

Under Alternative 5.B, lowering the altitude from 1,500 feet AGL to 500 feet AGL would be the same as proposed under Alternative 5.A. For health and safety, there is an increased risk of an aircraft mishap with a lower flight training altitude. However, as analyzed under Alternative 5.A,

there is a low likelihood for a mishap to occur and even lower likelihood for refuge visitors to be impacted.

4.8.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, there would be no impact to health and safety.

4.8.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.8.6.1 Alternative 6.A – Proposed Action

With implementation of Alternative 6.A, health and safety impacts would potentially occur during the construction phase and with the long-term operation of the reconfigured range for helicopter gunnery training. Because Manned Range 3 is located at an interior location of the range that is closed to public access, there are no public health or safety concerns. Hazards associated with heavy equipment operation and vehicle use to complete construction activities associated with construction of the targets would not differ substantially from those already encountered during the course of periodic range maintenance.

There would not be increased air operations or any potential increase in aircraft mishaps as a result of implementing this proposed action. The Luke AFB Supplement to AFI 13-212 would be updated to address the range procedures, protocols, and logistics to ensure continued safe operation of Manned Range 3. The munitions to be delivered to the range would not differ from those currently used. Weapons would typically be deployed to the south-southwest such that the Sauceda Mountains would serve as a backstop to keep ricocheted or errant deployments from leaving the restricted portion of the range. No increased risk for mishaps is anticipated with implementation of this proposed action and aircrews are expected to benefit from the increased training value. Therefore, implementation of this alternative would be expected to have negligible impacts to health and safety.

4.8.6.2 Alternative 6.B – No-Action Alternative

Implementation of Alternative 6.B, the no-action alternative for this proposal, would not impact health and safety. It should be noted, however, that the effectiveness of helicopter aircrews training would continue to be diminished by the less diverse targetry currently present at the BMGR East manned ranges.

4.8.7 Proposal 7 – On-the-Ground Training Exercises

4.8.7.1 Alternative 7.A – Proposed Action

Potential health and safety implications associated with implementation of Alternative 7.A would include exposure of ground troops training in both small and large groups to environmental hazards and considerations for public safety with respect to small ground troop training exercises within Area B, which is generally open to public access.

Military personnel involved in both small and large troop training exercises would be exposed to rugged terrain, remoteness, extreme temperatures (both hot and cold), intense sunlight, lack of drinking water, flash floods, abandoned mines and wells, and venomous wildlife. Participants would be advised of the potential hazards and given appropriate training prior to initiating the training activities to minimize hazards, take appropriate precautions, and follow prescribed protocols for seeking medical attention should it become necessary.

During the small troop training exercises in Area B, the Air Force would not close Area B off from public access, but would install signage describing the potential for the public to observe these training activities. Given that the purpose of this training is to remain undetected, it is unlikely that the public that may be recreating in Area B would observe or even be in close proximity to this training activity. Training activities conducted in Area B would occur in a manner that ensures no danger or potential harm to the public. Any target practice conducted during these exercises would occur only in areas where public access is prohibited.

The Luke AFB Supplement to AFI 13-212 would be modified to ensure that procedures, protocols, and logistics ensure safety in implementing the proposed on-the ground training activities with other BMGR East operations.

With the above stated precautions, there would be negligible impacts to health and safety with implementation of Alternative 7.A.

4.8.7.2 Alternative 7.B – No-Action Alternative

Under the no-action alternative, on-the-ground training exercises would not occur. As a result, CSAR and other similar teams would not be able to achieve their training at BMGR East. These crews would have to complete this training at another military installation. Implementation of the no-action alternative would not impact health and safety.

4.8.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.8.8.1 Alternative 8.A – Proposed Action

Public access to the Gila Bend AFAF is prohibited and therefore, impacts to public health and safety with implementation of Alternative 8.A would be negligible. The hazards associated with heavy equipment operation and vehicle use to complete activities associated with construction of the taxiway and air traffic control tower would not pose serious risks to workers; these activities are not unique, and standard building and construction procedures and practices would be followed by the construction contractor(s). The Luke AFB Supplement to AFI 13-212 would be modified to address the procedures, protocols, and logistics to ensure the safe operation of the new taxiway and air traffic control tower at Gila Bend AFAF. Conversely, implementation of this alternative would have a positive impact on flight safety at the Gila Bend AFAF by allowing for aircraft to taxi at an additional location at the airfield through development of the taxiway. Construction of the air traffic control tower would provide the required line-of-sight to the entire airfield as a result of the taller tower, which would improve overall flight safety at the airfield. The net impact to health and safety would be positive.

4.8.8.2 Alternative 8.B – Alternative Tower Site B

With implementation of Alternative 8.B, the health and safety impacts of taxiway construction would be the same as described under Alternative 8.A. The Alternative 8.B location for the air traffic control tower, however, would not be optimal as the field of view from the tower would be impacted by power lines as well as other base structures. Therefore, while still improving health and safety by separating aircraft movement, this alternative would have fewer benefits to health and safety as compared to Alternative 8.A.

4.8.8.3 Alternative 8.C – No-Action Alternative

Under the no-action alternative, the proposed taxiway and air traffic control tower would not be constructed. The existing runway would continue to function as the taxiway, maintaining the suboptimal airfield situation. The existing air traffic control tower would continue to be inadequate for observing the entire unobstructed airfield. While implementation of this alternative would maintain the existing condition, the current situation is not optimal, and improvements to safety at the Gila Bend AFAF would not be realized.

4.8.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.8.9.1 Alternative 9.A – Proposed Action

With implementation of Alternative 9.A, approximately 7 miles of the frequently used existing dirt road from the main tower within Manned Range 1 to the water well and adjacent RMCP 1 would be paved. This would be of benefit for health and safety as it would improve driving conditions by reducing dust-impaired visibility along this road. The hazards associated with heavy equipment operation and vehicle use to complete activities associated with paving the roadway segment would not pose serious risks to workers; these activities are not unique, and standard construction procedures and practices would be followed by the construction contractor(s). Implementation of this alternative would be expected to have a positive impact on ground safety on this section of the roadway.

4.8.9.2 Alternative 9.B – No-Action Alternative

Under the no-action alternative, the proposed road pavement project would not occur. The existing roadway would continue to be maintained as a dirt road. Potential improvements to ground safety as a result of improved visibility on this section of the range road network would not be realized.

4.8.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.8.10.1 Alternative 10.A – Proposed Action

Impacts to the general public with implementation of Alternative 10.A would not be expected as all proposed excavation and stockpile sites are located on portions of the range that are not open to public access. All excavation and stockpile sites would be sufficiently off the roadway so as to not pose a hazard for vehicular traffic, even during times of limited visibility (e.g. night, dust storms). All work in the washes would be conducted during dry periods so that the potential for flash floods occurring during excavation would be eliminated. The hazards associated with heavy equipment operation and vehicle use to complete activities associated with excavation and stockpiling sand and gravel would not pose serious risks to workers; these activities are not unique, and standard construction procedures and practices would be followed. There would be fewer trucks transporting sand and gravel for use at BMGR East from off-range locations, but this would not be expected to correlate with notable increased safety on public roads. Therefore, implementation of this alternative would have no anticipated impacts to health and safety.

4.8.10.2 Alternative 10.B – No-Action Alternative

Under the no-action alternative, the proposed sand and gravel extraction and stockpiling on BMGR East would not occur. Sand and gravel would continue to be transported from off-range

sources to the BMGR East, but this would not be expected to correlate with notable increased safety on public roads. There would be no anticipated impacts to health and safety as a result of this alternative.

4.8.11 Aggregate Impacts

There would be few additive and/or interactive impacts with implementation of all the proposed actions in terms of health and safety. To the extent each construction activity creates an additional worker safety environment; there would be additive impacts in terms of potential risk for construction-related mishaps to occur. However, all proposals involving construction would not introduce unique hazards and adherence to standard protocols and operating procedures would reduce risk levels. There could be aggregate impacts with the combination of Proposals 1 and 5 with some low-level attacks originating from airspace over the Cabeza Prieta NWR and attacks associated with training at the proposed STA (Section 4.8.1) should both proposals be implemented. However, there would not be additive or interactive impacts to health and/or safety. The aggregate impact of implementing those proposals that would improve aircrew training, particularly Proposals 1, 2, 3, 4, 5, 6, and 7, would be improved readiness training for aircrews and fewer deployments to other ranges for training (which involves a separate set of safety protocols, etc.).

4.9 CULTURAL RESOURCES

The cultural resource impact assessment conducted under NEPA is one component of cultural resource compliance; other laws, regulations and policies governing cultural resources apply outside of the NEPA requirement. The impact analysis for cultural resources in this document focuses on, but is not limited to complying with Section 106 of the NHPA. Section 106 requires federal agencies to:

- take into account the effects of their actions on historic properties (places eligible for inclusion on the NRHP) and
- provide the Advisory Council on Historic Preservation (ACHP) an opportunity to comment on those actions and their effects.

This document uses the NEPA terms “effects” and “impacts” interchangeably when assessing the impact of the ten proposed actions. For the purposes of this EIS, these are broad impact analysis terms that do not imply reference to the terms “effects” and “adverse effects” as narrowly defined under the NHPA.

Agencies demonstrate compliance with Section 106 by following the process outlined in the ACHP’s implementing regulation at 36 CFR Part 800, Protection of Historic Properties.

Subsections 800.5 and 800.6 describe the process by which federal agencies determine whether their undertakings will adversely affect historic properties (those cultural resources that are listed or eligible for inclusion on the NRHP), and if they will, how they are to consult to avoid, minimize, or mitigate the adverse effects in order to meet the requirement to "take into account" the effects of their undertakings on historic properties. That consultation usually involves the SHPO and tribes that attach cultural importance to places in the area that might be affected by the proposed action (ACHP 2009).

Subsections 800.2 through 800.6 of 36 CFR Part 800 describe the Section 106 process. Consultation with SHPO and Native American tribes that ascribe cultural affiliation to the area occurs throughout the process. The BMGR ICRMP provides specific guidance on the Section 106 review process simplified as: (1) identifying and evaluating historic properties; (2) assessing adverse effects; and if necessary, and (3) resolving adverse effects—all in consultation with SHPO, tribes, and others as appropriate. (Luke AFB 2009).

An action results in adverse effects to cultural resources eligible to the NRHP when it alters the characteristics that qualify the resource for inclusion in the register (its integrity and significance). Adverse effects commonly result from physical destruction, damage, or alteration of a resource, but also may result from: alteration of the character of the surrounding environment that contributes to the resource's integrity and significance; introduction of visual, audible, or atmospheric intrusions out of character with the resource or its setting; and neglect of the resource resulting in its deterioration or destruction; or transfer, lease, or sale of the property. In addition to affecting historic properties, a proposed action or alternative may affect places of traditional cultural value which may be protected by the NHPA as well as other federal laws and DoD and Air Force policies.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the importance of the resource; introducing visual or audible elements that are out of character for the period the resource represents (thereby altering the setting); or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by determining the location and nature of cultural resources that could be affected. Indirect impacts are those that may occur as a result of the completed project, such as increased vehicular or pedestrian traffic in the vicinity of the resource.

For this EIS, impacts to cultural resources are evaluated for lands to be affected by the proposed projects on BMGR East in Pima, Maricopa, and Yuma County, Arizona. Information on cultural

resources within the affected environment was derived from background research examining a variety of cultural resource surveys that have been conducted on BMGR East.

Impacts to TCPs are not addressed in detail for each proposal below, because no known TCPs have been specifically identified within the proposed project areas. The 56 FW/RMO will continue to consult with tribes that attach cultural importance to places on BMGR East to identify and evaluate places that may be eligible for inclusion on the NRHP for their traditional cultural value (i.e., as TCPs). Because even partial mitigation of impacts to TCPs is often impossible, impacts to such places will be avoided if possible.

Before implementing any proposed ground disturbing activities in areas where cultural resource surveys have not been completed, 56 FW/RMO will conduct intensive cultural resources surveys. Once the survey is completed, the 56 FW/RMO will assess the historic significance of the recorded resources, in consultation with tribes and SHPO, and make determinations of eligibility. Recorded resources will be avoided if possible. If avoidance of historic properties is not possible, the 56 FW/RMO will determine the effects of the proposed action on them, again in consultation with tribes and SHPO, and if needed, will consult to resolve adverse effects in accordance with Section 106 of the NHPA and 36 CFR Part 800.

As noted in Section 3.9.5, this Final EIS include some factual corrections with regard to cultural resources within the area of potential effect for the various proposals. In some cases, the analysis regarding potential effects has also changed; notably, for Proposals 1, 2, 6, and 10. In addition, since the Draft EIS was published, review under Section 106 of Proposals 4, 6, 8, 9, and 10 has been completed. Reviews of all other proposals (1, 2, 3, 5, and 7) are pending. If Section 106 review of any proposed action (undertaking) results in a substantial modification of that action, the selection of mitigation measures not analyzed in any manner in this Final EIS, or the identification of significant new circumstances or information relevant to the particular action, its impacts or any cumulative impacts, the Air Force would conduct any necessary supplemental environmental analysis in accordance with 40 CFR § 1502.9 and 32 CFR § 989.20(b).

None of the action alternatives can be selected in a Record of Decision until Section 106 review of that proposal has been completed.

4.9.1 Proposal 1– Sensor Training Area

4.9.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Intensive archaeological survey of the project area has been completed and 11 prehistoric and historical-period sites have been identified. Nine sites in or very near the area potentially affected by Alternative 1.A have been determined eligible for inclusion on the NRHP, and one historical-period site, Stoval Airfield (AZ Y:6:034 [ASM]), was previously determined eligible. One site, a

newly recorded, late-historical-period, single- or short-term-use camp site, is not eligible for inclusion on the NRHP. Road improvements between the northern range boundary near Stoval Airfield and the proposed STA location have the potential to affect many of the recorded sites.

Three historical-period sites are located the northernmost portion of the road. These sites are located along broad, stable segments of the road that are not likely to require widening or improvement to support access to the STA, and thus would not be affected by construction, maintenance, and use of the STA in this location.

Two of the eligible sites are located along road segments likely to require widening and other improvement; however, the sites are some distance from the proposed road improvement footprint, and adverse effects to these sites can be avoided during road widening and improvement. Measures to protect the sites in place also may be implemented if needed. In addition, road improvements are intended to keep the road passable, thus minimizing the likelihood of off-road driving to avoid muddy areas or deep, soft sand.

Two of the eligible sites are located very near the existing road footprint and may be affected by improvements along its track. Minor realignment along short segments of the existing road during improvements could avoid impacts to the sites, and protection in place measures may be implemented as needed. Maintaining the road in passable condition would have a beneficial effect by reducing unauthorized "drive-arounds" that currently affect sites.

An additional two eligible sites are bisected by the existing road, and improvements along its route would adversely affect them. Realignment outside the existing disturbed footprint would be required in order to avoid impacts to these sites resulting from road improvement, maintenance, and use. Measures to protect the sites in place also might be implemented if needed. Maintaining the road in passable condition would have a beneficial effect. If application of the criteria of adverse effect indicates that these sites will be adversely affected, then consultation will seek to identify measures to avoid, minimize, or mitigate adverse effects, in accordance with 36 CFR 800.6.

One of the eligible sites listed in Table 3-7 is AZ Y:6:72 (ASM), Yager Road or Stoval Road. It is likely that the existing dirt road may have followed or "reused" segments of this historic road; however, no such evidence has been identified during archaeological surveys of the project area. Several segments of the important historic road were recorded in the vicinity by SWCA in 1996. Only a small segment was rerecorded during the recent survey, and it lies outside the area potentially affected by road improvement and use.

Ongoing consultation may identify other properties that should be considered eligible for inclusion on the NRHP for their traditional cultural value, or may result in a finding that some of

the historic properties identified above should also be considered eligible under Criterion A or B, or both. Consultation will include assessment and, if needed, resolution of adverse effects. The latter may involve avoidance, protection in place, and data recovery, which might include some or all of the following: archival research, oral-historical research, and archaeological investigation (surface collection, testing, and/or excavation).

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.1.2 Alternative 1.B – South Tactical Range Site

Intensive archaeological survey of 100 percent of the project area has been completed and no historic properties have been identified. The area of potential effect includes roughly 1,200 acres centered on the existing Target 220. No road construction or improvement would be needed to support development of an STA in this location, as it can be accessed using existing maintained range roads. Cultural resources recorded in the area of potential effect include 11 isolated occurrences; no sites were identified, and none of these isolates is eligible for inclusion on the NRHP. On this basis, construction, maintenance, and use of the STA in this location would have no effect on historic properties.The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.1.3 Alternative 1.C – North Tactical Range Site

Construction, maintenance, and ongoing operation and use of Alternative 1.C would cause ground disturbance in an area with low levels of previous disturbance. The identification and evaluation of historic properties in this area is incomplete, but it is likely that historic properties are present and might be affected by implementation of this alternative. A single archaeological site has been identified along a road that will not be improved but might be used in connection with this alternative; it has been determined eligible for inclusion on the NRHP. If this alternative is later identified as the proposed action, then identification and evaluation of historic properties, assessment of project effect, and if needed, resolution of adverse effects would continue as part of Section 106, in consultation with SHPO and tribes that attach cultural importance to places on the BMGR East.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.1.4 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, current activities within the air-to-air firing and TAC ranges at BMGR East would remain the same. Baseline conditions for cultural resources would continue.

4.9.2 Proposal 2 – Target Reconfiguration

4.9.2.1 Alternative 2.A - Proposed Action

Most target reconfigurations are likely to consist of improving, modernizing, and/or expanding targets in an existing location; in other instances, existing targets that are no longer operationally viable may be removed. As a result, sites within the Active Intensive Use category (the currently active target positions and biennial EOD clearance areas on the three tactical ranges) are most likely to be affected by target reconfigurations. Those sites, and recommendations regarding their eligibility for inclusion on the NRHP, are presented in Chapter 3. These sites have been disturbed to some extent by military training and support activities since the range was created in the 1940s.

Twenty-two sites have been recorded in the Active Intensive Use areas; none has been evaluated for its eligibility for inclusion on the NRHP. The archaeologists who recorded them recommended that all but two sites, BMGR-99-A-10 and BMGR-00-D-01, were eligible for inclusion on the NRHP (see Table 3-8). All but four of these sites have been marked with highly visible polycarbonate poles to facilitate avoidance during EOD clearances and target maintenance. Those sites (Z:06:151 ASM, Z:06:078 ASM, Z:07:126 ASM, and Z:06:152 ASM) will be marked during the upcoming annual range closures.

Target reconfigurations away from existing target complexes may affect other sites, but are likely to be located in areas that have been disturbed to some extent by past military training and support activities, including the Active Moderate Use and Infrequent Moderate Use categories. Cultural resource inventories have been completed in almost all of these areas, and potential impacts to cultural resources will be one of the factors considered in selecting proposed target locations outside the Active Intensive Use area.

The potential for disturbance associated with ordnance impacts, EOD ordnance retrieval, construction and maintenance activities, and accelerated erosion associated with these activities would continue to affect cultural resources in the Active Intensive Use and Active Moderate Use categories, including 84 unevaluated sites (most of which have been recommended eligible for inclusion on the NRHP), under Alternatives 2.A and 2.B.

Potential impacts associated with renewed ordnance deliveries, EOD ordnance retrieval, target construction and maintenance activities, and accelerated erosion associated with these activities would occur to cultural resources located in the vicinity of target reconfigurations outside of the existing decennial but within the pre-2001 5-year EOD footprint (Infrequent Moderate Use and Reserve Light Use categories) under Alternative 2.A. Cultural resource surveys of approximately 90 to 95 percent of this area have been completed.

New ground disturbance from ordnance impacts, EOD activities, construction and maintenance activities, and associated erosion would occur and would likely impact cultural resources in currently undisturbed areas outside the pre-2001 5-year EOD footprint (Negligible Use category). Little cultural resource inventory has been completed in this area.

Identification of and evaluation of historic properties, assessment and application of the criteria of adverse effects, and (if needed) resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA for all of these actions. Target reconfigurations that will not affect historic properties will be covered under a programmatic agreement currently being negotiated among the 56 FW/RMO, the SHPO, and concerned tribes.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.2.2 Alternative 2.B – No-Action Alternative

Under the no-action alternative for this proposal, current target configurations and ordnance authorized for delivery to targets would remain unchanged. Baseline conditions for cultural resources would continue.

4.9.3 Proposal 3 – Moving Vehicle Target System

4.9.3.1 Alternative 3.A – Proposed Action

Implementation of Alternative 3.A would result in continued ground disturbance and soil erosion around North TAC Target 104/106 at a single prehistoric site recommended eligible for inclusion on the NRHP. Identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and (if needed) resolution of adverse effects through development of a mitigation plan would be completed in accordance with Section 106 of the NHPA.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.3.2 Alternative 3.B

Implementation of Alternative 3.B would result in surface disturbance and associated erosion that could impact cultural resources, if present (roughly 30 percent of the 44-acre project area remains unsurveyed). A single archaeological site, previously determined eligible for inclusion on the NRHP, was recorded in the surveyed portion of the area. It was investigated (all surface artifacts collected and all features mostly or entirely excavated) in 1979 and is no longer eligible. If this alternative is later identified as the preferred alternative, then identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and (if needed) resolution of adverse effects through development of a mitigation plan, would be completed in accordance with Section 106 of the NHPA.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.3.3 Alternative 3.C

Two sites recommended eligible for inclusion on the NRHP were recorded within the area potentially affected by implementation of Alternative 3.C. If this alternative is later identified as the preferred alternative, then identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and (if needed) resolution of adverse effects through development of a mitigation plan would continue as part of Section 106 review.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.3.4 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, no moving vehicle target would be created. Baseline conditions for cultural resources would continue.

4.9.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.9.4.1 Alternative 4.A – Proposed Action

No cultural resources have been identified in the Alternative 4.A project area. Therefore, there would be no impact to cultural resources with implementation of Alternative 4.A.

The proposed new target would be located in an area covered by an archaeological survey completed in 1998; the results of this survey are described in a 2000 report by Jerry D. Lyon and David B. Tucker entitled *ETAC 98: An Archaeological Survey of 7,880 Acres on the South Flank of the Sand Tank Mountains on the Barry M. Goldwater Air Force Range in Southwestern Arizona.* No cultural resources were recorded in the area that would be affected by target

construction or ongoing maintenance, use, and associated explosive ordnance disposal activities. The 56 FW/RMO has completed review of Alternative 4.A under Section 106 of the NHPA, including consultation with the SHPO and tribes that attach cultural importance to places on the BMGR East. No concerns were identified in this process, and the SHPO concurred with a *no historic properties affected* determination on April 2, 2010.

4.9.4.2 Alternative 4.B – No-Action Alternative

Under the no-action alternative for this proposal, no additional air-to-ground missile targets would be created and training would continue at existing air-to-ground missile targets. No cultural resources have been identified at existing air-to-ground missile target sites. Therefore, there would be no impacts to cultural resources if Alternative 4.B, the no-action alternative for this proposal, is selected.

4.9.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.9.5.1 Alternative 5.A – Proposed Action

Ground disturbance would not occur with implementation of Alternative 5.A; however, the lowered flight training area has the potential to introduce additional auditory or visual intrusion and vibratory disturbance impacts to cultural resources located on lands underlying the proposed airspace change. Ongoing consultation with USFWS, SHPO, and concerned tribes may identify cultural resources that should be considered eligible for inclusion on the NRHP for values other than their information potential. If so, consultation would include assessment of effects and, if needed, resolution of adverse effects. .

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.5.2 Alternative 5.B – Alternative Action

Potential impacts to cultural resources from implementation of Alternative 5.B would be the same as described for Alternative 5.A.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, no change in the flight training altitude over the Cabeza Prieta NWR would occur. Overflights of the refuge conducted in accordance with the 1994 MOU would continue. Auditory and visual intrusions from overflights

would continue. Impacts from vibrations caused by overflights are possible; however, none have been documented to date.

4.9.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.9.6.1 Alternative 6.A – Proposed Action

Under Alternative 6.A, there is the potential for increased ground disturbance within previously disturbed areas. Impacts would include ground disturbance during the construction and maintenance of targets and from strafing of targets with small munitions (e.g., .50 cal).

Thirty-one isolated occurrences have been recorded in the area potentially affected by Alternative 6.A. Most of these isolates consist of a few unretouched pieces of flaked stone, and none is eligible for inclusion on the NRHP. The 56 FW/RMO has completed review of Proposal 6.A under Section 106 of the NHPA, in consultation with the SHPO and tribes that attach cultural importance to places on the BMGR East. No concerns were identified in this process, and the SHPO concurred with a *no historic properties affected* determination on April 29, 2010.

4.9.6.2 Alternative 6.B – No-Action Alternative

Under Alternative 6.B, the no-action alternative for this proposal, no reconfiguration of Manned Range 3 would occur. Baseline conditions for cultural resources would continue.

4.9.7 Proposal 7 – On-the-Ground Training Exercises

4.9.7.1 Alternative 7.A – Proposed Action

Cultural resources could be impacted by minimal ground disturbance from roadside vehicle parking, foot traffic, and helicopter rotor wash that would occur with implementation of Alternative 7.A. Most such effects would occur in previously disturbed and surveyed areas in tactical ranges and Area B. Ground-based training will be planned to avoid the locations of previously recorded sites, and impacts associated with small teams operating vehicles only on approved roads and traveling on foot are expected to be similar to the effects of public recreational use of Area B. Review under Section 106 of the NHPA will address identification and evaluation of historic properties, assessment and application of the criteria of adverse effects, and (if needed) resolution of adverse effects,.

The Air Force cannot select this alternative in a Record of Decision until Section 106 review has been completed.

4.9.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, current on-the-ground training exercises would remain the same. Baseline conditions for cultural resources would continue.

4.9.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.9.8.1 Alternative 8.A – Proposed Action

Three isolated occurrences will be affected by proposed construction of the parallel taxiway; each consists of a single flake; none is eligible for inclusion on the NRHP. The 56 FW/RMO has completed review of Alternative 8.A under Section 106 of the NHPA, including consultation with the SHPO and tribes that attach cultural importance to places on the BMGR East. No concerns were identified in this process, and the SHPO concurred with a *no historic properties affected* determination on April 2, 2010.

4.9.8.2 Alternative 8.B – Alternative Tower Site B

The impacts of implementation of Alternative 8.B to cultural resources would be the same as described for Alternative 8.A. Both tower locations were included in the Section 106 review completed on April 2, 2010.

4.9.8.3 Alternative 8.C – No-Action Alternative

Under Alternative 8.C, the no-action alternative for this proposal, no taxiway or air traffic control tower would be constructed at Gila Bend AFAF and ongoing operations at the existing Gila Bend AFAF taxiways and air traffic control tower would continue. Baseline conditions for cultural resources would continue.

4.9.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.9.9.1 Alternative 9.A – Proposed Action

Eleven isolated occurrences were recorded during a survey of the road segment included in Alternative 9.A; however, all are located well outside the 16-foot-wide area to be paved and none is eligible for inclusion on the NRHP. The 56 FW/RMO has completed review of Proposal 9.A under Section 106 of the NHPA, in consultation with the SHPO and tribes that attach cultural importance to places on the BMGR East. No concerns were identified in this process, and the SHPO concurred with a *no historic properties affected* determination on April 2, 2010.

4.9.9.2 Alternative 9.B – No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, the road from Manned Range 1 to RMCP 1 would not be paved. Baseline conditions for cultural resources would continue.

4.9.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.9.10.1 Alternative 10.A – Proposed Action

All of the areas potentially affected by ground disturbance associated with excavation and stockpiling of sand and gravel have been surveyed for cultural resources. A single historic property, a World War II-era auxiliary airfield, was located within the area of potential effect, but the characters that qualify it for inclusion on the NRHP will not be affected by stockpiling sand and gravel in this location. The 56 FW/RMO has completed review of Alternative 10.A under Section 106 of the NHPA, including consultation with the SHPO and tribes that attach cultural importance to places on the BMGR East. No concerns were identified in this process, and the SHPO concurred with a *no historic properties affected* determination on September 13, 2010.

4.9.10.2 Alternative 10.B – No-Action Alternative

Under Alternative 10.B, the no-action alternative for this proposal, sand and gravel excavation and stockpiling would not occur. Baseline conditions for cultural resources would continue.

4.9.11 Aggregate Impacts

By following the procedures outlined at the beginning of this section, adverse effects on NRHP-eligible cultural resources of implementing the proposed actions would be avoided, minimized, and/or partially mitigated. In some cases, recovery or partial recovery of archeological data through excavation and other scientific means is the most appropriate preservation outcome for affected archeological sites (or portions of archeological sites). Invasive methods for recovering information from such sites, such as excavation, are by their nature destructive to the affected archeological site(s). In the event that such data recovery efforts are determined to be the most appropriate preservation outcome, data recovery will be conducted in accordance with ACHP guidance.

4.10 HAZARDOUS MATERIALS AND WASTE

The nature and magnitude of potential impacts associated with hazardous materials and wastes depends on the toxicity, storage, use, transportation, and disposal of these substances. Factors considered in the impacts assessment were changes in the storage, use, handling, or disposal of hazardous materials, toxic substances, and hazardous and associated risk to human health due to direct exposure; risk of environmental contamination; and applicable federal, state, DoD, and local regulations. An impact would be significant if any federal, state, DoD, or local regulatory threshold for management of hazardous materials, hazardous waste, munitions constituents, and/or solid waste were exceeded.

The alternatives that would involve construction would have common impacts in terms of hazardous materials, hazardous waste, and solid waste. Several proposals include routine EOD clearance activities to remove debris from training at proposed development sites prior to construction. Debris would be transported to an existing RMCP or onsite storage area and later transported to one of the existing RMCPs where ordnance would be processed to ensure it is safe for removal from BMGR East. Construction activities would temporarily increase hazardous materials use and waste disposal. The risk of uncontrolled release of hazardous substances would be minimized through the use of industry accepted methods of storage for fuels (e.g., double-walled aboveground storage tanks equipped with leak detection systems) and other hazardous materials (e.g., self-contained storage cabinets with appropriate flammability ratings).

Additionally, solid waste generated during construction would be collected and transported off-installation by a licensed contractor for proper disposal in a permitted solid waste landfill. This is consistent with existing solid waste collection and disposal procedures at the Gila Bend AFAF and BMGR East. BMPs, including spill plans associated with AZPDES permits and Air Force education programs regarding pollution prevention and proper transportation, handling, use, and disposal of materials would minimize or eliminate the release of these potentially hazardous substances into the environment.

For all proposals, IRP has been eliminated from further analysis as all sites have been remediated within the vicinity of the proposals; therefore, there would be no impacts in terms of IRP.

4.10.1 Proposal 1 – Sensor Training Area

4.10.1.1 Alternative 1.A –Proposed Action, Alternative 1.B, and Alternative 1.C

Under each STA alternative, the use of some hazardous substances would be required in order to install, operate, and maintain the infrastructure and equipment within the STA and the potential remote repeater facility. The construction-related impacts for hazardous materials and waste are discussed in the Section 4.10 introduction. This discussion focuses on the hazardous materials and waste associated with the use and operation of the STA. POLs and coolants would be used in range maintenance vehicles and POLs would be used to power equipment at the UMTE, two LSTSSs, and Smokey SAM Launcher sites. A total of four 500-gallon capacity diesel fuel tanks would be installed to provide fuel sources for the proposed generators at two LSTSS sites, the one UMTE site, and to power the proposed lights at the proposed STA. If repeater equipment is deemed necessary, an additional fuel tank may be required for a generator to power this equipment.

The following features of the proposed tank system would minimize or eliminate the potential for spills to occur.

- Tanks would be of dual-walled construction.
- Tanks would bear an Underwriters Laboratory regulation standard 142 approval rating for outdoor use.
- A fuel filler cap would be used to minimize spills.
- The fuel lines would be solid metal or metal braided and would also be Underwriters Laboratory approved for outdoor installation.

Air Force pollution prevention programs, including spill prevention control and countermeasure plans and storm water pollution prevention plans, would be applied to use of the fuel tanks. Operations at the UMTE, two LSTSS sites, and the potential remote repeater site would require periodic trips for refueling. Some potential for incidental leakage of POLs and/or coolants during refueling trips exists, although the impact, if it were to occur, would be negligible. The transport and handling of the fuel would occur in accordance with applicable federal, state, local, and DoD standards.

Routine EOD clearance activities to remove debris from infrared rockets, illuminating flares, and other waste materials would occur prior to construction and after targets are operational. This debris would be transported to an existing RMCP or onsite storage area and later transported to one of the existing RMCPs where ordnance would be processed to ensure it is safe for removal from BMGR East. Air Force education programs regarding pollution prevention and proper transportation, handling, use, and disposal of these materials would minimize or eliminate the release of these potentially hazardous substances into the environment.

While munitions delivery to the STA would not occur, munitions such as Smokey SAMs, infrared rockets, and flares would be used during training exercises. The periodic EOD clearance described in Section 2.2.1 would occur. There would be no change in overall levels of munitions delivered to BMGR East or potential for munitions constituents to be transported off-range. In accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan, the Air Force would continue to assess the potential for off-range migration of munitions constituents from their range operations with an assessment at least every 5 years.

No other hazardous materials would be introduced as a result of the proposal. At all of the alternative sites, solid waste and other construction waste would be transported off-range/off-site and disposed of in accordance with federal, state, local, and DoD laws, rules, and regulations.

4.10.1.2 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, there would be no impacts in terms of the hazardous materials and waste management.

4.10.2 Proposal 2 – Target Reconfiguration

4.10.2.1 Alternative 2.A – Proposed Action

With implementation of Alternative 2.A, target reconfiguration would occur on an intermittent case-by-case basis with individual targets or selected groups of targets updated as frequently as every 1 or 2 years and likely occurring in increments over 10 or more years rather than over just a few years. During each target reconfiguration action, there would be a temporary increase in the storage of hazardous materials and waste and impacts would be as described in the Section 4.10 introduction. Changes to munitions authorized for delivery to targets (e.g., infra-red guided munitions) would not be expected to result in a difference in munitions constituent types or distribution at BMGR East, nor their likelihood to be transported off-range. In rare cases, a change in target configuration could change the requirement to assess the potential for off-range migration of munitions constituents from range operations (i.e., per DoD Directive 4715.11 and the Operational Range Assessment Plan) prior to the minimum 5-year reassessments.

4.10.2.2 Alternative 2.B – No-Action Alternative

Under Alternative 3.B, the no-action alternative for this proposal, aircrews would continue to use the existing targets within BMGR East and no targets would be reconfigured. Therefore, no impacts are expected in terms of the hazardous materials and hazardous waste management.

4.10.3 Proposal 3 – Moving Vehicle Target System

4.10.3.1 Alternative 3.A – Proposed Action, Alternative 3.B, and Alternative 3.C

Under all Proposal 3 action alternatives, construction-related impacts would be as described in the Section 4.10 introduction. In the long term, POLs and coolants would be used in the remote controlled moving target and other equipment. These materials would be minor and managed in accordance with Air Force policies and, therefore, in accordance with federal, state, DoD, and local standards. Therefore, impacts would not be significant.

4.10.3.2 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, no impacts are expected in terms of the hazardous materials and hazardous waste management.

4.10.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.10.4.1 Alternative 4.A – Proposed Action

Construction-related impacts are addressed in the Section 4.10 introduction. The creation of a new air-to-ground missile location would be expected to result in an area with potentially high levels of munitions constituents as compared to non-target areas at BMGR East. Although the proposed air-to-ground missile site/Quilotosa Wash pathway is approximately 2.5 miles closer to the range boundary than the existing air-to-ground missile site/Sauceda Wash pathway, no increased potential for unacceptable risk to human and/or ecological receptors transport of munitions constituents off-range would be expected given the source-interaction-receptor analysis conducted to date. The potential for off-range migration of munitions constituents from range operations would continue to be reviewed at a minimum of every 5 years in accordance with DoD Directive 4715.11 and the Operational Range Assessment Plan.

4.10.4.2 Alternative 4.B – No-Action Alternative

Under Alternative 4.B, the no-action alternative for this proposal, there would be no impact to hazardous materials and waste management.

4.10.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.10.5.1 Alternative 5.A –Proposed Action

Implementation of Alternative 5.A would have no impact in terms of hazardous materials or waste. Although the potential for aircraft crashes is increased with lowered flight training, the crash response protocols already in place have been coordinated with the USFWS and other agencies for responses to both on- and off-range mishaps. The basic plan components include securing munitions, unspilled fuel, or other hazardous materials to the extent necessary and practicable; consulting with land managers/owners/regulatory agencies regarding surface access, removal of aircraft remains, and cleanup requirements and procedures; and remediating and restoring the site per regulatory requirements and agreements with land managers/owners and regulators (Departments of the Air Force, Navy, and Interior 2006). Therefore, all regulatory requirements would be met.

4.10.5.2 Alternative 5.B – Alternative Action

Alternative 5.B, lowering the altitude from 1,500 feet AGL to 500 feet AGL, would be the same as proposed under Alternative 5.A and no impacts in terms of hazardous materials or waste are expected. As analyzed in Alternative 5.A, all regulatory requirements would be met.

4.10.5.3 Alternative 5.C – No-Action Alternative

With implementation of Alternative 5.C, the no-action alternative for this proposal, there would be no impact in terms of hazardous materials and waste management.

4.10.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.10.6.1 Alternative 6.A – Proposed Action

With implementation of Alternative 6.A, construction-related impacts would be as described in the Section 4.10 introduction. The munitions proposed for use at the reconfigured target would be similar to those already used at Manned Range 3. The stationary and pop-up targets would require periodic replacement, resulting in increased waste generation and use of paints, POLs, and coolants during range maintenance activities. Overall, the impacts to hazardous materials and waste would be minimal and all federal, state, DoD, and local requirements would be adhered to. Therefore, there would not be a significant impact to hazardous materials and waste with implementation of Alternative 6.A.

4.10.6.2 Alternative 6.B – No-Action Alternative

Under Alternative 6.B, the no-action alternative for this proposal, there would be no impact to hazardous materials and waste management.

4.10.7 Proposal 7 – On-the-Ground Training Exercises

4.10.7.1 Alternative 7.A – Proposed Action

Implementation of Alternative 7.A would involve a minor amount of use of fuels and coolants in vehicles used for ground access and aircraft used for troop insertion and extraction, but would not result in a discernible change in the types, amounts, or handling of hazardous materials or wastes at BMGR East. The munitions that would be used in training would be small arms munitions similar to those used by hunters in Area B and at the BMGR East small arms range. Such munitions would be widely dispersed and non-hazardous. The proposed on-the-ground training units would be self-contained and would carry out all trash or other items that they brought on to the range. Consequently, potential impacts associated with hazardous materials and wastes would be negligible or nonexistent with implementation of Alternative 7.A.

4.10.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would be no impact to hazardous materials or waste management.

4.10.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.10.8.1 Alternative 8.A –Proposed Action, and Alternative 8.B

Short-term construction-related impacts from implementation of Alternatives 8.A and 8.B would be as described in the Section 4.10 introduction. In addition, construction of the taxiway would include a temporary asphalt batching plant. The AZPDES CGP would address BMPs that would address proper management, controls, and spill response for the plant. Asphalt is a petroleum product that, once cured, has not been shown to be a source of toxic substances. Testing of the leachability of asphalt using EPA test methods have shown that it has very low levels of leachable metals; volatile, semivolatile, and organic compounds; and polynuclear aromatic hydrocarbons (U.S. Department of the Air Force 2000). In the long term, industrial activities associated with the taxiway would be addressed in the base's general storm water AZPDES permit.

There would be construction debris associated with the existing air traffic control tower. The air traffic control tower was constructed in 1964 and asbestos containing materials and lead-based paint (LBP) may be present. Prior to commencing demolition activities, testing for LBP and asbestos containing material would be performed. Asbestos, if encountered, would be removed by licensed contractors in accordance with applicable federal and state laws and regulations and disposed of in a local asbestos-permitted landfill. The handling and disposal of existing LBP and LBP-contaminated materials would be carried out in accordance with applicable federal, state, DoD, and local regulations. Long-term demands on fuels for heating and power of the new air traffic control tower would likely be slightly less than those for the old tower as new construction standards incorporate sustainability strategies.

Due to the above factors and existing programs for management of hazardous materials and hazardous waste at Gila Bend AFAF, implementation of either alternative under Proposal 8 would not have significant implications for hazardous materials and waste management.

4.10.8.2 Alternative 8.B – No-Action Alternative

Under Alternative 8.B, the no-action alternative for this proposal, there would be no impact in terms of hazardous materials and waste.

4.10.9 Proposal 9 – Manned Range 1 to RCMP 1 Road Pavement

4.10.9.1 Alternative 9.A –Proposed Action

Construction-related impacts associated with implementation of Alternative 9.A would be as described in the Section 4.10 introduction and Section 4.10.8 with regard to asphalt and the

asphalt batch plant. Based on the analysis presented therein, implementation of this proposed action would not have a significant adverse impact on hazardous materials and waste management.

4.10.9.2 Alternative 9.B – No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, there would be no hazardous materials and waste management impacts.

4.10.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.10.10.1 Alternative 10.A – Proposed Action

With implementation of Alternative 10.A, fuels, oils, and coolants would be used to operate the excavation and transport equipment. Standard Air Force protocols would ensure the good working condition of these vehicles and address spill response in the unlikely event that such equipment releases hazardous substances into the environment. With these measures, there would be negligible impacts to hazardous materials and waste management with implementation of this proposal. All federal, state, local, and DoD requirements would be adhered to; therefore, impacts would not be significant.

4.10.10.2 Alternative 10.B – No-Action Alternative

As compared to Alternative 10.A, there would continue to be increased fuel consumption associated with the longer distance transport of sand and gravel resources from approved, outside, commercial sources delivered to BMGR East for needed maintenance. This impact would be minimal and no changes in hazardous materials and waste management would be expected. Therefore, this impact would not be significant.

4.10.11 Aggregate Impacts

With implementation of two or more proposals involving construction there would be additive impacts in the increased use, handling, and storage of hazardous materials and generation of hazardous waste and solid waste. No aggregate increase in munitions expenditures is anticipated. Existing programs in place would address continued compliance with federal, state, DoD, or local regulations. Therefore, aggregate hazardous materials and waste impacts would not be significant.

4.11 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

Socioeconomics focuses on the general features of the local economy that could be affected by the proposed action and alternatives. Potential impacts to communities are considered to be significant if alternative actions would likely cause:

- substantial change to the overall mission of an installation that directly results in employment provision or loss;
- substantial population change through the provision or loss of employment; and/or
- inconsistencies with regional growth management plans.

General socioeconomic impacts that would result from construction activities associated with many of the proposed actions are common and are, therefore, noted below. Similarly, because the environmental justice analysis impacts would not differ with any of the proposals, this analysis also is provided below. The proposal-by-proposal evaluations that follow (Sections 4.11.1 through 4.11.10) provide supplementary analysis, as applicable.

Construction Impacts

Nearly all proposed action alternatives involve some level of construction activity at BMGR East to implement the proposal. The only proposals that do not include construction activity are Alternative 5.A, lowering flight training altitude over a portion of the Cabeza Prieta NWR, and Alternative 7.A, on-the-ground training exercises. Cost estimate data is not available for each proposed action alternative; however, the construction activity associated with the proposals would result in varying degrees of short-term influxes of jobs and expenditures in the area. This direct economic impact is estimated to occur primarily within the construction, utility, and road-building sectors. The economic gain would be a one-time regional economic gain primarily limited to the duration of the period of construction of the proposed actions. Once the funds used for construction are no longer circulating through the regional economy, the economic gains would no longer be realized.

The projects are confined to BMGR East and would not create long-term jobs potentially increasing the population or altering the racial or ethnic composition of the surrounding communities.

Environmental Justice

Environmental justice impacts occur when there are disproportionate and adverse impacts to minority and/or low-income populations. These impacts can be to any resource area, but are addressed under socioeconomics because they are tied to the demographic data compiled in Section 3.11. While nearly all of the communities surrounding BMGR East meet the definition of minority and low-income (see Table 3-19), the resource analysis has not identified any adverse impacts that would extend off-range to population areas and potentially affect these populations. Therefore, no environmental justice impacts are predicted with implementation of any of the proposed actions.

4.11.1 Proposal 1 – Sensor Training Area

4.11.1.1 Alternative 1.A –Proposed Action, Alternative 1.B, and Alternative 1.C

The socioeconomic and environmental justice impacts of implementing Alternative 1.A are discussed in the Section 4.11 introduction. Although construction costs have not been estimated, the costs associated with this alternative are expected to be comparatively greater than the other proposals addressed in this EIS. The establishment of the STA at BMGR East would provide the capability to fully qualify F-16 and A-10 aircrews in tactical air-to-ground combat at one range. Therefore, deployment costs for BMGR users to obtain this training at other locations would not be incurred. (Existing Air Force MOUT facilities in the United States are located at the Juniper Butte Range in Idaho and the Nevada Test and Training Range in Nevada.)

4.11.1.2 Alternative 1.D – No-Action Alternative

Under Alternative 1.D, the no-action alternative for this proposal, there would be no construction-associated impacts. BMGR users would incur deployment costs in order to obtain this training at other range locations (i.e., Juniper Butte Range in Idaho and the Nevada Test and Training Range in Nevada).

4.11.2 Proposal 2 – Target Reconfiguration

4.11.2.1 Alternative 2.A –Proposed Action

Impacts from implementing Alternative 2.A would be limited to minor construction associated with the target reconfiguration; this was covered in the discussion of construction impacts in the Section 4.11 introduction. Unlike the other proposals, however, target reconfiguration would occur intermittently as needs are identified and implemented at the range. Therefore, under Alternative 2.A, there would be a long-term impact of sporadic construction expenditure impacts on the local economy.

4.11.2.2 Alternative 2.B – No-Action Alternative

Under Alternative 2.B, the no-action alternative for this proposal, there would be no socioeconomics or environmental justice impacts.

4.11.3 Proposal 3 – Moving Vehicle Target System

4.11.3.1 Alternative 3.A –Proposed Action, Alternative 3.B, and Alternative 3.C

The socioeconomic and environmental justice impacts from implementing the proposed action and alternatives for this proposal are discussed in the Section 4.11 introduction.

4.11.3.2 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, there would be no socioeconomics or environmental justice impacts.

4.11.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.11.4.1 Alternative 4.A – Proposed Action

The construction-associated socioeconomic and environmental justice impacts from implementing Alternative 4.A are discussed in the Section 4.11 introduction.

4.11.4.2 Alternative 4.B – No-Action Alternative

Under Alternative 4.B, the no-action alternative for this proposal, there would be no socioeconomics or environmental justice impacts.

4.11.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.11.5.1 Alternative 5.A –Proposed Action

Implementation of Alternative 5.A would not include any direct impacts in terms of construction expenditures. The aircraft operations associated with the lowered flight training altitude would not affect any populated area and would not be expected to result in any decrease in visitation to Cabeza Prieta NWR or Organ Pipe Cactus National Monument. Therefore, no indirect impacts are expected in the tourism and related industries in the Ajo and other nearby communities. There would be no disproportionate adverse impact to low income and/or minority populations. Therefore, potential socioeconomic impacts associated with implementation of Alternative 5.A would be negligible or nonexistent.

4.11.5.2 Alternative 5.B – Alternative Action

Same as Alternative 5.A, there would be no socioeconomics or environmental justice impacts from lowering the flight training altitude.

4.11.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, there would be no socioeconomics or environmental justice impacts.

4.11.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.11.6.1 Alternative 6.A – Proposed Action

The construction-associated socioeconomic and environmental justice impacts from implementing Alternative 6.A are discussed in the Section 4.11 introduction.

4.11.6.2 Alternative 6.B – No-Action Alternative

Under Alternative 6.B, the no-action alternative for this proposal, there would be no socioeconomic or environmental justice impacts.

4.11.7 Proposal 7 – On-the-Ground Training Exercises

4.11.7.1 Alternative 7.A – Proposed Action

Implementation of Alternative 7.A would not result in any direct construction expenditure related impacts. There is the potential that deployed units would seek services or supplies in the communities around the BMGR on occasion; however, these missions are designed to be self-contained, with units securing supplies at their home base prior to deployment. Although small group troop training would largely occur within Area B of BMGR East, which is generally open to public access (with a BMGR permit), no change in recreation use levels and associated expenditure is expected within or near BMGR East as a result of implementation of this proposal. There would be no disproportionate, adverse impact to minority or low-income populations associated with implementation of this alternative. Therefore, Alternative 7.A would have negligible socioeconomic impact and no environmental justice impact.

4.11.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would be no socioeconomic or environmental justice impacts.

4.11.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.11.8.1 Alternative 8.A – Proposed Action and Alternative 8.B

The socioeconomic and environmental justice impact of implementing Alternatives 8.A and 8.B is discussed in the Section 4.11 introduction. Although construction costs have not been estimated, the costs associated with this alternative are expected to be comparatively greater than the other proposals addressed in this EIS.

4.11.8.2 Alternative 8.C – No-Action Alternative

Under Alternative 8.C, no change in socioeconomic or environmental justice impacts would be expected.

4.11.9 Proposal 9 – Manned Range 1 to RCMP 1 Road Pavement

4.11.9.1 Alternative 9.A –Proposed Action

The construction-associated socioeconomic and environmental justice impacts from implementing Alternative 9.A are discussed in the Section 4.11 introduction.

4.11.9.2 Alternative 9.B – No-Action Alternative

Under Alternative 9.B, the no-action alternative for this proposal, no changes in socioeconomic conditions or environmental justice would occur. Expenditures associated with periodic grading and other maintenance for this frequently used road segment and comparatively greater expense associated with wear and tear on Air Force vehicles would continue.

4.11.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.11.10.1 Alternative 10.A – Proposed Action

Under Alternative 10.A, sand and gravel materials would no longer be purchased from approved, outside, commercial sources. These sources are varied within the region, and represent a small share of the sand and gravel purchased in the region. Nonetheless, the proposed action would reduce military spending in the local economy. The Air Force would incur expenses associated with the use of the equipment to excavate, stockpile, and use sand and gravel on BMGR East (e.g., vehicle operators, fuel, equipment maintenance), but this would be considerably less than the amount currently expended for purchasing sand and gravel off-range. The socioeconomic impact would be minimal. There would be no environmental justice impact from implementation of Alternative 10.A, as there would be no disproportionate adverse impact to low-income and/or minority populations.

4.11.10.2 Alternative 10.B – No-Action Alternative

Under Alternative 10.B, the no-action alternative for this proposal, the 56 RMO would continue to purchase materials from approved, outside, commercial sources that have the desired material composition and have them delivered to BMGR East for needed maintenance. No change in socioeconomic or environmental justice conditions would be expected.

4.11.11 Aggregate Impacts

The combined impact of implementing two or more of the proposals that include construction expenditures would be the short-term influx of jobs and expenditures in the area due to construction activities. The greatest potential for additive impacts is with those proposals that are expected to require the most cost to implement – Proposal 1 (the STA) and Proposal 8 (new taxiway and air traffic control tower at Gila Bend AFAF). The regional economic impact is

estimated to occur primarily within the construction, utility, and road-building sectors; but even in additive form, impacts would be transient and minor. No aggregate environmental justice impacts would occur with implementation of two or more proposals and there would not be disproportionate adverse impacts to minority and/or low income populations.

4.12 NOISE

Noise effects are considered significant when the sound levels that an action would impose exceed the levels regarded as compatible for selected land-use activities. In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published "Guidelines for Considering Noise in Land-Use Planning and Control" relating L_{dn} to compatible land uses. This committee was composed of representatives from the U.S. Departments of Defense, Transportation, and Housing and Urban Development; EPA; and Veterans Administration. Since the issuance of these guidelines, federal agencies have adopted the guidelines for their noise analyses.

Following the lead of the committee, the DoD and the FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect (see Appendix C). Although these guidelines are not mandatory, they provide the best means for determining noise impact in communities. The land-use guidelines are based on the best available scientific data, including interpretation of noise levels by the "Schultz Curve," widely accepted in the scientific community as a predictor of the average response of communities to various noise levels. The 65 dB L_{dn} value is the level which, when exceeded, is normally not compatible with residential land use. This is a benchmark often applied to determine residential land-use compatibility. By extension, it is also used as a criterion in planning of airspace use. In this EIS, it is recognized that affected areas are diverse and it is not necessarily appropriate to use a single criterion. Two other levels are also useful.

- An L_{dn} of 55 dB was identified by the U.S. EPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety" (USEPA 1972). Noise may be heard, but there is no risk to the public or its welfare.
- At L_{dn} values below 55 dB, the percentage of annoyance is correspondingly lower. Annoyance is never zero, but at an L_{dn} of 45 dB or less it is considered by most to be small enough to be negligible.

4.12.1 Proposal 1 – Sensor Training Area

4.12.1.1 Alternative 1.A – Proposed Action – Air-to-Air Range Site

Under the proposed action for the STA, cumulative noise exposure levels are not anticipated to differ from those that regularly occur at and near BMGR East. This is because the number of

sorties and the types of aircraft that would train at the proposed STA would not represent an appreciable change in the operations normally conducted at BMGR East. Aircraft would enter/exit and transit the proposed STA airspace subrange (to be established) similarly as under the existing condition. However, a shift in noise exposure levels from aircraft operations of an unquantified, but low magnitude would occur within BMGR East subranges. This is due to three main factors. First, the number of sorties that would occur within the STA airspace, an estimated daily maximum of 96 sorties per flying day, would be somewhat greater than the current levels of use in the existing overlying airspace. Second, some operations currently conducted at other locations on the BMGR East (e.g., TAC or manned ranges) in the absence of an STA, would likely be shifted to the STA following its development. Lastly, the STA operations may differ from current use of overlying airspace in terms of generally lower altitude distribution.

These factors would be expected to contribute to a higher cumulative L_{dnmr} noise exposure level for the STA area subrange than under current conditions (which as measured for the Air-to-Air ranges is 49 dB or lower [U.S. Department of the Air Force 1999]). The potential increase in noise level would be low to moderate and confined to the area underlying the STA aircraft operating area. Even in the most concentrated flight operating areas of the BMGR East, cumulative L_{dnmr} noise exposure levels have been estimated below the 65 dB threshold (62 dB in North and South TAC) and found not to propagate to off-range locations (U.S. Department of the Air Force 1999). Therefore, noise exposure levels in the vicinity of the STA would not be expected to approach the 65 dB threshold nor would off-range land uses to the north of the BMGR be exposed to incompatible noise levels. There may be slight increases in noise exposure levels within the Cabeza Prieta NWR; however, impacts within the Cabeza Prieta NWR must be analyzed within the context of the MLWA of 1999 (Section 3032), which states that the Cabeza Prieta NWR is to be managed "to support current and future military aviation training needs consistent with a 1994 Memorandum of Understanding between the Departments of the Interior and Air Force."

There would be moderate temporary increases in noise levels resulting from construction of the STA and long-term minimal, but ongoing/regular, noise associated with generator use, and minimal periodic noise associated with range maintenance activities and ground training. These noise sources would be confined to the core STA area, which is not open to general public entry and is far from communities. As further detailed below, the resulting noise exposure would be insignificant.

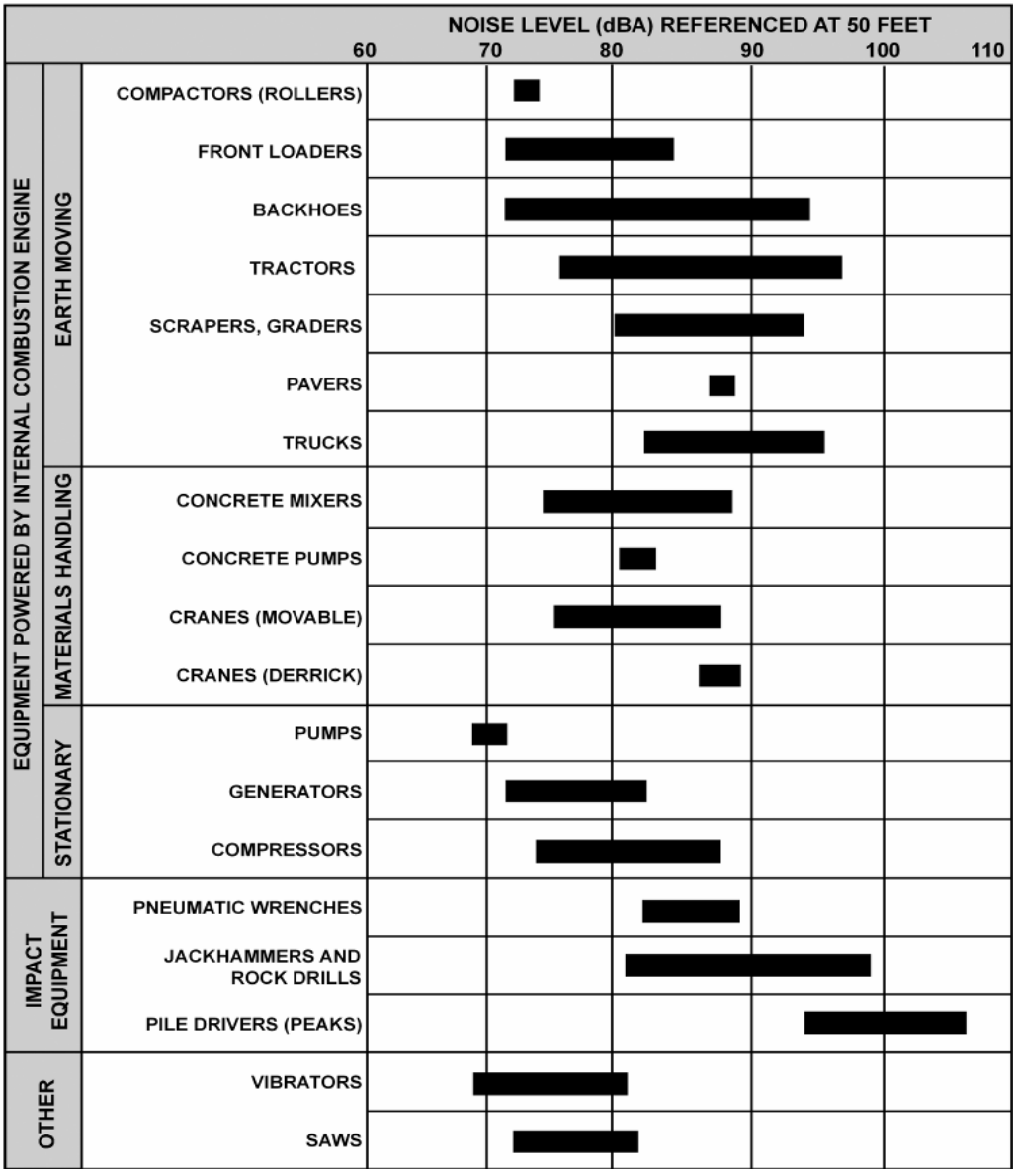
The construction noise would be from the intermittent movement and operation of equipment and vehicles, and human activity. Most of this impact would presumably occur during normal working hours and be at levels less than those of a typical construction site. As shown in

Figure 4-1, during operation, heavy equipment and other construction activities generate noise levels ranging typically from 70 to 90 dBA at a distance of 50 feet. The short-term increase in noise exposure levels would be localized to the project site and dissipate rapidly with distance. Noise receptors would be limited to construction and oversight personnel and wildlife. Noise levels from periodic maintenance would be at variable levels from the movement of equipment and vehicles, and human activity. Noise levels would possibly reach levels similar to noise levels that would occur during construction. The noise would be intermittent during periods when maintenance activities were occurring.

At maximum load, the generators typically would each produce a sound intensity level of 74 dBA at 23 feet from the unit and an estimated 40 dBA at 153 feet (Luke AFB 2001d). As stated in Section 2.2.1, although solar power is preferred for equipment at the STA, this EIS evaluates the potential for the installation and use of one generator to power the UMTE, one generator to power the STA lights, and the two generators to power the two LSTSSs. Given the existing noise environment, generators would represent a minimal change in overall noise exposure levels.

On-the-ground troop training, which may include helicopters landing at the STA on an average of twice per week during the up to 6-week Desert Talon and WTI exercises, would result in localized and temporary and intermittent sources of noise. Other periodic on-the-ground training would typically be limited to foot traffic, such as close air support ground forward air control and search and rescue types of operations

Figure 4-1
Common Construction Noise Levels



Note: Based on limited available data samples
Source: EPA 1971

4.12.1.2 Alternative 1.B – South Tactical Range Site

The noise impacts of Alternative 1.B would be the same as described under Alternative 1.A, with the exception that potentially greater concentrations of aircraft operations in South TAC could increase cumulative L_{dnmr} noise exposure levels in the vicinity to levels at or above the threshold 65 dB DNL. However, similar to Alternative 1.A, these noise levels would be internal to BMGR East and would not result in incompatible community noise levels. Noise level increases would

be less noticeable as compared to Alternative 1.A because there are more existing operations in the South TAC airspace than the Air-to-Air Range.

4.12.1.3 Alternative 1.C – North Tactical Range Site

The noise impacts of Alternative 1.C would be the same as described under Alternative 1.B, with the exception that potentially greater concentrations of aircraft operations in North TAC as opposed to South TAC. Additionally, there would potentially be less noise impacts within the Cabeza Prieta NWR as compared to Alternative 1.A.

4.12.1.4 Alternative 1.D – No-Action Alternative

No change in noise exposure levels from ongoing BMGR operations would occur under the no-action alternative.

4.12.2 Proposal 2 – Target Reconfiguration

4.12.2.1 Alternative 2.A - Proposed Action

Implementation of the proposed action for target reconfiguration would not result in noise impacts that would discernibly change from the baseline conditions. There would be no appreciable change in the types of materials and construction methods for target simulations, the types of ordnance delivered on the reconfigured target, or distribution of ordnance delivery impacts. Intermittent ground-based noise associated with target maintenance and EOD activities would be shifted to reconfigured sites, but would remain largely within areas of historical target use areas. Noise levels would primarily consist of those associated with earth moving and stationary equipment (see Figure 4-1) and receptors would be limited to construction personnel, range maintenance personnel, and wildlife.

4.12.2.2 Alternative 2.B – No-Action Alternative

Under the no-action alternative for Proposal 2, there would be no noise impacts.

4.12.3 Proposal 3 – Moving Vehicle Target System

4.12.3.1 Alternative 3.A – Proposed Action

Under Alternative 3.A, noise-generating activity would occur on a short-term basis with the installation of the new equipment to support the moving vehicle target system. Noise levels would primarily consist of those associated with earth moving and stationary equipment (see Figure 4-1) and receptors would be limited to construction and oversight personnel and wildlife. Over the long term, there would be a new intermittent noise-generating activity associated with the movement of the tow vehicle and target along the track. Quantitative estimates of noise exposure are not available; however, noise levels associated with the operation of the moving

vehicle target system would be expected to be less than noise levels from earth moving and stationary equipment (see Figure 4-1), interior to BMGR East, and well below the 65 dB annual average threshold exposure level. Receptors would be limited to wildlife.

4.12.3.2 Alternative 3.B

The noise exposure impacts of Alternative 3.B would be the same as described for Alternative 3.A, except that the impacts would be slightly shifted to the west.

4.12.3.3 Alternative 3.C

The noise exposure impacts of Alternative 3.B would be the same as described for Alternative 3.A, except that the impacts would be slightly shifted to the east.

4.12.3.4 Alternative 3.D – No-Action Alternative

Under Alternative 3.D, the no-action alternative for this proposal, there would be no impact to noise exposure levels.

4.12.4 Proposal 4 – New Target for Air-To-Ground Missiles

4.12.4.1 Alternative 4.A – Proposed Action

Under Alternative 4.A, the establishment of a second live missile target in East TAC would be expected to result in minimal noise impacts. In the short term, there would be minor construction noise associated with the establishment of the target (see noise levels associated with earth moving and stationary equipment in Figure 4-1). Receptors to this short-term noise would be largely limited to construction, oversight, and range maintenance personnel and wildlife. As noted in Section 3.12.5.5, the baseline noise exposure impacts of air-to-ground missile operations are less than 45 dB CDNL. Over the long term, implementation of Alternative 4.A would not be correlated with an increase in air-to-ground missile expenditures; rather, it would be capable of supporting missile attacks from a variety of directions and altitudes. Changes in associated flight activity would be expected to result in minor changes to noise exposure levels in the immediate vicinity of the new target. Such impacts would be interior to BMGR East and would not be significant. Receptors to this long-term noise would be primarily limited to wildlife.

4.12.4.2 Alternative 4.B – No-Action Alternative

There would be no noise effects associated with implementation of Alternative 4.B, the no-action alternative for this proposal.

4.12.5 Proposal 5 – Lowering Flight Training Altitude Over a Portion of the Cabeza Prieta National Wildlife Refuge

4.12.5.1 Alternative 5.A – Proposed Action

MR_NMAP modeling was used to analyze the potential noise exposure impacts that would result with the lowering of the flight training area over the Cabeza Prieta NWR from 1,500 feet AGL to 500 feet AGL to enable more realistic attack approaches to targets in South TAC and low-altitude intercepts in the Air-to-Air range.

Modeling was conducted for the following airspace structures potentially affected by Alternative 5.A: North TAC, South TAC, and the Air-to-Air Low range. Because the lowered flight training area would only affect a portion of the Air-to-Air Low range, the following three sub-areas of the Air-to-Air Low range were modeled:

- Air-to-Air Low North – range area north of Cabeza Prieta NWR,
- Air-to-Air South 1 – northern portion of range area over Cabeza Prieta NWR, and
- Air-to-Air South 2 – southern portion of range area over Cabeza Prieta NWR.

In addition to analyzing the effects of training within the lowered flight training area (at altitudes between 500 feet and 1,500 feet AGL), the effects of generally lowered flight training throughout the Air-to-Air range were analyzed. This was to account for the shift in training operations to lower altitudes as compared to analysis in the noise exposure baseline. As compared to the baseline, fewer sorties were modeled at higher altitudes (above 5,000 feet AGL) and more sorties were modeled at lower altitudes (1,500 to 5,000 feet AGL). The results indicate that there is an approximately 5.7 dB L_{dnmr} increase associated with the shift in operating at lower altitudes throughout the Air-to-Air range. However, both the baseline and the adjusted baseline are below 45 dB L_{dnmr}, significantly below community noise impact levels.

Against this adjusted baseline, the impacts of flight operations within the proposed lowered flight training area were analyzed. The results indicate a 4.9 dB L_{dnmr} increase in noise exposure levels within the proposed lowered flight training area, an increase from below 45 db L_{dnmr} to 48 dB L_{dnmr}. Receptors to noise in the area of Cabeza Prieta NWR underlying the proposed lowered flight training area would be backcountry recreationists; an increase in annoyance levels would be expected in this group.

No notable changes would occur to L_{dnmr} exposure levels in South TAC, North TAC, or the Air-to-Air High range.

4.12.5.2 Alternative 5.B – Alternative Action

Noise exposure levels under Alternative 5.B would increase at the same magnitude as described for Alternative 5.A; however, the area exposed to the approximately 5dB increase would be smaller due to the reduced size of the lowered flight training area.

4.12.5.3 Alternative 5.C – No-Action Alternative

Under Alternative 5.C, the no-action alternative for this proposal, baseline noise exposure levels would potentially fluctuate with changes in operations as currently authorized (including under the 1994 MOU). There would be variations in noise exposure levels commensurate with changes in operational tempo and operational flight profiles for training missions that occur over the Cabeza Prieta NWR. Such variations are evident in the 5.7 dB L_{dnmr} difference in the adjusted baseline noise exposure level (adjusted for operating at lower altitudes throughout the Air-to-Air range, see Section 4.12.5.1) as compared to the baseline noise exposure levels modeled from operational profiles that were in effect in the late 1990s (see Section 3.12.6).

4.12.6 Proposal 6 – Reconfigure Manned Range 3 for Helicopter Training

4.12.6.1 Alternative 6.A – Proposed Action

With implementation of Alternative 6.A, there would be short-term noise exposure associated with the construction of the approximately 25 pop-up targets and associated infrastructure. Noise levels would primarily consist of those associated with earth moving and stationary equipment (see Figure 4-1). Receptors to this short-term noise would primarily be limited to construction, oversight, and range personnel and wildlife. Over the long-term, there would be only slight changes in noise exposure from aerial gunnery and aircraft operations associated with Manned Range 3 as well as realigned missions, as the proposed helicopter gunnery range would absorb some missions from East TAC and Manned Ranges 1, 2, and 4 would absorb missions that currently use Manned Range 3. All changes would be interior to the BMGR and result in only slight changes in the cumulative L_{dnmr} noise contours associated with these ranges. The off-range noise footprint would not change appreciably and significant impacts to the noise environment would not result from the implementation of Alternative 6.A. Receptors to this long-term noise would primarily be wildlife.

4.12.6.2 Alternative 6.B – No-Action Alternative

There would be no noise impacts associated with implementation of Alternative 6.B, the no-action alternative for this proposal.

4.12.7 Proposal 7 – On-the-Ground Training Exercises

4.12.7.1 Alternative 7.A – Proposed Action

Under Alternative 7.A, there would be minor, intermittent noise impacts associated with aircraft operations associated with the insertion of ground troops and the activity of ground troops as they perform their training missions on BMGR East, including shooting at targets. Such noise levels would not affect cumulative noise exposure levels associated with BMGR East baseline operations (see Figure 3-12). For larger troop training exercises, receptors would be limited to the ground troops in training. For small troop training exercises, receptors would largely be limited to the ground troops and recreation users of Area B. Targets would primarily be established within East TAC, thereby minimizing noise impacts to recreational users within Area B.

4.12.7.2 Alternative 7.B – No-Action Alternative

Under Alternative 7.B, the no-action alternative for this proposal, there would be no noise impacts.

4.12.8 Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend Air Force Auxiliary Field

4.12.8.1 Alternative 8.A – Proposed Action

Under Alternative 8.A, there would be short-term noise impacts from construction activities associated with the construction of the proposed taxiway and new replacement air traffic control tower. Construction equipment noise would likely include that from the operation of earth moving, stationary, and impact equipment (see Figure 4-1). Receptors would include construction and oversight personnel, personnel working at the Gila Bend AFAF airfield, and wildlife. There are no sensitive noise receptors (i.e., schools, churches, residences) near the proposed construction activity. Over the long term, implementation of Alternative 8.A would address existing safety and capacity issues at Gila Bend AFAF, but would not result in additional aircraft operations at the airfield. The baseline noise exposure levels at Gila Bend AFAF (see Figure 3-11) would remain unchanged.

4.12.8.2 Alternative 8.B – Alternative Tower Site B

Impacts of implementation of Alternative 8.B would differ from those of Alternative 8.A only with regard to the specific geographic location of the short-term noise impacts associated with construction of the Air Traffic Control Tower.

4.12.8.3 Alternative 8.C – No-Action Alternative

Implementation of Alternative 8.C, the no-action alternative for this proposal, would not result in any noise impacts.

4.12.9 Proposal 9 – Manned Range 1 to RMCP 1 Road Pavement

4.12.9.1 Alternative 9.A – Proposed Action

With implementation of Alternative 9.A, there would be short-term noise impacts associated with the road paving. Noise levels associated with earth moving and stationary equipment (see Figure 4-1) would occur during daytime construction activities. Receptors would be limited to construction, oversight, and range personnel and wildlife. Due to reduced maintenance requirements, there would be less intermittent noise since the periodic road grading of this frequently used 7-mile dirt road segment would no longer be required. Because traffic volumes and speeds, vehicle types, roadway geometry, and the general acoustical properties of the sites would remain essentially unchanged, long-term noise impacts associated with implementation of Alternative 9.A would be minimal.

4.12.9.2 Alternative 9.B – No-Action Alternative

As compared to Alternative 9.A, under Alternative 9.B, there would be slightly greater long-term, intermittent noise impacts associated with the periodic maintenance of the 7-mile dirt road segment that extends between Manned Range 1 and RMCP 1.

4.12.10 Proposal 10 – Sand and Gravel Excavation, Stockpiling, and Use on BMGR East

4.12.10.1 Alternative 10.A – Proposed Action

Under Alternative 10.A, there would be periodic and intermittent, short-term daytime noise at the proposed sand and gravel extraction and stockpile sites and along roads used in transporting the materials. Noise levels associated with the equipment to be used with implementation of this proposal include front loaders, tractors, and trucks, which have noise levels at 50 feet of approximately 70 to 95 dBA. The short-term increase in noise exposure levels would be localized to the project sites and would dissipate rapidly with distance from the project sites. Noise receptors in the vicinity of the project sites would include construction and oversight personnel, range maintenance personnel, and wildlife.

4.12.10.2 Alternative 10.B – No-Action Alternative

Under Alternative 10.B, short-term intermittent noise associated with transporting sand and gravel from off-range sources to sites for BMGR East target maintenance would continue. As

compared to Alternative 10.A, overall transport distances would be greater. However, by comparison, overall differences in noise exposure levels would be negligible.

4.12.11 Aggregate Impacts

If all proposed actions were implemented, there would be the potential for additive impacts in terms of intermittent daytime construction noise if proposed actions located in close proximity are implemented simultaneously. The resultant noise exposures would potentially be greater due to this aggregate impact. This potential is greatest for proposals that involve activity in the tactical ranges (e.g., target reconfiguration, moving target installation, and sand and gravel extraction and stockpiling), because activities would be concentrated during the 6-week annual closure period used to remove spent ordnance and to repair and replace targets at tactical ranges. This potential also exists with regard to Gila Bend taxiway improvement and air traffic control tower construction. Overall, such aggregate impacts would be minimal as they would be interior to BMGR East and receptors would be limited to construction, oversight, and range personnel and wildlife.

Long-term, aggregate impacts associated with implementation of all proposed actions could result in increase use levels among the more casual (non-regular) users of BMGR East. Although the average annual sortie count would not be expected to exceed the baseline, there would likely be a slight shift in patterns of concentrated flight activity and ordnance delivery. As compared to the baseline, 5 to 10 percent of the operations currently concentrated at the manned and tactical ranges would be dispersed to other locations within BMGR East, including the proposed STA. Training operations would continue to be conducted at varying altitudes, depending on the training emphasis, which fluctuates based on what type of training supports the anticipated or actual conflicts that active duty pilots may face in combat. Noise exposure levels would increase whenever the training emphasis is placed on flight operations occurring at lower altitudes, and decrease whenever emphasis is placed on flight operation occurring at higher altitudes.

4.13 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

Unavoidable adverse impacts (also referred to as residual impacts) are the effects that would still remain after mitigation measures have been applied. In some cases, unavoidable adverse impacts occur because there is no reasonable or effective mitigation to reduce the impact. In other cases, mitigation is not expected to be effective enough to reduce the level of impact to a low or negligible level. Adverse impacts that could not be avoided should the proposed actions be implemented include the following:

- With the proposal and alternative actions involving ground disturbance (all except for Alternative 5.A), a low amount of emissions of dust would occur even after the application of control measures, such as those that would be called for in the dust control permitting process.
- There would be localized unavoidable adverse impacts to soils and the limited vegetation and wildlife at areas that would be disturbed by the proposals.
- Where impacts to cultural resources cannot be avoided through project design or protection in place measures, adverse effects to cultural resources would be unavoidable. Partial mitigation of adverse effects may be achieved through data recovery at sites eligible for inclusion on the NRHP for their potential to provide important information about history or prehistory (under Criterion D); however, such actions in themselves are considered to have an adverse effect. Data recovery will be conducted in accordance with ACHP guidance, including its *Recommended Approach for Consultation on the Recovery of Significant Information from Archeological Sites*, published in the Federal Register on June 17, 1999. If TCPs are identified in or near the areas affected by the proposed actions, there is the potential that unavoidable adverse impacts to those TCPs would result from implementation of the proposed actions.
- The approximate 5 dB increase in noise levels associated with flight activities in the proposed lower flight training area over the Cabeza Prieta NWR (Proposals 5.A and 5.B).
- Health and safety risks associated with implementation of some proposals would be mitigated by programs in place to minimize the associated risks, but the risks would not be entirely avoidable.
- Operation of the STA could result in unavoidable closures of the associated laser hazard area to public recreation use. Impacts to recreation would be unavoidable given that recreation use is subject to compatibility with the overriding military mission.
- There would be increased use of hazardous materials and increased production of waste, particularly during the construction phase for the proposed actions. Although such materials and wastes would be managed in accordance with laws and regulations to protect the environment from adverse environmental effects, some impacts (such as use of landfill capacity) would be unavoidable.

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

The majority of areas of potential effect for the various proposals have been previously

disturbed, with high levels of previous impact at sites at Gila Bend AFAF and low levels of disturbance in the San Cristobal Valley. Disturbed areas do not actively serve a productive role in the natural environment. They remain largely unvegetated and provide little habitat for animals, particularly in context of the surrounding area. In the long term, should use of the areas discontinue, the natural recovery of the area would be expected to be slow. The area, however, would eventually be expected to be revegetated, beginning with common grass and shrubs species and eventually supporting vegetation that occurs in the vicinity. If management actions that the Air Force has taken to reduce the spread of non-native and invasive species are successful, the area would be expected to support mostly native vegetation and wildlife common in the creosote-bursage desert scrub flats. The creosote-bursage desert scrub flats have low productivity due to its typically sparse to moderately dense layers of subshrubs and shrubs less than two meters tall. This supports common reptile and burrowing small mammals. Most productivity in this environment is correlated with the wash systems.

4.15 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed actions and the action alternatives, where applicable, propose either changes in physical features or changes in existing operations that would enhance military training within BMGR East. These actions would require the continuing commitment of range land and airspace resources in support of that training. Some of these resources would be irreversibly and irretrievably committed to these actions at least for the life of the range land withdrawal, which is currently authorized through 2024. The extent to which renewal of the BMGR would lead to irreversible and irretrievable commitments of resources is examined in this section.

For the purposes of this EIS, irreversible commitment of resources is interpreted to mean that once resources are committed, the action will continue to be committed and the production or use of those resources will be lost for other purposes throughout the life of the action being implemented. An irretrievable commitment of resources defines those resources that are used, consumed, destroyed, or degraded during the life of the range that could not be retrieved or replaced during or after the life of the range.

4.15.1 Earth Resources

With the exception of Alternative 5.A, all of the proposed actions or their action alternatives could result in ground disturbance. While implementation of each of these actions would have some short-term effects on earth resources, soil disturbances generally would be stabilized over time and have no long-term effects that are irreversible or irretrievable. However, some of these actions would result in the development of targets that may subject earth resources to repeated ordnance impacts. This would be minimal for the STA because lasers would be used and for the

helicopter training at Manned Range 3 because small caliber munitions would be used. The new air-to-ground target would likely result in ongoing disturbances. Reconfigured targets may also have long-term impacts depending on the locations of reconfigured targets and the intensity of their use. These effects would be irreversible for the life of the target, but would not be expected to be irretrievable losses as the soils would generally become stabilized and recover if these proposed targets were later retired. Munitions constituent concentrations would be expected to be higher at former target sites, particularly those authorized for live munitions delivery such as the proposed new air-to-ground missile site.

4.15.2 Water Resources

A minimal amount of water that would be used for dust suppression during the construction phase associated with most of the proposed actions and action alternatives relative to natural recharge rates would be a negligible irretrievable commitment of groundwater resources. Alternatives 8.A and 9.A would increase impervious surface, which would result in a storm water management condition that would last through the life of these improvements. All of the proposed actions and action alternatives except for Alternative 5.A (lowered flight altitude over a portion of Cabeza Prieta NWR) would potentially result in increased sedimentation in ephemeral washes during the construction phase and from ongoing disturbance. Although these increased sedimentation impacts to drainages would be minimal, the impact would be irreversible and irretrievable.

4.15.3 Air Quality

With implementation of the proposed actions, the air quality of the BMGR would be irreversibly and irretrievably committed to some degradation from vehicle and generator use, target construction and maintenance, ordnance delivery, change in aircraft operating altitude or other military activities proposed by the action alternatives over the life of these activities. The extent of the degradation would be temporary, local, and insignificant, however, and would not involve the commitment of air resources beyond the life of the actions.

4.15.4 Biological Resources

As noted above for earth resources, with the exception of Alternative 5.A, all of the proposed actions and action alternatives would result in ground disturbance. Most of these actions are proposed in locations with some prior ground disturbance ranging from using an existing road or target where the degree of prior disturbance would be high to former 5-year EOD clearance areas where the degree of prior disturbance would be low to moderate. Areas with the least amount of prior disturbance are most likely to have vegetation that contributes to habitat for wildlife. Ground disturbance associated with the proposed action generally occurs in areas with low to

moderate habitat quality and the amount of habitat loss would be a small fraction of a percentage of the available habitat in the region.

In some locations an irreversible and irretrievable loss of perennial vegetation or habitat that extends beyond the life of the proposed action could occur. This could occur at the core target construction and munitions impact areas for the air-to-ground missile target and the helicopter gunnery target area, as well as the taxiway and air traffic control tower at Gila Bend AFAF. These long-term losses could occur either because ordnance contamination at targets designated for live munitions is too extensive to safely permit reclamation efforts or because the affected soils could no longer support some types of vegetation or habitat.

Direct mortality or injury of some wildlife from ordnance, vehicle, or laser use could occur as a result of implementing the proposed actions, or an action alternative. Affected individual animals would be irretrievably lost; however, no irreversible or irretrievable damage to the long-term health of any species population is foreseen.

If any proposed actions were found to adversely affect the endangered Sonoran pronghorn, this could potentially be an irreversible and irretrievable loss because the current population is small. The preliminary analysis did not identify any actions that were likely to result in population-level impacts. A Biological Opinion was completed by the USFWS through ESA Section 7 consultation under a programmatic consultation that addressed the sum of actions (including, but not limited to the 10 proposed actions) conducted by the Air Force on BMGR East that may affect listed species.

Based on this formal consultation with the USFWS, with the completion of the Final Biological Opinion dated May 4, 2010, it was determined that 6 of the 10 proposed actions may result in adverse effects to Sonoran pronghorn and that 4 of the 10 proposed actions may result in adverse effects to the lesser long-nosed bat; however, none is likely to jeopardize the continued existence of the Sonoran pronghorn or lesser long-nosed bat.

4.15.5 Land Use

The following actions would require an irreversible and irretrievable commitment of the footprint of the new land use feature for the life of these features. Should the features be decommissioned and removed, the land would once again be available for other land uses that are compatible with the military mission, as defined by the MLWA of 1999:

- STA, regardless of the location selected.

- Target reconfiguration – to the extent that existing target footprints are changed to either enlarge a target or to establish a new target in a different location. This potentially may be offset by lands from which an existing target is retired and removed.
- Moving vehicle target system – to the extent that an existing road is extended to complete the track for use in operating the moving vehicle target system. When moving vehicle target system training is not being conducted, the track could be used as an access road.
- New target for air-to-ground missiles, including a buffer for the associated EOD clearance requirements (estimated at 75 acres in total).
- New target area proposed to support a helicopter gunnery range at Manned Range 3.
- New taxiway and air traffic control tower at Gila Bend AFAF.
- Stockpile sites used for storing sand and gravel.

BMGR East is overlain by restricted airspace areas R-2301E, R-2304, and R-2305 and there would be no change in this airspace designation, although there would be some Air Force internal changes. If the STA were built and operated on land underlying the Air-to-Air range, a new airspace subrange boundary may be required to separate operational use of the STA from other BMGR operations. If the STA were built within North or South TAC, the use of the associated airspace for those ranges would be affected when the STA is activated because it would be important to separate training operations. This could extend to Manned Ranges 2 and 4 if flight maneuvers for approaching an STA within North TAC affect the use of the airspace overlying these ranges. Similarly, if the flight floor over portions of the Cabeza Prieta NWR were lowered to 500 feet AGL, the use of that airspace to non-participating aircraft in the altitude range of 500 to 1,500 feet AGL would be lost when that airspace is needed for military operations The time in which the airspace is not available because of another operational use, regardless of which action alternative is considered, is both irreversible and irretrievable. However, the loss is only irreversible and irretrievable for the period of time when there are conflicting uses in which concurrent use of the airspace would not be safe. If the STA were not activated or if the low-level airspace overlying the Cabeza Prieta NWR were not in use, there would be no loss during that time period as the airspace could be used for other currently authorized flight activity.

4.15.6 Outdoor Recreation

To the extent that recreation access is restricted for the laser hazard area associated with the Alternative 1.A STA site, this would be an irreversible and irretrievable loss of recreation access for as long as the laser hazard area is in effect. Impacts of Alternative 5.A, lowered flight training

altitude over a portion of the Cabeza Prieta NWR, to dispersed Wilderness recreation experiences within Cabeza Prieta NWR and Organ Pipe Cactus National Monument would also persist for as long as the airspace reconfiguration remains in place and is utilized.

4.15.7 Health and Safety

A number of the proposed actions would result in changed conditions resulting in establishment of new procedures specific to safe operation at BMGR East, which would be reflected in updates to the Luke AFB supplement to AFI 13-212. Most of these would involve target approach flight patterns, munitions authorized for delivery, and/or new range operations. The improved safety conditions with Alternative 9.A, the paving of the road between Manned Range 1 and RMCP 1, and Alternative 8.A, the building of a parallel taxiway to prevent conflicts with aircraft using the runway and improving observation conditions within the air traffic control tower at the Gila Bend AFAF, would continue through the life of these projects. The negligible potential increased risk for mishaps with Alternative 5.A, lowered flight training altitude over a portion of the Cabeza Prieta NWR, would be a continuing condition as long as the airspace reconfiguration remains in place and is utilized.

4.15.8 Cultural Resources

Cultural resources might be affected by implementation of all of the proposed actions and action alternatives, with the following exceptions: Alternative 1.B, the STAC STA location; Alternative 4.A, the proposed new air-to-ground missile site; Alternative 6.A, the proposed helicopter gunnery range on Manned Range 3; Alternatives 8.A and 8.B, new taxiway and air traffic control tower at Gila Bend AFAF, Alternative 9.A, paving the existing road between Manned Range 1 and RMCP 1, and Alternative 10.A, extracting and stockpiling sand and gravel.

By following the procedures outlined at the beginning of this section, adverse effects on NRHP-eligible cultural resources of implementing the proposed actions would be avoided, minimized, and/or partially mitigated. In some cases, recovery or partial recovery of archeological data through excavation and other scientific means is the most appropriate mitigation measure for affected archeological sites (or portions of archeological sites); however, invasive methods for recovering information from such sites are by their nature destructive. In the event that such data recovery efforts are determined to be the most appropriate preservation outcome, data recovery will be conducted in accordance with ACHP guidance, including its *Recommended Approach for Consultation on the Recovery of Significant Information from Archeological Sites*, published in the Federal Register on June 17, 1999. If TCPs are identified in or near the areas affected by these proposed enhancements, there is the potential that unavoidable adverse impacts to such TCPs would result from implementing the proposed actions.

4.15.9 Hazardous Materials and Waste

Hazardous materials and munitions used in implementation of the proposed actions and action alternatives would be irreversibly and irretrievably committed to that use. To the extent feasible, recycling of spent munitions and other waste stream materials would allow for reuse of some materials, but that which could not be reused would be irreversibly and irretrievably added to the waste stream.

4.15.10 Socioeconomics

Air Force budgetary expenditures for implementation of the proposed action and action alternatives would be committed to these projects both in terms of short-term expenditures for construction actions as well as long-term expenditures for ongoing operation and maintenance actions. Alternative 10.A, sand and gravel extraction, stockpiling, and use would be expected to minimally reduce these expenditures over the long-term.

4.15.11 Noise

Long-term changes to the BMGR East noise environment would be associated with changes in aircraft operations, munitions delivery, ground activities (vehicles and people), and (in some cases) generator use for:

- Alternative 1.A, 1.B, and 1.C STA sites;
- Alternative 2.A target reconfiguration;
- Alternative 3.A, 3.B, and 3.C moving vehicle target sites;
- Alternative 4.A new air-to-ground missile target;
- Alternative 6.A, reconfiguration of Manned Range 3 for helicopter training;
- Alternative 7.A, on-the-ground training activities; and
- Alternative 10.A, sand and gravel excavation, stockpiling, and use.

Changes in noise levels associated with these proposals would irreversibly and irretrievably affect the localized noise environments for as long as the proposals are implemented. Implementation of Alternative 8.A, new taxiway and air traffic control tower and Alternative 9.A, paving the road between Manned Range 1 and RMCP 1, would not have long-term impacts to the BMGR noise environment. Implementation of Alternative 5.A or 5.B would result in a long-term approximately 5 dB increase in noise exposure levels for the dispersed recreation areas and Wilderness underlying the lowered flight training areas.

5 CUMULATIVE EFFECTS

5.1 CUMULATIVE EFFECTS BACKGROUND

Cumulative effects are those additive or interactive effects that would result from the incremental impact of the proposed 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 (40 CFR § 1508.7). Interactive effects may be either countervailing—where the net cumulative effect is less than the sum of the individual effects—or synergistic—where the net cumulative effect is greater than the sum of the individual effects. The Council on Environmental Quality handbook for considering cumulative effects advises that focusing the cumulative effects analysis on meaningful cumulative impact issues, rather than on all conceivable impact relationships, is critical to the success of the analysis to support better decisions about the proposed action and alternatives (Council on Environmental Quality 1997). The handbook also advises that cumulative effects be analyzed in terms of the specific resources, ecosystem, and human community that may be affected by the proposed action or alternatives. The analysis must consider how cumulative effects may be manifested over short and long time frames, and how they may cause meaningful impacts which extend into areas that may exceed political or administrative boundaries. Each affected resource, ecosystem, and human community must be analyzed in terms of its own capacity to accommodate additional effects, based on its own time and space parameters. In 2005, the Council of Environmental Quality released additional guidance regarding consideration of past actions and noted that it is not practical to analyze how the cumulative effects of an action interact with the universe. Instead, the analysis of environmental effects must focus on the aggregate effects of past, present, and reasonably foreseeable future actions that are truly meaningful. Furthermore, the scope of the cumulative impact analysis is related to the magnitude of the environmental impacts of the proposed action. Proposed actions of limited scope do not typically require as comprehensive an assessment of cumulative impacts as proposed actions that have significant environmental impacts over a large area (Council on Environmental Quality 2005).

In 2006, a comprehensive analysis of the cumulative effects of all ongoing and past military operations, Air Force and Marine Corps natural resources management programs, and all other relevant past, present, and reasonably foreseeable future actions was completed for the entire BMGR as part of the EIS for the proposed BMGR INRMP (Departments of the Air Force, Navy, and Interior 2006). In that analysis, 70 different past, present, and reasonably foreseeable future actions were identified as applicable to the BMGR. The study area for that analysis encompassed

not only the BMGR but also those adjacent areas that could affect its environment. The analysis considered not only the effects on individual resources, but also on the ecosystem and human community of the study area.

The 2006 analysis provides a recent, comprehensive, and widely reviewed baseline of how the cumulative effects of all meaningful past and present actions at the BMGR have affected its environment with regard to individual resources, the ecosystem, and the human community. Although the reasonably foreseeable future actions considered in 2006 would require some updating, the 2006 analysis is directly relevant to analyzing the cumulative effects of the actions proposed in this EIS for BMGR East. Thus, the cumulative effects analysis provided herein is tiered from the 2006 analysis.

While the entire 2006 EIS is available through the Range Management Office at Luke AFB, the 70 past, present, and reasonably foreseeable future actions that were considered in that EIS are included in Appendix E of this EIS for ease of reference. Figure E-1 in Appendix E shows the locations of many of these actions. Table E-2 describes the additive or interactive effects of past, present, and reasonably foreseeable future actions on individual resources. These tables and the figure are extracted directly from the cumulative effects analysis of the 2006 EIS.

The 2006 EIS for the BMGR INRMP identified five key findings with regard to the additive or interactive effects of meaningful past, present, and reasonably foreseeable future actions on the ecological landscape and human community of the BMGR and its relevant region of influence.

1. Development in the region has changed the landscape with regard to the ecosystem and human communities. The resulting principal centers of economic activity in the BMGR region include Yuma, the lower Gila River corridor in the vicinity of Wellton and Tacna, Gila Bend, Ajo, Sonoyta, and San Luis Rio Colorado. The additive or interactive ecological effects of economic development are principally the collective result of:
    - dewatering of the Gila River through impoundments and diversions;
    - conversion of Rio Sonoyta stream flows from perennial to intermittent due to groundwater pumping;
    - loss of riverine and riparian habitat along these formally perennial streams;
    - irreversible conversion of native Sonoran desert to agricultural, urban, and industrial purposes within the Yuma Valley, lower Gila River corridor, Gila Bend, Ajo, Sonoyta, and San Luis Rio Colorado areas;
    - development of transportation corridors linking the principal centers of economic activity;

- livestock grazing within the interior of the region; and
- opening of the interior of the BMGR region as a result of unimproved road development to support livestock grazing, prospecting and mining, and land survey.

As a result of these actions, the structural components of the ecosystem have changed. The most critical effects are loss of riverine and riparian habitat, and other habitats to agriculture and urbanization, and the fragmentation of habitat from transportation corridors and irrigation canals. These effects have impacted natural communities and some wildlife species, in part by curtailing wildlife movements; limiting or eliminating floodplain and bottomland habitats (that were at least seasonally important to many upland wildlife species); and stressing other habitat with livestock grazing and opening the area to vehicle access through the development of backcountry roads.

2. The designations of Organ Pipe Cactus National Monument, Cabeza Prieta NWR, and the BMGR between 1937 and 1941 have provided long-standing resource conservation protection to much of the interior of the BMGR region. These designations have eliminated or prohibited appropriative land uses, such as livestock grazing, mining, and farming, from approximately 4,750 square miles. While the BMGR component of this land mass has been subject to military use and the resulting impairment of some of the natural and cultural resource qualities, less than 10 percent of the range area has been subjected to low to high levels of disturbance. Furthermore, less than 3 percent of the area has been impacted by moderate to high levels of disturbance. The headwaters of almost all surface water drainage from the region originates internally and drains to locations outside of the region; therefore, the area is generally impervious to sources of hazardous materials, or wastes borne by surface water runoff or sediment transport via surface water drainages.
3. The adverse effects of off-road driving and concentrated foot traffic by drug smugglers and UDIs currently cause the most significant environmental impacts in the complex of land consisting of the BMGR, Cabeza Prieta NWR, Organ Pipe Cactus National Monument, and BLM Ajo block. Border Patrol interdiction of cross-border traffic in areas outside of the complex likely diverted smugglers and UDIs into the complex. Cross-border traffic reached a peak in late 2006 and early 2007 but recently declined to pre-2004 levels. The decline is expected to continue as cross-border traffic is expected to remain at much reduced levels in the near future due to: (1) construction of barriers to pedestrian and/or vehicle traffic along the border shared by the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus National Monument with Mexico, which is nearing completion; (2) intensified surveillance and security patrols by the Border Patrol; (3) a

new Arizona law that sanctions employers that hire UDIs; and (4) the sharp economic decline in the United States, which has reduced job opportunities for UDIs.

Although decreased cross-border traffic has reduced certain direct environmental impacts, the benefit has come at some potentially adverse environmental costs. For example, Border Patrol activities to curtail illegal migration and smuggling has increased off-road driving for law enforcement and search and rescue purposes, and the construction of drag roads for surveillance purposes. Drag road construction has disrupted surface water runoff channels and the network of cross-country vehicle tracks from illegal and interdiction traffic adversely affects soils, surface drainage hydrology, wildlife, wildlife habitat, cultural resources, visual resources, and public safety. Further, the construction of border fencing has involved grading and widening of some BMGR roads, particularly in BMGR West, to allow heavy trucks (needed to support construction activities) access to the border. Grading and widening actions, coupled with the ongoing road maintenance required to support heavy construction vehicle traffic, has resulted in long and deeply incised portions of roads which may broadly affect surface drainage hydrology in some areas. The border security barriers themselves will restrict or entirely curtail cross-border movement of mega fauna, such as bighorn sheep, deer, or Sonoran pronghorn, along much of the international border.

4. Despite the potentially adverse effects associated with illegal cross-border traffic, the current relationship between the ecological conditions of the BMGR region and its human community is best characterized as increasingly tense. The tension is between a fairly well-protected and expansive core land area that continues to harbor a representative cross section of indigenous Sonoran Desert natural communities and biodiversity that is surrounded by transportation corridors, centers of population, and economic development activity that in a number of ways threaten the long-term ecological health of the core, as described in the first two points.
5. The additive or interactive effects of past, present, and reasonably foreseeable future actions on the human community are also divergent. While the economic development activities that have occurred within the region have provided humans livelihoods and support for diverse cultural amenities, development has also brought the loss of other natural and cultural resource values. Such values are either no longer available or are available in diminished quantity and quality for the enjoyment and benefit of the human community. For example, the endangered Sonoran pronghorn continues to survive within the United States but marginally so and almost exclusively within habitat

currently found in Organ Pipe Cactus National Monument, Cabeza Prieta NWR, and the BMGR.

Many factors have contributed to the decline of this species, but the loss of the habitats adjacent to and within the former Gila River riparian corridor is one of the most critical affecting its continued survival. The availability of these habitats have been irreversibly lost to this species as a result of the development of the railroad and interstate highway that block its north-south movements, conversion of river corridor habitats to agriculture and other economic uses, and dewatering of the river itself. As a result of these and other additive or interactive effects, the Sonoran pronghorn population has lost much of its capacity to tolerate the effects of severe drought during its spring and early summer fawning season.

In one of a number of management efforts to compensate for the aggregate losses incurred by this species, substantial portions of Organ Pipe Cactus National Monument, Cabeza Prieta NWR, and the BMGR are now closed to visitor use each year from March 15th through July 15th to increase the potential for pronghorn fawn survival by decreasing the potential for harmful levels of harassment of fawns during a vulnerable point in their lives. While the human community has benefited economically from modifications to the Gila River corridor and development of transportation infrastructure, trade-offs have included reductions in recreational access to lands within Sonoran pronghorn range on a seasonal basis and the threat of continued decline of the Sonoran pronghorn population.

5.2 CUMULATIVE EFFECTS METHODOLOGY

This EIS describes ten proposed actions and their alternatives to enhance training within BMGR East. Such improvements would enhance aerial training and ground activities within the range, and operations at the Gila Bend AFAF. The improvements would include providing opportunities for precision guided weapons use in an urban setting, reconfiguring targets based on current combat scenarios, providing a wider variety of attack training scenarios, establishing a new air-to-surface missile target, and improving safety and operational capacity.

Cumulative effects analyzed in this chapter should not be confused with the aggregate effects analyzed in Chapter 4. Aggregate impacts pertain to the proposed action and alternatives only, while cumulative impacts pertain to the additive or interactive effects which result from the incremental impact of the proposed action and alternatives when added to other past, present, and reasonably foreseeable future actions.

While each of the proposed actions addressed in this EIS has at least one alternative—the no-action alternative—the three following proposed actions also have action alternatives.

- Proposal 1 – Sensor Training Area, includes alternative locations in South TAC and North TAC.
- Proposal 3 – Moving Vehicle Target, includes two alternative locations for the moving vehicle track of which both are in North TAC in close proximity to the proposed location.
- Proposal 8 – New Taxiway and Air Traffic Control Tower at the Gila Bend AFAF, includes one alternative location for the air traffic control tower within 0.5 mile of the proposed location of the tower.

For the purposes of the cumulative effects analysis, there would be no discernable difference in the effects of the action alternative locations that may be selected for the moving vehicle target track or the air traffic control tower because they are near to each other and would be comparable in the amount of ground disturbance and the type of vegetation affected. While the area of disturbance and the features developed would be comparable regardless of the location selected for the action of developing a Sensor Training Area, the alternative locations are widespread and potentially could have a different cumulative effect.

Therefore, the cumulative effects analysis focuses entirely on the proposed action alternative for nine of the ten proposed actions as the result would not likely differ from the action alternatives proposed for the moving vehicle target or new air traffic control tower. For the remaining proposal, the cumulative effects analysis is based on an assumption that the proposed location for the STA underlying the Air-to-Air Range would be implemented. However, for the resources for which a different cumulative effect might be realized with the alternative action location for the STA, separate paragraphs within that resource analysis describe how the cumulative effects would differ from implementing the alternative action rather than the proposed action.

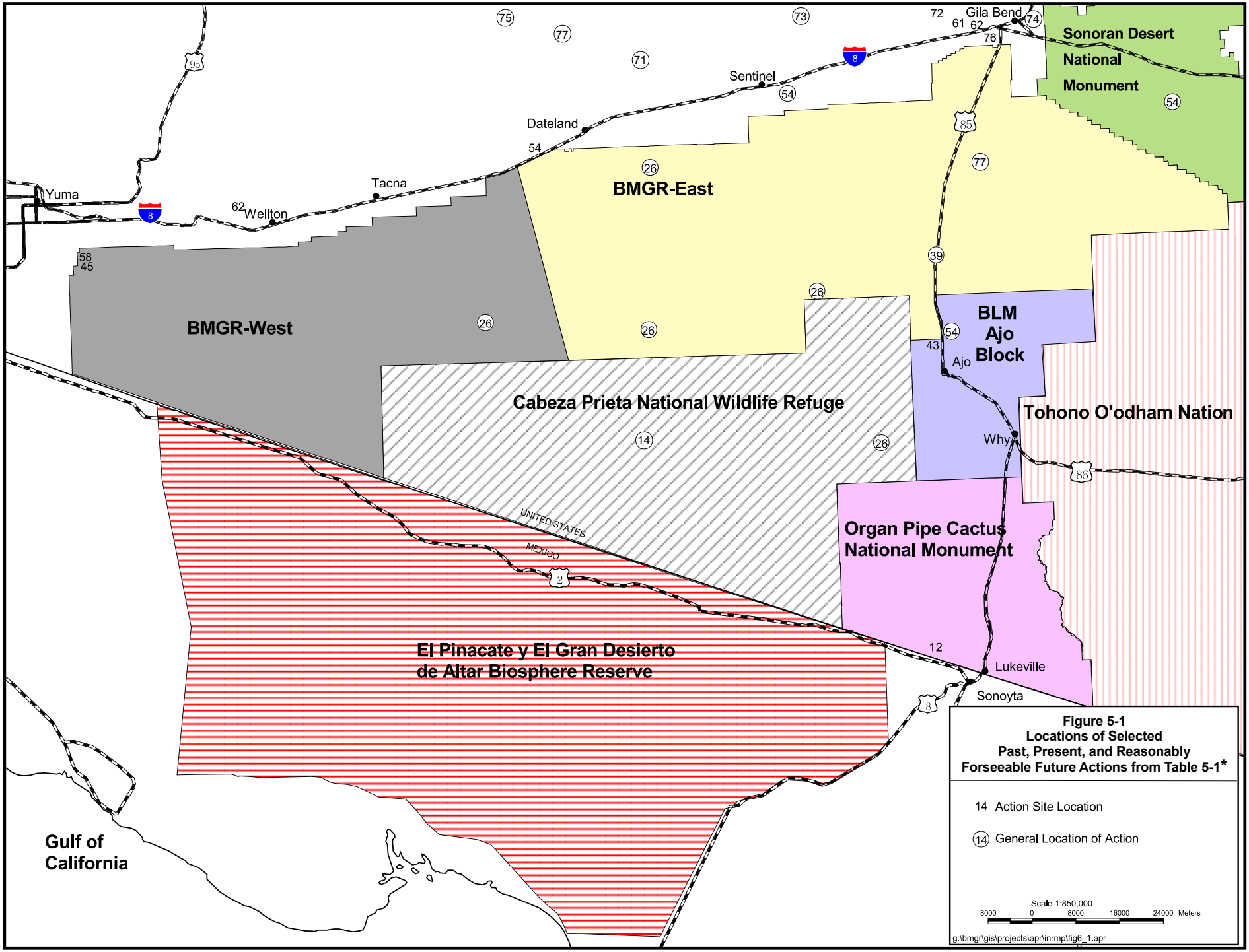
For the cumulative effects analysis, the effects of the ten proposed actions in aggregate must be considered along with other past, present, and reasonably foreseeable future actions. As noted in Section 5.1, most of the past, present, and reasonably foreseeable future actions within the BMGR region were assessed for the BMGR INRMP EIS, and the specific actions considered and the effects analysis are included in Appendix E. Table 5-1 provides an update to some of the previously considered actions, particularly those which are expected to occur in the near term, but have not been implemented to date. Table 5-1 also adds new actions identified since the development of actions considered in the BMGR INRMP EIS. Figure 5-1 shows the locations of these actions.

The cumulative effects analysis for this range enhancement EIS for BMGR East builds upon the findings of the INRMP cumulative effects by considering the changes in actions listed in Table 5-1 and the aggregate effects of the ten actions proposed in the current EIS.

The individual resources potentially affected by the proposed action and alternatives were divided into resource impact assessment categories as described in Chapter 3. Chapter 4 provides the individual and aggregate impact assessments of how the proposed actions and each alternative would affect each resource category.

The resource impact assessment categories include:

- earth resources
- water resources
- air quality
- biological resources
- land use
- outdoor recreation
- health and safety
- cultural resources
- hazardous materials and waste management
- socioeconomics and environmental justice
- noise



*Note: 16 of the 26 actions listed in Table 5-1 are shown on this map. The locations of the other 10 actions either are applicable to broad areas of the BMGR or its vicinity, as identified in Table 5-1, or are at places outside of this map window.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	**Name**	**See Map**	**BMGR East**	**BMGR West**	**Organ Pipe Cactus NM**	**Cabeza Prieta NWR**	**Other Areas**	**Mexico**	
Updates to Prior Analysis Included in Appendix E (numbers in left column correlate to Table E-1 in Appendix E)									
12	U.S. Border Patrol activities and illegal UDI and drug smuggler entry to the United States	✓	✓	✓	✓	✓	✓		Cross-border traffic reached a peak in late 2006 and early 2007 but has recently declined to pre-2004 levels. Air Force security reported 377 UDI apprehensions on BMGR East in calendar year 2007; apprehensions in calendar year 2008 averaged about half of this amount. The decline in cross-border traffic is expected to continue and traffic is expected to remain at much reduced levels for at least the near future due to: (1) construction of barriers to pedestrian and/or vehicle traffic along the border shared by the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus National Monument with Mexico, which is nearing completion; (2) intensified surveillance and security patrols by the Border Patrol; (3) a new Arizona law that sanctions employers that hire UDIs; and (4) the sharp economic decline in the United States, which has reduced job opportunities for UDIs.
14	Cabeza Prieta NWR/Wilderness and Comprehensive Conservation Plan and Wilderness Stewardship Plan	✓				✓			The Cabeza Prieta NWR/Wilderness Comprehensive Conservation Plan and Wilderness Stewardship Plan was completed in 2007 to provide long-range guidance on Refuge management and a basis for a long-term adaptive management process including: implementation, monitoring progress, evaluating and adjusting, and revising plans accordingly.
18	International border vehicle barrier			✓	✓	✓	✓		Construction activities to extend a pedestrian and/or vehicle barrier along the international border through Cabeza Prieta NWR, BMGR, and other areas west to the Colorado River are under development (2004+). As of winter 2008, 218.2 miles of pedestrian fencing and 157 miles of vehicle fencing have been installed in addition to fencing previously installed along the international border within Organ Pipe Cactus National Monument.
25	Cleanup of inactive Air Force targets		✓						EOD surface clearances and debris cleanups were being considered for 18 inactive targets and 3 non-target sites. No implementation of this action is currently proposed.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe Cactus NM	Cabeza Prieta NWR	Other Areas	Mexico	
26	Sonoran pronghorn forage enhancement, artificial waters, and semi-captive breeding	✓	✓	✓		✓	✓		Additional forage plots have been developed to support natural forage growth and sustain pronghorn during drought. Dual objectives of forage plots are to reduce adult mortalities and promote sustainable fawn survival and recruitment. To date, five forage plots, three in the Cabeza Prieta NWR and two in BMGR East, have been developed.
30	BMGR ICRMP		✓	✓					The rangewide ICRMP addressing goals, objectives, and action items for the management of cultural resources on BMGR East was completed in 2009; the completion date for the portion of the ICRMP addressing BMGR West is to be determined.
36	Reduced EOD clearance requirements		✓						In August of 2001, the Air Force 5-year EOD clearance criteria for tactical and manned ranges was reduced from a distance of one nautical mile from each target or until the density of collectible munitions items is five pieces per acre or less (whichever is the greater distance), to one kilometer from each target or until the density of collectible munitions items is five pieces per acre or less (whichever is the shorter distance). These criteria were modified again in July 2007 when the EOD clearance criteria for tactical and manned ranges were further reduced. Currently, for targets not used for live munitions, EOD clearance is performed every 2 years to a radius of 300 feet or the shorter radius where the debris density factor is less than five items per acre. For live munitions targets, the clearance is performed every 2 years to a radius of 500 feet or the shorter radius where the debris density factor is less than five items per acre. Every 10 years, that EOD clearance area is to be to 1,000 feet or the shorter radius where the debris density factor is less than five items per acre.
38	Cellular Phone Towers								An additional cellular phone tower has been established on BLM-administered land at Oatman Mountain, north of Painted Rock Reservoir.
39 and 43	Phelps Dodge Ajo, Inc. mine reopening and associated Gila Bend to Ajo 230 kV transmission line	✓	✓						New technologies in copper mining could make the reopening of the Phelps Dodge Ajo, Inc. mine feasible if copper prices reach economically feasible levels. If the mine reopens, it would be necessary to construct a transmission line from Gila Bend to Ajo to support mine operations and to upgrade the Tucson, Cornelia, and Gila Bend Railroad to ship the concentrate. To date, copper prices have not supported an economically feasible reopening; however, this action could occur under suitable financial conditions.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe Cactus NM	Cabeza Prieta NWR	Other Areas	Mexico	
44	Future aircraft and weapons (F-22A, F-18 E/F, MV-22/CV-22, Joint Strike Fighter, Joint Direct Attack Munitions, other stand-off weapons)		✓	✓					New aircraft and weapons for the Air Force, Marine Corps, and Navy are being developed or entering production. These aircraft and weapons will replace those currently in use throughout the armed forces. BMGR is a likely candidate for continued military training using these new aircraft weapon systems. Department of the Navy environmental studies evaluating potential home bases for the MV-22 and Joint Strike Fighter are underway and are expected to include training operations within the BMGR (date unknown). The Air Force is also evaluating potential home bases for the Joint Strike Fighter, to include training operations with the BMGR.
45	Relocating Unmanned Aerial Vehicle (UAV) to MCAS Yuma	✓		✓					The relocation of a Marine squadron to MCAS Yuma that operates UAVs has not occurred and is no longer expected to occur.
54	Environmental Baseline Survey (EBS) activities for non-renewed parcels	✓					✓		A Phase 1 EBS was completed by Luke AFB (2002) for the four parcels of BMGR lands that were not renewed by the MLWA of 1999. Areas with recognized environmental conditions, that indicate an existing release, a past release, or material threat of a release of hazardous substances or petroleum products within the parcels, were identified. With the exception of possible displaced munitions located within Sand Tank Mountains and Sentinel Plain parcels, no other recognized environmental conditions were classified at the EBS sites. Current status is that the munitions identified at former targets and along roads and washes within the Sand Tank Mountain parcel (former Area A) have been cleared by the Air Force, but BLM concurrence on the clearance work is pending. A Military Munitions Response Program is underway at the other three parcels for any required remediation work.
58	Yuma Area Service Highway	✓		✓			✓		Portions of the highway to connect Interstate 8 (east of Yuma) to the U.S.-Mexico border at San Luis are currently under construction, including a portion within the northwestern most edge of BMGR West.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	**Name**	**See Map**	**BMGR East**	**BMGR West**	**Organ Pipe Cactus NM**	**Cabeza Prieta NWR**	**Other Areas**	**Mexico**	
61	Paloma Ranch west of Gila Bend and mixed-use development proposed in Gila Bend	✓					✓		Approximately 100,000 acres of fallow Paloma Ranch agricultural land west of Gila Bend is planned for future development of either residential or light and heavy industrial uses. To date, the only major development proposed within Paloma Ranch is an electrical power plant and residential development, including a 55,000-home Master-Planned Community.
62	Power Plants being constructed/proposed at Gila Bend and Wellton	✓					✓		Construction of a 2,000-megawatt power plant by Panda Power and Gila Bend Power Partners, LLC occurred north of Gila Bend. Construction of a second 750-megawatt plant proposed in the vicinity of Wellton is on hold. Mixed land use development is expected near the plants.
68	Beddown of Combat Search and Rescue assets at Davis-Monthan AFB		✓	✓			✓		A CSAR unit has been established at Davis Monthan AFB in order to meet Air Force needs to support worldwide, deployable long-range combat search and rescue of downed aircrew members. This action added 12 HH-60 helicopters, 10 HC-130 fixed-wing aircraft, and 1,059 personnel to Davis-Monthan AFB. Training occurs in low altitude tactical navigation areas of East TAC, North TAC (northeast of Crater Range), and the Yuma tactical aircrew combat training system range. (This action began in the fall of 2002, and has now been completed.)
New Actions Identified for This Cumulative Effects Analysis									
71	APS Palo Verde Hub to North Gila Substation 500kV Transmission Line	✓	✓				✓		Proposed construction of a 500 kV transmission line from Palo Verde Nuclear Generating Station to the North Gila substation located in Yuma. The proposed route of the transmission line follows an existing utility corridor located north of Interstate 8. The Final EA, FONSI, and Decision Record were issued in 2007.
72	Volkswagen Proving Grounds	✓	✓				✓		Volkswagen proposes to lease 11,900 acres of State Trust Land to construct and operate global automobile proving grounds to be located approximately 10 miles west of Gila Bend. Construction is proposed to begin after 2010.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	**Name**	**See Map**	**BMGR East**	**BMGR West**	**Organ Pipe Cactus NM**	**Cabeza Prieta NWR**	**Other Areas**	**Mexico**	
73	Renewable energy	✓	✓	✓			✓		Although there is potential for renewable energy resources such as solar and wind to occur on land surrounding the BMGR, the only permitted activity in or near the BMGR is the Solano Solar Power Generating Station, discussed below. There is some small-scale commercial solar energy testing activity on private land in Arizona. A renewable energy production plant is proposed in western Pinal County. The reasonably foreseeable development of solar energy resources on the public land in Arizona has seen a major increase in the past year (2008).
74	Gila Bend Residential Developments	✓	✓				✓		In addition to the Paloma Ranch Master-planned community (see action #61 above), two Master-planned communities are proposed within the city of Gila Bend. One of the communities would be located on the north and south side of Interstate 8 and would border the northern boundary of BMGR East.
75	Kofa NWR Mountain Lion Predatory Management EA	✓		✓			✓		Kofa NWR is currently in the administrative draft phase of this EA in cooperation with the AGFD, the Department of Defense, the BLM, and the National Park Service. There is currently no predation management guidance for Kofa NWR. This EA would provide the management for mountain lion predation upon desert bighorn sheep in an effort to increase the declining population of desert bighorn sheep.
76	Solano Solar Power Generation Station	✓	✓				✓		Construction is expected to begin in December 2009, with the estimated completion in 2011. Abengoa Solar (a subsidiary of a similarly named technology company based in Seville, Spain) and Arizona Public Service plan to build a 280-megawatt solar thermal power plant about 70 miles southwest of Phoenix just southwest of Gila Bend. During 3 years of construction, the power plant will employ 1,500 workers at the 1,900-acre site. After completion, it is anticipated that 80 permanent employees will work at Solano.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe Cactus NM	Cabeza Prieta NWR	Other Areas	Mexico	
77	Re-establishment of Sonoran pronghorn within their historic range in southern Arizona	✓				✓			The USFWS proposes to relocate some Sonoran pronghorn raised in a captive-rearing pen on the Cabeza Prieta NWR in areas outside of the current occupied habitat within the United States. The proposal consists of two components: 1) construction and operation of a second captive-rearing pen, and 2) capture-relocate-release of Sonoran pronghorn. Two sites are being considered for either project component: King Valley region of the Kofa NWR and east of State Route 85 on BMGR East. The second pen would cover 0.5 square mile and include a forage enhancement plot within the pen to irrigate native vegetation, two water sources, and a well for the water sources and irrigation system. The proposal includes moving approximately 10 animals to the new pen in late 2010; if the new pen site is successful as a captive-rearing pen, releasing up to 20 Sonoran pronghorn from the pen into suitable habitats adjacent to the pen site during the winters of 2012-2013 and 2013-2014.
78	Implementation of the BMGR Integrated Natural Resources Management Plan		✓	✓					In 2007, the Air Force and Marine Corps, in cooperation with the Department of the Interior and AGFD, completed an INRMP for the BMGR. Resource-specific management goals were established for earth, water, vegetation, wildlife, and visual resources as well as transportation, recreation, Native American access, non-military land use, perimeter land use, and Special Natural/Interest areas. Some of the high priority actions in the plan include developing and implementing wildlife, habitat, and cultural resources inventory and monitoring programs; implementing the cultural resources programmatic agreement; implementing recovery actions for special status species; developing an invasive species management program; establishing best management practices to mitigate impacts to range resources; publishing revised public visitation maps and rules; installing road signs and fences to support road infrastructure and public access; and codifying rules and establishing a schedule of fees for enforcing the regulations.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	**Name**	**See Map**	**BMGR East**	**BMGR West**	**Organ Pipe Cactus NM**	**Cabeza Prieta NWR**	**Other Areas**	**Mexico**	
79	Testing of extended-range, precision-guided artillery projectiles		✓	✓		✓			The BMGR is being considered by the U.S. Army Yuma Proving Ground (YPG) as a potential site for testing of extended-range, precision-guided artillery projectiles over firing distances that typically would exceed 25 km. As provided by the MLWA of 1999, armament and high-hazard testing is a Congressionally authorized use of the BMGR. Although testing use of the BMGR has occurred on occasion, the priority use of this range always has and is expected to continue to be training of military flight crews. YPG consideration of the BMGR is in an early exploratory phase designed to evaluate the potential compatibility of artillery test activities with ongoing military training operations and Air Force and Marine Corps management requirements. Test fires on the BMGR would likely be used to supplement test programs being conducted at YPG, particularly those that may require more land and restricted airspace than is available at YPG to provide adequate safety buffers. Artillery test operations would require designated firing points, or gun positions; designated targets and associated impact areas; and associated safety buffers. Some instrumentation would also be required to monitor and record test performances. Most test rounds would likely be inert although some live rounds may require firing to validate the performance of pre- or post-production projectiles.

TABLE 5-1

PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe Cactus NM	Cabeza Prieta NWR	Other Areas	Mexico	
80	Temporary Basing of an Interim Pilot Training Center for F-35B			✓			✓		The Marine Corps is proposing to temporarily establish an interim F-35B Pilot Training Center (PTC) at Marine Corps Air Station (MCAS) Yuma, Arizona. This action would involve the temporary basing of a squadron of up to 18 F-35B aircraft and establishment of the interim PTC over the period from 2010 through 2014. This action is being proposed as a contingency measure in response to potential delays with the Initial Joint Training Site. The Marine Corps anticipates that the PTC would be disestablished at MCAS Yuma and relocated per the 2005 Base Realignment and Closure Act recommendations to Eglin Air Force Base after completion of a supplemental EIS for the Initial Joint Training Site proposal and resolution of any litigation. A substantial amount of training for the Interim PTC would require the use of training ranges and special use airspace, to include BMGR West. The amount of use for the specific ranges and airspace has not yet been determined for this proposed action. The Interim PTC syllabus includes numerous events involving air-to-ground ordnance delivery training. At BMGR West, these events would include inert laser guided bomb delivery to existing BMGR West targets, estimated at 9 to18 annually. Ordnance delivery would also occur at existing targets within the Chocolate Mountain Gunnery Range/R-2507 in California.

5.3 EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

5.3.1 Introduction

The additive or interactive effects of the ten actions proposed in this EIS, in aggregate, when considered together with the effects of other past, present, and reasonably foreseeable future actions in the BMGR East region, are presented below by resource category.

5.3.2 Earth Resources

The potential for cumulative impacts to earth resources is limited to those actions that have additive or interactive impacts with the highly localized impacts of the proposed action to earth resources (noted in Sections 4.2.1 through 4.2.11). Therefore, this cumulative impacts analysis is focused on actions within BMGR East and at Gila Bend AFAF and is primarily limited to the past and ongoing military use footprint associated with airfield and support infrastructure at Gila Bend AFAF. The analysis also considers road, target infrastructure, munitions delivery, range maintenance, natural and cultural resource management, and EOD activities at BMGR East.

As detailed in Section 2.3.1, the extent of soil disturbance from training activities on BMGR East has largely been defined by the extent of the EOD footprint. The current biennial EOD clearance areas are greatly reduced from the pre-2001, 5-year footprint (see Figure 2-7). The establishment of the current biennial EOD clearance areas has had a countervailing impact by lessening the overall disturbance footprint. However, EOD clearance areas experience moderate to low disturbance, with higher levels of disturbance occurring proximal to targets. Military training activities on the BMGR cause low to moderate levels of disturbance of vegetation on about 6.9 percent of the range surface. In addition, approximately 3 percent of the range surface receives moderate to high levels of disturbance that results in complete disruption of the original soil surface in core use areas or developed use sites (Departments of the Air Force, Navy, and Interior 2006). Within this context, there would be additive impacts to soil resources from continued military use at BMGR East. Despite the acreage and levels of disturbance associated with the implementation of the proposed actions in aggregate (see Table 4-1), the overall military surface disturbance footprint within the BMGR would remain relatively unchanged. Correspondingly, key findings of the 2006 EIS for the BMGR INRMP cumulative impacts analysis at the ecological landscape and human community scales of the BMGR and its relevant ROI would remain unchanged.

The majority of the other past, present, and reasonably foreseeable actions identified would occur outside of BMGR East and well beyond the area of potential effect for the proposed

actions evaluated in this EIS. The following actions and their potential cumulative effects are noted:

- The highly dispersed continued UDI and U.S. Border Patrol activities at BMGR East (e.g., vehicle use, ORV pursuits, etc.) and other regular use areas (e.g., drag roads) potentially represent minor localized additive impacts with the footprints of the proposed actions. Recent actions have reduced UDI traffic and lessened soil disturbance resulting from UDI activities in BMGR East and the vicinity; however, recovery of disturbed soils would occur at varying rates and could require many years.
- The establishment of additional Sonoran pronghorn forage plots could potentially result in minor and localized additive impacts to soils.
- As new weapons systems come on line and are authorized for use at BMGR East, they could result in a change in surface disturbance levels at existing targets or new impact areas.
- The YPG proposal to fire precision-guided artillery projectiles is in a preliminary stage so the size and location of the anticipated impact area is yet to be defined. However, ground disturbance is anticipated at the impact area and may result in impacts to soils and increase potential for soil erosion.

5.3.3 Water Resources

The cumulative impacts analysis presented for earth resources closely correlates with the cumulative impacts analysis for water resources. However, the analysis of cumulative impacts on water resources occurs at the watershed level, and considers the potential for increased sedimentation loads or disruption of natural drainage within the Gila River watershed. The ground disturbing activities noted for soil resources as assessed in Section 5.3.2 may result in minimally increased sedimentation in drainages of the Gila River watershed. Other proposed actions involving earth disturbing activities between BMGR East and the Gila River would have additive impacts. This includes the following relatively large-scale developments:

- increased urbanization in the vicinity of Gila Bend, including Paloma Ranch,
- establishment of the proposed Volkswagen proving grounds, and
- establishment of proposed Abengoa Solar and other power plants.

The surface hydrology between BMGR East and the Gila River would be further altered by these large-scale developments. These developments would occur in accordance with local development guidelines, and require implementation of BMPs and other impact reducing control

measures. The overall magnitude of cumulative impacts to water resources from these cumulative actions cannot be predicted; however, potential impacts to water resources associated with the implementation of the proposed actions would represent a minor incremental impact in comparison to these other actions.

5.3.4 Air Quality

The construction emissions associated with the proposed actions would generate low to moderate emissions, with the bulk of emissions associated with land disturbance activities and the resultant production of PM_{10}. Generator emissions from Proposal 1, operation of the moving vehicle target under Proposal 3, and sand and gravel extraction under Proposal 10 would result in minor ongoing and/or recurring air emissions. The reduced flying altitude of aircraft over Cabeza Prieta NWR under Proposal 5 would not generate additional emissions; however, emissions would impact a more localized area due to the reduced altitude. Nearly all of the potential cumulative effect actions identified are within the same airshed and have the potential for additive air emissions. This includes ongoing military and non-military activities within BMGR East, particularly next generation aircraft that may begin training at BMGR East in future years. Outside BMGR East, the potential Phelps Dodge Ajo mine reopening, establishment of power plants, the Volkswagen proving ground, and large-scale residential developments have the greatest potential for additive emissions. Barring the reopening of the mine in Ajo, these cumulative impacts are not expected to result in emission levels that would exceed the National Ambient Air Quality Standards within or in the vicinity of BMGR East. Spatially, the greatest potential for cumulative impacts on air quality to occur is with actions within BMGR East.

The potential effects of proposed GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, a measurable impact on global climate change would only occur when proposed GHG emissions combine with GHG emissions from other man-made activities on a global scale.

Currently, there are no formally adopted or published NEPA thresholds of significance for GHG emissions stemming from proposed actions. On February 11, 2010, CEQ released *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions.* This document suggests that while there is no significance threshold for NEPA analysis of GHG emissions, that the "25,000 metric tons may provide a useful, presumptive threshold for discussion and disclosure of GHG emissions" and that "This rationale is pertinent to the presentation of NEPA analysis as well". Thus, a review of the GHG emissions from the proposed BMGR East operation actions, as compared to the 25,000 metric ton per year threshold provides a context for discussion. GHG emissions were calculated and are included in Appendix B (see

also Section 4.4.11). These emissions only achieve approximately 0.08 percent of the 25,000 metric tons discussion threshold and therefore can be construed as negligible. The GHG emissions would not be considered a significant contributing factor to global climate change.

5.3.5 Biological Resources

The ecology of BMGR East has retained much of the natural process and function only attainable across large protected landscapes. The size of the BMGR and its proximity to other large masses of protected lands including the Sonoran Desert and Organ Pipe Cactus National Monuments, Cabeza Prieta NWR, and El Pinacate Biosphere Reserve, together with the natural resources management plans and conservation values, allow these lands to retain a high degree of biotic diversity.

However, actions in and around the BMGR may have long-term ramifications to species and habitats on the BMGR and adjacent lands. Industrial, residential, and agricultural development along the Interstate 8 corridor, in the Yuma area, and in Mexico may increase various disturbance factors and impact species and wildlife populations in the region. Restrictions on wildlife movement patterns intensify as roads, canals, railroads, border barriers, fencing, and patrols further limit intra-species contact in a regional context. Additionally, increased disturbance to soils perpetuate the presence of nonnative plants that may disrupt natural systems. Nonnative species are aided in their dispersal by off-road vehicles, new and expanded roadways, and changing ecological process. Expanding illegal border traffic and the attempted control of such activities are major factors in the future management of wildlife, and especially the Sonoran pronghorn, on BMGR East.

Land managers are faced with managing for factors that cannot necessarily be controlled. Many of the species and habitats on BMGR are at their ecological extreme. Recent periods of drought have been the worst ever recorded, and maximum temperatures attain new records on a frequent basis. For example, in the Sonoran Desert region, changing climatic conditions are leading to redistribution of species in the ranges and alternations to annual phenomena such as species breeding cycles.

A prime example of a species on the ecological edge is the Sonoran pronghorn, whose population has been decimated by the drought and continues to be stressed by human activities within its habitat range. However, there are also countervailing human influences such as the success from recovery plan actions including forage plots and captive breeding/rearing pens that have contributed to the increased population numbers sufficiently to consider proposals to relocate animals into its historic range. Should the proposal for re-establishment of Sonoran

pronghorn within their historic range in southern Arizona (project 77 in Table 5-1) result in re-establishment of the Sonoran pronghorn east of State Route 85, a reassessment of ongoing activities in this area and potential impacts Sonoran pronghorn would be evaluated. The population would be classified under the Section 10(j) of the ESA, which is an experimental population. The Air Force would participate in such an evaluation in coordination with other members of the Sonoran Pronghorn Recovery Team (USFWS, AGFD, MCAS Yuma, National Park Service, BLM, the University of Arizona, and the Mexican Government).

5.3.6 Land Use

Civilian land use, land status, or land management changes would not directly result from implementation of the actions proposed in this EIS. However, all development in the region contributes to the ongoing loss of open space and Sonoran Desert environment. The proposed actions have a relatively small developmental footprint, but would include target features and support facilities within the STA, additional roadway for the moving vehicle track, target features in Manned Range 3 for helicopter gunnery training, and a new taxiway at the Gila Bend AFAF. These uses of what is currently best characterized as open desert would contribute to past, present, and proposed larger-scale land developments in the BMGR region, including residential and other urban developments, highways and other transportation features, utility infrastructure including power plants, native land conversions for agricultural purposes, and the Volkswagen proving grounds.

The proposed actions would have no additive cumulative effect on the dimensions, hours of use, or utilization rates of the restricted airspace at the BMGR and no additive effect on non-military aviation outside of the BMGR. The lowering of the operational floor of R-2301E over a portion of the Cabeza Prieta NWR would allow for an increase in military flight operations below 1,500 feet AGL in the affected area, which are currently limited to twice-annual use of the low-level flight corridors currently authorized for the Marine Corps WTI course. WTI use of the existing low-level corridors, which are currently authorized by the 1994 MOU, includes 240 to 480 annual sorties of fixed-wing aircraft and 40 to 80 annual sorties of helicopters. Helicopters operated by the U.S. Border Patrol typically have recently been overflying this area of the Cabeza Prieta NWR at altitudes below 500 feet AGL on a twice a day basis to perform routine surveillance for illegal traffic crossing from Mexico. Cross-border traffic declined sharply in 2008 so the frequency with which the surveillance flights are required in the future may also decline if this trend continues. Periodic surveillance or survey flights associated with resource management activities also occur in the area on an occasional basis. The proposed action would introduce an estimated 4,200 to 6,200 fixed-wing aircraft sorties to the area annually and would become the predominant aviation activity in the affected airspace. The scheduling and range

control procedures required for all flight operations in BMGR East restricted airspace would preclude conflicts between aircraft that are not participating in the same activity. Thus, there would be no adverse additive cumulative effect on flight operations in the affected airspace (below 1,500 feet AGL overlying the Cabeza Prieta NWR).

5.3.7 Outdoor Recreation

The greatest cumulative influence on recreation is population growth and increased urbanization in the BMGR region. As population increases and places where people live and work occur closer to the BMGR, there is a correlating increase in recreation demand. Additionally, recreational interests and demand change in accordance with population trends (e.g., increased interest in ORV use, new recreation activities such as geocaching, etc.). Such issues are being addressed by land managers for recreation lands in the BMGR region such as the USFWS for Cabeza Prieta NWR; National Park Service for Organ Pipe Cactus National Monument; and BLM for Sonoran Desert National Monument, the Ajo Block, and other BLM lands in the BMGR region. Part of the continuing mission for these land managers is to respond to and accommodate changes in recreation demand and to continue to manage the Wilderness areas in accordance with the requirements for these lands. Although recreation opportunities and the setting in BMGR East and West are necessarily constrained by the military mission, most of the BMGR West lands are accessible for recreation. Therefore, the non-wilderness portions of Cabeza Prieta NWR, Organ Pipe Cactus National Monument, Sonoran Desert National Monument and BLM lands would be most subject to changing recreation use patterns.

Within BMGR East, there would be the potential for the proposed action – particularly the proposed STA, emerging weapons systems, and YPG artillery impact area – to result in increasing conflicts between the military mission and recreation use, and potentially result in reduced recreation access to the BMGR, particularly with regard to bighorn sheep hunting in the Mohawk Mountains.

5.3.8 Health and Safety

Identification and management of health and safety risks reduces the potential for additive and interactive health and safety impacts. The laser hazard area associated with the proposed STA, safety footprints associated with emerging weapons systems, and the YPG artillery impact area may increase the overall restricted access areas of the BMGR at certain times or on a permanent basis. Threats associated with UDI and U.S. Border patrol activities continue to be dynamic, and the downward trend in UDI smuggling activity is expected to continue. Additional analysis would be conducted for the introduction of emerging weapons systems and/or the YPG artillery firing/BMGR impact area. With management programs, cumulative impacts would not create a

situation involving endangerment or unusual risk to military personnel, visitors to BMGR East, or residents and visitors of lands adjacent to the range.

5.3.9 Cultural Resources

All of the potential cumulative effects actions listed in Table 5-1 that cause ground disturbance or affect land use have the potential to affect cultural resources. All actions on federal land or undertaken by federal agencies (including federally permitted, licensed, or funded actions) would be subject to review under Section 106 of the NHPA; thus impacts to historic properties would be taken into account. Private development on lands where cultural resources are unprotected poses the greatest threat to those resources, but quantification is difficult without details regarding where development would take place and how much land would be affected. Because on a regional scale there is a high ratio of federal lands to private lands, most actions that might affect cultural resources would be subject to review. Within BMGR East, actions that cause the greatest amount of ground disturbance will make the greatest contribution to cumulative effects. Those activities include air-to-ground ordnance delivery, target and road maintenance, and EOD clearances. These activities may impact resources directly and also may accelerate erosion that ultimately impacts sites. This potential for impact is greatest in the biennial EOD clearance areas extending 300 feet from existing targets and, secondly, in the decennial EOD clearance areas extending 1,000 feet from existing targets.

5.3.10 Hazardous Materials and Waste

Many of the cumulative effect actions could potentially increase the use, transport, and storage of hazardous materials and generation of hazardous and solid wastes in the BMGR region. Required compliance with federal, state, and local regulations reduces the potential release of these materials and wastes to the environment. Greater concentrations of these materials and wastes would occur in Gila Bend and the increasing developed area and Ajo (particularly if the Phelps Dodge Ajo mine is reactivated) as opposed to within BMGR East. With regard to the proposed actions, additive and interactive impacts are associated with hazardous materials and waste associated with ongoing military and non-military use of BMGR East; however, ongoing pollution prevention, waste minimization, and spill response programs minimize such effects. Next generation munitions could have different munitions constituents, and YPG artillery may result in a change in distribution of munitions constituents within BMGR East. Ongoing EOD clearance operations and periodic evaluation of the potential for munitions constituents to be transported off-range would have countervailing impacts. The assessment and cleanup of the parcels of land formerly part of the BMGR that were not renewed with the 1999 MLWA would also have countervailing impacts.

5.3.11 Socioeconomics and Environmental Justice

The socioeconomic impacts of the proposed actions would be additive and interactive with the existing expenditures and employment associated with operation and maintenance of BMGR East. Contractors currently providing services, such as road maintenance, may have expanded employment opportunities for proposals such as sand and gravel extraction, target reconfiguration, or road paving. Short-term job opportunities would also increase due to construction of a new taxiway and air traffic control tower at the Gila Bend AFAF; however, these impacts would be modest.

There would also continue to be an economic benefit by extension to Luke AFB and other installations that use the BMGR to support their training. Because the range supports the missions of these installations, there is an interrelationship between the economic impact realized in the community where these installations are located and the BMGR. While the implementation of the proposed actions would provide for enhancement of existing training missions, the overall economic support interrelationship would not change in any meaningful way; therefore, the cumulative impact would be negligible.

The economic expansion and development within the region identified, with many of the other potential cumulative impact issues, would have a greater influence on jobs, economic activity, demographics, and other socioeconomic elements than the implementation of the proposed actions. As the socioeconomic conditions in the area change, there would be little direct impact to BMGR East; however, the economic contribution of the BMGR to the surrounding communities would become less important as other economic sectors generate more direct and indirect jobs and spending. With increased economic activity, there could be changes in low-income population distribution in the areas surrounding BMGR East. Changes in demographics could also reduce the minority population in these communities.

The BMGR East 55 dB cumulative noise contours extend off-range into Census Tracts 49 and 50 in the Ajo area (see Figure 3-12). While such noise exposure levels do not rise to a level of significance, they are potentially adverse as they would be expected to result in low levels of annoyance in the community (based on the Schultz curve, see Figure C-2 in Appendix C). Census Tract 50 is defined as a minority and low-income population, with 46.5 percent of the population minorities and 22.3 percent of the population below the poverty level. However, Census Tract 49 is not considered a minority or low income population. Therefore, this ongoing adverse noise impact would not disproportionately affect a minority or low-income population.

5.3.12 Noise

Noise associated with the proposed actions would be additive to noise from ongoing military operations on the BMGR as well as other sources of noise in the BMGR vicinity such as highway traffic and aircraft operations by other agencies (i.e., U.S. Border Patrol and AGFD). Noise generated from these sources, while present, is at much lower levels than the noise associated with military aircraft operations and explosive ordnance detonations. Other non-military aircraft operating on the BMGR are relatively quiet (i.e., in comparison to most DoD aircraft) and would not be expected to cause cumulative effects to the noise exposure levels or the noise environment. The evaluation of the noise signature of future military aircraft is ongoing and a separate assessment of environmental impacts (including noise) would be required if and when new aircraft are proposed for use on the BMGR.

The most probable successor aircraft for BMGR East and Gila Bend AFAF is the F-35. Although accurate prediction of the specific future noise contours of the successor aircraft remain under development, preliminary noise data indicates that it may be noisier than the current F-16 or A-10. Recognizing that the area affected by future noise contours could therefore be larger than under the noise contours for current operations, the Gila Bend AFAF Joint Land Use Study (JLUS) is based on noise contours of an alternative aircraft, the F-18E Super Hornet, which represents a reasonable approximation of a new single engine fighter in noise impacts (see Figure 3-5) (Arizona Department of Commerce 2005). Implementation of the JLUS recommendation and implementation of recommendations in the Gila Bend Master Plan Update and planning for unincorporated Maricopa County would have countervailing impacts. The potential artillery firing with YPG would have the potential for additive explosive noise impacts requiring further evaluation in the environmental analysis for that proposal.

The Temporary Basing of an Interim PTC for F-35B at MCAS Yuma would potentially have cumulative noise effects on a regional scale, but due to the geographic separation between the proposed PTC training operations and the interim nature of these operations, no cumulative impacts with the proposed action are foreseen.

6 PERSONS CONSULTED

Federal Contacts

Border Patrol
- Yuma Sector
  - Agent Michael Bernacke

Bureau of Land Management
- El Centro (California) Field Office
  - Linda Costell, Lands and Realty Specialist
- Imperial Sands Dunes National Recreation Area
  - Neal Hamada, Recreation Area Manager
- Phoenix Field Office
  - Jim Anderson, Lands and Realty Specialist
  - Hillary Connor, Lands and Realty Specialist
- Sonoran Desert National Monument
  - Lori Young

Department of the Air Force
- Luke Air Force Base
  - Aaron Alvidrez, Wildlife Biologist
  - John Arnett, Wildlife Biologist
  - Tim Berry, Explosive Ordnance Disposal Specialist
  - Chris Black, GIS Specialist
  - Chas Buchanan, Operations
  - Darcy Finzer, Yulista Security
  - Daniel Garcia, Environmental Science Manager
  - Carol Heathington, Strategic Operations Planner
  - Adrienne Knoll, GIS Specialist
  - Lisa McCarrick, Environmental Planner
  - Yvonne Newell, Air Program Manager
  - Adrianne Rankin, Archaeologist
  - Richard Whittle, Wildlife Biologist
- Air Education Training Command
  - Marion Erwin, Planning and Programs Branch

Immigration and Naturalization Service
- U.S. Border Patrol

Marine Corps
- MCAS Yuma
  - Ron Pearce, MCAS Range Management Department Director

National Park Service
Organ Pipe Cactus National Monument
Peter Holm, Ecologist
Dane Tantay, Law Enforcement

U.S. Army Corps of Engineers
Elizabeth Brooks, Arizona Regulatory Branch, Los Angeles District, Arizona-Nevada Office

U.S. Fish and Wildlife Service
Cabeza Prieta National Wildlife Refuge
Margot Bissell, Public Use Assistant,
Curtis McCasland, Refuge Manager
Jim Atkinson, Sonoran Pronghorn Team Lead
Kofa National Wildlife Refuge
Susanna Henry, Refuge Manager

State Contacts

Arizona Department of Environmental Quality
Nancy Caroli, Senior GIS Analyst

Arizona Game and Fish Department
Jill Bright, Wildlife Specialist II
Russ Engel, Habitat Program Manager
John Hervert, Wildlife Program Manager
Sabra Schwartz, HDMS Program Supervisor

Arizona Department of Environmental Quality
Scott Porter, Compliance and Enforcement Supervisor

Arizona Department of Transportation
Marsha Farnsworth, Administrative Assistant

Local and Other Contacts

City of Yuma Dept. of Community Planning
Doug Thomsen, Planner

The Flood Control District of Maricopa County
Tom Wergen, Sand and Gravel Permitting

Maricopa County Planning and Development
Rob Kuhfuss, Planner

Pima County Planning and Zoning
Arlan Colton, Planner
Janet Elmo, Planner
Sherry Ruther, Planner

Town of Ajo
Silvia Howard, Town Planner

Town of Gila Bend
Melissa Cantor, Town Planner

Town of Wellton
Town Planner

Yuma County Planning Department
Andrew Fanagan, Planner

7 DRAFT EIS DISTRIBUTION

The Draft EIS for the BMGR East Range Enhancements was sent to the agencies and organizations listed in this chapter. The Draft EIS was also sent to the following libraries to provide opportunities for the general public to review the document.

LIBRARIES

Ajo Branch Library

Casa Grande Public Library

Flagstaff Public Library

Gila Bend Branch Library

Glendale Public Library

Mesa Public Library

Phoenix Public Library

Prescott Public Library

San Luis Branch Library

Scottsdale Public Library

Tempe Public Library

Tohono O'odham Education Department Library

Tucson/Pima Library

Wellton Branch Library

Yuma County Library

FEDERAL GOVERNMENT

Congressional Representatives

U.S. House of Representatives

Representative Jeff Flake, 6th District

Representative Trent Franks, 2nd District

Representative Gabrielle Giffords, 8th District

Representative Raul Grijalva, 7th District

Representative Harry E. Mitchell, 5th District

Representative Ed Pastor, 4th District

Representative Ann Kirkpatrick, 1st District

Representative John Shadegg, 3rd District

U.S. Senate

Senator Jon Kyl

Senator John McCain

Department of the Interior

Bureau of Land Management

Brian Bellew, Tucson Field Office

Emily Garber, Lower Sonoran Field Office

Todd Shoaff, Yuma Field Office

Jim Kenna, Arizona State Office

Fish and Wildlife Service

Sherry Barrett, Arizona Ecological Services Field Office, Southern Arizona

Curt McCasland, Cabeza Prieta National Wildlife Refuge

Steve Spangle, Arizona Ecological Services Field Office

Dr. Benjamin Tuggle, Southwest Regional Office

Headquarters

Dr. Willie R. Taylor, Office of Environmental Policy and Compliance

National Park Service

Hal J. Grovert, Intermountain Regional Office, Denver

Lee Baiza, Organ Pipe Cactus National Monument

U.S. Department of Interior

Loretta Sutton, Office of Environmental Policy and Compliance

Department of Homeland Security

Border Patrol

Brian Levin, Tucson Field Operations Office

Environmental Protection Agency

Headquarters

Stephen L. Johnson, Administrator

Region IX

Kathleen Johnson, San Francisco

David Gasman, Environmental Review Office , San Francisco

STATE GOVERNMENT

Department of Environmental Quality

Martin McCarthy, Southern Regional Office

Patrick Cunningham, Phoenix Main Office

Arizona State Historic Preservation Office

James Garrison, State Historic Preservation Officer

Ann Howard, Compliance Specialist

Department of Water Resources

Sandra Fabritz-Whitney, Water Management Division

Game and Fish Department

Pat Barber, Region IV

Troy Smith, AGFD Region IV Acting Habitat Program Manager

Bill Knowles, AGFD Region IV Acting Habitat Program Manager

Larry D. Voyles, State Office

Governor Jan Brewer's Office

LOCAL GOVERNMENT

County Government

Maricopa County

Board of Supervisors

Pima County

Board of Supervisors

Pinal County

Board of Supervisors

Yuma County

Harold Aldrich, Planning Division

Gail Gallagher, Department of Development Services

Board of Supervisors

Community Government

City of Ajo

George Gradillas, Constable

Town of Gila Bend

Fred Hull, Mayor

Town of Wellton

Gary L. Rinehart, Town Manager

TRIBAL GOVERNMENT

Ak-Chin Indian Community

Caroline Antone, Cultural Resource Manager

Louis J. Manuel, Chairman

Cocopah Tribe

Sherry Cordova, Chairwoman

Jill McCormick, Cultural Resource Manager

Colorado River Indian Tribes

Eldred Enas, Chairman

Michael Tsosie, Director, Colorado River Indian Tribal Museum

Fort McDowell-Yavapai Nation

Dr. Clinton Pattea, President

Karen Ray, Cultural Program Specialist

Fort Mohave Indian Tribe

Linda Otero, Director, Aha Makav Cultural Society

Timothy Williams, Chairman

Fort Yuma-Quechan Tribe

Mike Jackson, Sr., President

Chairperson, Quechan Cultural Committee

Bridget Nash-Chrabascz, Tribal Historic Preservation Officer

Gila River Indian Community

Andrew Darling, Director, Cultural Resource Management Program

Barnaby Lewis, Tribal Historic Preservation Officer

William R. Rhodes, Governor

Hia C-ed Alliance

Lorraine Eiler

Havasupai Tribe

Roland Manakaja, Natural Resources Director

Don Watahomigie, Chairman

Hopi Tribe

Mary A. Felter, Tribal Secretary (Chairman and Vice-Chairman offices vacant when Draft EIS was prepared)

Leigh Kuwanwisiwma, Director, Hopi Cultural Preservation Office

Terry Morgart, Legal Researcher, Hopi Cultural Preservation Office

Hualapai Tribe

Loretta Jackson-Kelly, Tribal Historic Preservation Officer, Office of Cultural Resources

Wilfred Whatoname, Sr., Chairman

Intertribal Council of Arizona

John R. Lewis, Executive Director

Kaibab Band of Paiute Indians

Charley Bullets, Director Cultural Preservation Office

Ona Segunda, Chairwoman

Pascua Yaqui Tribe

Amalia A.M. Reyes, Language and Culture Preservation Specialist

Peter Yucupicio, Chairman

Salt River Pima-Maricopa Indian Community

Shane Anton, Cultural Preservation Supervisor

Diane Enos, President

San Carlos Apache Tribe

Vernelda Grant, Director, Historic Preservation and Archaeology Department/Tribal Historic Preservation Officer

Wendsler Noise, Chairman

Tohono O'odham Nation

Stanley Cruz, Chairman, Pisinemo District

Delma Garcia, Chairwoman, Hickiwan District

Veronica Harvey, Chairwoman, Baboquivari District

Barbara Havier, Chairwoman, Sells District

Marla Kay Henry, Chairwoman, Chukut Kuk District

Karen Howe, Ecologist, Wildlife Program

Vernon Jose, Legislative Chairman

Joseph Joaquin, Cultural Affairs Specialist

Phyllis Juan, Chairwoman, Schuk Toak District

Camillus Lopez, Chairman, Gu Achi District

Isidro B. Lopez, Vice Chairman

Albert Manuel, Jr., Chairman, San Lucy District

Ned Norris Jr., Chairman

Austin Nunez, San Xavier District

Felicia Nunez, Legislative Vice Chairwoman

Pete Delgado, Executive Assistant to Chairman

Geneva Ramon, Chairwoman, Gu Vo District

Peter Steere, Cultural Affairs Department

Rita Wilson, Sif Oidak District

Tonto Apache Tribe

Ivan Smith, Chairman

Wally Davis, Jr., Cultural Resource Department

White Mountain Apache Tribe

Ronnie Lupe, Chairman

Ramon Riley, Cultural Resources Director

Mark Altaha, Tribal Historic Preservation Officer

Yavapai-Apache Nation

Thomas Beauty, Chairman

Yavapai-Prescott Tribe

Linda Hogo, Director Cultural Resources

Ernest Jones, Sr., President

Zuni Pueblo

Norman Cooeyate, Governor

Kurt Dongoske, Preservation Coordinator, Zuni Cultural Resources Enterprises

NON-GOVERNMENTAL ORGANIZATIONS

Arizona Desert Bighorn Sheep Society

Jim Unmacht, President

Arizona Grazing Clearinghouse

Jeff Burgess

Arizona State Association of 4WD Clubs

Rebecca Antle, President

Arizona Wildlife Federation

Ryna Rock, President

Center for Biological Diversity

Rebecca O'Sullivan, Tucson Regional Office Manager

Coalition for Sonoran Desert Protection

Carolyn Campbell, Executive Director

Defenders of Wildlife

Matt Clark, Southwest Representative

Eva Lee Sargent, Director of Southwest Program

Desert Wildlife Unlimited

Norm Wuytens, President

Drylands Institute

Stephen Buchmann, President

Friends of Cabeza Prieta

Bill Broyles

International Sonoran Desert Alliance

Tracy Taft, Executive Director

Natural Resources Defense Council

Sharon Buccino, Land & Forests Program Director

Sierra Club

Southwest Regional Office

Sandy Bahr, Grand Canyon Chapter

Sonoran Institute

Luther Propst, Executive Director

Southwest Forest Alliance

Dave Sherman

Sky Island Alliance

Melanie Emerson, Executive Director

The Four Corners Institute

Dr. Melissa Savage

The Nature Conservancy

Rob Marshall

The Wilderness Society

Deanna Archuleta, Regional Director

Phil Hanceford, Denver Office

Yuma Audubon Society

Pat Rather, President

Yuma Valley Rod and Gun Club

Jim Ammons, President

INDIVIDUALS

Michael Ebert

Paul Friesma

Carole Galvez

LeRoy Santan

Betty Mason

Margaret McKenna

Wendell Setterberg

Suzanne Weadock

8 LIST OF PREPARERS

TEC Inc.

Dana H. Banwart Comparison Table	B.S. in Biology with 9 years of environmental management and planning.
Kate Bartz Recreation Public Health and Safety	M.S. Landscape Architecture and Environmental Planning with 22 years of experience in natural resources and environmental planning.
Dan Broockmann Cultural Resources	M.A. in Anthropology with 5 Years experience in cultural resources.
Elaine Emerson Technical Editing	B.A. in English Literature and American Studies with 18 years experience as an editor.
Lesley Hamilton Air Quality	B.A. in Chemistry with 21 years in air quality and environmental management.
Mary Harclerode Production	A.A. Business Administration with 2 years experience.
Rachel Healey Socioeconomics Hazardous Materials and Waste	B.S. in Biology, M.B.A., with 5 years experience in environmental planning.
Elizabeth Jennings Technical Editing	B.A. in English, with 5 years of editing experience.
Terry Rudolph Cultural Resources	M.A. in Anthropology with 30 years of experience in cultural resources and environmental management.
Meredith Sherrill GIS Specialist	B.A. in Environmental Science with 2 years of GIS experience.
Ken Swain Earth Resources Water Resources	M.S. in Geology with 17 years in site characterization, remediation, and restoration.

Asher Williams Earth Resources Water Resources	B.S. in Environmental Science and 1 year experience in environmental planning.
Carol Wirth Project Management Noise	B.S. Ecology and Evolutionary Biology with 15 years experience in environmental planning.

Logan Simpson Design Inc.

Heather English Biological Resources	M.S. Biology with 11 years experience in wildlife biology.
Bruce Palmer Biological Resources	BS in Wildlife Biology with almost 30 years of experience in natural resource management, endangered species issues, and the application of environmental regulation.
Richard Remington Biological Resources	B.S. Wildlife Biology with 32 years experience in wildlife management and habitat planning.

URS

Beth Defend Project Management Description of Proposed Action and Alternatives Purpose and Need Land Use Cumulative Impacts Public Involvement	BA in Technical Journalism with 24 years in NEPA compliance and environmental planning
Ryan Rausch Cumulative Impacts	BS in Biology, Masters of Environmental Law and Policy, and 5 years of experience in environmental planning

Blue Ridge Research and Consulting

Micah Downing Noise Analysis	BS in Physics, Masters in Aeroacoustics, and PhD in Mechanical Engineering, and 20 years of experience in noise and sonic boom research and environmental analysis.
Rachel Frederick Noise Analysis	BS in Mechanical Engineering, and 1 year of experience in noise analysis.

Resource Perspectives, Inc.

Brock Tunnicliff Description of Proposed Action and Alternatives Purpose and Need Airspace/Range Operations Analysis	PhD in Natural Resource Management and Planning with 30 years of experience in natural resource, military, and environmental planning.

CORE TEAM MEMBERS

Luke Air Force Base, 56 RMO

Aaron Alvidrez Wildlife Biologist	BS in Wildlife Biology with 10 years of experience in natural resource management
John Arnett Wildlife Biologist	MS in Wildlife Ecology with 16 years experience in wildlife research and management, and environmental permitting
Tim Berry Munitions Disposal Specialist	Retired AF Master Sergeant with 23 years of experience in Explosive Ordnance Disposal, 8 ½ years working on the BMGR.
Chas Buchannan Director, Range Operations	

Dan Garcia Chief, Environmental Science Management	BS in Civil Engineering and Master of Business Administration with 26 years of experience in engineering and environmental management
Carol Heathington Range Operations Officer	MA in Conservation Archaeology with 30 years of experience in cultural resource compliance and management
Adrienne Knoll GIS Analyst	BS in Geology and Environmental Science, A.A.S. in computer programming, NGA Diploma in GIS and Topographic Surveying, 10 years of GIS experience. Studying for MA in Education
Lisa McCarrick Project Manager	BS in Environmental Resources Management with 16 years experience in environmental management
Adrianne G. Rankin Archaeologist	BA in Archaeology with 30 years of experience in the archaeology and ethnography of southern and southwestern Arizona and northwestern Mexico
Jim Uken, Director, 56 RMO	Director of 56th Fighter Wing Range Management Office, 9 years in that capacity. Responsible for all range operations and stewardship activity. Commanded 56ist Fighter Sq w/ 600 personnel; commanded 832nd Expeditionary Air Support Operations Group, Sarajevo B-H. 21 years of tactical aviation experience using DoD ranges and range systems. Basic NEPA training, 2001.
Rick Whittle Wildlife Biologist	PhD, Entomology/MS, Wildlife Ecology, 13 years of experience as Medical Entomologist, US Army, 2 years experience as Wildlife Biologist, USAF

Air Education Training Command

Marion Erwin A7CPP, NEPA Compliance	BA in Biology and BS in Environmental Engineering with 23 years of experience in environmental management
David Martin A7CPP, NEPA Compliance	

Headquarters Air Force

Pat Collins SAF/GCN	
Joe Miller AFLOA JACE/FSC	
Jack Bush HAF/A7CIB	

Cabeza Prieta National Wildlife Refuge

Curt McCasland Refuge Manager	
James Atkinson Sonoran Pronghorn Recovery Team Leader	

9 REFERENCES

Advisory Council on Historic Preservation (ACHP). 2009. Advisory Council on Historic Preservation website. Accessed 03/04/09

Ahlstrom, Richard V. N. (editor). 2000. *Living in the Western Papaguería: An Archaeological Overview of the Barry M. Goldwater Air Force Range in Southwestern Arizona*. SWCA Cultural Resource Report No. 98-186. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Ahlstrom, Richard V.N. and Jerry D. Lyon (editors). 2000. *Desert Foragers and Farmers of the Growler Valley: An Archaeological Survey of 8,065 Acres on the South Tactical Range on the Barry M. Goldwater Air Force Range in Southwestern Arizona.* SWCA Cultural Resource Report No. 98-140. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Ahmet, Koral, Christopher J. Doolittle, and Stephanie M. Whittlesey. 2006. *Gila Bend Air Force Auxiliary Field: Intensive Archaeological Survey of 2,322 Acres on the Barry M. Goldwater Range East, Arizona*. BMGR East Cultural Resource Management Program. Cultural Resource Studies in the Western Papagueria 11. Luke AFB, AZ.

Altschul, Jeffery H. and Adrianne G. Rankin (editors). 2008. *Fragile Patterns: the Archaeology of the Western Papagueria*. SRI Press, Tucson, Arizona.

Air Force Civil Engineer Support Agency (Preparing Activity), U.S. Army Corps Of Engineers, and Naval Facilities Engineering Command. 2006. Unified Facilities Criteria (UFC), *Airfield and Heliport Planning and Design*. UFC 3-260-01, 1 November 2001, Change of 19 May 2006. Available at: http://www.wbdg.org/ccb/DOD/UFC/ufc_3_260_01.pdf. Accessed 4 August 2008.

ARCADIS, Geraghty & Miller. 1998. Water Resources Assessment for the Barry M. Goldwater Range Including the Cabeza Prieta National Wildlife Refuge and Gila Bend Auxiliary Field. Report prepared for Luke Air Force Base 56 RMO/ESM. 4 May.

Arizona Antelope Foundation. 2008. Sonoran Pronghorn Monthly Update. http://www.azantelope.org/Sonoran_Pronghorn_Update_2008-09.pdf. Accessed 10 November.

Arizona Department of Commerce. 2008a. Profile, Maricopa County, AZ. Retrieved from: http://www.azcommerce.com/doclib/COMMUNE/Maricopa%20County.pdf. October.

Arizona Department of Commerce. 2008b. Profile, Pima County, AZ. Retrieved from: http://www.azcommerce.com/doclib/COMMUNE/Pima%20County.pdf. October.

_____. 2008c. Profile, Yuma County, AZ. Retrieved From: http://www.azcommerce.com/doclib/commune/yuma%20county.pdf. October.

_____. 2007. July 1, 2007 Populations Estimates for Arizona's Counties, incorporated Places and Balance of County. Retrieved from: http://www.azcommerce.com/doclib/econinfo/FILES/2007AZestimates.pdf. 1 July.

_____. 2005. *Joint Land Use Study, Part 2: Gila Bend Air Force Auxiliary Field/Barry M. Goldwater Range*. February.

Arizona Department of Economic Security. 2006. Arizona Population Projections, 2006-2055 ADOC Population Projections. Retrieved From: http://www.azcommerce.com/econinfo/demographics/Population%20Projections.html. 31 March.

Arizona Department of Water Resources (ADWR). 2001. Arizona Water Information. http://www.adwr.state.az.us/azwaterinfo/OutsideAMAs/LowerColoradoRiver/basins/lowergila.html. Accessed 2 July.

Arizona Game and Fish Department (AGFD). 2004. *Echinomastus erectocentrus* var. *acuñensis*. Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix, AZ. 1-7 pp.

_____. 2002. Big Game Animal Descriptions and Distribution Maps. http://www.gf.state.az/frames/fishwild/idx_game.htm. Accessed 6 June.

_____. 2001. *Athene cunicularia hypugaea.* Unpublished abstract compiled and edited by the Heritage Data Management System, Arizona Game and Fish Department, Phoenix.

_____. 1996. Wildlife of Special Concern in Arizona (in preparation).

_____. 1988. Threatened Native Wildlife in Arizona. Arizona Game and Fish Department Publication. Phoenix, Arizona.

_____.1981. The Sonoran pronghorn. Special Report Number 10. 55 pp.

Arizona Rare Plant Committee. 2001. *Arizona Rare Plant Field Guide.*

Barry, Robert X. 2002. Record of Communication with Bob Barry Wildlife Biologist, 56th Fighter Wing Range Management Office, and URS. 21 May.

Barry, Robert X. 1997. Facsimile to Danielle Sterns, Dames & Moore, from Robert X. Barry, Wildlife Biologist, Luke Air Force Base. January.

Bauer, Sharon K., Glenn P. Darrington, Kristopher S. Shepard, and J. Simon Bruder. 1996. *Range 3: Cultural Resource Survey North of the Sauceda Mountains, Barry M. Goldwater Air Force Range, Southwestern Arizona*. Dames & Moore Intermountain Cultural Resource Services Research Paper No. 33. Phoenix, Arizona.

Baumann, Steve. 1998. Trip Report 12-15-1998. Western Archaeological and Conservation Center, National Park Service. Tucson, Arizona.

Benson, L. 1969. Cacti of Arizona. The University of Arizona Press, Tucson, Arizona.

Bernacke, Michael. 2008. 2008. Personal communication between Agent Bernacke, U.S. Border Patrol, Yuma Sector, and Michael Zorba, URS Corporation, regarding quantity of border apprehensions. 1 December.

Bissell, M. 2008. Personal communication with Margot Bissell, Public Use Assistant, Cabeza Prieta NWR. 21 October.

Blueline Consulting. 2004. GIS Based, Population Growth Modeling Analysis, for the Sonoran Desert National Monument and Phoenix South Resource Management Plan. Prepared for the Bureau of Land Management and Sonoran Institute. May.

Blue Ridge Research and Consulting. 2009. Letter report on the Results of the MR_NMAP Analysis for Areas of Barry M. Goldwater Range East. 20 April.

Brooks, Elizabeth. 2009. Personal communication between Elizabeth H. Brooks, Arizona Regulatory Branch, U.S. Army Corps of Engineers, Los Angeles District, Arizona-Nevada Office and Carol Wirth, TEC Inc. 16 September.

Brown, D.E., ed. 1982. Biotic Communities of the American Southwest-United States and Mexico. Desert Plants 4(1-4). University of Arizona, Tucson.

Bruder, J. Simon, Kristopher S. Shepard, and Deborah I. Olszewski. 1995. *The Western Edge: Cultural Resources Assessment for the Yuma Aviation Training Range Complex on the Goldwater Range, Southwestern Arizona.* Dames and Moore Intermountain Cultural Resource Services Research Paper 24.

Bruder, J. Simon, Kristopher S. Shepard, and Glenn P. Darrington. 1994. *Targets: Cultural Resources Sample Survey of East Tactical Range, Barry M. Goldwater Air Force Range, Southwestern Arizona*. Intermountain Cultural Resource Services Research Paper No. 24. Dames & Moore, Phoenix, Arizona.

Buchannan, Chas. 2009. E-mail communication between Chas Buchannan, 56 RMO/DO, Luke AFB, to Beth Defend, URS Corp. 11 March.

_____. 2008. E-mail communication from Chas Buchannan, 56 RMO/DO, Luke AFB, to Kate Bartz, TEC Inc. 13 November.

Bureau of Labor Statistics (BLS). 2008. Economic News Release, Regional and State Unemployment, 2007 Annual Average Summary. Retrieved From: http://www.bls.gov/news.release/srgune.nr0.htm. 29 February.

Bureau of Land Management (BLM). 2008a. Organ Pipe Cactus National Monument - Park Statistics. http://www.nps.gov/orpi/parkmgmt/statistics.htm. Downloaded 14 October.

_____. 2008b. Bureau of Land Management Sonoran Desert National Monument. http://www.blm.gov/az/st/en/prog/blm_special_areas/natmon/son_des.2.html. Downloaded 17 October.

_____. 1999. Phoenix Field Office, Arizona Game and Fish Department Region IV, and U.S. Air Force Luke Air Force Base. Draft Barry M. Goldwater East Habitat Management Plan. AZ-02-WHA-11. January.

_____. 1990. Final Lower Gila South Resource Management Plan (Goldwater Amendment).

Cockrum, E.L. 1964. Recent Mammals of Arizona. Part 5 *in* C.H. Lowe, editor, *The Vertebrates of Arizona*. Tucson: University of Arizona Press.

Cockrum, E.L. and Y. Petryszyn. 1991. The Long-Nosed Bat, *Leptonycteris*: An Endangered Species in the Southwest? Occasional Papers, the Museum, Texas Tech University.

Corman, T.E. 2005. *Arizona Breeding Bird Atlas*. University of New Mexico Press, Albuquerque.

Council on Environmental Quality. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. June.

_____. 1997. Considering Cumulative Effects Under the National Environmental Policy Act. January.

Dahlem. 2002. Record of Communication with Gene Dahlem, Resource Specialist for the BLM, Phoenix Field Office, and various URS document preparers. December.

Dalton, D.C. 2001. Foraging Habitat and Activity of the California Leaf-Nosed Bat, *Macrotus californicus*, located on the eastern section of the Barry M. Goldwater Air Force Range. July.

Dalton, V.M. and D.C. Dalton. 1999. Bat Roost Survey of the Eastern Section of the Barry M. Goldwater Air Force Range. Unpublished report prepared for 56th Range Management Office, Natural Resources Program, Luke Air Force Base, Arizona. December.

Dalton, V.M. and D.C. Dalton. 1994. Mine/Bat Survey: Eastern and Western Sections Barry M. Goldwater Air Force Range. Final Report. Report submitted to Luke Air Force Base 56 CES/CEVN.

Dalton, V.M., D.C. Dalton, P.E. Brown, and R.D. Berry. 2000. Foraging Habitat and Activity of the California Leaf-Nosed Bat, *Macrotus californicus*, Located on the Eastern Section of the Barry M. Goldwater Air Force Range. February.

Dames & Moore. 1997. Bat Surveys at Mine Sites on the Barry M. Goldwater Range. Dames & Moore Job No. 01016-610-050. Final Report to Natural Resources Program, Luke Air Force Base, Arizona.

_____. 1996. Sensitive Species Surveys on the Barry M. Goldwater Range. Dames & Moore Job No. 13474-050-050. Final Report to Natural Resources Program, Luke Air Force Base, Arizona, Contract No.DACW45-93-D-0021.

Departments of the Air Force, Navy, and Interior. 2006. *Final Environmental Impact Statement, Barry M. Goldwater Range Proposed Integrated Natural Resources Management Plan Volumes I, II, and III.* March.

Department of Defense (DoD). 2004. UFC 3-210-10, *Low Impact Development*. 25 October.

Doelle, William H. 1980. *The Buried Trench Project, Luke Air Force Range, Arizona*. MS, Arizona State Museum Library, University of Arizona, Tucson, Arizona.

Doolittle, Christopher J. 2004. *Damage Assessment at Four Rockshelter Sites on the Barry M. Goldwater Range East, AZ.* SRI Technical Report 04-18, Statistical Research Inc. Tucson, Arizona.

Doolittle, Christopher J and Vincent M. LaMotta. 2005. *Intensive Archaeological Survey of Proposed Pronghorn Forage Plots, Barry M. Goldwater Range East, Arizona.* Barry M. Goldwater Cultural Resource Management Program, Cultural Resources Studies in the Western Papagueria 4.

Doolittle, Christopher J., Gabrielle Duff, Vincent M. LaMotta, Marcy Rockman, Stephanie M. Whittlesey, and Martyn D. Tagg. 2006. *NTAC 2001: Intensive Archaeological Survey of 8,434 Acres on the North Tactical Range, Barry M. Goldwater Range East*. BMGR East Cultural Resource Management Program. Cultural Resource Studies in the Western Papagueria 9, Statistical Research Inc. Tucson, Arizona.

Doolittle, Christopher J., Stephanie M. Whittlesey, Vincent M. LaMotta, Kenneth M. Becker, and Koral Ahmet. 2005. *STAC 2000: Intensive Archaeological Survey of 5,575 Acres on the South Tactical Range, Barry M. Goldwater Range East, Arizona.* BMGR East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 6.

Duff, Gabrielle, Koral Ahmet, Michael P. Heilen, Vincent M. LaMotta, Marcy Rockman, Kerry L. Sagebiel, Martyn D. Tagg, and Stephanie M. Whittlesey. 2006a. *STAC 2001: Intensive Archaeological Survey and Evaluation of 8,075 Acres on the South Tactical Range, Barry M. Goldwater Range East, Arizona*. BMGR East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 10.

Duff, Gabrielle, Marcy Rockman, Stephanie M. Whittlesey, Michael P. Helien; Christopher J. Doolittle, and Martyn D. Tagg. 2006b. *Manned Ranges 3 and 4:*

Intensive Archaeological Survey of 6,252 Acres on Manned Ranges 3 and 4, Barry M. Goldwater Range East, Arizona. BMGR East Cultural Resource Management Program, Cultural Resources Studies in the Western Papagueria 8. Statistical Research Inc., Tucson, Arizona.

Ezell, Paul. 1954. *The Archaeological Survey of Northwestern Papagueria*. The Kiva 19 (2-4):1-26.

Fontana, Bernard L.1965. An Archaeological Survey of the Cabeza Prieta Game Range, Arizona. Manuscript of file, Arizona State Museum Library, University of Arizona, Tucson, Arizona.

Geraghty & Miller. 1997. Wetlands and Floodplains Overview for the Barry M. Goldwater Range Including the Cabeza Prieta National Wildlife Refuge. Report prepared for Luke Air Force Base 56 CES/CEVN. 24 September.

Gilbert, J. 1994. Letter from Joy Gilbert, Yuma Resource Area Manager, Bureau of Land Management, to Commanding Officer, Marine Corps Air Station Yuma. August 31.

Hall, J.A., P. Comer, A. Gondor, R. Marshall, and S. Weinstein. 2001. Conservation Elements of and a Biodiversity Management Framework for the Barry M. Goldwater Range, Arizona. The Nature Conservancy of Arizona, Tucson.

Hamada, N, 2008. Personal communication with Neil Hamada, California BLM. 15 October.

Harris, C.M. (editor). 1979. Handbook of Noise Control. McGraw-Hill.

Hartmann, Gayle Harrison and Mary Charlotte Thurtle (Editors). 2000 Draft: *The Only Water for 100 Miles: The Tinajas Altas Archaeological Survey*. SWCA Cultural Resource Report 98-270.

Harvey and Stanley Associates, Inc. 1987. Yuma Puma (*Felis concolor browni*), Feasibility Report, Population Status Survey. Prepared by R.R. Duke, R.C. Klinger, R. Hopkins, and M. Kutilek. Submitted to: Michael Walker, Bureau of Reclamation, Lower Colorado Region. 45 pp.

Hays, C.L. and P.R. Krausman. 1993. Nocturnal activity of female desert mule deer. Journal of Wildlife Management. 57(4):897-904.

Hayward, B.J. and E.L. Cockrum. 1971. The Natural History of the Western Long-Nosed Bat (*Leptonycteris sanborni*). University of Western New Mexico. WRI-SCI 1(2).

Heil, K.D. and B. Melton. 1994. Status report for *Echinomastus erectoceutrus* var. *acunensis* (W.T. Marshall) H. Bravo-H.

Henry, S. 2008. Personal communication with Susanna Henry, Refuge Manager, Kofa National Wildlife Refuge. 4 November 2008.

Hill, Matthew E., and J. Simon Bruder. 2000. *Farmers and Forager, or Cultivators and Collectors?: Opportunistic Occupation in the Interior Desert of the Western Papaguería*. Intermountain Cultural Resource Services Research Paper No. 57. Dames and Moore, Phoenix, Arizona.

Hoffmeister, D.F. 1986. *Mammals of Arizona.* University of Arizona Press, Tucson and the Arizona Game and Fish Department.

Huckell, Bruce B. 1979. *The Coronet Real Project: Archaeological Investigations on the Luke Range, Southwestern Arizona*. Arizona State Museum Archaeological Series 129. University of Arizona, Tucson.

Institute of Water Research. 2008. Website: http://www.iwr.msu.edu/~ouyangda/rusle/k_factor.htm. Accessed 19 November 2008.

Johnson, R. R. and L. Haight. 1985. Avian use of xeroriparian ecosystems in the North American warm deserts. pp. 156-160. In: Johnson, R. Roy, C.D. Ziebell, D.R. Patton, P.F. Ffolliott, and R.H. Hamre. (Technical coordinators). Riparian Ecosystems and their Management: Reconciling Conflicting Uses. First North American Riparian Conference. USDA Forest Service General Technical Report RM-120.

Johnson, T.B. 1990. Yuma Puma. Wildlife Views. Arizona Game and Fish Department. August.

Keane, Melissa, J. Simon Bruder, Michael Corbett, Deborah I. Olszewski, and Glenn P. Darrington. 1998. *Pilots in Training: An Historical and Archaeological Inventory of Luke Air Force Base and the Gila Bend Air Force Auxiliary Field*. Intermountain Cultural Resources Services Research Paper No. 23. Dames and Moore, Phoenix.

Keane, Melissa, Jannelle Warren-Findley, Michael Corbett, and J. Simon Bruder. 1997. *Training Cold Warriors: An Historical Perspective and Consideration of the Built Environment at Luke AFB and the Gila Bend AFAF, 1946-1989.* Dames & Moore Intermountain Cultural Resource Paper No. 39. Phoenix.

Krausman, P.R., L.K. Harris, and J. Francine. 2001. Noise Effects of Military Overflights on the Sonoran Pronghorn, Barry M. Goldwater Range, 56th FW/RMO, Arizona. Final Report. Prepared for the Air Force Center for Environmental Excellence. June.

Larsen, E., and C. Olson. 1997. Aquatic Coleoptera and Hemiptera of Organ Pipe Cactus National Monument, Arizona. Entomological News 108(1):34–42.

Lee, M.L., J.D, Yoakum, B.W. O'Gara, T.M. Pojar, and R.A. Ockenfels. 1998. Pronghorn Management Guides, Proceedings of the Pronghorn Antelope Workshop and Arizona Game and Fish Department. Printed by the Arizona Antelope Foundation, Inc.

Lester, Cynthia. 2001. Letter from Cindy Lester, Chief, Arizona Regulatory Branch, U.S. Army Corps of Engineers, Los Angeles District, Arizona-Nevada Office to Eric Oswald, Environmental Planner, 56th Range Management Office. 6 September 2001.

Luke Air Force Base (AFB). 2009. Barry M. Goldwater Range Integrated Cultural Resources Management Plan. Part I: Background and Rangewide Management Issues, Part II: Cultural Resource Management on the BMGR East. Prepared by 56th Range Management Office, Luke Air Force Base, Air Education Training Command. April.

_____. 2008. 2001a. Environmental Assessment for the Proposed Installation of Unmanned Threat Emitters and Target Enhancements at the Barry M. Goldwater Range, Arizona. 28 November.

_____. 2005. Final Environmental Assessment, Proposed Expeditionary Training at the Gila Bend Air Force Auxiliary Field and the Barry M. Goldwater Range. December.

_____. 2001b. Environmental Assessment for the Proposed Flash Burning of Military Munitions Residue at the Barry M. Goldwater Range, Arizona. 10 January.

Luke AFB. 2001c. Finding of No Significant Impact for the Proposed Flash Burning of Military Munitions Residue at the Barry M. Goldwater Range. May.

_____. 2001d. Environmental Assessment for the Proposed Installation of Unmanned Threat Emitters and Target Enhancements at the Barry M. Goldwater Range, Arizona. 28 November.

_____. 1997. Barry M. Goldwater Range Land Withdrawal Legislative Environmental Impact Statement. Final Air Quality Technical Report.

Lyon, Jerry D., David B Tucker. 2001. *ETAC 98: An Archaeological Survey of 7,880 Acres on the South Flank of the Sand Tank Mountains on the Barry M. Goldwater Air Force Range in Southwestern Arizona*. SWCA Cultural Resource Report No. 99-184. CH2M Hill, Austin, Texas, and SWCA Environmental Consultants, Tucson, AZ.

Lyon, Jerry D (editor). 2000. Procurement, Processing, and Passing Through: An Archaeological Survey of 14, 390 Acres in the Central Sauceda Valley (East TAC) on the Barry M. Goldwater Air Force Range in Southwestern Arizona. 2 vols. SWCA Cultural Resource Report No. 98-267. ARCADIS Geraghty & Miller, Phoenix, Arizona, and SWCA Environmental Consultants, Tucson, AZ.

Maricopa Association of Governments. 2007. Socioeconomic Projections of Population, Housing and Employment by Municipal Planning Area and Regional Analysis Zone. Retrieved From: http://www.azcommerce.com/doclib/econinfo/FILES/2006MAGprojectionsJURI.pdf. May.

Maricopa County Air Quality Department. Pollution Control Regulations Rule 200, Section 305, Dust Control, and Rule 310, Fugitive Dust from Dust Generating Operations. Retrieved from: http://www.maricopa.gov/aq/divisions/planning analysis/AdoptedRules.aspx. 20 November 2008.

Maricopa County Flood Control District. 2008. Sand and Gravel Excavation Sites Permitting Website: http://www.fcd.maricopa.gov/Permitting/Gravel/sandGravel.aspx 20 November 2008.

Marine Corps Air Station (MCAS) Yuma and Southwest Division Naval Facilities Engineering Command. 2003. Final Biological Assessment for Marine Corps Operations and Training at the Barry M. Goldwater Range, Arizona. Prepared by URS Corporation. 24 September.

Marshall, R.M., S. Anderson, M. Batcher, P. Comer, S. Cornelius, R. Cox, A Gondor, D. Gori, J. Humke, R. Paredes Aguilar, I.E. Parra, S. Schwartz.. 2000. *An Ecological Analysis of Conservation Priorities in the Sonoran Desert Ecoregion.* Prepared by The Nature Conservancy Arizona Chapter, Sonoran Institute, and Instituto del

Medio Ambiente y el Desarrollo Sustentable del Estado de Sonora with support from Department of Defense Legacy Program, Agency and Institutional Partners.

McCasland, C. 2008. Personal communication with Curtis McCasland, Cabeza Prieta NWR Manager. 17 October.

McClellan, Carole, and Lawrence Vogler. 1977. *An Archaeological Assessment of Luke Air Force Range Located in Southwestern Arizona.* Arizona State Museum Archaeological Series No. 113. Cultural Resource Management Section, Arizona State Museum, University of Arizona, Tucson.

McIvor, D.E., J.A. Bissonette, and G.S. Drew. 1995. Taxonomic and conservation status of the Yuma mountain lion. *Conservation Biology 9*: 1033-1040.

Midwest Research Institute. 2005. MRI Project No. 110397. Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust. Conducted for the Western Governors Association Western Regional Air Partnership. October.

Miller, Glen A. 1978. Archaeological Field Reconnaissance and Survey Conducted in the Childs Valley between Feb 15-21, 1978. Letter report submitted to Arizona State Museum, University of Arizona, Tucson, and on file at Luke AFB, Arizona.

Millsap, B.A. and R.R. Johnson. 1988. Ferruginous Pygmy-Owl. Pages 137-139 *in* R.L. Glinski et al., eds. *Proceedings of the Southwest Raptor Management Symposium and Workshop.* National Wildlife Federation, Washington, D.C.

Monson, G. and A.R. Phillips. 1980. Species of Birds in Arizona. Part 4 *in* C.H. Lowe, editor, *The Vertebrates of Arizona.* Tucson: University of Arizona Press. 270 pp.

Morgart. 2002. Records of communication between John Morgart, Wildlife Biologist, Cabeza Prieta NWR and various URS document preparers. Various dates. December.

Morrison, M.L., P.C. Hardy, D.J. Griffin, and A.J. Kuenzi. 1997. Neotropical Migratory Bird Monitoring Program: Barry M. Goldwater Range Arizona. Unpublished report prepared for the U.S. Department of the Air Force, Range Management Office, Luke Air Force Base, Arizona by the School of Renewable Natural Resources, University of Arizona, Tucson.

National Park Service, 2008. Organ Pipe Cactus National Monument – Park Statistics. http://www.nps.gov/orpi/parkmgmt/statistics.htm Downloaded 17 October.

Natural Resources Conservation Service. 2008. Soil Survey Data for Luke Air Force Base Range. Website: http://soildatamart.nrcs.usda.gov/Report.aspx?Survey=AZ647&UseState=AZ. Accessed 19 November 2008.

Neuzil, Anna A. 2008. *Intensive Archaeological Survey of 540.02 Acres in the vicinity of Manned Range 3, Barry M Goldwater Range East, Arizona*. EcoPlan Associates Mesa, Arizona.

Neuzil, Anna, Jill Hjeilman, Jason Sperinck, Daniel Garcia, Helena Ruter, Bruce G. Phillips. 2009. *Draft Report on Intensive Archaeological Survey of 903.42 Acres on the Barry M Goldwater Range East, Arizona*. EcoPlan Associates Mesa, Arizona.

Nowak, R.M. and J.L. Paradiso. 1983. *Walker's Mammals of the World.* 4th Edition. Baltimore and London: The Johns Hopkins University Press. 1362 pp.

Olson, D.M. and E. Dinerstein. 1998. the global 200: a representation approach to conserving the earth's most biologically valuable ecoregions. Conservation Biology 12:502-515.

Olszewski, Deborah I., Glenn P. Darrington, Sharon K. Bauer. 1995. *From the Aguila Mountains to the Crater Range: Cultural Resources Sample Survey of the North Tactical Range, Barry M Goldwater Air Force Range, Southwestern AZ*. Intermountain Cultural Resource Services Paper No. 25. Dames & Moore, Phoenix, AZ.

Phillips, S.J. and P. W. Comus (eds.). 2000. *A Natural History of the Sonoran Desert.* Arizona-Sonoran Desert Museum Press, Tucson, Arizona.

Phillips, A.R., B.G. Phillips, and N. Brian. 1982. Status Report: *Neolloydia erectocentra* (Coulter) L. Benson var. *acunensis* L. Benson. Final report to U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

Rankin, Adrianne G. 2010. Intensive Archaeological Survey of Two Sand and Gravel Extraction Areas and a Stockpile Location, Barry M. Goldwater Range East, Arizona. 56 RMO/ESM, Luke AFB.

Rautenstrauch, K.H. and P.R. Krausman. 1989. Influence of water availability on movements of desert mule deer. *Journal of Mammalogy*. 70:197-201.

Reichenbacher, F.W. and R.B. Duncan. 1989. Sanborn's Bat and Rare Plant Studies at Barry M. Goldwater Bombing Range, Yuma County, Arizona. Final Report. F.W. Reichenbacher & Associates, prepared for EIP Associates.

Roberts, Heidi, Richard V.N. Ahlstrom, and David B. Tucker (editors). 2000. *East TAC, An Archaeological Survey of 7,792 Acres on the Barry M. Goldwater Range in Southwestern Arizona.* SWCA Cultural Resource Report No. 97-7. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Rockman, Marcy. 2009. End of Fieldwork Report for the ETAC 2009 Survey, Barry M. Goldwater Range East, Arizona. Statistical Research, Inc., Tucson, Arizona.

Rosenberg, K.V., R.D. Ohmart, W.C. Hunter and B.W. Anderson. 1991. *Birds of the Lower Colorado River Valley.* Tucson: The University of Arizona Press. 416 pp.

Rosenstock, S.S., C.S. O'Brien, R.B. Waddell, and M.J. Rabe. 2004. *Studies of Wildlife Water Developments in Southwestern Arizona: Wildlife Use, Water Quality, Wildlife Diseases, Wildlife Mortalities, and Influences on Native Pollinators.* Technical Guidance Building No. 8. Federal Aid in Wildlife Restoration. Project W-78-R.

Russo, J.P. 1956. The Desert Bighorn in Arizona. Arizona Game and Fish Department Wildlife Bulletin, 1:1-153.

Schilz, Allan. 2009. End of Fieldwork Notification for Intensive Archaeological Survey of 15 miles (596 acres) of Area B Roads. April 20, 2009. ACS. Tempe AZ.

Schneider, Paul B. 1981. A Report on Desert Tortoise Distribution and Relative Abundance in Six Selected Areas in Southern Nevada.

Seymour, Gregory R. and David P. Doak. 1993, *An Archaeological Sample Survey of 17,600 Acres in the Sauceda and Crater Mountain Ranges on the Eastern Barry M. Goldwater Air Force Range, Maricopa County, Arizona.* SWCA Archaeological Report No 93-01. SWCA, Tucson, AZ.

Simmons, H. 1969. The social organization, behavior, and environment of the desert bighorn sheep in the Cabeza Prieta Game Range, Arizona. Ph.D. dissertation. University of Arizona, Tucson. *In* Broyles, B. 1997. Wildlife Water Developments in Southwestern Arizona. Journal of the Arizona-Nevada Academy of Science. Volume 30(1). Issue 1.

Simmons, N.M. 1980. Behavior. *In: The Desert Bighorn, Its Life History, Ecology, and Management.* G. Monson and L. Sumner, editors. The University of Arizona Press, Tucson, 370 pp.

Slaughter, Mark C., David Tucker, and Annick Lascaux (editors). 2000. *Trade Corridors and Ethnic Boundaries: An Archaeological Survey of 12,089 Acres along San Cristobal and Growler Washes on the Barry M. Goldwater Range in Southwestern Arizona.* SWCA Cultural Resource Report No. 98-181. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Snow, C. 1972. American Peregrine Falcon and Arctic Peregrine Falcon. Habitat Management Series for Endangered Species, Report No. 1. BLM, USDOI.

Sonoran Institute. 2003. Socioeconomic Trend 1970 to 2000. Reports for Ajo and Gila Bend. These reports were prepared for the Bureau of Land Management to contribute to planning for the Sonoran Desert National Monument. May.

Spicer, R.B. 1988. Sanborn's Long-nosed Bat. Wildlife Views. Arizona Game and Fish Department. August. Page 20.

Statistical Research, Inc. 2008. Updates to the database created by National Park Service Western Archeological and Conservation Center (Ahlstrom 1999).

Tagg, Martyn. 2009. Administrative Draft of Chapter 6, Results (Site Descriptions). For An Intensive Archaeological survey of 15.6 miles (625 acres) of Area B Roads. SRI. Tucson AZ.

Tagg, Martyn D., Kerry L. Sagebiel, and Julie Minor. 2009. Administrative Draft: Stoval Road and Sensor Training Area: Intensive Survey of 2,464 Acres in the San Cristobal Valley, BMGR East AZ. SRI Technical Report 09-02.

Tagg, Martyn D. and Michael P. Heilen. 2009. *NTAC 2004: Intensive Archaeological Survey of 58.8 Miles of Roads and Assessment of 35 Sites on the North Tactical Range, Barry M. Goldwater Range East, Arizona.* BMGR East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 19.

Tagg, Martyn D. and Michael P. Heilen. 2008a. *NTAC 2003: Intensive Archaeological Survey of 2,009 Acres on the North Tactical Range, Barry M. Goldwater Range East, Arizona.* BMGR East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 15.

Tagg, Martyn D. and Michael P. Heilen. 2008b. *STAC 2003: Intensive Archaeological Survey of 4,945 Acres on the South Tactical Range, Barry M. Goldwater Range East, Arizona*. BMGR East Cultural Resource Management Program. Cultural Resource Studies in the Western Papagueria 16. Statistical Research Inc., Tucson, Arizona.

Tagg, Martyn D., Christopher J. Doolittle, Jeffrey H. Altschul, and Kurt Heidelberg. 2008. *ETAC 1999: Intensive Archaeological Survey of 2,900 Acres on the East Tactical Range, Barry M. Goldwater Range East, Arizona*. BMGR East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 2.

Taylor, M.A. 1997. Enclosure to letter from Michael A. Taylor, Field Manager, Bureau of Land Management, Phoenix Field Office to Col. David L. White, 56 FW/RMO, Luke Air Force Base. 21 November.

Thompson, Scott. 2004. *Gateway to Combat: A Historic Context for Military Aviation Training on the Barry M. Goldwater Range East, Arizona, World War II and Early Cold War Eras.* Barry M. Goldwater Range East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 1. Statistical Research, Tucson.

Thurtle, Mary Charlotte. 2001. *The Cultural Landscape of Okie Hill: An Archaeological Survey of 5,355 Acres on the North Tactical Range of the Barry M. Goldwater Range in Southwestern Arizona*. SWCA Cultural Resource Report No. 99-205. CH2M Hill, Austin, Texas, and SWCA Environmental Consultants, Tucson, Arizona.

Town of Gila Bend. 2006. Town of Gila Bend General Plan. Retrieved From: http://www.gilabendaz.org/vertical/Sites/%7B460CCFC8-4ABF-4D56-9D05-343DF365E86C%7D/uploads/%7BADBAFC26-4C10-424E-B173-E59B29CAA9C6%7D.PDF. 28 November.

Tucker, David B. (editor). 2000a. *Footsteps on the Bajada: An Archaeological Survey of 15,813 Acres on the North Tactical Range of the Barry M. Goldwater Air Force Range in Southwestern Arizona*, 2 vols. SWCA Cultural Resource Report No. 99-140. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Tucker, David B. (editor). 2000b. *South TAC II: An Archaeological Survey of 7,083 Acres in the Northeastern Growler Valley on the Barry M. Goldwater Air Force*

Range in Southwestern Arizona. SWCA Cultural Resource Report No. 99-104. ARCADIS Geraghty and Miller, Phoenix, and SWCA Environmental Consultants, Tucson, Arizona.

Tunnicliff, Brock. 2005. Overview of Endangered Species at the BMGR. PowerPoint Presentation and accompanying written text. Prepared for the Congressionally Appointed Task Force addressing military training and protection of endangered species at the Barry M. Goldwater Range.

Turner D.S., C.R. Schwalbe, P.L. Warren. 1997. Inventory and monitoring of unique sand dune ecosystems, Barry M. Goldwater Air Force Range, Arizona. Final Report for Legacy Resources Management Program Project No. 95-1009. Natural Resources Program, Luke Air Force Base, Arizona.

Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*, 1 November 2001, change of 19 May 2006.

U.S. Army Corps of Engineers. 1995. Site Inspection Report at the Barry M. Goldwater Range Luke Air Force Base, Arizona. Prepared for the Army Corps of Engineers. October.

U.S. Army Engineer Research and Development Center Cold Regions Research and Engineering Laboratory. 2007. *Characterization of Energetic Constituents on Ranges*. Paper presented at the Remediation Innovative Technology Seminar, Spring 2007. Retrieved From: https://portal.navfac.navy.mil/pls/portal/docs/PAGE/NAVFAC/NAVFAC_WW_PP/NAVFAC_NFESC_PP/ENVIRONMENTAL/ERB/RESOURCEERB/RITS_2007A_RANGES.PDF

U.S. Census Bureau. 2008a. Table 1: Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2000 to July 1, 2008 (NST-EST2008-01) and Table 3: Estimates of Resident Population Change for the United States, Regions, States, and Puerto Rico and Region and State Rankings: July 1, 2007 to July 1, 2008 (NST-EST2008-03). Release Date: 22 December.

_____. 2008b. 2000 Census, Summary File 3, Table P1, Total Population.

U.S. Census Bureau. 2008c. 1990 Census, Summary Tape File, Table P001, Persons.

_____. 2008d. 1980 Census.

_____. 2008e. 1970 Census.

_____. 2008f. American Fact Finder, Fact Sheet, 2000 Census.

_____. 2008g. 2006 American Community Survey.

_____. 2008h. 2000 Census, Summary File 3, Table P43. Sex By Employment Status for the Population 16 Years and Over.

_____. 2008i. 2000 Census, Summary File 3, Table P49, Sex By Industry for the Employed Civilian Population 16 Years and Over.

_____. 2008j. 2000 Census, Summary File 3, Table P6, Race.

_____. 2008k. 2000 Census, Summary File 3, Table P7, Hispanic or Latino by Race.

_____. 2008l. 2000 Census, Summary File 3, Table P87, Poverty Status in 1999 by Age.

_____. 2007. Press release: Nevada Fastest Growing State in Nation 12th Straight Year, Census Bureau Reports. http://www.census.gov/Press-Release/cb97-213.html. 31 December.

_____. 1993. 1990 Census of Population and Housing, Population and Housing Units Counts for the United States.

U.S. Department of the Air Force. 2008a. Air Force Instruction (AFI) 91-204. Safety Investigations and Reports. 24 September.

_____. 2008b. Air Force Safety Center. Aircraft Statistics. http://www.afsc.af.mil/organizations/aviation/aircraftstatistics/index.asp. Downloaded r 6 November.

_____. "AGM-65 Maverick" Fact Sheet. Available at: http://www.af.mil/factsheets/factsheet.asp?fsID=72. Dated November 2007. Accessed 27 December 2007.

_____. 2007b. Memorandum from Headquarters, United States Air Force (AF/A30-AR), Subject: Blanket Waiver for Range Clearance Requirements on All Ranges. 10 July.

_____. 2007c. Air Force Instruction 13-212. Space, Missile, Command and Control. Range Planning and Operations. 16 November. Available at: http://www.e-publishing.af.mil/shared/media/epubs/AFI13-212.pdf. Accessed 4 June 2008.

U.S. Department of the Air Force. 2007a. 2006a. State Military Munitions Rule Summary Guide. May.

_____. 2006b. Operational Range Assessment Plan, V2.0. Revised Draft. Retrieved From: http://www.afcee.af.mil/shared/media/document/AFD-070913-047.pdf. September.

_____. 2006c. Environmental Assessment for the Proposed Expeditionary Training at Gila Bend Air Force Auxiliary Field and Barry M. Goldwater Range East. January.

_____. 2005. Qualitative Assessment, Munitions Constituent Migration at Operational Ranges, Barry M. Goldwater Range, Arizona. October.

_____. 2005 b. Environmental Assessment for Proposed Sensor Training Area at Barry Goldwater Range East.

_____. 2000. Proposed Paving of Various Road Segments, Parking, and Pad Areas at the Barry M. Goldwater Range. 30 May

_____. 1999. Renewal of the Barry M. Goldwater Range Land Withdrawal Final Legislative Environmental Impact Statement Volumes 1 and 2. March.

_____. 1997. Biological Assessment for Lesser Long-Nosed Bat and Cactus Ferruginous Pygmy-Owl on the Barry M. Goldwater Range. Prepared by Luke Air Force Base for the United States Fish and Wildlife Service.

_____. 1986. Natural Resources Management Plan for Luke Air Force Range. Report prepared for Luke Air Force Base, Arizona by University of Arizona, Department of Agriculture.

U.S. Department of the Air Force, U.S. Department of the Navy, Department of the Interior. 2005. Final Environmental Assessment for the Barry M. Goldwater Range Integrated Natural Resources Management Plan.

U.S. Department of the Navy. 2005. Final Range Condition Assessment (RCA), Decision Point 1 Recommendations Report for 14 the Rodman and Pinecastle Ranges. Prepared by EnSafe Inc. Memphis, TN. March.

U.S. Environmental Protection Agency (USEPA). 1972. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety. U.S. Environmental Protection Agency Report 550/9-74-004. March.

USEPA. 1971. Noise from Construction Equipment and Operations, Building Equipment and Home Appliances. NTID 300-1.

U.S. Fish and Wildlife Service. 2008a. USFWS Cabeza Prieta National Wildlife Refuge. http://www.fws.gov/southwest/refuges/arizona/cabeza.html. Downloaded 17 October.

U.S. Fish and Wildlife Service. 2008b. USFWS Kofa National Wildlife Refuge. http://www.fws.gov/southwest/refuges/arizona/kofa/. Downloaded 17 October.

_____ 2008. Proposal to reestablish additional Sonoran pronghorn populations within their historic range. October 2008.

_____. 2006. Division of Planning, National Wildlife Refuge System, Southwest Region. *Cabeza Prieta National Wildlife Refuge, Comprehensive Conservation Plan, Wilderness Stewardship Plan, and Environmental Impact Statement*. August.

_____. 2005. Endangered Pronghorn Births Signal Success. http://news.fws.gov/NewsReleases/showNews.cfm?newsId=7E18CD5E-1143-3066-404F71D8B4500263. 7 May.

_____. 2004. News Release, Sonoran Pronghorn Survey and Capture Brings Good News. http://news.fws.gov/NewsReleases/R2/E34D86FC-BB27-2926-031369755E91F00B.html. 17 December.

_____. 2003. Revised Biological Opinion Based on Review of the Proposed Military Training Administered by the U.S. Air Force on the BMGR and its Effects on the Sonoran Pronghorn (*Antilocapra americana sonoriensis*). AESO/SE 2-21-96-F-094-R2. 6 August.

_____. 2002. Vol. 67, No. 229, Pages 71032 – 71064. Part V, Department of the Interior, Fish and Wildlife Service, 50 CFR Part 17, Endangered and Threatened Wildlife and, Plants; Designation of Critical Habitat for, the Arizona Distinct Population Segment of the Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*); Proposed Rule. 27 November.

_____. 2001. Biological Opinion for Proposed and Ongoing Activities Marine Corps Air Station Yuma in the Arizona portion of the Yuma Training Range Complex (YTRC) on the Barry M. Goldwater Range. Consultation No. 2-21-95-F-114R2. 16 November.

____. 2000b. Supplement and Amendment to the Sonoran Pronghorn Recovery Plan. October.

U.S. Fish and Wildlife Service. 1998. Final Revised Sonoran Pronghorn Recovery Plan (*Antilocapra americana sonoriensis*). Region 2, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 3 December.

_____. 1994. Arizona Ecological Services State Office Phoenix, Arizona. Lesser Long-nosed Bat Recovery Plan. Prepared for Region 2, U.S. Fish & Wildlife Service, Albuquerque. May.

U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service. 2008. Federal Land Manager's Air Quality Related Values Workgroup Final Draft Phase I Report. June 2008.

U.S. Marine Corps. 2001. U.S. Department of Defense, Marine Corps Air Station Yuma. *Final Yuma Training Range Complex Supplemental Environmental Impact Statement* (for the reassessment of cumulative effects on Sonoran pronghorn). September.

U.S. Marine Corps. 1997. *Yuma Training Range Complex Final Environmental Impact Statement*. Prepared by Dames & Moore. January.

Vanderpot, Rein, and Jeffrey H. Altschul. 2004. *Foragers and Ranchers in the Western Papaguería: Intensive Archaeological Survey and Evaluation of the Manned Range and AUX-6 Roads, Barry M. Goldwater Range East, Arizona*. Barry M. Goldwater Range East Cultural Resource Management Program, Cultural Resource Studies in the Western Papaguería 3. Statistical Research, Tucson, Arizona.

Vaughan, S. L. 1984. Home Range and Habitat Use of the Desert Tortoise *Gopherus agassizii* in the Picacho Mountains, Pinal County, Arizona. Unpublished M. S. Thesis, Arizona State University, Tempe.

Wergen, Tom. 2008. Maricopa Sand and Gravel Permitting Program. Phoenix, Arizona. 20 November

Western Regional Air Partnership. 2004. Western Regional Air Partnership Fugitive Dust Handbook. November.

Whittle, R. 2008. Personal communication with Richard Whittle, Wildlife Biologist, 56 RMO. 17 October.

Wirt, E.B. 1994. Baseline study of microhabitat in desert tortoise shelter sites, Sand Tank Mountains, BMGR, Arizona, study in progress (personal communication).

Workman, G.D., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson and E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (*Antilocapra americana*). Report to the U.S. Air Force, Hill Air Force Base, Utah.

Wyle Laboratories. 1997. Barry M. Goldwater Range Legislative Environmental Impact Statement. Final Noise Technical Report. Prepared for Dames & Moore and Luke Air Force Base. 13 August.

Appendix A
Notice of Intent

This page intentionally left blank.

initial agency determinations are published in DFAS Regulation 5400.11–R; 32 CFR part 324; or may be obtained from Defense Finance and Accounting Service, Freedom of Information/Privacy Act Program Manager, Corporate Communications and Legislative Liaison, 6760 E. Irvington Place, Denver, CO 80279–8000.

RECORD SOURCE CATEGORIES:

From individuals, Department of Defense Components, such as, United States Air Force, Army, Navy, and Marine Corps.

EXEMPTIONS CLAIMED FOR THE SYSTEM:

None.

[FR Doc. E7–25287 Filed 12–27–07; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Air Force

[USAF–2007–0027]

Proposed Collection; Comment Request

AGENCY: Department of the Air Force, DoD.

ACTION: Notice.

In compliance with Section 3506(c)(2)(A) of the Paperwork Reduction Act of 1995, the Officer Procurement Branch, Air Force Personnel Center, announces the proposed extension of a public information collection and seeks public comment on the provisions thereof. Comments are invited on: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; (b) the accuracy of the agency's estimate of the burden of the proposed information collection; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the information collection on respondents, including through the use of automated collection techniques or other forms of information technology.

DATES: Consideration will be given to all comments received by February 26, 2008.

ADDRESSES: You may submit comments, identified by docket number and title, by any of the following methods:

• *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.

• *Mail:* Federal Docket Management System Office, 1160 Defense Pentagon, Washington, DC 20301–1160.

Instructions: All submissions received must include the agency name, docket number and title for this **Federal Register** document. The general policy for comments and other submissions from members of the public is to make these submissions available for public viewing on the Internet at *http://www.regulations.gov* as they are received without change, including any personal identifiers or contact information.

FOR FURTHER INFORMATION CONTACT: To request more information on this proposed information collection or to obtain a copy of the proposal and associated collection instruments, please write to the Officer Procurement Branch (DPSIPR), Air Force Personnel Center, 550 C Street West, Suite 10, ATTN: Ms Adriana Bazan, Randolph AFB, TX 78150–4712, or call HQ AFPC/DPSIPR at 210–565–3711.

Title; Associated Form; and OMB Number: Application for Appointment as Reserve of the Air Force or USAF Without Component, Air Force (AF) Form 24, OMB Number 0701–0096.

Needs and Uses: The information collection requirement is necessary for providing information to determine if applicant meets established qualifications for appointment as a Reserve (Air National Guard of the United States (ANGUS) and United States Air Force Reserve (USAFR)) or in the USAF without component. Use of the Social Security Number (SSN) is necessary to make positive identification of an applicant and his or her records.

Affected Public: Individuals or households.

Annual Burden Hours: 1966.

Number of Respondents: 5899.

Responses Per Respondent: 1.

Average Burden Per Response: 20 minutes.

Frequency: On occasion.

SUPPLEMENTARY INFORMATION:

Summary of Information Collection

This is an information collection from persons applying for appointment as a member of the Reserve of the Air Force or an Air Force member without a component and entry into active duty. The information contained on AF Form 24 supports the Air Force as it applies to direct appointment (procurement) programs for civilian and military applicants. It provides necessary information to determine if an applicant meets established qualifications for appointment to fill authorized USAFR and ANGUS position vacancies and active duty requirements. Eligibility requirements are outlined in Air Force Instruction 36–2005.

Dated: December 19, 2007.

Patricia L. Toppings,

Alternate OSD **Federal Register** *Liaison Officer, Department of Defense.*

[FR Doc. E7–25166 Filed 12–27–07; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Air Force

Notice of Intent To Prepare an Environmental Impact Statement (EIS) for Proposed Range Enhancements at the Barry M. Goldwater Range, Arizona

AGENCY: Department of the Air Force.

ACTION: Notice of Intent (NOI).

SUMMARY: This NOI is being issued pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 United States Code 4321, et seq.), the Council on Environmental Quality Regulations for implementing procedural provisions of NEPA (40 Code of Federal Regulation (CFR) Parts 1500–1508), and Air Force policy and procedures (32 CFR Part 989) to advise the public of the Air Force's intent to prepare an EIS that will evaluate the environmental effects associated with range enhancements and alternatives within the eastern portion of the Barry M. Goldwater Range (BMGR), Arizona.

The Air Force is also initiating a scoping process and public meetings to assist in determining the extent of issues to be addressed in the EIS. Three scoping meetings will be held, as scheduled below. Each meeting will include an open house where the public may review maps and other displays. Federal, state, and local agencies; Native American tribes; and interested individuals are encouraged to take this opportunity to identify environmental concerns that should be addressed in the preparation of the EIS.

DATES: Public scoping meetings will be held as follows:

Tuesday, January 15, 2008, 6–8 p.m., Glendale High School, Media Center, 6216 W. Glendale Avenue, Glendale, AZ.

Wednesday, January 16, 2008, 6–8 p.m., El Rio Center, 1390 W. Speedway Boulevard, Tucson, AZ.

Thursday, January 17, 2008, 6–8 p.m., Gila Bend Union High School, 308 N. Martin Avenue, Gila Bend, AZ.

SUPPLEMENTARY INFORMATION: The eastern portion of the BMGR (BMGR-East) is assigned to the Secretary of the Air Force and is operated by Luke Air Force Base to train combat aircrews and support personnel.

Periodically, operational and infrastructure upgrades to the range are

needed to keep training both realistic and relevant to current and emerging war fighting technology and tactics. Consequently, the Air Force now proposes upgrades to BMGR-East that include:

*Developing a training area to train in the use of precision-guided munitions in an urban setting (no actual air-to-ground ordnance would be released)

* Reconfiguring targets in tactical and manned ranges, which may include relocating targets within pre-2001 annual explosive ordnance disposal clearance areas within the tactical ranges

* Introducing a remotely operated moving target to provide aircrews with realistic training to engage moving vehicle targets

* Reconfiguring Manned Range 3 to include a helicopter gunnery range with fixed, moving, and pop-up targets

* Modifying the Memorandum of Understanding (MOU) among the Department of the Interior and the Secretaries of the Navy and the Air Force to change the floor for routine flight training operations over portions of the Cabeza Prieta National Wildlife Refuge from 1,500 feet to 500 feet above ground level to support realistic low-level approaches to targets; BMGR-East restricted airspace (R–2301E) is currently authorized for use from the surface to 80,000 feet above mean sea level, but training flight operations, with the exception of certain low-level flights along designated corridors, are limited by the 1994 MOU to 1,500 feet over the National Wildlife Refuge

* Developing an additional target for air-to-ground missiles in the East Tactical Range to allow training in air-to-ground missile delivery from multiple directions; the proximity of the current missile target to the range boundary severely constrains training

* Supporting training by small squads of troops or individual soldiers on foot

* Paving the road from Manned Range 1 to the water well to minimize vehicle wear, maintenance costs, and dust on this heavily used road

* Excavating, transporting, and stockpiling sand and gravel resources to provide an on-range source of these materials for road maintenance as well as target reconfiguration and maintenance

* Constructing a taxiway and air traffic control tower at the Gila Bend Air Force Auxiliary Field to improve airfield safety and expand operational capacity

Anticipated issues to be addressed in the EIS include, but are not limited to, airspace and range operations; water, biological resources (including endangered species), cultural resources; air quality; noise; and public access, health, and safety.

Written comments may be submitted at the meetings. Agencies and the public are also invited to provide written comment via mail on issues that are important to them. These written comments should be mailed to the address listed below, and must be received no later than January 28, 2008 to ensure fullest consideration in the EIS.

FOR FURTHER INFORMATION CONTACT: Direct any written comments or requests for information to Ms. Lisa McCarrick, 56 FW/RMO, 7224 N. 139th Drive, Luke AFB, AZ 85309–1420 (Phone 623/856–9475).

Bao-Anh Trinh,

Air Force Federal Register Liaison Officer.

[FR Doc. E7–25234 Filed 12–27–07; 8:45 am]

BILLING CODE 5001–05–P

DEPARTMENT OF DEFENSE

Department of the Army

[USA–2007–0034]

Proposed Collection; Comment Request

AGENCY: Office of the Administrative Assistant to the Secretary of the Army, (OAA-AAHS), DoD.

ACTION: Notice.

In compliance with Section 3506(c)(2)(A) of the Paperwork Reduction Act of 1995, the Department of the Army announces a proposed public information collection and seeks public comment on the provisions thereof. Comments are invited on: (a) Whether the proposed collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility; (b) the accuracy of the agency's estimate of the burden of the proposed information collection; (c) ways to enhance the quality, utility, and clarity of the information to be collected; and (d) ways to minimize the burden of the information collection on respondents, including through the use of automated collection techniques or other forms of information technology.

DATES: Consideration will be given to all comments received by February 26, 2008.

ADDRESSES: You may submit comments, identified by docket number and title, by any of the following methods:

- *Federal eRulemaking Portal: http://www.regulations.gov.* Follow the instructions for submitting comments.
- *Mail:* Federal Docket Management System Office, 1160 Defense Pentagon, Washington, DC 20301–1160.

Instructions: All submissions received must include the agency name, docket number and title for this **Federal Register** document. The general policy for comments and other submissions from members of the public is to make these submissions available for public viewing on the Internet at *http://www.regulations.gov* as they are received without change, including any personal identifiers or contact information.

FOR FURTHER INFORMATION CONTACT: To request more information on this proposed information collection or to obtain a copy of the proposal and associated collection instruments, please write to U.S. Army Corps of Engineers, 441 G Street, NW., Room 3D72, Washington, DC 20314–1000, or call Department of the Army Reports Clearance Officer at (703) 428–6440.

Title, Associated Form, and OMB Number: Estuary Habitat Restoration Program Project Application; ENG Form 6019–R; OMB Control Number 0710–0014.

Needs and Uses The Corps will solicit applications for estuary habitat restoration projects under section 104 of the Estuary Restoration Act 2000. Requested information will include proposed project location, types and acreage of habitat to be restored, and project description including restoration techniques, project goals and expected benefits, monitoring plan, costs, and other supporting information. Project applications may be submitted either electronically or in paper format. This information is needed to select projects for funding.

Affected Public: State, local, or tribal government and not-for-profit institutions.

Annual Burden Hours: 1,000.

Number of Respondents: 100.

Responses Per Respondent: 1.

Average Burden Per Response: 10 hours.

Frequency: On occasion.

SUPPLEMENTARY INFORMATION:

Summary of Information Collection

Information will be collected by voluntary submission of estuary habitant restoration project via e-mail, or paper submissions that may be accomplished by computer disk by regular mail or hand delivery. Supplemental information may also be collected via phone interviews.

Appendix B
Air Quality Calculations

This page intentionally left blank.

APPENDIX B AIR EMISSIONS CALCULATIONS

Air quality impacts were estimated for the two primary elements associated with the BMGR Range Improvement proposed actions: construction and operations. The following is a discussion of the assumptions, references, and methods used to perform the air emission estimate calculations.

CONSTRUCTION

Air quality impacts from proposed construction activities were estimated from (1) combustion emissions due to the use of fossil fuel-powered equipment; (2) fugitive dust emissions (PM_{10} and $PM_{2.5}$) during earth-moving activities, and the operation of equipment on bare soil; and (3) VOC emissions from application of asphalt materials during paving operations.

Factors needed to derive the construction source emission rates were obtained from *Compilation of Air Pollution Emission Factors, AP-42, Volume I* (USEPA 1995); *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling* (USEPA 2004a); *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition* (USEPA 2004b); *Nonroad Engine and Vehicle Emission Study—Report* (USEPA 1991); *Exhaust Emission Factors for Nonroad Engine Modeling—Spark-Ignition* (USEPA 2004c); *Conversion Factors for Hydrocarbon Emission Components* (USEPA 2004d); *Comparison of Asphalt Paving Emission Factors* (CARB 2005); *WRAP Fugitive Dust Handbook* (WRAP 2004); *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust* (MRI 2005) and *Mobile 6.2.03* (EPA 2003).

The analysis assumed that all construction equipment was manufactured before 2000. This approach is based on the well-known longevity of diesel engines, although use of 100 percent tier 0 equipment may be somewhat conservative. Consistent with Chapter 3 of the Western Regional Air Partnership (WRAP) fugitive dust handbook, the analysis inherently reduced PM_{10} fugitive dust emissions from earth-moving activities by 50 percent as this control level is included in the emission factor itself in the form of wetting.

Off-Road Equipment Emissions. The NONROAD model (EPA 2005) is the EPA standard method for preparing emission inventories for mobile sources that are not classified as being related to on-road traffic, railroads, air traffic, or water-going vessels. As such, it is the starting place for quantifying emissions from construction-related equipment.

The NONROAD model uses the following general equation to estimate emissions separately for CO, NOx, PM (essentially all of which is $PM_{2.5}$ from construction sources), and total hydrocarbons (THC), nearly all of which are non-methane hydrocarbons:

EMS = EF * HP * LF * Act * DF

Where:

EMS = estimated emissions
EF = emissions factor in grams per horsepower hours
HP = peak horsepower
LF = load factor (assumed percentage of peak horsepower)
Act = activity in hours of operation per period of operation
DF = deterioration factor

The emissions factor is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be "base" (before 1988), "tier 0" (1988 to 1999), or "tier 1" (2000 to 2005). Tier 2 emissions factors could be applied to equipment that satisfies 2006 national standards (or slightly earlier California standards). The technology type for two-stroke gasoline equipment can be "base" (before 1997), "phase 1" (1997 to 2001), or "phase 2" (2002 to 2007). Equipment for phases 1 and 2 can have catalytic converters. For this study, all diesel equipment was assumed to be either tier 0 or tier 1 and all two-stroke diesel equipment was assumed to be phase 1 without catalytic converters.

The load factor is specific to the equipment type in the NONROAD model regardless of engine size or technology type, and it represents the average fraction of peak horsepower at which the engine is assumed to operate. NONROAD model default values were used in all cases. Because Tier 0 equipment was conservatively used throughout the analysis period, deterioration factors were not used to estimate increased emissions due to engine age. Based on the methodology described, it is possible to make a conservative estimate of emissions from off-road equipment if the types of equipment and durations of use are known.

Construction calculations were performed for each of the relevant proposed actions.

Fugitive Dust. Emission rates for fugitive dust were estimated using guidelines outlined in the WRAP fugitive dust handbook (WRAP 2004) and AP-42, Volume 1, Section 13.2.2. The methodology used in the WRAP Handbook assumes standard dust mitigation best practices activities of 50 percent from wetting. The WRAP handbook offers several options for selecting factors for PM_{10} (coarse PM) depending on what information is known.

After PM_{10} is estimated, the fraction of fugitive dust emitted as $PM_{2.5}$ is estimated. The most recent WRAP study (MRI 2005) recommends the use of a fractional factor of 0.10 to estimate the $PM_{2.5}$ portion of the PM_{10}. The WRAP factors were used to estimate fugitive dust emissions from land disturbance activities.

For site preparation activities, the emission factor was obtained from Table 3-2 of the WRAP Fugitive Dust Handbook. The areas of disturbance and approximate durations were used, resulting in the selection of the first factor with worst-case conditions for use in the analysis.

AP-42, Section 13.2.2, Unpaved Roads, was used to calculate the amount of fugitive dust generated by large trucks driving on roads. As the percentage of paved/unpaved road that may be traveled is unknown, it was assumed that 30 percent of the roads used would be unpaved. The constants used in the emissions estimate came from Table 13.2.2-2, and were based on industrial roads.

PM_{10}, $PM_{2.5}$, and Mobile Sources. Diesel exhaust is a primary, well-documented source of $PM_{2.5}$ emissions. The vast majority of PM emissions in diesel exhaust is $PM_{2.5}$. Therefore, all calculated PM is assumed to be $PM_{2.5}$. A corollary result of this is that the PM_{10} fraction of diesel exhaust is estimated very conservatively as only a small fraction of PM_{10} is present in the exhaust. However, ratios of PM_{10} to $PM_{2.5}$ in diesel exhaust are not yet published and therefore for the purposes of the EIS calculations, all PM emissions are equally distributed as PM_{10} and $PM_{2.5}$.

VOC Emissions from Paving and Pavement Marking. VOC emissions from the application of hot mix asphalt were calculated for the construction of the taxiway and Manned Range 1 to RMCP 1 road pavement. The estimates used the published CARB hot mix asphalt emission factor.

Construction Workers – Mobile Sources. Mobile source emissions were calculated for construction workers for each of the construction years. These emissions assumed that each worker drove their own car. The average mileage driven each workday within the Installation fenceline was variable depending on the location of the proposed action, and ranges from 15 to 60 miles round trip and at a rate not exceeding 30 miles per hour. Emission factors were derived from the USEPA Mobile 6 mobile emissions model for the years 2010 and 2011.

OPERATIONS

Operations evaluated for air emissions include emissions from generators that would be placed in operation at the Sensor Training Area, aircraft emissions associated with F-16s flying at 500 feet AGL over the Cabeza Prieta NWR, diesel equipment emissions from sand and gravel extraction and fugitive dust from transport of the sand and gravel to storage locations.

Generator Emissions. Four 20 kW generators would each run diesel fuel for up to 1,800 hours per year. To calculate emissions, factors from AP-42, Volume 1, Section 3.3, *Gas and Diesel Industrial Engines* were used with an assumed load factor of 50 percent.

Aircraft Emissions. To estimate the amount of emissions that would be generated by F-16 aircraft passing over the Cabeza Prieta NWR, the following formula was used:

500 ft AGL Emissions$_p$ = aircraft emissions$_p$ (lb/hr) * (flight time over NWR/sortie) * (# of sorties)

Where:

500 ft AGL Emissions$_p$ = the emissions of a specific pollutant, in lb/yr
aircraft emissions$_p$ = the emission rate of an F-16 in "Approach Mode" for a specific pollutant, in lb/hr (from baseline data)
flight time over NWR/sortie = hour/sortie (from baseline data)
# of sorties = the number of sorties that would fly at the new 500 feet AGL

Baseline data from 1996, as used in the BMGR Renewal LEIS, was used as follows:

- 52,480 sorties total were flown in R-2301E in 1996 (Table 3-1, LEIS)
- 3,567 hours of flight time were used to accomplish this (Table 3-1, LEIS)
- F-16 aircraft emissions in "Approach mode" Table 10 (Air Quality Technical Document, URS, 1997)

Current data used in this EIS, as follows:

- Projected number of flights to use the 500 ft AGL = 5,850 sorties (email from Beth Defend, URS, October 29, 2008)

In order to make an estimate on emissions, the average flight time for flying in R-2301E was used, even though only a portion overlies Cabeza Prieta NWR.

Diesel Equipment Emissions. Off-road equipment emissions from the excavation of sand and gravel were calculated in the same way as described under Construction, above.

Fugitive Dust Emissions. Fugitive dust emissions from trucks hauling sand and gravel to storage locations were calculated in the same way as described under Construction, above.

BMGR East - Range Improvements Construction Air Emission Calculations

Total Area to be disturbed: 2,295,920 SY
474 Acres

Proposal 1 - Construct Sensor Training Area

EOD clearance prior to development would be 1,217 acres
at 100 ft intervals, this would cover 106 linear miles.
Uncontrolled particulate emissions from EOD trucks traversing ground:
[1]$E = k*(s/12)^a(W/3)^b$ where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

PM10 = 1.86 lb/VMT = 197 lb or **0.10 Tons**
PM2.5= 0.185 lb/VMT = 20 lb or **0.01 Tons**

[1] Emission factors from U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors - Volume I (AP-42), Section 13.2.2, 5th Edition.

assume 400 acres to be disturbed

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Backhoe/loader	2	8	150	98	0.21	0.99	3.49	6.9	0.85	0.722	108	380	751	93	79
Skid/steer Loader	3	8	38	168	0.59	0.68	2.7	8.38	0.93	0.402	136	538	1,670	185	80
Dozer	2	6	60	299	0.58	0.68	2.7	8.38	0.93	0.402	187	743	2,307	256	111
Dump truck (12 CY)	8	8	150	275	0.21	0.68	2.7	8.38	0.89	0.402	831	3,300	10,242	1,088	491
										Subtotal	1,262	4,961	14,971	1,622	761

Grading 17 mile unpaved road and widening to 20 ft; reinforcing unstable areas with gravel. Up to 3 miles of other roads may be similarly improved
Assume 30% of areas unstable, requiring gravel.

Grading 234,667 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Dozer	1	6	20	90	0.59	0.99	3.49	6.9	0.93	0.722	14	49	97	13	10
Skid steer loader	4	4	30	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	9	39	91	15	8
Backhoe/loader	2	6	46	98	0.21	0.99	3.49	6.9	0.85	0.722	25	87	173	21	18
Small diesel engines	2	4	30	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	9	12	2	1
Dump truck	6	1	30	275	0.21	0.68	2.7	8.38	0.89	0.402	16	62	192	20	9
										Subtotal	65	246	565	72	46

Gravel Work 9,973 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	2	4	44	135	0.58	0.68	2.7	8.38	0.93	0.402	41	164	509	57	24
Skid steer loader	3	4	37	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	8	36	84	14	7
Small diesel engines	2	4	22	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	7	9	2	1
Dump truck (12 CY)	23	0.5	37	275	0.21	0.68	2.7	8.38	0.89	0.402	37	146	454	48	22
										Subtotal	87	353	1,056	120	54

Building Construction 500,000 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	4	2	132	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	6	27	64	11	5
Concrete truck	19	4	39	250	0.21	0.68	2.7	8.38	0.89	0.402	84	333	1,032	110	50
Dump truck	6	6	90	275	0.21	0.68	2.7	8.38	0.89	0.402	101	402	1,248	133	60
Delivery truck	3	1	144	180	0.21	0.68	2.7	8.38	0.89	0.402	4	18	54	6	3
Backhoe/loader	3	8	66	98	0.21	0.99	3.49	6.9	0.85	0.722	26	91	180	22	19
Small diesel engines	4	4	84	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	8	42	54	10	5
										Subtotal	229	913	2633	290	141

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	3	4	96	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	3	19	24	4	2
Delivery truck	2	2	66	180	0.21	0.68	2.7	8.38	0.89	0.402	5	22	67	7	3
Skid steer loader	4	8	138	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	25	113	266	44	22
Concrete truck	7	2	84	250	0.21	0.68	2.7	8.38	0.89	0.402	33	131	407	43	20
Crane	1	8	51	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	6	14	93	15	5
										Subtotal	72	298	857	114	52

Fugitive Dust Emissions:

PM $_{10}$ tons/acre/mo	acres	days of disturbance	**PM $_{10}$** Total	**PM $_{2.5}$/PM $_{10}$** Ratio	**PM $_{2.5}$** Total
0.42	40.0	200	112	0.1	11.2

POV Emissions from Construction Workers

Assume 40 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

	# vehicles	# days	mi/day	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
2010	50	180	40	0.0021	0.0203	0.0013	0.00002	0.0001	762	7302	476	7	20
2011	50	120	40	0.0016	0.0258	0.0013	0.00002	0.0001	384	6185	321	4	13

Diesel Truck Traffic on the Ranges Due To Construction - assume average rt within range borders is 16 miles

	# trips	RT mi	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
2010	2,078	20	0.0008642	0.00386	0.01514143	1.8078E-05	0.000427	36	160	629	1	18
2011	1386	20	0.0008	0.0036	0.0140	0.00003	0.0004	23	99	389	1	11

Uncontrolled particulate emissions from construction trucks driving on gravel and dirt roads (assume 30% of traffic is on these unimproved roads):

$^{1}E = k*(s/12)^{a}(W/3)^{b}$ where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

30% of 3000*16 = 14,400 miles

PM10 = 1.86 lb/VMT = 26,784 lb or **13.39 Tons**

PM2.5= 0.185 lb/VMT = 2,664 lb or **1.33 Tons**

Total Air Emissions from Construction of Proposal 1, Alternative A.1:

VOC Tons	**CO** Tons	**NOx** Tons	**SO2** Tons	**PM $_{10}$** Tons	**PM $_{2.5}$** Tons
1.46	10.26	10.95	1.12	126.05	13.10

Proposal 3 - Moving Vehicle Target System

Alternative 3a - Construct additional 7.75 miles of dirt road

Grading 90,933 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Dozer	1	6	8	90	0.59	0.99	3.49	6.9	0.93	0.722	6	20	39	5	4
Skid steer loader	4	4	12	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	3	15	37	6	3
Backhoe/loader	2	6	18	98	0.21	0.99	3.49	6.9	0.85	0.722	10	34	68	8	7
Small diesel engines	2	4	12	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	1	4	5	1	0
Dump truck	6	1	12	275	0.21	0.68	2.7	8.38	0.89	0.402	6	25	77	8	4
										Subtotal	26	98	224	29	18

Fugitive Dust Emissions:

PM_{10} tons/acre/mo	acres	days of disturbance	**PM_{10}** Total	**$PM_{2.5}/PM_{10}$** Ratio	**$PM_{2.5}$** Total
0.42	18.8	18	5	0.1	0.5

POV Emissions from Construction Workers

Assume 40 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

# vehicles	# days	mi/day	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
10	25	40	0.0021	0.0203	0.0013	0.00002	0.0001	21	203	13	0	1

Diesel Truck Traffic on the Ranges Due To Construction - assume average rt within range borders is 16 miles

# trips	RT mi	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb
90	16	0.0008642	0.00386	0.01514143	1.8078E-05	0.000427	1	6	22	0	1

Uncontrolled particulate emissions from construction trucks driving on gravel and dirt roads (assume 30% of traffic is on these unimproved roads):

$^{1}E = k*(s/12)^{a}(W/3)^{b}$ where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

30% of 90*16 = 432 miles

PM10 = 1.86 lb/VMT = 804 lb or **0.40 Tons**

PM2.5= 0.185 lb/VMT = 80 lb or **0.04 Tons**

Total Air Emissions from Construction of Proposal 3a:

VOC T/yr	**CO** T/yr	**NOx** T/yr	**SO2** T/yr	**PM_{10}** T/yr	**$PM_{2.5}$** T/yr
0.02	0.15	0.13	0.01	5.15	0.52

Proposal 8 - Construct New Taxiway and Air Traffic Control Tower at the Gila Bend AFAF

Clearing 42 AC

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Backhoe/loader	2	8	20	98	0.21	0.99	3.49	6.9	0.85	0.722	14	51	100	12	10
Skid/steer Loader	2	8	6	168	0.59	0.68	2.7	8.38	0.93	0.402	14	57	176	20	8
Dozer	2	6	12	299	0.58	0.68	2.7	8.38	0.93	0.402	37	149	461	51	22
Dump truck (12 CY)	8	0.5	15	275	0.21	0.68	2.7	8.38	0.89	0.402	5	21	64	7	3
										Subtotal	71	277	801	90	44

Construct a taxiway parallel to the airfield runway - 75 ft wide with 50 ft shoulder on east side – total dimension = 8500 ft X 125 ft + arming areas measuring 1075 X 200 ft

Grading 141,944 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Dozer	2	6	12	90	0.59	0.99	3.49	6.9	0.93	0.722	17	59	116	16	12
Skid steer loader	4	4	36	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	10	46	110	18	9
Backhoe/loader	4	6	28	98	0.21	0.99	3.49	6.9	0.85	0.722	30	106	210	26	22
Small diesel engines	2	4	26	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	2	8	10	2	1
Dump truck	12	1	18	275	0.21	0.68	2.7	8.38	0.89	0.402	19	74	230	24	11
										Subtotal	77	294	677	86	55

Gravel Work 23,662 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	3	4	104	135	0.58	0.68	2.7	8.38	0.93	0.402	146	582	1,805	200	87
Skid steer loader	6	4	87	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	37	168	397	66	34
Small diesel engines	3	4	104	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	9	49	62	11	5
Dump truck (12 CY)	10	0.5	87	275	0.21	0.68	2.7	8.38	0.89	0.402	38	150	464	49	22
										Subtotal	230	948	2,728	327	148

Paving 55,216 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Grader	1	4	24	150	0.59	0.68	2.7	8.38	0.93	0.402	13	51	157	17	8
Roller	2	4	24	30	0.59	1.8	5	6.9	1	0.8	13	37	52	7	6
Paver	1	8	24	107	0.59	0.68	2.7	8.38	0.93	0.402	18	72	224	25	11
Delivery truck	1	2	3	180	0.21	0.68	2.7	8.38	0.89	0.402	0	1	4	0	0
										Subtotal	45	162	437	50	24

Volume of hot mix asphalt 1,490,838 ft^3
Average density of HMA 145 lb/ft^3
CARB EF for HMA 0.04 lb/ton
VOC emissions from HMA paving 4,323 lb

Construct new air traffic control tower - 6 stories tall

Building Construction 4,800 SF

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Skid steer loader	1	2	7	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	6	27	64	11	5
Concrete truck	1	4	10	250	0.21	0.68	2.7	8.38	0.89	0.402	84	333	1,032	110	50
Dump truck	1	6	7	275	0.21	0.68	2.7	8.38	0.89	0.402	101	402	1,248	133	60
Delivery truck	1	1	6	180	0.21	0.68	2.7	8.38	0.89	0.402	4	18	54	6	3
Backhoe/loader	1	8	3	98	0.21	0.99	3.49	6.9	0.85	0.722	26	91	180	22	19
Small diesel engines	1	4	5	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	8	42	54	10	5
										Subtotal	229	913	2633	290	141

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO2** g/hp-hr	**PM** g/hp-hr	**VOC** lb	**CO** lb	**NOx** lb	**SO2** lb	**PM** lb
Small diesel engines	1	4	4	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	3	19	24	4	2
Delivery truck	1	2	2	180	0.21	0.68	2.7	8.38	0.89	0.402	5	22	67	7	3
Skid steer loader	1	8	7	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	25	113	266	44	22
Concrete truck	1	2	8	250	0.21	0.68	2.7	8.38	0.89	0.402	33	131	407	43	20
Crane	1	6	2	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	6	14	93	15	5
										Subtotal	72	298	857	114	52

Fugitive Dust Emissions:

PM_{10} tons/acre/mo	acres	days of disturbance	**PM_{10}** Total	**$PM_{2.5}/PM_{10}$** Ratio	**$PM_{2.5}$** Total
0.42	18.8	18	5	0.1	0.5

Fugitive Dust Emissions:

PM_{10}		days of	**PM_{10}**	**$PM_{2.5}/PM_{10}$**	**$PM_{2.5}$**
tons/acre/mo	acres	disturbance	Total	Ratio	Total
0.42	4.2	168	10	0.1	1.0

POV Emissions from Construction Workers
Assume 40 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

			VOC	**CO**	**NOx**	**SOx**	**PM**	**VOC**	**CO**	**NOx**	**SOx**	**PM**
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
20	200	15	0.0021	0.0203	0.0013	0.00002	0.0001	127	1217	79	1	3

Diesel Truck Traffic on the Ranges Due To Construction - assume average rt within range borders is 16 miles

		VOC	**CO**	**NOx**	**SOx**	**PM**	**VOC**	**CO**	**NOx**	**SOx**	**PM**
# trips	RT mi	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
1,242	16	0.0008642	0.00386	0.01514143	1.8078E-05	0.000427	17	77	301	0	8

Uncontrolled particulate emissions from construction trucks driving on gravel and dirt roads (assume 30% of traffic is on these unimproved roads):
[1]$E = k*(s/12)^a(W/3)^b$ where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

30% of 1229*16 = 5,899 miles

PM10 = 1.86 lb/VMT = 10,973 lb or **5.49 Tons**

PM2.5= 0.185 lb/VMT = 1,091 lb or **0.55 Tons**

Total Air Emissions from Construction of Proposal 8:

VOC	**CO**	**NOx**	**SO2**	**PM_{10}**	**$PM_{2.5}$**
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
2.60	2.09	4.26	0.48	15.60	1.77

Proposal 9 - Manned Range 1 to RMCP 1 Road Pavement
Pave approx 7 miles of road – 16 ft wide 591360 SF

Grading 65,707 SY

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Dozer	1	6	5	90	0.59	0.99	3.49	6.9	0.93	0.722	3	12	24	3	3
Skid steer loader	2	4	16	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	2	10	24	4	2
Backhoe/loader	2	6	12	98	0.21	0.99	3.49	6.9	0.85	0.722	6	23	45	6	5
Small diesel engines	2	4	8	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	0	2	3	1	0
Dump truck	5	1	10	275	0.21	0.68	2.7	8.38	0.89	0.402	4	17	53	6	3
										Subtotal	17	65	150	19	12

Gravel Work 14,587 CY

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Grader	3	4	50	135	0.58	0.68	2.7	8.38	0.93	0.402	70	280	868	96	42
Skid steer loader	6	4	42	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	18	81	192	32	16
Small diesel engines	3	4	50	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	4	23	30	5	3
Dump truck (12 CY)	28	0.5	42	275	0.21	0.68	2.7	8.38	0.89	0.402	51	202	627	67	30
										Subtotal	144	586	1,717	200	90

4 in. asphalt 35 – 40 loads of asphalt trucked to site 182 CY/truck
Paving 7,293 CY

						VOC	**CO**	**NOx**	**SO2**	**PM**	**VOC**	**CO**	**NOx**	**SO2**	**PM**
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb

Grader	1	4	2	150	0.59	0.68	2.7	8.38	0.93	0.402	1	4	13	1	1
Roller	2	4	2	30	0.59	1.8	5	6.9	1	0.8	1	3	4	1	0
Paver	1	8	2	107	0.59	0.68	2.7	8.38	0.93	0.402	2	6	19	2	1
Asphalt truck	20	1	2	180	0.21	0.68	2.7	8.38	0.89	0.402	2	9	28	3	1
										Subtotal	6	22	64	7	3

Volume of hot mix asphalt	196,923	ft^3
Average density of HMA	145	lb/ft^3
CARB EF for HMA	0.04	lb/ton
VOC emissions from HMA paving	571	lb

Fugitive Dust Emissions:

PM_{10}		days of	**PM_{10}**	**$PM_{2.5}/PM_{10}$**	**$PM_{2.5}$**
tons/acre/mo	acres	disturbance	Total	Ratio	Total
0.42	1.4	68	1	0.1	0.1

POV Emissions from Construction Workers

Assume 40 miles per day per vehicle (one vehicle per worker)

On-base POV emissions

			VOC	**CO**	**NOx**	**SOx**	**PM**	**VOC**	**CO**	**NOx**	**SOx**	**PM**
# vehicles	# days	mi/day	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
20	68	60	0.0021	0.0203	0.0013	0.00002	0.0001	173	1655	108	1	4

Diesel Truck Traffic on the Ranges Due To Construction - assume average rt within range borders is 16 miles

		VOC	**CO**	**NOx**	**SOx**	**PM**	**VOC**	**CO**	**NOx**	**SOx**	**PM**
# trips	RT mi	lb/mi	lb/mi	lb/mi	lb/mi	lb/mi	lb	lb	lb	lb	lb
1,226	16	0.0008642	0.00386	0.01514143	1.8078E-05	0.000427	17	76	297	0	8

Uncontrolled particulate emissions from construction trucks driving on gravel and dirt roads (assume 30% of traffic is on these unimproved roads):

[1]E = k*(s/12)[a](W/3)[b] where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

30% of 1226*16 =	5,885	miles			
PM10 =	1.86	lb/VMT =	10,946	lb or	**5.47 Tons**
PM2.5=	0.185	lb/VMT =	1,089	lb or	**0.54 Tons**

Total Air Emissions from Construction of Proposal 9:

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
0.46	1.20	1.17	0.11	6.87	0.74

Aggregate 2010 Emission Totals:

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
3.03	9.14	11.01	1.15	102.49	10.76

Aggregate 2011 Emission Totals:

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
1.51	4.56	5.50	0.57	51.17	5.37

BMGR East - Range Improvements Operation Air Emission Calculations

Proposal 1 - Sensor Training Area
Assume the UMTE requires a 20 kW generator & 500 gallon diesel fuel tank. Refill every 3 mos. 1 gal /hr use rate 5 days per week, 8 hr per day
Utilities – assume use of 20kW generator and 500 gal AGT, and fuel consumption of 1 gal/hr.

Four 20 kW generators, Four 500-gallon AGT for diesel
One gal /hr use rate 5 days per week, 8 hr per day
40 gal per week = refill tanks every 3 months

Operational Emissions - Generators

The generators are typically operated 40 hours per week (minus 7 weeks/yr when range maintenance occurs) = 1,800 hours/yr

Generator size		CO	NOx	PM10	SO2	VOC	CO2
kW	#	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr	lb/yr
20	1	161	748	53	49	61	27747
	Total	645	2992	212	198	242	110987
	Tons/yr	**0.32**	**1.50**	**0.11**	**0.10**	**0.12**	**55.49**

50% Load Factor

Pollutant	EFs Diesel Fuel [a, b] lb/hp-hr
CO	0.00668
NO_x	0.031
PM-10	0.0022
SO_2 [c]	0.00205
VOC	0.00251
CO_2	1.15

[a] Emission factors (Efs)used to estimate emissions from the consumption of diesel fuel.

[b] Emission factors from U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors - Volume I (AP-42), Section 3.3, 5th Edition; . factors based upon power output

Proposal 3 - Moving Vehicle Target System
Assume that the tow vehicle and the target travel an average of 16,100 miles per year (per vehicle)

Uncontrolled particulate emissions from two vehicle and target traversing unpaved road at target location:

$$\frac{^{1}E = k*(s/12)^{a}(S/30)^{d}}{(M/0.5)^{c}} - C$$

where

s = 5.1
a = 1
S = 45
d = 0.5
M = 0.03
c = 0.2
k = 1.8 for PM10
k = 0.18 for PM2.5
C = 0.00047 for PM10 and
C = 0.00035 for PM2.5

PM10 = 1.86 lb/VMT = 52943 lb or **26.47 Tons/yr**
PM2.5= 0.185 lb/VMT = 5285 lb or **2.64 Tons/yr**

Emission factors from U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors - Volume I (AP-42),5th Edition, Section 13.2.2, *Unpaved Roads* .

	Total miles	**VOC** lb/mi	**CO** lb/mi	**NOx** lb/mi	**SOx** lb/mi	**PM** lb/mi	**CO2** lb/mi	**VOC** lb	**CO** lb	**NOx** lb	**SOx** lb	**PM** lb	**CO2** lb
2010	16100	0.00190701	0.024251	0.001561	1.9401E-05	0.000074	0.93256024	31	390	25	0	1	15014

Vehicle Emissions from EPA's Mobile 6.2

Total Emissions from Moving Target Range Operations, Yearly:

VOC T/yr	**CO** T/yr	**NOx** T/yr	**SO2** T/yr	**PM_{10}** T/yr	**$PM_{2.5}$** T/yr	**CO_2** T/yr
0.02	0.20	0.01	0.00	26.47	2.64	7.51

Proposal 5 - Lower Flight Training Altitude Over a Portion of Cabeza Prieta NWR

F-16 used for all calculations - predominant fixed wing aircraft affect by proposed change.
Emission factors based on "Approach" power setting, Air Quality Technical Report for LEIS, Table 10
except CO2 EF, which is from GHG Protocol, Mobile Sources.
Sortie base line data from LEIS Tables 3-1 and 3-13.

Estimated maximum number of sorties to use the 500 ft AGL = 5,850 (based on email 10/29/2008 from Beth Defend, URS)

CO	3528	lb/yr or	1.76	Ton/yr
NOx	12934	lb/yr or	6.47	Ton/yr
HC	706	lb/yr or	0.35	Ton/yr
SOx	0	lb/yr or	0.00	Ton/yr
PM_{10}	392	lb/yr or	0.20	Ton/yr

Proposal 9 - Pave Road from Manned Range 1 to RMCP 1

No Action Alternative - leave road unpaved as it is now:

Road travel is estimated by installation at 26,082 miles per year
Uncontrolled particulate emissions from travel on unpaved road (existing conditions):

$$\frac{^{1}E = k*(s/12)^{a}(S/30)^{d}}{(M/0.5)^{c}} - C$$

where

E =	particulate emission factor	
s =	5.1	
a =	1	
S =	35	
d =	0.5	
M =	0.03	
c =	0.2	
k =	1.8	for PM10
k =	0.18	for PM2.5
C =	0.00047	for PM10 and
C =	0.00035	for PM2.5

PM10 =	1.86	lb/VMT =	37819	lb or	**18.91 Tons/yr**
PM2.5=	0.185	lb/VMT =	3774	lb or	**1.89 Tons/yr**

Uncontrolled particulate emissions from travel on paved road (proposed conditions):

$$E = k*(sL/2)^{0.65*}(W/3)^{1.5} - C$$

where

k =	0.016	for PM10
k =	0.004	for PM2.5
sL =	0.6	
W=	3	
C=	0.00047	for PM10
C=	0.00036	for PM2.5

PM10 =	1.86	lb/VMT =	178.55	lb or	**0.09 Tons/yr**
PM2.5=	0.185	lb/VMT =	38.312	lb or	**0.02 Tons/yr**

Annual Estimated Emissions Reduction Due to Paving Road:

PM_{10}	**$PM_{2.5}$**
T/yr	T/yr
18.82	1.87

Proposal 10 - Sand and Gravel Excavation, Stockpiling and Use on BMGR East

Excavate from 10 different sites
Material to be transported to 4 different storage locations at BMGR East and 1 at Gila Bend AFAF
Excavation would primarily occur during three 7-week periods of range maintenance
12,990 CY excavated annually

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	CO2 lb/hr/equip	VOC lb	CO lb	NOx lb	SO2 lb	PM lb	CO2 lb
Backhoe/loader	1	6	105	98	0.21	0.99	3.49	6.9	0.85	0.722	12.6	28	100	197	24	21	7938
Dump truck	10	0.5	105	275	0.21	0.68	2.7	8.38	0.89	0.402	7	45	180	560	59	27	3675
											Subtotal	74	280	757	84	48	11613

10423 CY transported to offsite storage 869 trips in 12 CY dump truck
Avg trip to storage = 3.3 miles one way

	# trips	RT mi	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	CO2 lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb	CO2 lb
2010	869	6.6	0.0008642	0.00386	0.01514143	1.8078E-05	0.000440	3.123967	**5**	**22**	**87**	**0**	**3**	**17909**

Efs from Mobile 6.2, Heavy Duty Diesel Vehicle

Uncontrolled particulate emissions from dump trucks traversing unpaved roads in BMGR-East from excavation to stockpile location:
[1]$E = k*(s/12)^a(W/3)^b$ where s = 5.1, W = 27, a = 0.9 and b = 0.45, k = 1.5 for PM10 and 0.15 for PM2.5

PM10 = 1.86 lb/VMT = 10663 lb or **5.33 Tons/yr**
PM2.5= 0.185 lb/VMT = 1061 lb or **0.53 Tons/yr**

[1] Emission factors from U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors - Volume I (AP-42), Section 13.2.2, 5th Edition; .

Fugitive Dust Emissions:

[2]assume CY of excavated material weighs 2565 lbs (50% sand/50% gravel)

Operation	[3]EF		Total Tons Material	Total Tons/yr Emissions (PM10)
Mining/plant feed, handling	0.00055	lb/ton	16660	0.005
Load out, handling WITHOUT watering	0.0024	lb/ton	13367	0.016
			Subtotal	0.021

Operation	[3]EF		Total Acres Used	Total Tons/yr Emissions (PM10)
Stockpiles, raw material and product storage	630	lb/acre-yr	2	0.7
			Subtotal	0.680

[2]American Civil Engineer's Pocket Book, Mansfield Merriman

[3]Emission factors from Emission Inventory Help Sheet for Sand and Gravel Plants, Maricopa County Air Quality Department, 2008

[4]acreage based on total CY split across 4 sites, piles calculated at 1 yard height to produce maximum acreage used.

Sand and Gravel Extraction and Storage Operational Emissions per Year:

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	CO2
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr
0.04	0.15	0.42	0.04	6.04	0.62	14.76

Aggregate Total Operational Emissions per Year:

VOC	CO	NOx	SO2	PM_{10}	$PM_{2.5}$	CO2	
T/yr	T/yr	T/yr	T/yr	T/yr	T/yr	T/yr	
0.53	2.43	8.40	0.14	32.81	3.57	22.30	
						20.23	metric tons

No Action Alternative - Sand and Gravel Trucked in from Supplier in Phoenix:

13000 CY transported to offsite storage 1,083 trips in 12 CY dump truck
Round trip is equal to, on average, 170 miles

	# trips	RT mi	VOC lb/mi	CO lb/mi	NOx lb/mi	SOx lb/mi	PM lb/mi	CO2 lb/mi	VOC lb	CO lb	NOx lb	SOx lb	PM lb	CO2 lb
2010	1,083	170	0.0008642	0.00386	0.01514143	1.8078E-05	0.000440	3.123967	**159**	**711**	**2789**	**3**	**81**	**575331**

References

Arizona Department of Environmental Quality. 2004. Open Burning Permit 3008.

California Air Resources Board (CARB). 2005. Comparison of Asphalt Paving Emission Factors.

Maricopa County Regulation III –Control of Air Contaminants. 2008. Rule 200, Permit Requirements.

_____. Rule 310, Fugitive Dust from Dust-Generating Operations.

Midwest Research Institute (MRI). 2005. MRI Project No. 110397. Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust. Conducted for the Western Governors Association Western Regional Air Partnership (WRAP). October.

U.S. Department of the Air Force. 1998. Renewal of the Barry M. Goldwater Range Land Withdrawal, Draft Legislative Environmental Impact Statement.

_____. 2003. Maricopa County Air Quality Department Air Quality Permit Number 020213, Revision 2.

U.S. Environmental Protection Agency (USEPA). 2004a. EPA Report No. NR-005c. Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling

_____. 2004b. EPA Report No. NR-009c. Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition

_____. 2004c. EPA Report No. NR-010d. Exhaust Emission Factors for Nonroad Engine Modeling—Spark-Ignition. April.

_____. 2004d. EPA 420-P-04-001, NR-002b. Conversion Factors for Hydrocarbon Emission Components. April.

_____. 2003. Mobile 6.2.03. Mobile Source Emission Factor Model.

_____. 1995. Compilation of Air Pollution Emission Factors. AP-42, Volume I.

_____. 1991. EPA 460/3-91-02. Nonroad Engine and Vehicle Emission Study—Report.

USRS. 1997. Air Quality Technical Document.

Western Regional Air Partnership (WRAP). 2004. WRAP Fugitive Dust Handbook. November.

Appendix C
Noise

This page intentionally left blank.

APPENDIX C NOISE

Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). Noise analysis thus requires a combination of physical measurement of sound, physical and physiological effects and psychological and sociological acoustic effects.

Section 1.0 of this appendix describes how sound is measured and summarizes noise impacts in terms of community acceptability and land use compatibility. Section 2.0 gives detailed descriptions of the effects of noise that lead to the impact guidelines presented in Section 1.0. Section 3.0 provides a description of the specific methods used to predict aircraft noise, including a detailed description of sonic booms.

1.0 NOISE DESCRIPTORS AND IMPACT

Aircraft operating in military airspace generate two types of sound. One is "subsonic" noise, which is continuous sound generated by the aircraft's engines and also by air flowing over the aircraft itself. The other is sonic booms (where authorized for supersonic), which are transient impulsive sounds generated during supersonic flight. These are quantified in different ways.

Section 1.1 describes the characteristics which are used to describe sound. Section 1.2 describes the specific noise metrics used for noise impact analysis. Section 1.3 describes how environmental impact and land use compatibility are judged in terms of these quantities.

1.1 Quantifying Sound

Measurement and perception of sound involve two basic physical characteristics: amplitude and frequency. Amplitude is a measure of the strength of the sound and is directly measured in terms of the pressure of a sound wave. Because sound pressure varies in time, various types of pressure averages are usually used. Frequency, commonly perceived as pitch, is the number of times per second the sound causes air molecules to oscillate. Frequency is measured in units of cycles per second, or hertz (Hz).

Amplitude. The loudest sounds the human ear can comfortably hear have acoustic energy one trillion times the acoustic energy of sounds the ear can barely detect. Because of this vast range, attempts to represent sound amplitude by pressure are generally unwieldy. Sound is, therefore, usually represented on a logarithmic scale with a unit called the decibel (dB). Sound measured

on the decibel scale is referred to as a sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Because of the logarithmic nature of the decibel scale, sounds levels do not add and subtract directly and are somewhat cumbersome to handle mathematically. However, some simple rules of thumb are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. Thus, for example:

60 dB + 60 dB = 63 dB, and

80 dB + 80 dB = 83 dB.

The total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

Because the addition of sound levels behaves differently than that of ordinary numbers, such addition is often referred to as "decibel addition" or "energy addition." The latter term arises from the fact that the combination of decibel values consists of first converting each decibel value to its corresponding acoustic energy, then adding the energies using the normal rules of addition, and finally converting the total energy back to its decibel equivalent.

The difference in dB between two sounds represents the ratio of the amplitudes of those two sounds. Because human senses tend to be proportional (i.e., detect whether one sound is twice as big as another) rather than absolute (i.e., detect whether one sound is a given number of pressure units bigger than another), the decibel scale correlates well with human response.

Under laboratory conditions, differences in sound level of 1 dB can be detected by the human ear. In the community, the smallest change in average noise level that can be detected is about 3 dB. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or halving) of the sound's loudness, and this relation holds true for loud sounds and for quieter sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound *intensity* but only a 50 percent decrease in perceived *loudness* because of the nonlinear response of the human ear (similar to most human senses).

The one exception to the exclusive use of levels, rather than physical pressure units, to quantify sound is in the case of sonic booms. As described in Section 3.2, sonic booms are coherent waves with specific characteristics. There is a long-standing tradition of describing individual

sonic booms by the amplitude of the shock waves, in pounds per square foot (psf). This is particularly relevant when assessing structural effects as opposed to loudness or cumulative community response. In this environmental analysis, sonic booms are quantified by either dB or psf, as appropriate for the particular impact being assessed.

***Frequency*.** The normal human ear can hear frequencies from about 20 Hz to about 20,000 Hz. It is most sensitive to sounds in the 1,000 to 4,000 Hz range. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (American National Standards Institute 1988). Sound levels that have been so adjusted are referred to as A-weighted sound levels.

The audible quality of high thrust engines in modern military combat aircraft can be somewhat different than other aircraft, including (at high throttle settings) the characteristic nonlinear crackle of high thrust engines. The spectral characteristics of various noises are accounted for by A-weighting, which approximates the response of the human ear but does not necessarily account for quality. There are other, more detailed, weighting factors that have been applied to sounds.

In the 1950s and 1960s, when noise from civilian jet aircraft became an issue, substantial research was performed to determine what characteristics of jet noise were problematic. The metrics Perceived Noise Level and Effective Perceived Noise Levels were developed. These accounted for nonlinear behavior of hearing and the importance of low frequencies at high levels, and for many years airport/airbase noise contours were presented in terms of Noise Exposure Forecast, which was based on Perceived Noise Level and Effective Perceived Noise Level. In the 1970s, however, it was realized that the primary intrusive aspect of aircraft noise was the high noise level, a factor which is well represented by A-weighted levels and day-night average sound level (DNL). The refinement of Perceived Noise Level, Effective Perceived Noise Level, and Noise Exposure Forecast was not significant in protecting the public from noise.

There has been continuing research on noise metrics and the importance of sound quality, sponsored by the Department of Defense (DoD) for military aircraft noise and by the Federal Aviation Administration (FAA) for civil aircraft noise. The metric L_{dnmr}, which is described later and accounts for the increased annoyance of rapid onset rate of sound, is a product of this long-term research.

The amplitude of A-weighted sound levels is measured in dB. It is common for some noise analysts to denote the unit of A-weighted sounds by dBA. As long as the use of A-weighting is

understood, there is no difference between dB or dBA; it is only important that the use of A-weighting be made clear. In this environmental analysis, A-weighted sound levels are reported as dB.

A-weighting is appropriate for continuous sounds, which are perceived by the ear. Impulsive sounds, such as sonic booms, are perceived by more than just the ear. When experienced indoors, there can be secondary noise from rattling of the building. Vibrations may also be felt. C-weighting (American National Standards Institute 1988) is applied to such sounds. This is a frequency weighting that is relatively flat over the range of human hearing (about 20 Hz to 20,000 Hz) that rolls off above 5,000 Hz and below 50 Hz. In this study, C-weighted sound levels are used for the assessment of sonic booms and other impulsive sounds. As with A-weighting, the unit is dB, but dBC is sometimes used for clarity. In this study, sound levels are reported in both A-weighting and C-weighting dBs, and C-weighted metrics are denoted when used.

***Time Averaging*.** Sound pressure of a continuous sound varies greatly with time, so it is customary to deal with sound levels that represent averages over time. Levels presented as instantaneous (i.e., as might be read from the display of a sound level meter) are based on averages of sound energy over either 1/8 second (fast) or 1 second (slow). The formal definitions of fast and slow levels are somewhat complex, with details that are important to the makers and users of instrumentation. They may, however, be thought of as levels corresponding to the root-mean-square sound pressure measured over the 1/8-second or 1-second periods.

The most common uses of the fast or slow sound level in environmental analysis is in the discussion of the maximum sound level that occurs from the action, and in discussions of typical sound levels. Figure C-1 is a chart of A-weighted sound levels from typical sounds. Some (air conditioner, vacuum cleaner) are continuous sounds whose levels are constant for some time. Some (automobile, heavy truck) are the maximum sound during a vehicle passby. Some (urban daytime, urban nighttime) are averages over some extended period. A variety of noise metrics have been developed to describe noise over different time periods. These are described in Section 1.2.

1.2 Noise Metrics

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound level changes value as time goes on (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level, for short. It is usually abbreviated by ALM, L_{max}, or L_{Amax}.

The maximum sound level is important in judging the interference caused by a noise event with conversation, TV or radio listening, sleeping, or other common activities. Table C-1 reflects L_{max} values for typical aircraft associated with this assessment operating at the indicated flight profiles and power settings.

Table C-1 Representative Maximum Sound Levels (L_{max})

Aircraft (engine type)	***Power Setting***	***Power Unit***	***L_{max} Values (in dBA) At Varying Distances (In Feet)***				
			500	***1,000***	***2,000***	***5,000***	***10,000***
Takeoff/Departure Operations (at 300 knots airspeed)							
A-10A	6200	NF	99.9	91.7	82.2	68.2	57.8
B-1	97.5%	RPM	126.5	118.3	109.9	98.3	88.7
F-15 (P220)	90%	NC	111.4	104.3	96.6	85	74.7
F-16 (P229)	93%	NC	113.7	106.2	98.1	86.1	75.7
F-22	100%	ETR	119.7	112.4	104.6	93	82.9
Landing/Arrival Operations (at 160 knots airspeed)							
A-10A	5225	NF	97	88.9	78.8	60.2	46.4
B-1	90%	RPM	98.8	91.9	84.5	72.8	62
F-15 (P220)	75%	NC	88.5	81.6	74.3	63.2	53.4
F-16 (P229)	83.5%	NC	92.6	85.5	77.8	66.1	55.6
F-22	43%	ETR	111.3	103.9	95.9	83.9	73.1

Engine Unit of Power: RPM—Revolutions Per Minute; ETR—Engine Thrust Ratio; NC—Engine Core RPM; and NF—Engine Fan RPM. *Source*: SELCalc2 (Flyover Noise Calculator), Using Noisemap 6/7 and Maximum Omega10 Result as the defaults.

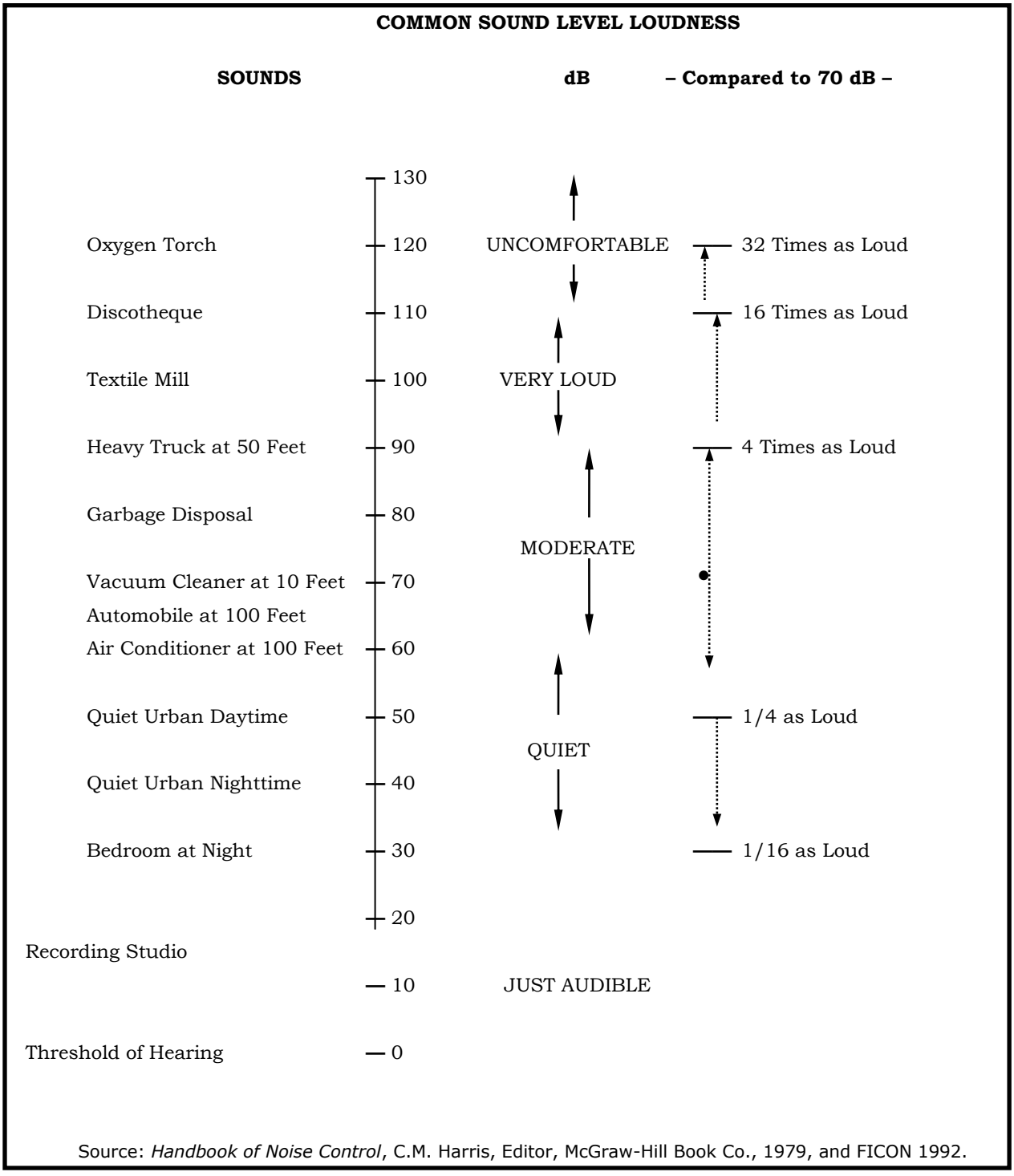


Figure C -1 Typical A-Weighted Sound Levels of Common Sounds

Peak Sound Level

For impulsive sounds, the true instantaneous sound pressure is of interest. For sonic booms, this is the peak pressure of the shock wave, as described in Section 3.2 of this appendix. This pressure is usually presented in physical units of pounds per square foot. Sometimes it is represented on the decibel scale, with symbol Lpk. Peak sound levels do not use either A or C weighting.

Sound Exposure Level

Individual time-varying noise events have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. Although the maximum sound level, described above, provides some measure of the intrusiveness of the event, it alone does not completely describe the total event. The period of time during which the sound is heard is also significant. The Sound Exposure Level (abbreviated SEL or L_{AE} for A-weighted sounds) combines both of these characteristics into a single metric.

SEL is a composite metric that represents both the intensity of a sound and its duration. Mathematically, the mean square sound pressure is computed over the duration of the event, then multiplied by the duration in seconds, and the resultant product is turned into a sound level. It does not directly represent the sound level heard at any given time, but rather provides a measure of the net impact of the entire acoustic event. It has been well established in the scientific community that SEL measures this impact much more reliably than just the maximum sound level. Table C-2 shows SEL values corresponding to the aircraft and power settings reflected in Table C-1.

Table C-2 Representative Sound Exposure Levels (SEL)							
Aircraft (engine type)	***Power Setting***	***Power Unit***	***SEL Values (in dBA) At Varying Distances (In Feet)***				
			500	***1,000***	***2,000***	***5,000***	***10,000***
Takeoff/Departure Operations (at 300 knots airspeed)							
A-10A	6200	NF	102.6	96.2	88.5	76.9	68.3
B-1	97.5%	RPM	129.5	123.1	116.5	107.3	99.3
F-15 (P220)	90%	NC	117.3	112	106.1	97	88.4
F-16 (P229)	93%	NC	116.5	110.8	104.6	95	86.3
F-22	100%	ETR	124.2	118.7	112.7	103.5	95.2
Landing/Arrival Operations (at 160 knots airspeed)							
A-10A	5225	NF	97.9	91.5	83.3	67	55
B-1	90%	RPM	103.4	98.3	92.7	83.4	74.4
F-15 (P220)	75%	NC	94.2	89.2	83.6	74.9	66.9
F-16 (P229)	83.5%	NC	97.4	92.1	86.3	76.9	68.2
F-22	43%	ETR	114.9	109.3	103.1	93.5	84.5

Engine Unit of Power: RPM—Revolutions Per Minute; ETR—Engine Thrust Ratio; NC—Engine Core RPM; and NF—Engine Fan RPM. *Source*: SELCalc2 (Flyover Noise Calculator), Using Noisemap 6/7 and Maximum Omega10 Result as the defaults.

Because the SEL and the maximum sound level are both used to describe single events, there is sometimes confusion between the two, so the specific metric used should be clearly stated. SEL can be computed for C-weighted levels (appropriate for impulsive sounds), and the results denoted CSEL or L_{CE}. SEL for A-weighted sound is sometimes denoted ASEL. Within this study, SEL is used for A-weighted sounds and CSEL for C-weighted.

Equivalent Sound Level

For longer periods of time, total sound is represented by the equivalent continuous sound pressure level (L_{eq}). L_{eq} is the average sound level over some time period (often an hour or a day, but any explicit time span can be specified), with the averaging being done on the same energy basis as used for SEL. SEL and L_{eq} are closely related, with L_{eq} being SEL over some time period normalized by that time.

Just as SEL has proven to be a good measure of the noise impact of a single event, L_{eq} has been established to be a good measure of the impact of a series of events during a given time period. Also, while L_{eq} is defined as an average, it is effectively a sum over that time period and is, thus, a measure of the cumulative impact of noise.

Day-Night Average Sound Level

Noise tends to be more intrusive at night than during the day. This effect is accounted for by applying a 10 dB penalty to events that occur after 10 pm and before 7 am. If L_{eq} is computed over a 24-hour period with this nighttime penalty applied, the result is the DNL. DNL is the community noise metric recommended by the USEPA (USEPA 1974) and has been adopted by most federal agencies (Federal Interagency Committee on Noise 1992). It has been well established that DNL correlates well with long-term community response to noise (Schultz 1978; Finegold *et al.* 1994). This correlation is presented in Section 1.3 of this appendix.

DNL accounts for the total, or cumulative, noise impact at a given location, and for this reason is often referred to as a "cumulative" metric.

It was noted earlier that, for impulsive sounds, such as sonic booms, C-weighting is more appropriate than A-weighting. The day-night average sound level computed with C-weighting is denoted CDNL or L_{Cdn}. This procedure has been standardized, and impact interpretive criteria similar to those for DNL have been developed (Committee on Hearing, Bioacoustics and Biomechanics 1981).

Onset-Adjusted Monthly Day-Night Average Sound Level

Aircraft operations in military training airspace generate a noise environment somewhat different from other community noise environments. Overflights are sporadic, occurring at random times and varying from day to day and week to week. This situation differs from most community noise environments, in which noise tends to be continuous or patterned. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset.

To represent these differences, the conventional DNL metric is adjusted to account for the "surprise" effect of the sudden onset of aircraft noise events on humans (Plotkin *et al.* 1987; Stusnick *et al.* 1992; Stusnick *et al.* 1993). For aircraft exhibiting a rate of increase in sound level (called onset rate) of from 15 to 150 dB per second, an adjustment or penalty ranging from 0 to 11 dB is added to the normal SEL. Onset rates above 150 dB per second require an 11 dB penalty, while onset rates below 15 dB per second require no adjustment. The DNL is then determined in the same manner as for conventional aircraft noise events and is designated as Onset-Rate Adjusted Day-Night Average Sound Level (abbreviated L_{dnmr}).

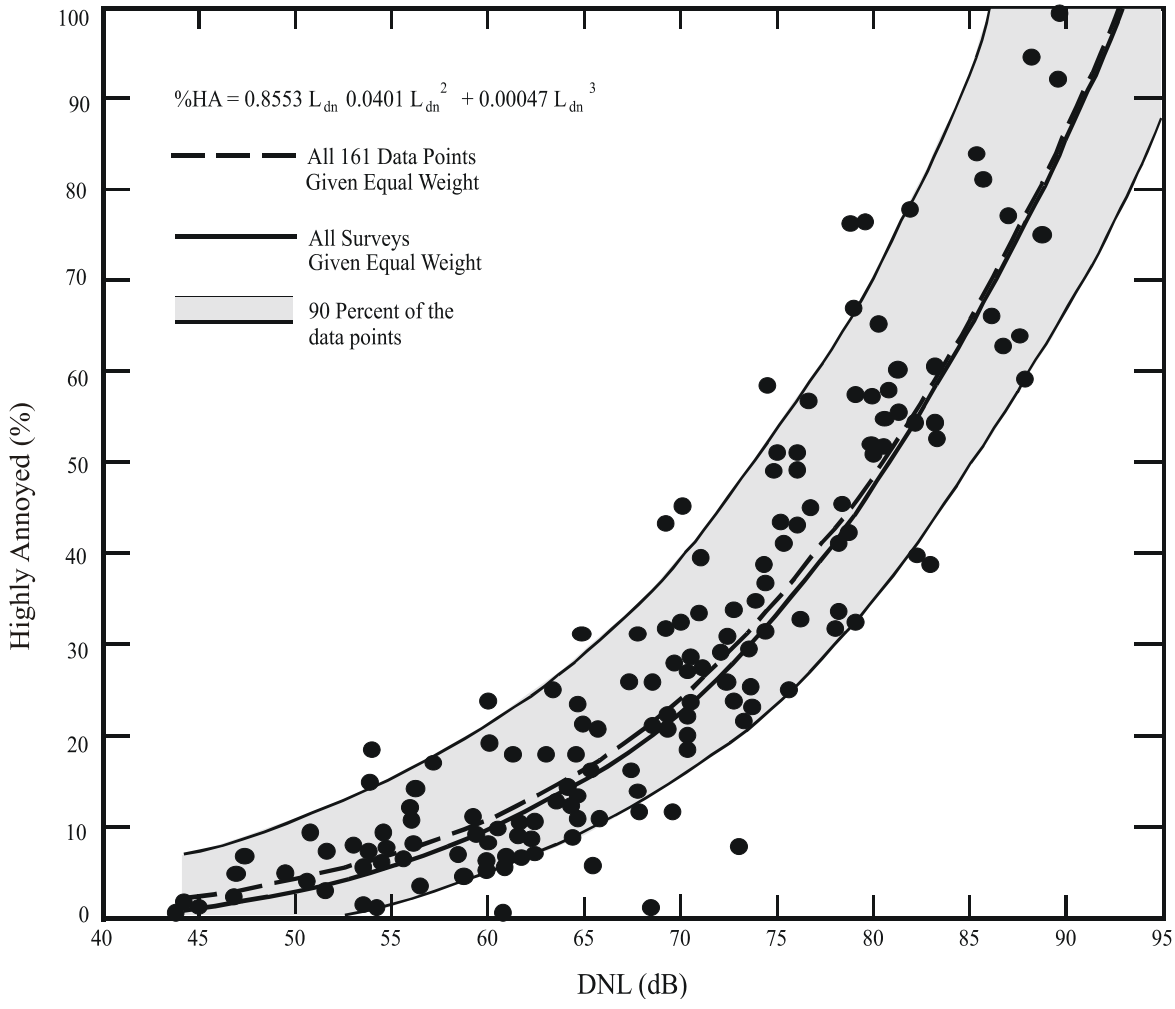
Because of the irregular occurrences of aircraft operations, the number of average daily operations is determined by using the calendar month with the highest number of operations. The

monthly average is denoted L_{dnmr}. Noise levels are calculated the same way for both DNL and L_{dnmr}. L_{dnmr} is interpreted by the same criteria as used for DNL.

1.3 Noise Impact

Community Reaction

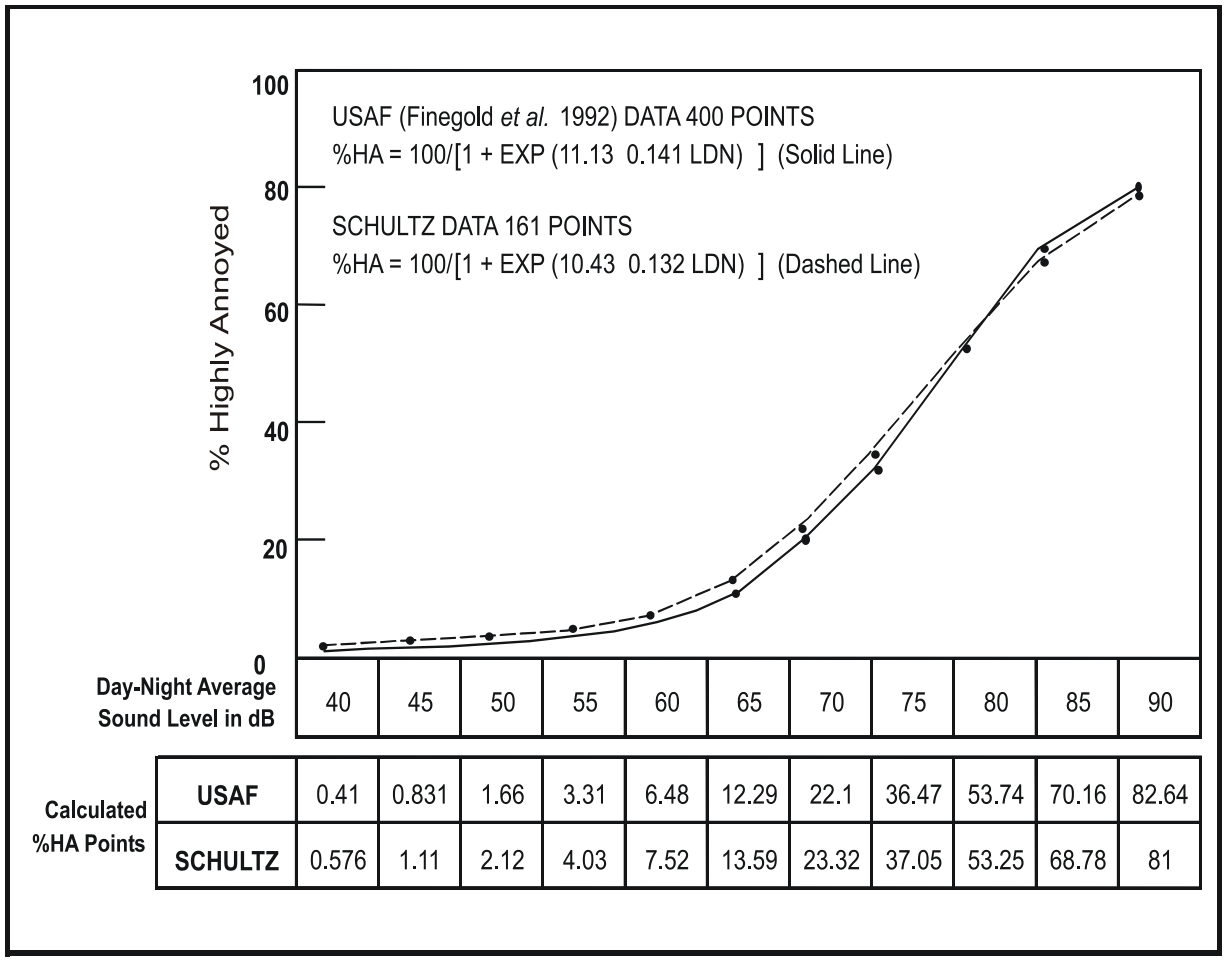
Studies of long-term community annoyance from numerous types of environmental noise show that DNL correlates well with the annoyance. Schultz (1978) showed a consistent relationship between DNL and annoyance. Shultz's original curve fit (Figure C-2) shows that there is a remarkable consistency in results of attitudinal surveys which relate the percentages of groups of people who express various degrees of annoyance when exposed to different DNL.



Source: Schultz 1978

Figure C-2 Community Surveys of Noise Annoyance

A more recent study has reaffirmed this relationship (Fidell *et al.* 1991). Figure C-3 (Federal Interagency Committee on Noise 1992) shows an updated form of the curve fit (Finegold *et al.* 1994) in comparison with the original. The updated fit, which does not differ substantially from the original, is the current preferred form. In general, correlation coefficients of 0.85 to 0.95 are found between the percentages of groups of people highly annoyed and the level of average noise exposure. The correlation coefficients for the annoyance of individuals are relatively low, however, on the order of 0.5 or less. This is not surprising, considering the varying personal factors that influence the manner in which individuals react to noise. Nevertheless, findings substantiate that community annoyance to aircraft noise is represented quite reliably using DNL.



Day-Night Average Sound Level in dB	40	45	50	55	60	65	70	75	80	85	90
Calculated %HA Points — USAF	0.41	0.831	1.66	3.31	6.48	12.29	22.1	36.47	53.74	70.16	82.64
Calculated %HA Points — SCHULTZ	0.576	1.11	2.12	4.03	7.52	13.59	23.32	37.05	53.25	68.78	81

Figure C-3 Response of Communities to Noise; Comparison of Original (Schultz 1978) and Current (Finegold *et al.* 1994) Curve Fits

As noted earlier for SEL, DNL does not represent the sound level heard at any particular time, but rather represents the total sound exposure. DNL accounts for the sound level of individual

noise events, the duration of those events, and the number of events. Its use is endorsed by the scientific community (American National Standards Institute 1980, 1988, 2005; USEPA 1974; Federal Interagency Committee on Urban Noise 1980; Federal Interagency Committee on Noise 1992).

While DNL is the best metric for quantitatively assessing cumulative noise impact, it does not lend itself to intuitive interpretation by non-experts. Accordingly, it is common for environmental noise analyses to include other metrics for illustrative purposes. A general indication of the noise environment can be presented by noting the maximum sound levels which can occur and the number of times per day noise events will be loud enough to be heard. Use of other metrics as supplements to DNL has been endorsed by federal agencies (Federal Interagency Committee on Noise 1992).

The Schultz curve is generally applied to annual average DNL. In Section 1.2, L_{dnmr} was described and presented as being appropriate for quantifying noise in military airspace. The Schultz curve is used with L_{dnmr} as the noise metric. L_{dnmr} is always equal to or greater than DNL, so impact is generally higher than would have been predicted if the onset rate and busiest-month adjustments were not accounted for.

There are several points of interest in the noise-annoyance relation. The first is DNL of 65 dB. This is a level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like aviation which do cause noise. Areas exposed to DNL above 65 dB are generally not considered suitable for residential use. The second is DNL of 55 dB, which was identified by USEPA as a level "...requisite to protect the public health and welfare with an adequate margin of safety," (USEPA 1974) which is essentially a level below which adverse impact is not expected. The third is DNL of 75 dB. This is the lowest level at which adverse health effects could be credible (USEPA 1974). The very high annoyance levels correlated with DNL of 75 dB make such areas unsuitable for residential land use.

Sonic boom exposure is measured by C-weighting, with the corresponding cumulative metric being CDNL. Correlation between CDNL and annoyance has been established, based on community reaction to impulsive sounds (Committee on Hearing, Bioacoustics and Biomechanics 1981). Values of the C-weighted equivalent to the Schultz curve are different than that of the Schultz curve itself. Table C-3 shows the relation between annoyance, DNL, and CDNL.

Table C-3 Relation Between Annoyance, DNL and CDNL		
DNL	***% Highly Annoyed***	***CDNL***
45	0.83	42
50	1.66	46
55	3.31	51
60	6.48	56
65	12.29	60
70	22.10	65

Interpretation of CDNL from impulsive noise is accomplished by using the CDNL versus annoyance values in Table C-3. CDNL can be interpreted in terms of an "equivalent annoyance" DNL. Impulsive noise tends to annoy people at lower levels than those found emanating from continuous noise sources. For example, CDNL of 51 and 60 dB are equivalent to DNL of 55 and 65 dB, respectively. If both continuous and impulsive noise occurs in the same area, impacts are assessed separately for each.

Land Use Compatibility

As noted above, the inherent variability between individuals makes it impossible to predict accurately how any individual will react to a given noise event. Nevertheless, when a community is considered as a whole, its overall reaction to noise can be represented with a high degree of confidence. As described above, the best noise exposure metric for this correlation is the DNL or L_{dnmr} for military overflights. Impulsive noise can be assessed by relating CDNL to an "equivalent annoyance" DNL, as outlined above.

In June 1980, an ad hoc Federal Interagency Committee on Urban Noise published guidelines (Federal Interagency Committee on Urban Noise 1980) relating DNL to compatible land uses. This committee was composed of representatives from DoD, Transportation, and Housing and Urban Development; USEPA; and the Veterans Administration. Since the issuance of these guidelines, federal agencies have generally adopted these guidelines for their noise analyses.

Following the lead of the committee, DoD and FAA adopted the concept of land-use compatibility as the accepted measure of aircraft noise effect. The FAA included the committee's guidelines in the Federal Aviation Regulations (United States Department of Transportation 1984). These guidelines are reprinted in Table C-4, along with the explanatory notes included in the regulation. Although these guidelines are not mandatory (note the footnote "*" in the table), they provide the best means for determining noise impact in airport communities. In general, residential land uses normally are not compatible with outdoor DNL values above 65 dB, and the extent of land areas and populations exposed to DNL of 65 dB and higher provides the best

means for assessing the noise impacts of alternative aircraft actions. In some cases a change in noise level, rather than an absolute threshold, may be a more appropriate measure of impact.

Table C-4 Land-Use Compatibility With Yearly Day-Night Average Sound Levels

Land Use	**Yearly Day-Night Average Sound Level (DNL) in Decibels**					
	Below 65	**65–70**	**70–75**	**75–80**	**80–85**	**Over 85**
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoria, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware, and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts, and camps	Y	Y	Y	N	N	N
Golf courses, riding stables, and water recreation	Y	Y	25	30	N	N

Numbers in parentheses refer to notes.

* The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining

the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise-compatible land uses.

KEY TO TABLE C-4

Y (YES) = Land Use and related structures compatible without restrictions.

N (No) = Land Use and related structures are not compatible and should be prohibited.

NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 = Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and
construction of structures.

NOTES FOR TABLE C-4

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor NLR of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an NLR of 20 dB; thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year-round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise-sensitive areas, or where the normal noise level is low.

(5) Land-use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

2.0 NOISE EFFECTS

The discussion in Section 1.3 presents the global effect of noise on communities. The following sections describe particular noise effects.

2.1 Hearing Loss

Noise-induced hearing loss is probably the best defined of the potential effects of human exposure to excessive noise. Federal workplace standards for protection from hearing loss allow a time-average level of 90 dB over an 8-hour work period, or 85 dB averaged over a 16-hour period. Even the most protective criterion (no measurable hearing loss for the most sensitive portion of the population at the ear's most sensitive frequency, 4,000 Hz, after a 40-year exposure suggests a time-average sound level of 70 dB over a 24-hour period (USEPA 1974). Since it is unlikely that airport neighbors will remain outside their homes 24 hours per day for extended periods of time, there is little possibility of hearing loss below a DNL of 75 dB, and this level is extremely conservative.

2.2 Nonauditory Health Effects

Nonauditory health effects of long-term noise exposure, where noise may act as a risk factor, have not been found to occur at levels below those protective against noise-induced hearing loss, described above. Most studies attempting to clarify such health effects have found that noise exposure levels established for hearing protection will also protect against any potential nonauditory health effects, at least in workplace conditions. The best scientific summary of these findings is contained in the lead paper at the National Institutes of Health Conference on Noise and Hearing Loss, held on January 22–24, 1990, in Washington, D.C., which states "The nonauditory effects of chronic noise exposure, when noise is suspected to act as one of the risk factors in the development of hypertension, cardiovascular disease, and other nervous disorders, have never been proven to occur as chronic manifestations at levels below these criteria (an average of 75 dBA for complete protection against hearing loss for an eight-hour day)" (von Gierke 1990; parenthetical wording added for clarification). At the International Congress (1988) on Noise as a Public Health Problem, most studies attempting to clarify such health effects did not find them at levels below the criteria protective of noise-induced hearing loss; and even above these criteria, results regarding such health effects were ambiguous.

Consequently, it can be concluded that establishing and enforcing exposure levels protecting against noise-induced hearing loss would not only solve the noise-induced hearing loss problem but also any potential nonauditory health effects in the work place.

Although these findings were directed specifically at noise effects in the work place, they are equally applicable to aircraft noise effects in the community environment. Research studies regarding the nonauditory health effects of aircraft noise are ambiguous, at best, and often contradictory. Yet, even those studies which purport to find such health effects use time-average noise levels of 75 dB and higher for their research.

For example, in an often-quoted paper, two University of California at Los Angeles researchers found a relation between aircraft noise levels under the approach path to Los Angeles International Airport and increased mortality rates among the exposed residents by using an average noise exposure level greater than 75 dB for the "noise-exposed" population (Meecham and Shaw 1979). Nevertheless, three other University of California at Los Angeles professors analyzed those same data and found no relation between noise exposure and mortality rates (Frerichs *et al*. 1980).

As a second example, two other University of California at Los Angeles researchers used this same population near Los Angeles International Airport to show a higher rate of birth defects during the period of 1970 to 1972 when compared with a control group residing away from the airport (Jones and Tauscher 1978). Based on this report, a separate group at the United States Centers for Disease Control performed a more thorough study of populations near Atlanta's Hartsfield International Airport for 1970 to 1972 and found no relation in their study of 17 identified categories of birth defects to aircraft noise levels above 65 dB (Edmonds 1979).

A recent review of health effects, prepared by a Committee of the Health Council of The Netherlands (Committee of the Health Council of the Netherlands 1996), analyzed currently available published information on this topic. The committee concluded that the threshold for possible long-term health effects was a 16-hour (6:00 a.m. to 10:00 p.m.) L_{eq} of 70 dB. Projecting this to 24 hours and applying the 10 dB nighttime penalty used with DNL, this corresponds to DNL of about 75 dB. The study also affirmed the risk threshold for hearing loss, as discussed earlier.

In summary, there is no scientific basis for a claim that potential health effects exist for aircraft time-average sound levels below 75 dB.

2.3 Annoyance

The primary effect of aircraft noise on exposed communities is one of annoyance. Noise annoyance is defined by the USEPA as any negative subjective reaction on the part of an individual or group (USEPA 1974). As noted in the discussion of DNL above, community annoyance is best measured by that metric.

Because the USEPA Levels Document (USEPA 1974) identified DNL of 55 dB as ". . . requisite to protect public health and welfare with an adequate margin of safety," it is commonly assumed that 55 dB should be adopted as a criterion for community noise analysis. From a noise exposure perspective, that would be an ideal selection. However, financial and technical resources are generally not available to achieve that goal. Most agencies have identified DNL of 65 dB as a criterion which protects those most impacted by noise, and which can often be achieved on a practical basis (Federal Interagency Committee on Noise 1992). This corresponds to about 12 percent of the exposed population being highly annoyed.

Although DNL of 65 dB is widely used as a benchmark for significant noise impact, and is often an acceptable compromise, it is not a statutory limit, and it is appropriate to consider other thresholds in particular cases.

In this analysis, no specific threshold is used. The noise in the affected environment is evaluated on the basis of the information presented in this appendix and in the body of the environmental analysis.

Community annoyance from sonic booms is based on CDNL, as discussed in Section 1.3. These effects are implicitly included in the "equivalent annoyance" CDNL values in Table C-3, since those were developed from actual community noise impact.

2.4 Speech Interference

Speech interference associated with aircraft noise is a primary cause of annoyance to individuals on the ground. The disruption of routine activities in the home, such as radio or television listening, telephone use, or family conversation, gives rise to frustration and irritation. The quality of speech communication is also important in classrooms, offices, and industrial settings and can cause fatigue and vocal strain in those who attempt to communicate over the noise. Research has shown that the use of the SEL metric will measure speech interference successfully, and that a SEL exceeding 65 dB will begin to interfere with speech communication.

2.5 Sleep Interference

Sleep interference is another source of annoyance associated with aircraft noise. This is especially true because of the intermittent nature and content of aircraft noise, which is more disturbing than continuous noise of equal energy and neutral meaning.

Sleep interference may be measured in either of two ways. "Arousal" represents actual awakening from sleep, while a change in "sleep stage" represents a shift from one of four sleep

stages to another stage of lighter sleep without actual awakening. In general, arousal requires a somewhat higher noise level than does a change in sleep stage.

An analysis sponsored by the Air Force summarized 21 published studies concerning the effects of noise on sleep (Pearsons *et al*. 1989). The analysis concluded that a lack of reliable in-home studies, combined with large differences among the results from the various laboratory studies, did not permit development of an acceptably accurate assessment procedure. The noise events used in the laboratory studies and in contrived in-home studies were presented at much higher rates of occurrence than would normally be experienced. None of the laboratory studies were of sufficiently long duration to determine any effects of habituation, such as that which would occur under normal community conditions. A recent extensive study of sleep interference in people's own homes (Ollerhead 1992) showed very little disturbance from aircraft noise.

There is some controversy associated with the recent studies, so a conservative approach should be taken in judging sleep interference. Based on older data, the USEPA identified an indoor DNL of 45 dB as necessary to protect against sleep interference (USEPA 1974). Assuming a very conservative structural noise insulation of 20 dB for typical dwelling units, this corresponds to an outdoor DNL of 65 dB as minimizing sleep interference.

A 1984 publication reviewed the probability of arousal or behavioral awakening in terms of SEL (Kryter 1984). Figure C-4, extracted from Figure 10.37 of Kryter (1984), indicates that an indoor SEL of 65 dB or lower should awaken less than 5 percent of those exposed. These results do not include any habituation over time by sleeping subjects. Nevertheless, this provides a reasonable guideline for assessing sleep interference and corresponds to similar guidance for speech interference, as noted above.

2.6 Noise Effects on Domestic Animals and Wildlife

Animal species differ greatly in their responses to noise. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Aircraft noise may mask or interfere with these functions. Secondary effects may include nonauditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines.

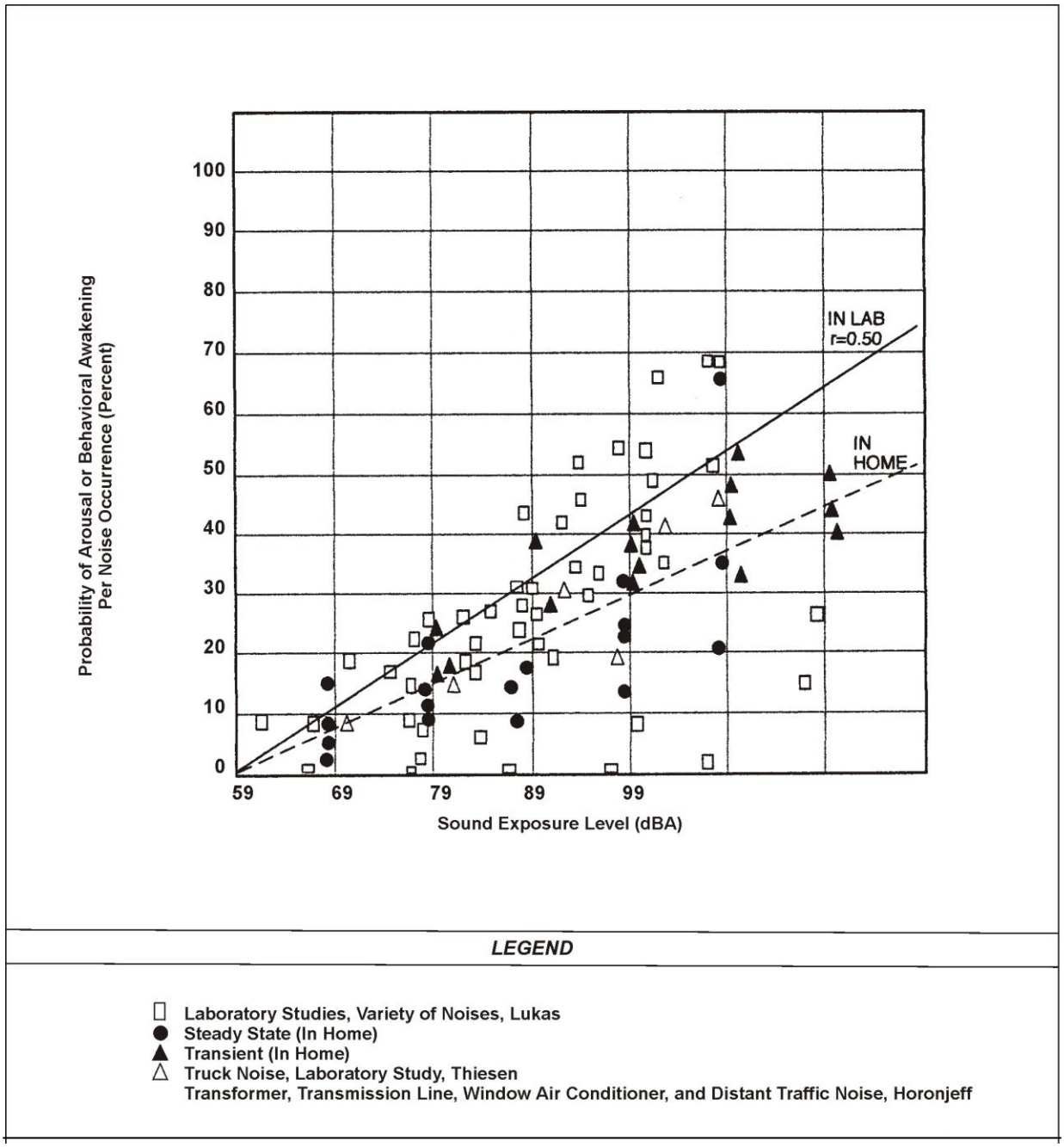


Figure C-4 Probability of Arousal or Behavioral Awakening in Terms of Sound Exposure Level

2.7 Noise Effects on Structures

Subsonic Aircraft Noise

Normally, the most sensitive components of a structure to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the peak sound pressures impinging on the structure is normally sufficient to determine the possibility of damage. In general, at sound levels above 130 dB, there is the possibility of the excitation of structural component resonance. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (National Research Council/National Academy of Sciences 1977).

A study directed specifically at low-altitude, high-speed aircraft showed that there is little probability of structural damage from such operations (Sutherland 1989). One finding in that study is that sound levels at damaging frequencies (e.g., 30 Hz for window breakage or 15 to 25 Hz for whole-house response) are rarely above 130 dB.

Noise-induced structural vibration may also cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects within the dwelling, such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, such noise-induced vibrations occur at sound levels above those considered normally incompatible with residential land use. Thus assessments of noise exposure levels for compatible land use should also be protective of noise-induced secondary vibrations.

Sonic Booms

Sonic booms are commonly associated with structural damage. Most damage claims are for brittle objects, such as glass and plaster. Table C-5 summarizes the threshold of damage that might be expected at various overpressures. There is a large degree of variability in damage experience, and much damage depends on the pre-existing condition of a structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 1 psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). These damage rates are associated with a combination of boom load and glass condition. At 10 psf, the probability of breakage is between one in a hundred and one in a thousand. Laboratory tests of glass (White 1972) have shown that properly installed window glass will not break at overpressures below 10

psf, even when subjected to repeated booms, but in the real world glass is not in pristine condition.

Table C-5 Possible Damage to Structures From Sonic Booms

Sonic Boom Overpressure Nominal (psf)	***Type of Damage***	***Item Affected***
0.5 - 2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards.
	Glass	Rarely shattered; either partial or extension of existing.
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	Failures show that would have been difficult to forecast in terms of their existing localized condition. Nominally in good condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in nominally good state, slurry-wash; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Inside ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good glass will fail regularly to sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and will-plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Source: Haber and Nakaki 1989

Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it will often crack due to shrinkage while curing, or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high from these factors.

Some degree of damage to glass and plaster should thus be expected whenever there are sonic booms, but usually at the low rates noted above. In general, structural damage from sonic booms should be expected only for overpressures above 10 psf.

2.8 Noise Effects on Terrain

Subsonic Aircraft Noise

Members of the public often believe that noise from low-flying aircraft can cause avalanches or landslides by disturbing fragile soil or snow structures in mountainous areas. There are no known instances of such effects, and it is considered improbable that such effects will result from routine, subsonic aircraft operations**.**

Sonic Booms

In contrast to subsonic noise, sonic booms are considered to be a potential trigger for snow avalanches. Avalanches are highly dependent on the physical status of the snow, and do occur spontaneously. They can be triggered by minor disturbances, and there are documented accounts of sonic booms triggering avalanches. Switzerland routinely restricts supersonic flight during avalanche season. Landslides are not an issue for sonic booms. There was one anecdotal report of a minor landslide from a sonic boom generated by the Space Shuttle during landing, but there is no credible mechanism or consistent pattern of reports.

2.9 Noise Effects on Historical and Archaeological Sites

Because of the potential for increased fragility of structural components of historical buildings and other historical sites, aircraft noise may affect such sites more severely than newer, modern structures. Again, there are few scientific studies of such effects to provide guidance for their assessment. One study involved the measurements of sound levels and structural vibration levels in a superbly restored plantation house, originally built in 1795, and now situated approximately 1,500 feet from the centerline at the departure end of Runway 19L at Washington Dulles International Airport. These measurements were made in connection with the proposed scheduled operation of the supersonic Concorde airplane at Dulles (Wesler 1977). There was special concern for the building's windows, since roughly half of the 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning within the building itself.

As noted above for the noise effects of noise-induced vibrations on normal structures, assessments of noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites.

3.0 NOISE MODELING

3.1 Subsonic Aircraft Noise

An aircraft in subsonic flight generally emits noise from two sources: the engines and flow noise around the airframe. Noise generation mechanisms are complex and, in practical models, the noise sources must be based on measured data. The Air Force has developed a series of computer models and aircraft noise databases for this purpose. The models include NOISEMAP (Moulton 1992) for noise around airbases, and MR_NMAP (Lucas and Calamia 1996) for use in MOAs, ranges, and low-level training routes. These models use the NOISEFILE database developed by the Air Force. NOISEFILE data includes SEL and L_{Amax} as a function of speed and power setting for aircraft in straight flight.

Noise from an individual aircraft is a time-varying continuous sound. It is first audible as the aircraft approaches, increases to a maximum when the aircraft is near its closest point, then diminishes as it departs. The noise depends on the speed and power setting of the aircraft and its trajectory. The models noted above divide the trajectory into segments whose noise can be computed from the data in NOISEFILE. The contributions from these segments are summed.

MR_NMAP was used to compute noise levels in the airspace. The primary noise metric computed by MR_NMAP was L_{dnmr} averaged over each airspace. Supporting routines from NOISEMAP were used to calculate SEL and L_{Amax} for various flight altitudes and lateral offsets from a ground receiver position.

3.2 Sonic Booms

When an aircraft moves through the air, it pushes the air out of its way. At subsonic speeds, the displaced air forms a pressure wave that disperses rapidly. At supersonic speeds, the aircraft is moving too quickly for the wave to disperse, so it remains as a coherent wave. This wave is a sonic boom. When heard at the ground, a sonic boom consists of two shock waves (one associated with the forward part of the aircraft, the other with the rear part) of approximately equal strength and (for fighter aircraft) separated by 100 to 200 milliseconds. When plotted, this pair of shock waves and the expanding flow between them, have the appearance of a capital letter “N,” so a sonic boom pressure wave is usually called an “N-wave.” An N-wave has a characteristic "bang-bang" sound that can be startling. Figure C-5 shows the generation and evolution of a sonic boom N-wave under the aircraft. Figure C-6 shows the sonic boom pattern for an aircraft in steady supersonic flight. The boom forms a cone that is said to sweep out a “carpet” under the flight track.

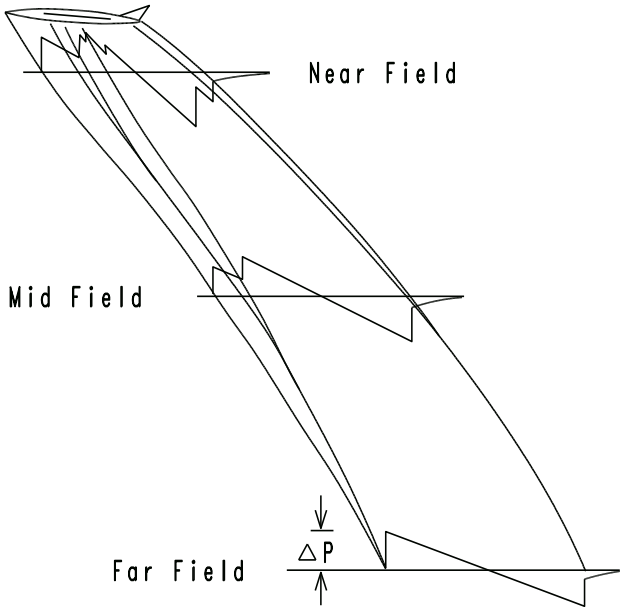


Figure C-5 Sonic Boom Generation and Evolution to N-Wave

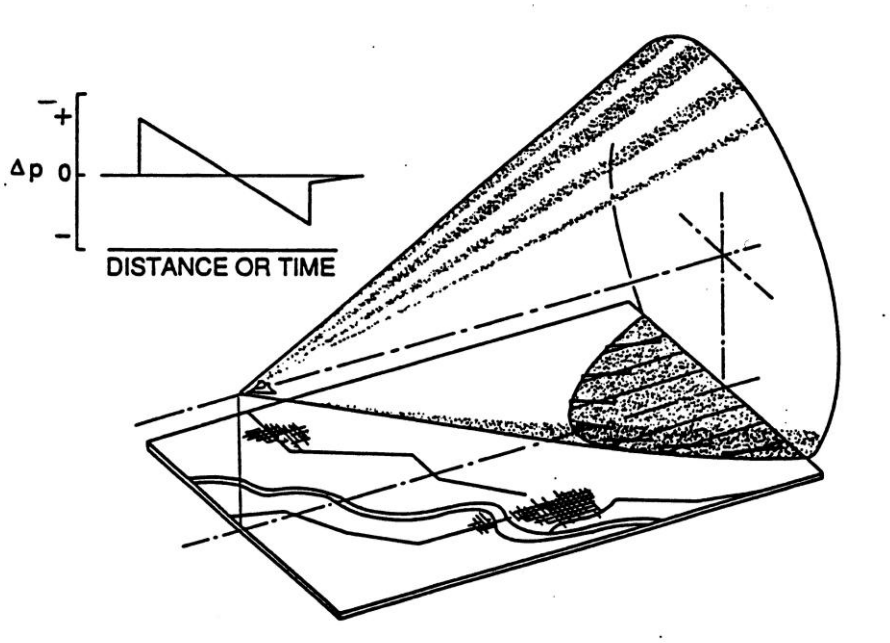


Figure C-6 Sonic Boom Carpet in Steady Flight

The complete ground pattern of a sonic boom depends on the size, shape, speed, and trajectory of the aircraft. Even for a nominally steady mission, the aircraft must accelerate to supersonic speed

at the start, decelerate back to subsonic speed at the end, and usually change altitude. Figure C-7 illustrates the complexity of a nominal full mission.

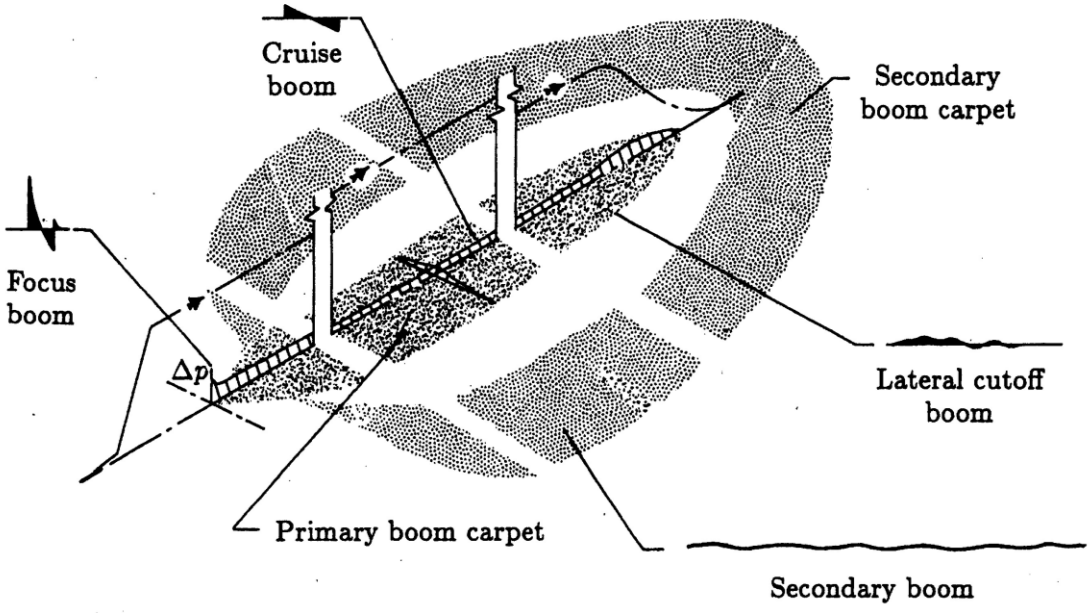


Figure C-7 Complex Sonic Boom Pattern for Full Mission

The Air Force's PCBoom4 computer program (Plotkin and Grandi 2002) can be used to compute the complete sonic boom footprint for a given single event, accounting for details of a particular maneuver.

Supersonic operations for the proposed action and alternatives are, however, associated with air combat training, which cannot be described in the deterministic manner that PCBoom4 requires. Supersonic events occur as aircraft approach an engagement, break at the end, and maneuver for advantage during the engagement. Long time cumulative sonic boom exposure, CDNL, is meaningful for this kind of environment.

Long-term sonic boom measurement projects have been conducted in four supersonic air combat training airspaces: White Sands, New Mexico (Plotkin *et al.* 1989); the eastern portion of the Goldwater Range, Arizona (Plotkin *et al.* 1992); the Elgin MOA at Nellis AFB, Nevada (Frampton *et al.* 1993); and the western portion of the Goldwater Range (Page *et al.* 1994). These studies included analysis of schedule and air combat maneuvering instrumentation data and supported development of the 1992 BOOMAP model (Plotkin *et al.* 1992). The current version of BOOMAP (Frampton *et al.* 1993; Plotkin 1996) incorporates results from all four studies. Because BOOMAP is directly based on long-term measurements, it implicitly accounts

for such variables as maneuvers, statistical variations in operations, atmosphere effects, and other factors.

Figure C-8 shows a sample of supersonic flight tracks measured in the air combat training airspace at White Sands (Plotkin *et al.* 1989). The tracks fall into an elliptical pattern aligned with preferred engagement directions in the airspace. Figure C-9 shows the CDNL contours that were fit to six months of measured booms in that airspace. The subsequent measurement programs refined the fit, and demonstrated that the elliptical maneuver area is related to the size and shape of the airspace (Frampton *et al*. 1993). BOOMAP quantifies the size and shape of CDNL contours, and also numbers of booms per day, in air combat training airspaces. That model was used for prediction of cumulative sonic boom exposure in this analysis.

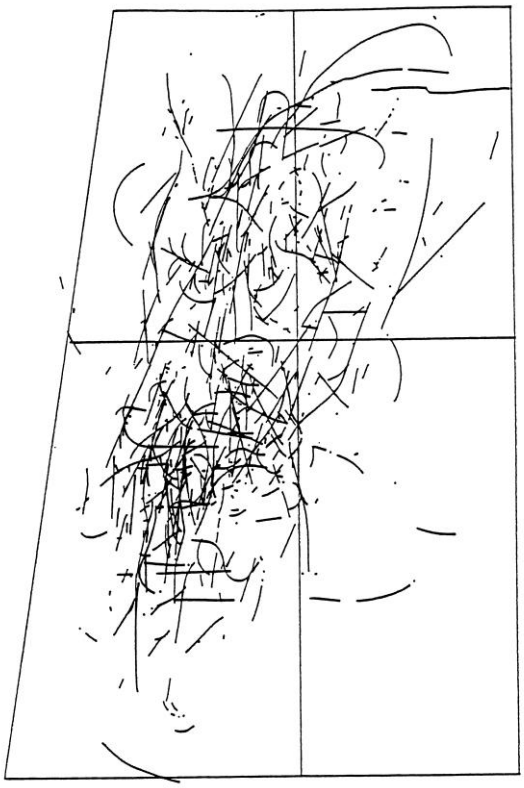


Figure C-8 Supersonic Flight Tracks in Supersonic Air Combat Training Airspace

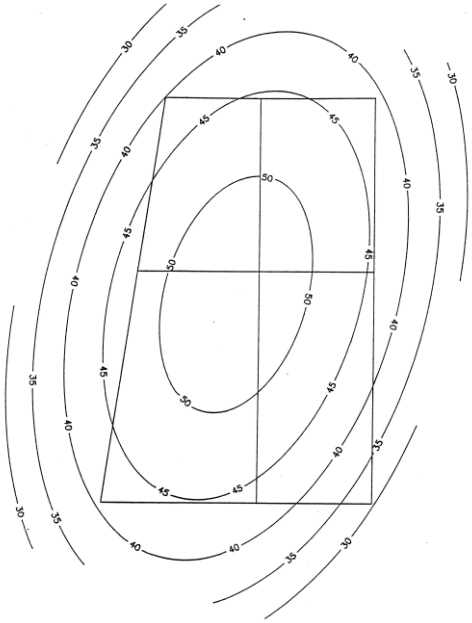


Figure C-9 Elliptical CDNL Contours in Supersonic Air Combat Training Airspace

REFERENCES

American National Standards Institute (ANSI). 1980. Sound Level Descriptors for Determination of Compatible Land Use. American National Standards Institute Standard ANSI S3.231980.

_____. 1988. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 1. American National Standards Institute Standard ANSI S12.9-1988.

_____. 2005. Quantities and Procedures for Description and Measurement of Environmental Sound, Part 4. Noise Assessment and Prediction of Long-term Community Response. American National Standards Institute Standard ANSI S12.9-2005.

Committee on Hearing, Bioacoustics and Biomechanics (CHABA). 1981. Assessment of Community Noise Response to High-Energy Impulsive Sounds. Report of Working Group 84, Committee on Hearing, Bioacoustics and Biomechanics, Assembly of Behavioral and Social Sciences. National Research Council, National Academy of Sciences. Washington, DC.

Committee of the Health Council of the Netherlands (CHCN). 1996. Effects of Noise on Health. Noise/News International 4. September.

Edmonds, L.D., et al. 1979. Airport Noise and Teratogenesis. Archives of Environmental Health, 243247. July/August.

Federal Interagency Committee on Noise (FICON). 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. Federal Interagency Committee on Noise. August.

Federal Interagency Committee on Urban Noise (FICUN). 1980. Guidelines for Considering Noise in Land-Use Planning and Control. Federal Interagency Committee on Urban Noise. June.

Fidell, S., Barger, D.S., and Schultz, T.J. 1991. Updating a Dosage-Effect Relationship for the Prevalence of Annoyance Due to General Transportation Noise. Journal of Acoustics Society of America., 89, 221233. January.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impacts of General Transportation Noise on People. In Noise Control Engineering Journal, Volume 42, Number 1. pp. 25-30. January-February.

Frampton, K.D., Lucas, M.J., and Cook, B. 1993. Modeling the Sonic Boom Noise Environment in Military Operating Areas. AIAA Paper 93-4432.

Frericks, R.R., *et al.* 1980. Los Angeles Airport Noise and Mortality: Faulty Analysis and Public Policy. *American Journal of Public Health*, 357-362. April.

Haber, J. and D. Nakaki. 1989. Sonic Boom Damage to Conventional Structures. HSD-TR-89-April.

Harris, C.M. (editor). 1979. Handbook of Noise Control. McGraw-Hill.

Hershey, R.L. and T.H. Higgins. 1976. Statistical Model of Sonic Boom Structural Damage. FAA-RD-76-87. July.

Jones, F.N., and Tauscher, J. 1978. Residence Under an Airport Landing Pattern as a Factor in Teratism. Archives of Environmental Health, 10-12. January/February.

Kryter, K.D. 1984. Physiological, Psychological, and Social Effects of Noise. NASA Reference Publication 1115, 446. July.

Lucas, M.J. and P.T. Calamia. 1996. Military Operations Area and Range Noise Model: NRNMAP User's Manual. Final. Wright-Patterson AFB, Ohio: AAMRL. A1/OE-MN-1996-0001.

Lucas, M.J. and K. Plotkin, 1988. ROUTEMAP Model for Predicting Noise Exposure From Aircraft Operations on Military Training Routes. Final, Wright-Patterson AFB, Ohio. AAMRL. AAMRL-TR-88-060.

Meacham, W.C., and Shaw, N. 1979. Effects of Jet Noise on Mortality Rates. *British J. Audiology*, 77-80. August.

Moulton, C.L. 1992. Air Force Procedure for Predicting Noise Around Airbases: Noise Exposure Model (NOISEMAP). Technical Report AL-TR-1992-59.

National Research Council/National Academy of Sciences (NRC/NAS). 1977. Guidelines for Preparing Environmental Impact Statements on Noise. Committee on Hearing, Bioacoustics, and Biomechanics.

Ollerhead, J.B., *et al.* 1992. Report of a Field Study of Aircraft Noise and Sleep Disturbance. The Department of Transport, Department of Safety Environment and Engineering. Civil Aviation Authority, London. December.

Page, J.A., B.D. Schantz, R. Brown, K.J. Plotkin, and C.L. Moulton. 1994. Measurements of Sonic Booms Due to ACM Training in R2301 W of the Barry Goldwater Air Force Range. Wyle Research Report WR 94-11.

Pearsons, K.S., Barber, D.S., and Tabachick, B.G. 1989. Analyses of the Predictability of Noise-Induced Sleep Disturbance. USAF Report HSD-TR-89-029. October.

Plotkin, K.J., 1996. PCBoom3 Sonic Boom Prediction Model: Version 1.0c. Wyle Research Report WR 95-22C. May.

Plotkin, K.J. and F. Grandi, 2002. Computer Models for Sonic Boom Analysis: PCBoom4, CABoom, BooMap, CORBoom, Wyle Research Report WR 02-11, June 2002.

Plotkin, K.J., C.L. Moulton, V.R. Desai, and M.J. Lucas. 1992. "Sonic Boom Environment under a Supersonic Military Operations Area," Journal of Aircraft 29(6): 1069-1072.

Plotkin, K.J., L.C. Sutherland, and J.A. Molino. 1987. Environmental Noise Assessment for Military Aircraft Training Routes, Volume II: Recommended Noise Metric. Wyle Research Report WR 86-21. January.

Plotkin, K.J., V.R. Desai, C.L. Moulton, M.J. Lucas, and R. Brown. 1989. "Measurements of Sonic Booms due to ACM Training at White Sands Missile Range," Wyle Research Report WR 89-18.

Schultz, T.J. 1978. Synthesis of Social Surveys on Noise Annoyance. Journal of Acoustics Society of America, 64, 377405. August.

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

Stusnick, E., D.A. Bradley, M.A. Bossi, and D.G. Rickert. 1993. The Effect of Onset Rate on Aircraft Noise Annoyance. Volume 3: Hybrid Own-Home Experiment. Wyle Laboratories Research Report WR 93-22. December.

Sutherland, L. 1990. Assessment of Potential Structural Damage from Low Altitude Subsonic Aircraft. Wyle Laboratories Research Report WR 89-16. El Segundo, CA.

Sutherland, L.C. 1990. "Effects of Sonic Boom on Structures," Lecture 3 of Sonic Boom: Prediction and Effects, AIAA Short Course, October 1990.

United States Department of Transportation (USDOT). 1984. Airport Noise Compatibility Planning; Development of Submission of Airport Operator's Noise Exposure Map and Noise Compatibility Program; Final Rule and Request for Comments. 14 CFR Parts 11 and 150, Federal Register 49(244): 18 December.

United States Environmental Protection Agency (USEPA). 1972. Information on Levels of Environmental Noise Requisite to Protect the Public Health and Welfare with an Adequate Margin of Safety. U.S. Environmental Protection Agency Report 550/9-74-004. March.

von Gierke, H.R. 1990. The Noise-Induced Hearing Loss Problem. NIH Consensus Development Conference on Noise and Hearing Loss. Washington, D.C. 22-24 January.

Wesler, J.E. 1977. Concorde Operations At Dulles International Airport. NOISEXPO '77, Chicago, IL. March.

White, R. 1972. Effects of Repetitive Sonic Booms on Glass Breakage. FAA Report FAA-RD-7243. April.

Appendix D
Common and Scientific Names of Wildlife and Plant Species Referenced in this EIS

This page intentionally left blank.

Mammals

Antelope jackrabbit	*Lepus alleni*
American badger	*Taxidea taxus*
Big brown bat	*Eptesicus fuscus*
Black-tailed jackrabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Burro	*Equus asinus*
California leaf-nosed bat	*Macrotus californicus*
California myotis	*Myotis californicus*
Cave myotis	*Myotis velifer*
Coyote	*Canis latrans*
Deer mouse	*Peromyscus* spp.
Desert bighorn sheep	*Ovis canadensis nelsoni*
Desert cottontail	*Sylvilagus audubonii*
Desert kangaroo rat	*Dipodomys deserti*
Grasshopper mouse	*Onychomys* sp.
Gray fox	*Urocyon cinereoargenteus*
Greater western mastiff bat	*Eumops perotis*
Ground squirrel	*Spermophilus* spp.
Harris' antelope squirrel	*Ammospermophilus harrisii*
Jackrabbit	*Lepus spp.*
Javelina	*Pecari tajacu*
Kangaroo rat	*Dipodomys spp.*
Kit fox	*Vulpes macrotis*
Lesser long-nosed bat	*Leptonycteris curasoae yerbabuenae*
Little pocket mouse	*Perognathus longimembris*
Mountain lion	*Puma concolor*
Mule deer	*Odocoileus hemionus*
Northern raccoon	*Procyon lotor*
Pallid bat	*Antrozous pallidus*
Pocket mouse	*Chaetodipus* spp.
Ringtail	*Bassariscus astutus*

Rock squirrel	*Spermophilus variegatus*
Sonoran pronghorn	*Antilocapra americana sonoriensis*
Western pipistrelle	*Pipistrellus hesperus*
Western spotted skunk	*Spilogale gracilis*
White-nosed coati	*Nasua narica*
White-throated woodrat	*Neotoma albigula*
White-tailed deer	*Odocoileus virginianus*
Woodrat	*Neotoma* spp.

Birds

American kestrel	*Falco sparverius*
Bell's vireo	*Vireo bellii*
Black-tailed gnatcatcher	*Polioptila melanura*
Black-throated sparrow	*Amphispiza bilineata*
Bunting	*Passerina spp.*
Western burrowing owl	*Athene cunicularia hypugea*
Cactus wren	*Campylorhynchus brunneicapillus*
Canyon Towhee	*Pipilo fuscus*
Common poorwill	*Phalaenoptilus nuttallii*
Crissal thrasher	*Toxostoma crissale*
Curve-billed thrasher	*Toxostoma curvirostre*
Elf owl	*Micrathene whitneyi*
Gambel's quail	*Callipepla gambelii*
Gila woodpecker	*Melanerpes uropygialis*
Gilded flicker	*Colaptes chrysoides*
Greater roadrunner	*Geococcyx californianus*
Harris's hawk	*Parabuteo unicinctus*
Horned lark	*Eremophila alpestris*
LeConte's thrasher	*Toxostoma lecontei*
Lesser nighthawk	*Chordeiles acutipennis*
Loggerhead shrike	*Lanius ludovicianus*
Lucy's warbler	*Vermivora luciae*

MacGillivray's warbler	*Oporornis tolmiei*
Mourning dove	*Zenaida macroura*
Northern cardinal	*Cardinalis cardinalis*
Northern mockingbird	*Mimus polyglottos*
Pyrrhuloxia	*Cardinalis sinuatus*
Red-tailed hawk	*Buteo jamaicensis*
Ruby-crowned kinglet	*Regulus calendula*
Sage sparrow	*Amphispiza belli*
Say's phoebe	*Sayornis saya*
Swainson's thrush	*Catharus ustulatus*
Tree swallow	*Tachycineta bicolor*
Turkey vulture	*Cathartes aura*
Verdin	*Auriparus flaviceps*
Western screech owl	*Otus kennicottii*
Western tanager	*Piranga ludoviciana*
White-winged dove	*Zenaida asiatica*
Canyon towhee	*Pipilo fuscus*

Reptiles

Banded sand snake	*Chilomeniscus cinctus*
Black-tailed rattlesnake	*Crotalus molossus*
Chuckwalla	*Sauromalus ater*
Coachwhip	*Masticophis flagellum*
Collard lizard	*Crotaphytus collaris*
Common kingsnake	*Lampropeltis getula*
Colorado Desert fringe-toed lizard	*Uma rufopunctata*
Desert iguana	*Dipsosaurus dorsalis*
Desert tortoise (Sonoran population)	*Gopherus agassizii*
Gila monster	*Heloderma suspectum*
Gopher snake	*Pituophis catenifer*
Long-nosed snake	*Rhinocheilus lecontei*
Long-tailed brush lizard	*Urosaurus graciosus*

Mohave rattlesnake	*Crotalus scutulatus*
Night snake	*Hypsiglena torquata*
Sidewinder	*Crotalus cerastes*
Speckled rattlesnake	*Crotalus mitchellii*
Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*
Tiger rattlesnake	*Crotalus tigris*
Western whiptail lizard	*Aspidoscelis tigris*
Western diamondback rattlesnake	*Crotalus atrox*
Western ground snake	*Sonora semiannulata*
Western shovel-nosed snake	*Chionactis occipitalis*
Zebra-tailed lizard	*Callisaurus draconoides*

Amphibians

Couch's spade-foot	*Scaphiopus couchii*
Great Plains toad	*Bufo cognatus*
Red-spotted toad	*Bufo punctatus*
True toads	*Bufo spp.*
Sonoran desert toad	*Bufo alvarius*

Plants

Agave	*Agave* spp.
Ajo lily	*Hesperocallis undulata*
Big galleta	*Hilaria rigida*
Brittlebush	*Encelia farinosa*
Buckhorn cholla	*Cylindropuntia acanthocarpa*
Cholla	*Cylindropuntia* spp.
Creosotebush	*Larrea tridentata*
Ironwood	*Olneya tesota*
Jojoba	*Simmondsia chinensis*
Mesquite	*Prosopis* spp.
Ocotillo	*Fouquieria splendens*
Paloverde	*Parkinsonia* spp.

Prickly pear	*Opuntia* spp.
Saguaro	*Carnegiea gigantea*
Desert sand verbena	*Abronia villosa*
Saltbush	*Atriplex* spp.
Smoketree	*Psorothamnus spinosus*
Triangle-leaf bursage	*Ambrosia deltoidea*
White bursage	*Ambrosia dumosa*

Appendix E
Cumulative Effects

This page intentionally left blank.

Appendix E
Baseline for Cumulative Effects Analysis

The 2006 EIS prepared for the BMGR INRMP included a comprehensive cumulative effects analysis of past, present, and reasonably foreseeable future actions within the BMGR region. The list of actions considered in that analysis is included in this appendix as Table E-1 and Figure E-1 shows the location of most of these actions.

The analysis completed in 2006 is directly relevant to the analysis of the cumulative effects of the range enhancement actions proposed for BMGR East. While the entire cumulative effects analysis of the 2006 BMGR INRMP EIS is incorporated by reference, Table E-2 provides the findings from the 2006 EIS for the resources analyzed in that document.

These tables are provided for reference in support of Section 5.0 on the analysis of cumulative effects for this BMGR East Range Enhancement EIS.

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
1	Historical mining and ranching activities		✓	✓	✓	✓	✓	✓	Fortuna Mine located in northwest Gila Mts. (1894-1925), Ajo Mine located near Ajo (1850s-1900), Betty Lee mine located near Copper Mts. (1920s-1930s), and 218 mines, prospects, claim groups, and mineral deposits within BMGR and adjacent areas prior to World War II, pre-1941. Cattle grazing located throughout BMGR region from Sand Tank Mts. (most intense) to Lechuguilla Desert (least intense), pre-1941.
2	Phelps Dodge Ajo. Mine	✓					✓		New Cornelia Open Pit (1910-1985).
3	Lower Gila South Resource Management Plan (Goldwater Amendment)		✓	✓					Implemented 1990 and expired November 2001.
4	Lechuguilla-Mohawk HMP			✓					Also includes public lands north and west of BMGR-West, implemented 1995 and expired November 2001.
5	Draft Barry M. Goldwater—East HMP		✓						Also includes Sand Tank Mt. Area, not finalized or implemented.
6	Transportation/utility corridors	✓	✓		✓		✓	✓	Major highways include U.S. 80 (1920s) and Interstate 8 (mid-1970s) from east of Gila Bend to west of Yuma, State Route 85 (1920s) from Gila Bend to Ajo to Mexico, and Highway 2 in Mexico (no date). Railroads include Southern Pacific, from east of Gila Bend to west of Yuma (1870s-present), and Tucson, Cornelia and Gila Bend, from Gila Bend to Ajo (1916 to 1986). Agricultural irrigation canals, along northern BMGR boundary (from 1920s), and utility lines, situated along Interstate 8 and State Route 85, were also developed.
7	Agricultural development	✓					✓	✓	Current croplands are generally interspersed along the lower Gila River and in the Yuma Valley from the 1890s and Mexico south of Organ Pipe NM from the 1970s.
8	Five BLM livestock grazing allotments: Cameron, Childs, Coyote Flat, Sentinel and Why allotments	✓					✓		Sentinel allotment is located south of Interstate 8. Remaining four allotments include all public lands surrounding Why and Ajo, Arizona (1940s-present). Grazing was ended at Cameron Allotment in September 2004 through a BLM buy-out of the allotee's grazing rights and range improvements. Removal of internal fences is in progress and livestock waters will be adapted to wildlife use. Construction of two or more forage enhancement plots for Sonoran pronghorn is pending (January 2005+).
9	Improvements at Childs Mountain	✓				✓			Construction of Air Route Surveillance Radar for FAA and watchable wildlife overlook for Cabeza Prieta NWR (1998-2000).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
10	Past designation and military use of BMGR		✓	✓					Use of the BMGR from 1941 through MLWA of 1999, also includes overlying restricted airspace.
11	AGFD management activities		✓	✓	✓	✓	✓		AGFD has been and continues to be responsible for management of wildlife resources within the BMGR since before the range was established in 1941.
12	U.S. Border Patrol activities and illegal UDA and drug smuggler entry to the United States		✓	✓	✓	✓	✓		The Border Patrol monitors and interdicts illegal UDA and drug smuggler entries to the United States along the entire Arizona/Mexico border (long standing continuous operation, sharp increase in illegal border crossings began about 1999 and continue in large numbers). Numerous wildcat roads and distinct foot trails in Organ Pipe Cactus NM, Cabeza Prieta NWR, and BMGR have been and continue to be created by border crossers. Numerous broken-down vehicles have been abandoned within these areas by border crossers. Border Patrol mission also includes search and rescue services for stranded migrants and placement and maintenance of radio-powered rescue beacons (14 installed on BMGR and adjacent areas in 2001). Impacts from illegal off-road driving and foot traffic, authorized Border Patrol off-road driving for interdictions and search and rescue, abandoned vehicles and personal belongings, trash, use of wildlife waters, and some damage to BMGR facilities. Illegal traffic also disrupts military training. Interdiction activities and infrastructure are being increased.
13	Past recreation within the BMGR		✓	✓					Hunting, camping, four-wheel driving, hiking, exploring are traditional dispersed recreation occurring as compatible with the military mission. Developed recreational areas located at Baker Tanks and the Gila Bend AFAF. Interpretive facilities are located at El Camino del Diablo and Tinajas Altas Mountains ACEC.
14	Cabeza Prieta NWR/Wilderness and Comprehensive Conservation Plan	✓				✓			Refuge established in 1939, 860,010 acres, 95 percent of refuge designated wilderness (1990), release of the draft plan and EIS is expected Spring-Summer 2005.
15	Organ Pipe Cactus National Monument and General Management Plan/Development Concept Plans	✓			✓				Monument established in 1937, 333,689 acres, 94 percent designated as wilderness (1978). General Management Plan/Development Concept Plans provided programmatic guidance for managing the Monument for the next 10 to 15 years (1997). Plan implementation was suspended in February 2001 pending completion of a Supplemental EIS (SEIS) addressing cumulative impacts on Sonoran pronghorn in accordance with a court order. Monument SEIS was completed in July 2001 and plan implementation resumed in November 2001.

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
16	Recreation on the BLM Ajo Block	✓					✓		Ongoing recreation activities within BLM lands in the vicinity of Ajo.
17	Marine Corps TACTS Range improvements			✓					Includes 17 threat emitters, some of which are mobile units (1996-1999).
18	International border vehicle barrier			✓	✓	✓	✓		A physical barrier in Organ Pipe Cactus NM is being constructed along the international border between the U.S. and Mexico to impede/deter entry into the U.S. of UDAs and drug smugglers driving cross-country in vehicles. Plans to extend the barrier along the international border through Cabeza Prieta NWR and BMGR—West to the Colorado River are under development (2004+).
19	Archaeology and other resource survey activities		✓	✓	✓	✓	✓		BMGR—West proposed project surveys from 1970s through present; BMGR—East proposed project surveys from 1970s through present, surface use and special area surveys from mid-1990s through present.
20	Sonoran Pronghorn Recovery Plan		✓	✓	✓	✓	✓	✓	Action applies to entire U.S. Sonoran pronghorn habitat area, first plan published 1982, updated 1998, and a Supplement and Amendment to the 1998 Final Revised Sonoran Pronghorn Recovery Plan completed January 2002.
21	Biological monitoring in association with tactical ranges		✓						Air Force biologists check daily for the presence of Sonoran pronghorn within North and South TAC range target areas prior to air to ground bombing and strafing missions, training missions are aborted at targets with pronghorn present (1997-present).
22	North American Free Trade Act (NAFTA) related developments	✓	✓	✓	✓		✓	✓	Mostly affects the U.S. Highway 95 and the proposed Yuma ASH corridors, but traffic has also increased on State Route 85. The primary port of entry would occur at San Luis (1995-present).
23	National Guard beddown at the Western Army National Guard Aviation Training Site (WAATS)	✓	✓						Between 32 and 50 Apache helicopters are being added to those stationed at the WAATS in Marana, Arizona. WAATS uses the BMGR to support live-fire weapons training needs. Gila Bend AFAF is used as a forward operating area for aircrew changes and helicopter refueling and rearming (2002).
24	Paving/Repaving of road segment, parking, and pad areas, BMGR—East and Gila Bend AFAF		✓						Ten road paving projects totaling about 8.25 miles within the BMGR and 11 paving projects totaling about 3.5 miles and 1.5 acres of parking areas at Gila Bend AFAF have been approved through an environmental assessment dated 20 September 2000. All of the projects have been completed.
25	Cleanup of inactive Air Force targets		✓						EOD surface clearances and debris cleanups are being considered for 18 inactive target and 3 non-target sites, action pending.

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
26	Sonoran pronghorn forage enhancement, artificial waters, and semi-captive breeding	✓	✓	✓		✓	✓		(1) The forage irrigation program is designed to improve the habitat available to free-roaming Sonoran pronghorn in the U.S. population. Program includes developing, operating, maintaining, monitoring, and, as necessary, adapting irrigated forage plots (about five acres) to support natural forage growth to sustain pronghorn during drought. Dual objectives of forage plots are to reduce adult mortalities and to promote sustainable fawn survival and recruitment. Two forage plots, one in the Cabeza Prieta NWR and one in BMGR—East, have been developed and three are under construction. Five forage plots should be operational, if needed, by spring 2005—three in the Cabeza Prieta NWR and two in BMGR—East. Additional plots would be developed in the BLM Ajo Block, Organ Pipe Cactus NM, and BMGR—West as required. (2) Maintaining and expanding a system of artificial waters is intended to support free-roaming Sonoran pronghorn during drought. The current system has six operational waters—five in Cabeza Prieta NWR and one in Organ Pipe Cactus NM. Six waters are planned for construction in 2005; most will be located in the CPNWR. (3) The captive-breeding program, initiated in 2004, is based on an approximately one square kilometer pen located in the Cabeza Prieta NWR. The breeding pen is equipped with a forage enhancement irrigation system, artificial water, predator exclusion fencing, and continuous staffing. Two does from Mexico and four does and one buck from the United States are currently in the pen. If the plan proceeds as envisioned, 10 to 15 fawns will be produced in the pen in 2005. Once the facility's productivity is assured, surplus animals produced will be released to join the free-roaming herd. Periodic exchanges of animals between the U.S. breeding facility and all three Sonoran pronghorn sub-populations is a part of the planned program to insure the genetic diversity of the overall population.
27	Man in the Biosphere Program	✓			✓			✓	Two designated biosphere reserves include the Organ Pipe Cactus NM and the El Pinacate y el Gran Desierto de Altar (1976).
28	Arizona State Parks Arizona Trails 2000 Plan		✓	✓	✓	✓	✓		This statewide plan provides information and recommendations to agencies for their management of motorized and non motorized trails. The plan guides the expenditures from the Arizona Off-highway Vehicle Recreation Fund, Arizona Heritage Fund Trails Component, and Federal Recreational Trails Program (1999).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
29	BLM National Management Strategy for Motorized Off-Highway Vehicle Use on Public Lands						✓		This national strategy provides guidance and offers recommendations for actions to improve OHV motorized vehicle management on public lands administered by the BLM. Applicable to BLM lands adjacent to the BMGR (2001).
30	BMGR ICRMP		✓	✓					This rangewide ICRMP describes requirements of the National Historic Preservation Act, as well as those of other heritage preservation statutes, and goals, objectives, and action items for the management of cultural resources on the BMGR (Summer 2002).
31	Proposed Air Force gravel extraction		✓						Ten extraction sites are proposed in the tactical ranges, in or near Manned Ranges 1 and 3, and along the DART Drop Road near Gila Bend AFAF to provide sand and gravel for the construction and maintenance of targets and other facilities within BMGR—East (action pending completion of NEPA process).
32	Flash Burning of military munitions residue	✓	✓						Flash burning of military missions residue is a recently approved process for insuring that demilitarized munitions that had been recovered from BMGR—East tactical and manned ranges are free of ignitable or explosive residues before being released for recycling as scrap metal (see Appendix B). The flashing of the militarized munitions occurs at the four RMCPs within BMGR—East (2000).
33	Rescheduling of South TAC annual EOD clean-up	✓	✓						EOD clearance for South TAC was recently rescheduled from April through June to the fall to avoid potential disturbances of Sonoran pronghorn during the summer heat.
34	Unmanned threat emitters	✓	✓						Includes the proposed installation of four unmanned threat emitters and reconfiguration of 10 target sites (2001).
35	Installing fences and signs on the BMGR	✓	✓						Signs, gates, and fences have been installed at each road entry point into East TAC Range from Management Unit 6 and from the Bender Springs area in Management Unit 7 (Fall 2001).
36	Reduced 5-year EOD clearance requirements		✓						The Air Force five-year EOD clearance criteria for tactical and manned ranges was reduced from a distance of one nautical mile from each target or until the density of collectible munitions items is five pieces per acre or less, whichever is the greater distance, to one kilometer from each or until the density of collectible munitions items is five pieces per acre or less, whichever is the shorter distance (August 2001).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
37	Transporting new boilers to Palo Verde Nuclear Generating Station and related road work	✓	✓						Travel route followed State Route 85 from Mexico through Organ Pipe Cactus National Monument and BMGR—East, modification of several at grade wash crossings was necessary (Summer 2002).
38	Cellular Phone Towers	✓	✓						Four towers ≤100 feet tall are proposed by American tower Corporation along State Route 85 at 100 by 100-foot sites named Tenmile Wash, Midway, Blindman Butte, and Childs Ranch. Luke AFB is considering granting leases of five years with nine 5-year extension options for the required lands (2001).
39	Gila Bend to Ajo 230 kilovolt (kV) Transmission line	✓	✓						Construction of a 230 kV transmission line from Gila Bend to Ajo to support the reopening of the Phelps Dodge Ajo, Inc. Mine was approved in 1998 with a 10-year approval lifespan. The transmission line would parallel the State Route 85 and the existing Public Service Co. 69 kV transmission line. No immediate plans to construct the new transmission line are active until economic conditions improve sufficiently (1998).
40	Increasing Air Force night training operations		✓			✓			Increases in night attack training are anticipated within the next several years to better prepare pilots for real world combat missions. As much as a two-fold increase in night sortie rates may occur (2002+).
41	Air Force Sensor Training Area/ Mission Support Plan		✓						The Air Force is installing new scoring systems and upgraded target simulations at existing targets to create more realistic training conditions. Plans are also being evaluated for a new electronically scored and recorded target area for training with precision-guided munitions (2005+).
42	Organ Pipe Cactus NM proposed projects	✓			✓				More than 100 past, current, and proposed projects; examples include 10 RV camping sites (1983-1984), enlarged parking areas at campgrounds and trailheads (1998-2000), low-level overflight reconnaissance for Sonoran pronghorn (ongoing), and North Puerto Blanco Loop Drive widening (pending).
43	Phelps Dodge Ajo, Inc. mine reopening	✓					✓		New technologies would allow further production from the mine if copper prices reach economically feasible levels. Primary activity would include copper ore mining, milling, and concentrating. Concentrate would be shipped via the Tucson, Cornelia, and Gila Bend Railroad, which would be upgraded. Workforce would include 350 to 400 new employees. Project life is expected to be 10+ years. (Startup pending, date unknown).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
44	Future aircraft and weapons (F-22A, F-18 E/F, MV-22/CV-22, Joint Strike Fighter, Joint Direct Attack Munitions, other stand-off weapons)		✓	✓					New aircraft and weapons for the Air Force, Marine Corps, and Navy are being developed or entering production. These aircraft and weapons will replace those currently in use throughout the armed forces. BMGR is a likely candidate for continued military training using these new aircraft weapon systems (date unknown).
45	Relocating Unmanned Aerial Vehicle (UAV) to MCAS Yuma	✓		✓					Relocation of a Marine squadron to MCAS Yuma that operates UAVs is under evaluation. The reconnaissance UAV flies at high altitudes and cannot be seen or heard at ground level. Squadron would add up to 195 personnel to MCAS Yuma. UAV operations would likely be conducted out of Cannon Air Defense Complex and AUX-2 (pending).
46	Dewatering of the Gila River and agricultural development	✓					✓		Eleven major reservoir or irrigation diversion dams, constructed on the Gila River system from 1891 to 1959, eliminated perennial or seasonally intermittent flows from the Lower Gila River. Gillespie Dam constructed on the Gila River north of Gila Bend in 1921 provided diversions via canals to the Gila Bend area for agricultural development. Agricultural development and water diversions from below Painted Rock Reservoir to Yuma eliminated a once extensive riparian ecosystem. Today, nearly 93,000 acres of irrigated cropland and orchards are located within 5 miles of the northern and western BMGR boundaries.
47	Reserva de la Biosfera (Biosphere Reserve) de El Pinacate Y El Gran Desierto de Altar (The Pinacate and Great Desert), Mexico	✓						✓	A designated core protection area lies within a larger protective buffer area and is contiguous with the Reserva de la Biosfera Alto Golfo de California y Delta del Rio Colorado located 40 miles to the southwest, where the Colorado River delta meets the Sea of Cortez. Ongoing extensive livestock grazing and wood cutting activities have damaged the natural flora and fauna of the region. The Biosphere Reserve was designated in 1992.
48	Flat-tailed Horned Lizard Rangewide Management Strategy	✓		✓					Management strategy established four flat-tailed horned lizard management areas in California and one in Arizona. The Arizona management area (established 1997), consists of approximately 114,000 acres of which about 99,000 acres are located within BMGR—West, is by far the single largest protected management area (24 percent of total) for this species. MCAS Yuma entered into a conservation agreement with the AGFD and USFWS to implement the management strategy. Rangewide Management Strategy updated and proposed listing of lizard withdrawn in 2003.

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
49	Past urban development and current regional population growth trends						✓		Communities, many dating from the 1850s, were developed in response to mining, agricultural, military, and transportation developments. Although agriculture remains important, the Yuma economy has long been diversified and includes military bases, multiple industries, recreation, and, most recently, seasonal and permanent retirement communities. Growth and economic diversity is also affecting other communities in the BMGR locality. The three counties in which the BMGR is located experienced 40 percent growth from 1990 to 2000 and are projected to increase by about 21 percent between 2000 and 2015. Key growth areas in the immediate BMGR region are Yuma, Gila Bend, and Ajo.
50	Continued development in vicinity of BMGR—West boundary (near Wellton and Yuma)	✓					✓		The Yuma and Yuma Foothills areas continue to experience rapid growth in residential, commercial, agricultural, and light industrial development. A recent project that demonstrates the rapid development occurring in the Yuma area is the County 14 road extension and the improvements associated with this development along the BMGR on the west side of the Gila Mountains. A number of residential subdivisions recently have been approved in this area to accommodate expanded growth. The boundaries of the City of Yuma and the Town of Wellton also have been expanded, including lands within the BMGR (Yuma County 2003, 2001a). Dome, Ligurta, Roll, Tacna, Wellton, and Mohawk, traditional agricultural communities, have also experienced unprecedented growth. Wellton, the largest community grew by 75 percent from 1990 to 2000. Continued growth is ongoing.
51	Munitions storage area improvements at Gila Bend AFAF	✓	✓						The munitions storage area at Gila Bend AFAF was upgraded and expanded to meet new Air Force explosive storage safety standards and for supporting military training mission requirements (2001).
52	Hickiwan casino, convenience store, and RV Park (about one mile east of Why)	✓					✓		A convenience store, gaming casino, and 92-space RV Park were constructed on the Tohono O'odham Nation about 1 mile east of Why, Arizona, from 1996 to 1998. Facilities developed to support these operations include a well, water treatment, and sewer.
53	Military Training Route (MTR) Realignment		✓		✓	✓	✓		Seven low-level MTRs that lead to BMGR—East were relocated to avoid overflights of villages and other areas within the Tohono O'odham Nation (1999).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
54	Environmental Baseline Survey (EBS) activities for non-renewed parcels	✓					✓		A Phase 1 EBS was completed by Luke AFB (2002) for the four parcels of BMGR lands that were not renewed by the MLWA of 1999. Areas with recognized environmental conditions, that indicate an existing release, a past release, or material threat of a release of hazardous substances or petroleum products within the parcels, were identified. With the exception of possible displaced munitions located within Sand Tank Mountains and Sentinel Plain parcels, no other recognized environmental conditions were classified at the EBS sites. The munitions issue is being addressed by the Air Force and the BLM.
55	Sonoran Desert NM establishment and management	✓					✓		Sonoran Desert NM, totaling approximately 496,337 acres, was designated in January 2001. The new national monument, which is north of and contiguous to the East TAC, includes the former 77,957-acre Sand Tank Mountains parcel of the BMGR (formerly Air Force Management Area A) that was not renewed by the MLWA of 1999. A management plan for the national monument is being prepared by the BLM. (Draft plan and EIS expected 2005)
56	Dairy located south of Interstate 8 at Aztec	✓					✓		A special use permit was granted in April 1999 by the Yuma County Board of Supervisors for the construction of a dairy farm at a location south of Interstate 8 at the Aztec exit. The dairy began operating in 2001. In November 2002, the Yuma County Board of Supervisors approved the modification of the special use permit to allow for the increase in the maximum number of cows to 5,000 (Yuma County Department of Development Services 2002).
57	Development of fallow agricultural land in Dateland area	✓					✓		The town of Dateland is encouraging development of fallow agricultural land north and south of Interstate 8.
58	Yuma Area Service Highway	✓		✓			✓		The highway has been proposed to connect Interstate 8 east of Yuma to U.S.-Mexico border at San Luis, with a portion within the northwesternmost edge of BMGR—West (estimated 2005).
59	San Luis, Arizona, commercial port-of-entry	✓					✓		Relocation of the San Luis commercial port-of-entry four miles from the existing port-of-entry, to a location west of the BMGR is planned in association with the development of the Yuma ASH (estimated 2005).
60	Parque Industrial Internacional (near San Luis)	✓						✓	A major 8,000-acre industrial park being developed in Mexico opposite the San Luis commercial port-of-entry and Yuma ASH terminus. Development began in the early 1990s. A counterpart 400-acre industrial park is anticipated in the United States just east of the proposed commercial port-of-entry (pending).

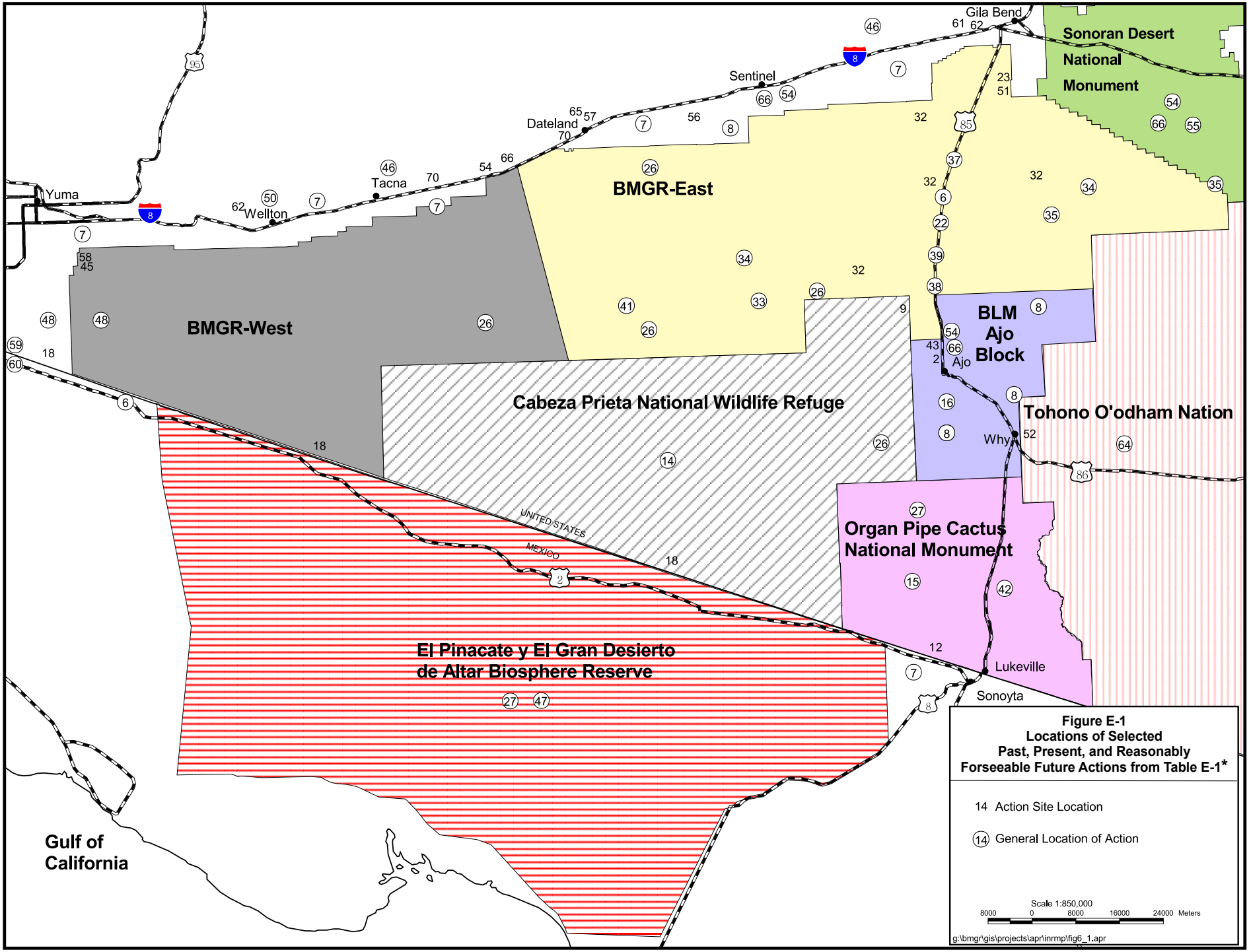
TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
61	Paloma Ranch just west of Gila Bend and mixed-use development proposed in Gila Bend	✓					✓		Approximately 100,000 acres of fallow Paloma Ranch agricultural land west of Gila Bend is planned for future development of either residential or light and heavy industrial uses. To date, the only major development proposed within Paloma Ranch is an electrical power plant (see description below).
62	Power Plants being constructed/proposed at Gila Bend and Wellton	✓					✓		Construction of a 2,000 megawatt power plant by Panda Power and Gila Bend Power Partners, LLC is underway. Construction of a second 750-megawatt plant is on hold. Mixed land use development is expected near the plants. In a separate venture, Dome Valley Energy Partners LLC plans to develop, build, own, and operate the Wellton-Mohawk Generating Facility, located 25 miles east of Yuma and 9 miles west of Wellton. An EIS has been prepared to evaluate this proposed natural gas fired plant and its proposed interconnection with Western Area Power Administration's transmission system at Ligurta Substation in Arizona. The Record of Decision is expected in late fall 2004.
63	Pima County Sonoran Desert Conservation Plan		✓				✓		The Sonoran Desert Conservation Plan was prepared by Pima County land use planning and its implementation is overseen by the Pima County Board of Supervisors. The plan identifies the BMGR as a potential area for biological conservation priority.
64	Management Plan for Tohono O'odham Nation	✓					✓		A long-term goal of the Tohono O'odham Nation is to develop a Resource Management Plan that may be implemented in cooperation with federal, state, and county agencies, as well as private landholders whose lands adjoin or include portions of the Nation's traditional territory (pending).
65	El Camino del Sol Airpark in Dateland	✓					✓		A residential airpark in Dateland has been proposed but it does not appear that the airpark will be developed in the near future.
66	BLM management of former BMGR Sentinel Plain, Sand Tank Mountains, Ajo Airport, and Interstate 8 parcels not renewed by the MLWA of 1999	✓					✓		Management of the Sand Tank Mountains parcel will be addressed by the pending Sonoran Desert National Monument management plan. Management of the Sentinel Plain and Ajo Airport parcels will be addressed by the pending Phoenix South Resource Management Plan. Management of the Interstate 8 parcels will be addressed by the pending Yuma Resource Management Plan. Draft plans and EISs expected 2005 and 2006 (Yuma).

TABLE E-1
PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS*

ACTION		LOCATION OF ACTION							SUMMARY DESCRIPTION OF ACTION
No.	Name	See Map	BMGR East	BMGR West	Organ Pipe NM	Cabeza Prieta NWR	Other Areas	Mexico	
67	YTRC improvements to military training facilities in BMGR—West			✓		✓			BMGR—West improvements including new ground support areas, ground support zones, TACTS Range threat emitters, modifications to the Moving Sands and Cactus West target complexes, a parachute drop zone, a runway upgrade at AUX-2, and low-level flight corridors overlying the Cabeza Prieta NWR were authorized under the YTRC EIS (1997) and YTRC Supplemental EIS (2001).
68	Beddown of Combat Search and Rescue (CSAR) assets at Davis-Monthan AFB		✓	✓			✓		A CSAR unit is being established at Davis Monthan AFB in order to meet Air Force needs to support worldwide, deployable long-range combat search and rescue of downed aircrew members. Action will add 12 HH-60 helicopters, 10 HC-130 fixed-wing aircraft, and 1,059 personnel to Davis-Monthan AFB. Training will occur in low altitude tactical navigation areas of East TAC, North TAC (northeast of Crater Range), and Yuma TACTS Range. (This action began in the fall of 2002, with the beddown to be completed by 2007.)
69	Removal of Cabeza Prieta NWR and Organ Pipe Cactus NM fence lines				✓	✓			Livestock exclusion fences along the Cabeza Prieta NWR and Organ Pipe Cactus NM boundaries with the BLM Ajo Block are being removed following closure of BLM's Cameron grazing allotment (2005).
70	Proposed Arizona Clean Fuels petroleum refinery in eastern Yuma County	✓					✓		The proposed petroleum refinery would be constructed north of Interstate 8 east of Tacna (at Avenue 45E) or at an alternative site north of Interstate 8 west of Dateland (at Avenue 64E). The refinery would produce gasoline, diesel fuel, jet fuel, liquefied petroleum gas , sulfur, and petroleum coke. Primary raw materials for the refinery would be crude oil and natural gasoline, which would be delivered to the refinery primarily via a pipeline. Other raw materials include butane, propane, alkylate, and oxygenates (which would be delivered via rail) and natural gas (which would be received by pipeline). Refined fuel products would be shipped from the refinery by pipeline, rail, and truck. Refined liquefied petroleum gas, sulfur, and petroleum coke would be shipped by rail. Project would include construction of a raw materials supply pipeline from either the ports of Guaymas or Tiajuana, Mexico, that would cross either the Yuma area or parts of BMGR—West. Existing highways and rail lines are available to import raw materials and export products. An existing pipeline may be available for product distribution; requirements for a new product distribution pipeline are currently unknown. A draft air quality permit for the refinery was circulated by the ADEQ for public comment during September-November 2004. A decision on the permit application is expected in early 2005. Other environmental compliance documentation is pending. Dates for the refinery construction and operation have not been announced.

* Adapted and updated from Yuma Training Range Complex Supplemental Environmental Impact Statement, September 2001



*Note: 42 of the 70 actions listed in Table E-1 are shown on this map. The locations of the other 28 actions either are applicable to broad areas of the BMGR or its vicinity, as identified in Table E-1, or are at places outside of this map window.

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
Earth Resources	1-29, 31, 32, 34-39, 41-44, 46-53, 55-70	While almost all of the past, present, and reasonably foreseeable actions identified in Table 6-2 were identified herein as potentially causing some effect on earth resources, the net additive or interactive effects are dominated by the past development involving intense agriculture, industrial, municipal, and residential land uses encompassing large acreages. These meaningful effects have permanently altered the structure and function of earth resources. Most development has affected the basin areas of both the Sonoran Desert and Salton Trough physiographic provinces, which are shared in part by the BMGR (most of the BMGR is in the Sonoran Desert section; however, the Yuma Desert, in the southwestern BMGR, is within the Salton Trough section). The physical disturbance that has occurred within the BMGR from past and present military, agency and public use, is minor in contrast to other earth resources effects that have occurred outside of range. Many of the identified actions would only have the potential for minor localized effects on earth resources such as increased erosion, which would not be meaningful in context of this additive or interactive effects analysis (e.g., the unmanned threat emitter and cellular phone tower projects), while others would have localized, major impacts that would be meaningful (e.g., reopening of the Phelps Dodge mine), but would not necessarily have additive or interactive impacts with other actions analyzed. One important exception may be the adverse effects of off-road driving and concentrated foot traffic by drug smugglers and UDAs, which is widely distributed throughout the U.S. side of the international border but is especially pronounced in Cabeza Prieta NWR, Organ Pipe Cactus NM, BMGR, Sonoran Desert NM, and the Tohono O'odham Nation. Border Patrol interdiction of cross-border traffic in areas outside of the contiguous Cabeza Prieta NWR, Organ Pipe Cactus NM, and BMGR complex is believed to have contributed to the explosive and ongoing regional growth in illegal border traffic by deflected smugglers and UDAs to this area. Within the complex, Border Patrol activities may serve to ameliorate some illegal migration and smuggling effects by deterring and limiting cross-border traffic, but can also exacerbate these effects by contributing additional off-road driving in interdiction and search and rescue efforts. Drag road construction and maintenance in the BMGR has disrupted and captured surface water runoff channels. Unless it is brought under control in the near future, off-road driving associated with cross-border traffic threatens to create an ever growing network of cross-country vehicle tracks of unmanageable proportions with widespread soil and surface hydrology effects. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. A second important exception would be the proposed refinery north of BMGR—West near Tacna. The project would occupy about 3,000 acres of vacant desert and abandoned agricultural land, which would be graded and prepared in accordance with the approved industrial plant and environmental requirements. Construction of a raw materials supply pipeline from either the ports of Guaymas or Tiajuana, Mexico, potentially would disturb earth resources in BMGR—West or its vicinity. A product distribution pipeline, if needed, would not be likely to affect the BMGR. There are relatively few actions that would have the potential for synergistic impacts where the net effect of two or more actions would

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		be greater than the individual effect of either. Meaningful synergistic impacts typically center around the large-scale effects that negatively affect earth resources, such as increased population and urban growth and various industrial and residential developments to support that growth. Long-term countervailing beneficial impacts have also resulted from past actions designating the Cabeza Prieta NWR, Organ Pipe Cactus NM, Sonoran Desert NM, and BLM Wildernesses and ACECs in the region and the ongoing preservation/conservation based management of these areas and the prohibition of the types of intense land uses that have negatively affected earth resources in the region. Together, with the Cabeza Prieta NWR, Organ Pipe Cactus NM, Sonoran Desert NM, and El Pinacate y el Gran Desierto de Altar, the BMGR represents an intact remaining example of the Sonoran Desert physiograpic province, as detailed in Section 4.2, which is a benefit that is expected to extend into the future.
Water Resources	1-8, 10-16, 18, 20, 23-29, 31, 36, 37, 41-43, 46-50, 52, 55-69	The two watersheds in the BMGR region most meaningfully affected by the net additive or interactive effects of identified past, present, and future actions are the Gila River, located north of the BMGR, and the Rio Sonoyta located south of the BMGR, with some effects in the vicinity west of BMGR also potentially affecting the Colorado River watershed. The most wide-reaching effects to these water resources began with the loss of perennial and seasonally intermittent flows from disruption of perennial flows with dams and loss of groundwater for municipal, domestic, and agricultural purposes. Some of the identified actions would continue to cause similar effects to these waters, but most would be of little meaning in this watershed context. Unless it is brought under control in the near future, off-road driving associated with cross-border traffic (see Earth Resources) threatens to become an important individual effect on surface hydrology by creating an ever growing, widespread network of cross-country vehicle tracks. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. There are no other meaningful important individual effects or synergistic adverse effects. As with earth resources, meaningful synergistic adverse impacts identified center around the large-scale effects that could negatively affect water resources, such as increased population and urban growth and various land uses involving water use or discharge into waterways. The BMGR is downgradient of lands that are protected, with the headwaters in Organ Pipe Cactus NM, Cabeza Prieta NWR, and Sonoran Desert NM. The uses on the BMGR, which have minimally affected water resources, in this large-scale watershed context, flow northward to the Gila drainages and southward into the Sonoran drainages in the Cabeza Prieta NWR and Mexico.
Climate and Air Resources	2-7, 10, 12, 14, 15, 23-29, 31, 32, 34, 36-50, 55-70	The air quality of the BMGR region is generally regarded as good despite past and present actions. Most air quality effects are short-term and dissipate over time, even large-scale effects such as those that occurred when the smelter was active at the Ajo Mine. Many other effects are localized and the potential for impacts to occur, either additively or interactively, is dependent upon the season and other atmospheric conditions affecting the distribution of particulate matter and other pollutants within the airshed. Generally, activities and uses potentially affecting BMGR air resources are located within industrialized or urban settings. Large-scale air circulation patterns

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		generally transport air into this airshed eastward from the Pacific Ocean and northward from the Gulf of California. These factors make additive or interactive impacts on air resources difficult to ascertain. The identified actions most likely to have additive or interactive impacts on BMGR air resources are large-scale urban, agricultural, and industrial development (including power plants and a proposed petroleum refinery); transportation corridors; and military use. Individual actions such as the Yuma ASH, power plant and refinery construction, agriculture, and development of industrial parks further expand these types of development within the BMGR perimeter, where the increased emissions are more likely to be additive or interactive with those resulting from actions and uses within the BMGR. The reopening of the Ajo Phelps Dodge is not expected to involve smelting and, thus, impacts on air quality are not expected to be major. An air quality permit application for the proposed refinery is pending final Arizona Department of Environmental Quality action. The refinery application states that the proposed industrial plant would utilize best available control technology that would ensure that the facility would meet or exceed all emission limits. Fugitive dust issues within the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM are being exacerbated by off-road driving associated with cross-border traffic (see Earth Resources). As with earth and water resources, however, perimeter lands that are managed for preservation purposes, including Cabeza Prieta NWR, Organ Pipe Cactus NM, Sonoran Desert NM, and El Pinacate y el Gran Desierto de Altar preclude types of uses that are principally associated with high levels of emissions. Likewise, development in the Tohono O'odham Nation has been at low levels, with few impacts on air quality.
General Vegetation	1-8, 10-18, 20, 23, 26, 28, 29, 31, 34-36, 38-39, 41, 42, 46-52, 55-69	As detailed in Section 4.5, the plant communities of the BMGR have retained relatively unaltered structure, composition, and function. Within some other areas of the greater Sonoran Desert ecoregion, however, these plant communities have been greatly affected by development that has destroyed or altered them significantly. Within the U.S. portion of the Sonoran Desert Ecoregion (Arizona and California), 87 percent of the landscape-scale land areas is managed by federal or state agencies, but less than 20 percent of this land is managed to promote the long-term persistence of conservation elements (Marshall and others 2000). The collective protection of plant communities within the contiguous BMGR-Cabeza Prieta NWR-Organ Pipe Cactus NM-Sonoran Desert NM, thus represents a large landscape-scale conservation area for the ecoregion. While large-scale development has not occurred within El Pinacate y el Gran Desierto de Altar, ongoing extensive livestock grazing and wood cutting activities have damaged the natural flora and fauna of this area to a greater extent than the other identified preservation areas. The past, present, and future actions within the BMGR and surrounding preservation areas are relatively minor and localized, the net additive or interactive effects on vegetation would be of little consequence in terms of these landscape-scale conservation areas. Many of the identified past, present, and future actions that have the greatest effect on general vegetation are outside of the protected area, but could nonetheless affect vegetation within these areas by factors such as the introduction and proliferation of invasive species and the unnatural proliferation of fire as carried by these invasive species. Unless it is brought under control in the near future, off-road driving associated with cross-border traffic (see Earth Resources) threatens to become an important individual effect on plant communities

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		through vehicles directly crushing plants and by creating an ever growing, widespread network of cross-country vehicle tracks that disrupt soils and surface water hydrology. Illegal off-road driving creates avenues that may promote the spread of invasive and noxious plant species. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. The development in the unprotected areas of the BMGR perimeter also has a substantial potential to have additive or interactive impacts with those effects on plant communities that occur within the BMGR.
General Wildlife and Wildlife Habitat	1-8, 10-20, 23-26, 28, 29, 31-44, 46-52, 55-68	The additive or interactive effects on general wildlife habitat are similar in context to those discussed for general vegetation in terms of loss and conversion of habitat. Effects to wildlife also include population declines from increased rates of death or injury and decreased recruitment rates, loss/conversion of habitat, habitat fragmentation, and disruption/disturbance from noise and human activity. Again, as with the previous resources discussed, the greatest and most extensive additive or interactive effects to general wildlife and wildlife habitat have occurred as the result of intense agriculture, industrial, municipal, and residential land uses development encompassing large acreages. Most of this use has been outside of the BMGR-Cabeza Prieta NWR-Organ Pipe Cactus NM-Sonoran Desert NM complex and, to some degree, outside of El Pinacate y el Gran Desierto de Altar. The additive or interactive impacts that potentially affect BMGR wildlife and wildlife habitat most directly are generally those on the BMGR perimeter that would potentially cause deleterious effects which could extend to wildlife populations and habitats on the BMGR. An exception within the BMGR is the adverse effects of off-road driving and concentrated foot traffic by drug smugglers and UDAs (see Earth Resources). Unless it is brought under control in the near future, off-road driving associated with cross-border traffic threatens to become an important individual effect on wildlife and wildlife habitat from vehicles crushing plants and animals, and by creating an ever growing, widespread network of cross-country vehicle tracks that disrupt soils and surface water hydrology. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. Illegal off-road driving may lead to habitat fragmentation and create avenues that promote the spread of invasive and noxious plant species. Due to the ecological landscape scale of habitat loss, curtailment, modification, and fragmentation within the BMGR region, these issues are further discussed in Section 6.3.2
Protected Species	1-8, 10-18, 20-23, 25-26, 28, 29, 31-34, 36-44, 46-50, 53, 55-68	Additive or interactive effects on protected species from the identified actions are readily identifiable for flat-tailed horned lizard and Sonoran pronghorn. A recent thorough assessment of additive or interactive effects on Sonoran pronghorn that result from past and present actions and that would result from reasonably foreseeable future actions within the historic range and current distribution of this species is presented in the YTRC Supplemental EIS (September 2001). Those actions causing Sonoran pronghorn habitat loss or curtailment, habitat modification and diminished quality of habitat, overutilization, disease or predation, management or regulatory conflicts, death or injury, harassment, diminished fawn recruitment, or exposure to toxic substances or materials have the potential for

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		adverse additive or interactive impacts. Somewhat underestimated by that 2001 document, however, have been the explosive and continuing growth in adverse effects from off-road driving and concentrated foot traffic by drug smugglers and UDAs (see Earth Resources). Unless it is brought under control in the near future, off-road driving associated with cross-border traffic threatens to become an important individual effect on the Sonoran pronghorn and its habitat through the direct effects of vehicles on these animals associated with increasing traffic and an ever growing, widespread network of cross-country vehicle tracks. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. Some actions have resulted in additive or interactive effects that have acted significantly to support the survival of this species. Most important among these countervailing actions are the long-standing prohibition on Sonoran pronghorn hunting in the U.S., habitat protection and conservation within the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM, and recovery efforts directed by the Sonoran Pronghorn Recovery Plan. Closure of the Cameron grazing allotment and the soon to be completed removal of livestock fences between the BLM Ajo Block and the Cabeza Prieta NWR and Organ Pipe Cactus NM will also benefit this species. For the flat-tailed horned lizard, additive or interactive impacts include urban, industrial, and agricultural development west of the BMGR within the historic and current range of this species, including development in California. The Yuma ASH may have important adverse impacts on this species in combination with other past, present, and future uses affecting this species. Off-road driving associated with cross-border traffic also may adversely and significantly affect flat-tailed horned lizard in a manner similar to Sonoran pronghorn. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. The 2003 Flat-tailed Horned Lizard Range-wide Management Strategy and four associated HMAs, including the one on the BMGR have countervailing effects on this species sufficient to lead to a January 2003 decision by the USFWS not to list the flat-tailed horned lizard as threatened. Additive or interactive effects on other protected species within the BMGR are more difficult to identify because the range is not as central to their survival and they have not been studied on the range to the extent that the Sonoran pronghorn and flat-tailed horned lizard have been. Additive or interactive impacts similar to those discussed for Sonoran pronghorn and flat-tailed horned lizard are nonetheless the cause of the decline and protected status of other species addressed in Section 4.7. Similarly, habitat protection and conservation within the BMGR, Cabeza Prieta NWR, and Organ Pipe Cactus NM has been a countervailing additive or interactive effect working in favor of protected species present within these areas.

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
Wildfire Management	1-8, 10-15, 23, 28, 29, 31, 40-41, 44, 46-50, 55-59, 61-67	The identified additive or interactive impacts of wildfire management are directly related to those on general vegetation and to the extent to which plant communities have been altered by the introduction of invasive species that could carry wildfire to a greater extent than would occur naturally. Additive or interactive impacts also result from development that increases the presence of human activities within the region.
Grounds Maintenance	3, 10, 13, 24, 48, 51, 67	Additive or interactive effects on grounds maintenance are limited to those past, present, and future actions affecting operations or procedures within the maintained grounds of the BMGR—primarily at Gila Bend AFAF or Cannon Air Defense Complex. The military use of these areas is predominant, but some limited recreation use does occur. Some of the repaving projects and the Munitions Storage Area project were within the Gila Bend AFAF, although they were not related to landscape-maintenance activities. The Cannon Air Defense Complex is within flat-tailed horned lizard range. However, no meaningful additive or interactive impacts on grounds maintenance are identified.
Public Utilities and Transportation Corridors	2-7, 10, 12, 37-39, 43, 46, 48-50, 58-62, 64, 65	The additive or interactive impact of the identified actions on public utilities and transportation corridors is a development-service relationship as the development of such services is interrelated with urban settlement and economic growth activities. The development of these services is somewhat precluded by the protected status of much of the lands in the BMGR region. Most development of public utilities and transportation corridors has occurred to the north and south of the BMGR, with network-type development centered in urban areas. The State Route 85/railroad corridor remains the only corridor within the BMGR, although the Yuma ASH is proposed for the western fringes of the range. Section 4.10 further discusses the particulars of these public utilities and transportation corridors. Meaningful additive or interactive impacts associated with public utilities and transportation corridor development are further discussed in and Section 6.3.2.
Special Management Areas	3-6, 10-13, 25, 48-50, 58, 67	The additive or interactive impact of the identified actions on special natural/interest areas relates to the historic recognition and management of the recently expired ACECs, SRMAs, and Backcountry Byway. This background information is covered in detail in Section 4.11. These special natural/interest areas have influenced and may continue to influence past, present, and future use of the BMGR by the military, Border Patrol, Arizona Game and Fish Department, and the public. The additive or interactive effect(s) to the flat-tailed horned lizard from the development within or near that portion of the HMA west of the BMGR, the Yuma ASH, and in the other designated management areas for this species in California and actions related to the Flat-tailed Horned Lizard Management Strategy could continue to effect the HMA. Future cleanup of inactive targets could cause some relatively low levels of disturbance within the expired Sentinel Plain SRMA
Outdoor Recreation	3-7, 9-18, 20, 28-30, 35, 42, 44, 46-50, 53, 55, 66, 67, 69	The identified additive or interactive impacts to outdoor recreation include the regional trends of increasing population and participation in outdoor recreation activities and the types of outdoor recreation opportunities in the BMGR region. Many of the identified past, present, and reasonably foreseeable actions involving development to accommodate population growth are correlated to the elimination of open space that was traditionally available for outdoor recreation and increasing reliance on public lands to provide outdoor

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		recreational opportunities. Access to private and public lands is becoming increasingly difficult due to various factors including transfer of ownership, changes in land use, fee increases, and urban sprawl. The explosive and continuing growth of illegal cross-border by drug smugglers and UDAs (see Earth Resources) may be having a depressing effect on outdoor recreation at the BMGR and other regional locations because of public concerns for safety and the adverse effects from off-road driving and concentrated foot traffic on the attractiveness of the environment. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. In addition, some designated recreation and preservation areas have had to limit outdoor recreation access for resource protection purposes. Because of the relevance of this topic in the context of this INRMP, these issues have been previously detailed in Section 4.12 and these additive or interactive outdoor recreation effects within the BMGR region are further addressed in Section 6.3.2.
Public Health and Safety	1-7, 9-18, 22-26, 28-29, 31, 35, 37-40, 42-47, 49-51, 53-54, 58, 65-67	The impacts of the actions identified on public health and safety are generally additive, where each identified action has some discernible potential to increase hazards or risks to public health or safety. For example, development of transportation corridors is correlated with the potential for vehicle/train accidents, risks from mining include heavy equipment use and excavation, risks associated with military operations include accidents or mishaps with aircraft, munitions, etc. Overall, however, these risks are generally managed by a combination of the responsible private parties and federal, state, and local governments so as to minimize the chances of them occurring and reduce impacts should they occur. An exception may be real or perceived risks to public safety from growing and widespread cross-border traffic by drug smugglers and UDAs (see Outdoor Recreation).
Law Enforcement	3-5, 10-16, 47, 49, 50, 55, 59	The identified additive or interactive impacts to law enforcement include those enforcement requirements related to resource protection and public safety within the BMGR and other public lands as well as the actions taken to prevent the unauthorized entry of illegal aliens and drug smuggling across the U.S.-Mexico border. Agencies involved in law enforcement primarily for public safety and resource protection generally include BLM, USFWS (within the refuge and with regard to endangered species protection), AGFD (with regard to hunting laws), NPS, and the Air Force and Marine Corps with regard to law enforcement on the BMGR. Arizona Department of Public Safety and local municipal law enforcement agencies provide the primary public law enforcement outside the BMGR. Law enforcement relative to the international border is primarily the responsibilities of the United States Customs Service and Border Patrol. Several of the identified actions were detailed in the existing conditions for this resource in Section 4.14. Meaningful additive or interactive impacts potentially resulting from the actions identified are the increased population and rates of illegal border activity. Minor additive or interactive effects could result from the relocation of the San Luis Port of Entry.

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
Transboundary and Domestic Perimeter Land Use	2-7, 9, 10, 12-18, 20, 27, 28, 29, 35, 37-39, 42, 43, 45-50, 52-56, 58-66, 70	Nearly all of the identified actions that are outside of the BMGR are identified as potential additive or interactive effects on transboundary and domestic perimeter land use. While some of the minor individual actions would not have meaningful effects, they are additive and influence overall regional development trends.
Cultural Resources	1-7, 10-19, 25, 31, 44, 46, 47, 49, 50, 55, 58-60, 64-67	Some historic military and non-military activities within the BMGR have no doubt resulted in the loss of cultural resources and the information potential represented in these resources. The significance of these losses cannot be assessed; however, the military surface use footprint within the range that has caused notable surface disturbance has been limited to a relatively small portion of the range (< 10 percent). Consideration of potential cultural resource effects has preceded most military and other government actions within the range that had been conducted over the last several decades with the result that potential adverse effects on these resources have been avoided or mitigated. A separate ICRMP, which is mutually supportive with the INRMP, has been developed for the management of cultural resources within the BMGR. Certain non-government activities, including public recreation, have not been adequately assessed as to their potential adverse effects on cultural resources and the extent to which damage to these resources has occurred so the significance of that potential damage cannot be determined. Management programs currently in place for the range are initiating actions to assess the extent to which recreation and other non-regulated activities, such as from growing and widespread cross-border traffic by drug smugglers and UDAs, may be affecting cultural resources. Recommendations for regulating recreation and other activities to protect cultural resources will be forthcoming when the results of these assessments are available.
Visual Resources	1-7, 9-19, 24-26, 31, 32, 35-40, 42-44, 46, 47, 49, 50, 55, 58-67	The additive or interactive effects of past activities on visual resources have generally not been significant in terms of the overall BMGR landscape. With the exception of some localized foreground areas, the vistas within and of the BMGR are of a natural and unmodified landscape. Military activities, such as target and electronic instrument installations, have created visual intrusions. These effects, however, were consequences of activities that are consistent with the purposes for which the BMGR was established and are not contrary to visual resources management standards for the range. Other visual foreground effects have resulted from vehicle use by non-military agencies and public visitors. Collectively, multiple roads and vehicle trails created by this use have modified the foreground character in some areas from a primitive to a semi-primitive appearance. Off-road driving and concentrated foot traffic from growing and widespread cross-border traffic by drug smugglers and UDAs may be greatly exacerbating adverse visual effects on the attractiveness of the foreground environment in affected areas. Plans to erect vehicle barriers and implement other border control measures along the entire length of the international boundary from at least Organ Pipe Cactus NM to the Colorado River may reduce this traffic to an environmentally manageable level, possibly by the 2009 timeframe. Some developments located outside of the range, such as Interstate Highway 8, communications towers, water towers, and buildings, are also visually intrusive within the middleground or background from viewpoints within the BMGR.

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
Hazardous Materials and Waste	1-7, 9, 10, 12, 25, 31, 32, 34, 37-40, 42-46, 49, 50, 54, 58-62, 64-67	The use, handling, transport, and storage of hazardous materials and waste, other than military munitions, is much more prevalent in the region, primarily in association with industrial and agriculture and transportation than within or adjacent to the BMGR. Most of the actions identified as having a potential effect are potential future projects that would involve the temporary use of hazardous substances and the creation of wastes from relatively minor activities that would not be meaningful. Additive or interactive impacts within the BMGR could result from military use, historic but inactive mines, fuel and other fluids from vehicles operated by civilian agencies and the public, and wildcat dumping. These effects are further discussed in Section 6.3.2.
Socioeconomics	1-8, 10-16, 19, 22-26, 28-34, 36-40, 42-48, 49, 50, 52, 55, 58-67, 70	Centers of economic activity within the BMGR region include Yuma, the Lower Gila River corridor, Gila Bend, Ajo, Sonoyta, and San Luis Rio Colorado. All of these areas have experienced economic growth over the last 10 years and the various ongoing and planned development projects, as indicated by the actions listed in Table 6-2, are evidence of expected continued growth. The expected additive or interactive effect of these economic activities is for continued growth in the region's population. No negative economic consequences of the area's growth are foreseen, but the expected continued increase in population will likely lead to increased competition for recreational opportunities within the BMGR and other public lands in the region.
Noise	2-7, 9-19, 23-25, 28, 29, 31-34, 36-40, 42-46, 49, 50, 52-53, 55, 58-67	In the absence of military or non-military human activities, the background noise that occurs within those portions of the BMGR that are away from developed areas on its perimeter is typically characterized by sounds produced by weather, wildlife, and other natural phenomenon. Natural quiet within the range under these conditions can reach levels of stillness comparable to other remote desert wilderness areas. Noise is generated within the region by many activities, but the predominant sources of noise within the BMGR are associated with military activities. Among these military activities, the most prevalent source of noise—in terms of the area, frequency, duration, and intensity of effect—is military aircraft flight operations. Other military training or support operations that generate noise within the range include live ordnance delivery training, vehicle use, portable or fixed-site generator operations, training ordnance delivery, EOD detonations, munitions and target scrap demilitarization processing, and small arms training. The additive or interactive effect of the noise generated by all military operations is non-significant for human health and safety and has generally not been found to cause harmful effects in wildlife populations. Noise from military sources can cause annoyance among recreational visitors; but given that the fundamental purpose of the range is for military training, a standard to require that military activities be managed to maintain conditions of natural quiet is inappropriate. Non-military sources of noise within the BMGR region include activities performed by civilian government agencies, members of the public, or persons entering the United States illegally from Mexico. Noise is also generated within the range by high-speed highway traffic on State Route 85. The U.S. Border Patrol conducts regular low-level helicopter overflights and surface vehicle patrols within the range. Other government agency activities are performed as required for natural and cultural resources management and civil law enforcement purposes. The principal noise generating activities among these management and enforcement operations involve surface vehicle use but some aircraft overflights are also conducted, usually in support of wildlife management purposes. Vehicle use is also the

TABLE E-2
ADDITIVE OR INTERACTIVE EFFECTS OF PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS ON INDIVIDUAL RESOURCES

Resource Impact Assessment Category	Actions Causing Potential Additive or Interactive Effects (Numbers from Table D-1)	Description of Meaningful Additive or Interactive Effects
		principal noise source generated by public visitors to the range. The most prevalent source of noise generated by non-military activity outside of the BMGR that affects the range is associated with traffic on Interstate Highway 8 and Mexico Highway 2 and Union Pacific Railroad trains. The Yuma ASH would also contribute high-speed traffic noise to the range environment. The additive or interactive effect of noise generated by all military and non-military sources is non-significant for human health and safety within the BMGR. Noise should generally not cause harmful effects in wildlife populations, but some noise abatement procedures are in place to reduce potential noise-induced harassment impacts on Sonoran pronghorn fawns during their first three to four months of life.

Appendix F
Comments and Responses to Comments on the Draft Environmental Impact Statement

This page intentionally left blank.

INTRODUCTION

This appendix contains comments received during the comment period for the Draft Environmental Impact Statement (EIS) for Proposed Range Enhancements at Barry M. Goldwater Range (BMGR) East and the Air Force's responses to those comments. The comment period began on 10 July 2009 and closed on 24 August 2009. Three public hearing were conducted on three separate days in late July 2009 (the 27th, 28th, and 29th) to provide the public with an opportunity to review project information, ask questions of the project team, and to make oral comments on the Draft EIS. In accordance with the National Environmental Policy Act (NEPA), public and agency comments were reviewed and incorporated into this Final EIS. These public and agency comments are used by the decisionmaker to evaluate the merits of the proposed action and alternatives.

Comments on the Draft EIS were generated through written correspondence. Two oral comments were submitted at the Glendale public hearing and no oral comments were submitted at the other two public hearings. The following process was used for reviewing and responding to these comments:

- All written and oral comments received during the public comment period were catalogued and assigned a unique identifying number. Comments were ordered as follows:
    1. Department of the Interior
    2. Environmental Protection Agency (EPA)
    3. Arizona Game and Fish Department (AGFD)
    4. Arizona State Historic Preservation Office (SHPO)
    5. Arizona Department of Environmental Quality (ADEQ)
    6. Ak Chin Indian Community
    7. White Mountain Apache Tribe Heritage Program
    8. Sierra Club, Grand Canyon Chapter
    9. Gunsight Development Corp.
    10. Sandy Bahr, Sierra Club, Grand Canyon Chapter (oral)
    11. Earle Runte, Gunsight Development Corp. (oral)
- Substantive comments were identified and bracketed. The interdisciplinary team that prepared the EIS reviewed these bracketed comments and provided a response. Three guidelines were used for determining substantive comments:
    1. The comment questions the purpose and need, alternatives, or other components of the proposal.
    2. The methodology of analysis or results were questioned.

3. The use, adequacy, and/or accuracy of data were questioned.

Section 2 of this appendix provides a copy of each comment with the bracketed substantive comments. Section 3 of this appendix provides a written response for each individual bracketed comment.

2. COMMENTS

Written comments are provided on the pages that follow.

The following two oral comments received at the Public Hearing in Glendale Arizona.

Oral Comment #1 - Sandy Bahr, Sierra Club, Grand Canyon Chapter

Lowering the floor for flying over the Cabeza Prieta NWR is a significant change. Our concerns regarding this include effects on recreation, noise, and wildlife disturbance. 10-1

Washes are critical for wildlife and impacts on wildlife should be minimized. Taking sand and gravel from washes would disturb wildlife. 10-2

Oral Comment #2 - Earle Runte, Gunsight Development Corp.

I believe that work done to mine sand and gravel from washes will be done in such a way to enhance the environment. Persons associated with Flood Control will ensure everything is done right.

The economy is depressed in the area around the Range so everything that is done to create jobs to keep young people in the area is the right thing to do.

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Pacific Southwest Region
1111 Jackson Street, Suite 520
Oakland, California 94607

IN REPLY REFER TO:
ER# 09-765

Electronically Filed

21 August 2009

Ms. Lisa McCarrick
Luke Air Force Base
56 FW/RMO
7224 N. 139th Drive
Luke AFB, AZ 85309-1420

Subject: Review of the Draft Environmental Impact Statement (DEIS) for Barry M. Goldwater East Range Enhancements, Yuma, Pima and Maricopa Counties, AZ

Dear Ms. McCarrick:

The Department of the Interior has received and reviewed the subject document and has no comments to offer.

Thank you for the opportunity to review this project.

Sincerely,

Patricia Sanderson Port
Regional Environmental Officer

cc:
Director, OEPC
FWS, Region II

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

SEP 0 8 2009

Lisa McCarrick
56 FW/RMO,
7224 N 139th Drive
Luke Air Force Base, Arizona 85309-1420

Subject: Draft Environmental Impact Statement for the Proposed Barry M. Goldwater Range East Range Enhancements, Yuma, Prima and Maricopa Counties, Arizona (CEQ # 20090227)

Dear Ms. McCarrick:

The U.S. Environmental Protection Agency (EPA) has reviewed the above-referenced project pursuant to the National Environmental Policy Act, Council on Environmental Quality's Regulations for Implementing NEPA (40 CFR 1500-1508), and Section 309 of the Clean Air Act. Our detailed comments are enclosed.

EPA commends the Air Force on its planned use of laser sensors rather than munitions at the Sensor Training Area. We also commend the low impact development at the New Taxiway and Air Traffic Control Tower at Gila Bend Air Force Auxiliary Field. EPA's resources on low impact development may be of assistance to you, and can be found at http://epa.gov/nps/lid/. EPA also supports road paving in Proposal 9, estimated to reduce 10 micron particulate matter (PM-10) emissions by more than 18 tons per year.

While we acknowledge the benefits of the 10 proposals to enhance range operations and training at the range, we have rated the Draft Environmental Impact Statement (DEIS) as Environmental Concerns – Insufficient Information (EC-2) (see enclosed "*Summary of Rating Definitions*") due to our concerns regarding coordination with the nearby range and proving grounds, surface water impacts, and air emissions.

We appreciate the opportunity to review this DEIS. When the FEIS is released for public review, please send one (1) hard copy to the address above (mail code: CED-2). If you have any questions, please contact me at (415) 972-3521, or contact Tom Kelly, the lead reviewer for this project. Tom can be reached at (415) 972-3852 or kelly.thomasp@epa.gov.

Sincerely,

Kathleen M. Goforth, Manager
Environmental Review Office
Communities and Ecosystems Division

Printed on Recycled Paper

Enclosures:
Summary of Ratings Definitions
Detailed Comments

cc: Sally McGuire, U.S. Army Corps of Engineers
Tim Murphy, Maricopa County Flood Control District
Doug Irwin, Maricopa County Air Quality Department
Curt McCasland, U.S. Fish and Wildlife Service
Chris Henninger, Arizona Department of Environmental Quality

SUMMARY OF EPA RATING DEFINITIONS*

This rating system was developed as a means to summarize the U.S. Environmental Protection Agency's (EPA) level of concern with a proposed action. The ratings are a combination of alphabetical categories for evaluation of the environmental impacts of the proposal and numerical categories for evaluation of the adequacy of the Environmental Impact Statement (EIS).

ENVIRONMENTAL IMPACT OF THE ACTION

"LO" (Lack of Objections)

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

"EC" (Environmental Concerns)

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

"EO" (Environmental Objections)

The EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

"EU" (Environmentally Unsatisfactory)

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potentially unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

ADEQUACY OF THE IMPACT STATEMENT

"Category 1" (Adequate)

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

"Category 2" (Insufficient Information)

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analysed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

"Category 3" (Inadequate)

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analysed in the draft EIS, which should be analysed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From EPA Manual 1640, Policy and Procedures for the Review of Federal Actions Impacting the Environment.

EPA DETAILED DEIS COMMENTS FOR PROPOSED BARRY M. GOLDWATER RANGE EAST RANGE ENHANCEMENTS, YUMA, PIMA AND MARICOPA COUNTIES, AZ, SEPTEMBER 8, 2009

Coordination with BMGR West and the Yuma Proving Ground

The DEIS would benefit from a discussion of operations at Barry M. Goldwater Range (BMGR) West and the Yuma Proving Grounds. The abstract for the DEIS states, "[t]he purpose of and need for these actions is to modernize BMGR East to provide the training resources needed to prepare air and ground forces to meet current and future defense missions." As far as EPA is aware, BMGR West and Yuma Proving Ground at least partially share the goal of providing training resources needed to prepare air and ground forces to meet current and future defense missions. 2-1

The DEIS mentions high cost to move units to alternate locations as justification to eliminate use of alternate ranges from consideration as an option. This point would be bolstered by clarifying that training resources similar to those proposed in the DEIS are not available at other military installations in Southwestern Arizona.

Surface Water Impacts

Permit Applicability

On page 3-13, the DEIS notes:

> "Some of the ephemeral surface drainage ways in BMGR East, including the major wash systems described above, may be considered jurisdictional waters of the United States and possibly subject to the CWA. Activities in and around jurisdictional waters require adherence to the CWA. Activities with the potential to impact such waters may require state water quality certification under Section 401 and/or federal permit under Section 402 and/or 404 of the CWA. The U.S. Army Corps of Engineers, Environmental Protection Agency (EPA), and ADEQ, as authorized by the EPA, administer these permits." 2-2
>
> Recommendation: Prior to development of the FEIS, EPA recommends the Army Corps of Engineers determine whether any of the washes impacted by the proposals are considered a water of the United States. The results of the Army Corps work can then be included in the FEIS, to resolve any confusion about the applicability of Clean Water Act requirements.

Sand and gravel pits are a covered sector under stormwater regulations, and a multi-sector general permit may be required. Additionally, an individual NPDES Clean Water 2-3

Act Permit may also be necessary if discharges are planned from sand and gravel processing, but neither of these was discussed in the DEIS.

2-3

> Recommendation: The FEIS should discuss the type of sand and gravel processing envisioned and the applicability of stormwater and NPDES permits.

Spent Munitions and Propellants

The DEIS refers to the June 2004 Limited Field Study and states ". . . all munitions constituents were below detectable concentrations, laboratory sample quantification limits, or residual human-health screening levels" (p. 3-107). Based on the Limited Field Study and the 2005 Qualitative Assessment, the DEIS states, "it was determined that there are no complete munitions constituent exposure routes to potential receptors in the vicinity of BMGR East" (p. 3-107). This is a significant conclusion worthy of additional disclosure. Human health screening level concentrations, for example, can vary by orders of magnitude depending on the expected human exposure used in development of the screening levels.

2-4

> Recommendation: The FEIS should include a table of munitions and propellant constituent concentrations, a map of sampled locations, human health and ecological screening levels, and a description of the method used to determine that no complete exposure routes exist (e.g. the method used for estimating surface water or groundwater concentrations from sediment sample concentrations), along with estimated concentration results for exposure pathways.

The DEIS acknowledges that the new target for live air to ground missles, the East TAC Range, will be located "in close proximity to Quilotosa Wash" (Table S-4). Because the new location is much closer to Quilotosa Wash than the prior locations, conclusions drawn about the migration of munitions and propellant constituents may no longer be accurate.

2-5

> Recommendation: The FEIS should discuss the potential for munitions and propellant constituents from the TAC Range to migrate with surface water or percolate downward to groundwater. The FEIS should also commit to several annual monitoring events (e.g. stormwater monitoring of initial seasonal rainfall) downstream of East TAC Range to ensure contaminants are not leaving the facility during the initial years of operation. Additionally, the FEIS should commit to contingent mitigation measures if unacceptably high concentrations are measured.

Air Emissions

EPA is concerned the DEIS may not include all PM10 emissions. Proposal 10 details sand and gravel excavation from on-site washes for on-site use in road maintenance,

2-6

target reconfiguration, and target maintenance. The DEIS states, "[a]nnual emissions are negligible with the exception of PM-10 (5.36 tons according to Table 4-11) which is primarily generated by the movement of dump trucks on unpaved roads as they travel to and from the storage locations." EPA seeks clarification that the DEIS PM-10 emissions estimate includes emissions associated with processing soil extracted from the washes. In addition to sand and gravel, the soil to be extracted will likely include silt, clay, and possibly cobbles. The process of digging and processing soil to obtain sand and gravel will create PM-10. Maricopa County's Emission Inventory Help Sheet for Sand and Gravel Plants (http://www.maricopa.gov/aq/divisions/planning_analysis/docs/2008_reporting_forms/08_Sand_and_Gravel.pdf) includes emissions factors for mining/plant feed, surge pile forming, crushing with watering, screening with watering, conveyor transfer, pile forming (with and without watering) and raw material and product storage. 2-6

> Recommendation: The FEIS should clarify whether or not PM-10 emissions from processing sand and gravel have already been included in the values of Table 4-11; and if not, adjust the estimate to account for the additional emissions. The FEIS should include any mitigation measure, such as the application of water, that will be implemented to reduce PM-10 emissions during processing.

The DEIS explains that a dust control permit will be required, from Maricopa County, for some of the proposals. EPA suggests the FEIS include specific mitigation measures to control dust for the entire facility, rather than preparing separate plans by county. EPA offers the following as potential dust control measures: 2-7

- stabilizing open storage piles and disturbed areas by covering and/or applying water or chemical/organic dust palliative, where appropriate, to both inactive and active sites, during workdays, weekends, holidays, and windy conditions;
- installing wind fencing and phase grading operations where appropriate; operating water trucks for surface stabilization under windy conditions; and preventing spillage and limiting vehicle speed to 15 miles per hour (mph) when hauling material and operating non-earthmoving equipment;
- limiting the speed of earth-moving equipment to 10 mph;
- covering or tarping vehicles hauling soil or other loose materials;
- watering active construction sites as needed or applying a non-toxic soil stabilizer;
- covering or applying soil stabilizers to disturbed areas within five days of completion of the activity at each site; and
- reclaiming and revegetating disturbed areas as soon as practicable after completion of activity at each site.

Green Ammunition

Consistent with the policy on pollution prevention (Department of Defense Instruction 4715.4, Sections 4.1.2, 4.2.2), EPA suggests the FEIS discuss the opportunity for green ammunition (i.e. does not contain lead [Pb]). EPA is aware that the initial research and testing on green ammunition has focused on smaller caliber ammunition than used at the BMGR East. Additionally, many have raised concerns about tungsten, one alternative to 2-8

lead (see National Park Service advisory at http://data2.itc.nps.gov/digest/printheadline.cfm?type=Announcements&id=3726). Still, provided an acceptable alternative can be found, green ammunition has the potential to eliminate lead contamination in the new areas of the range that will be coming under live fire.

2-8

Recommendation: The FEIS should include a discussion of the potential for green ammunition during live fire training.

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
5000 W. CAREFREE HIGHWAY
PHOENIX, AZ 85086-5000
(602) 942-3000 • WWW.AZGFD.GOV
REGION IV, 9140 E. 28TH ST., YUMA, AZ 85365

GOVERNOR
JANICE K. BREWER
COMMISSIONERS
CHAIRMAN, BOB HERNBRODE, TUCSON
JENNIFER L. MARTIN, PHOENIX
ROBERT R. WOODHOUSE, ROLL
NORMAN W. FREEMAN, CHINO VALLEY
JACK F. HUSTED, SPRINGERVILLE
DIRECTOR
LARRY D. VOYLES
DEPUTY DIRECTORS
GARY R. HOVATTER
ROBERT D. BROSCHEID

August 13, 2009

Ms. Lisa McCarrick
56 FW/RMO
7224 N. 139th Dr.
Luke Air Force Base, AZ 85309-1420

Re: Draft Environmental Impact Statement for Proposed Barry M. Goldwater Range East Range Enhancements

Dear Ms. McCarrick:

The Arizona Game and Fish Department (Department) has received the U.S. Air Force (Air Force) Draft Environmental Impact Statement (DEIS) for Proposed Barry M. Goldwater Range East (BMGR East) Range Enhancements (proposed enhancements) dated June 2009. Department personnel attended a public hearing on July 27 in Gila Bend, Arizona and have reviewed the DEIS regarding potential impacts to wildlife populations, habitats, and wildlife-oriented recreation. We are providing the following comments for your consideration.

DESCRIPTION OF ALTERNATIVES

As we understand, the DEIS describes and analyzes alternatives for 10 proposed enhancements aimed to meet the general training and support needs at the BMGR East and Gila Bend Air Force Auxiliary Field (AFAF). The Air Force has determined that the training and range support infrastructure currently in place at BMGR East is in need of key additions, modifications, improvement, and upgrades to ensure aircrew training remains realistic and relevant. Although each proposed enhancement is supported by individual purposes and needs, the shared purpose and need for the proposed enhancements is described as: 1) support air combat power, 2) expand training value, flexibility, and capacity, and 3) invest in one of the nation's most capable and productive ranges. Further, the DEIS asserts that the 10 proposed enhancements are independent of each other, have stand-alone value for improving training operations, and are described and analyzed as:

1. Develop a Sensor Training Area, which is a new target complex used to train aircrews for air-to-ground combat through the use of laser sensors rather than firing munitions at the targets. Features common to all three alternatives include: 1) a 640-acre site with approximately 400 acres developed over time and 240 acres left undeveloped, 2) an approximately 0.25-acre ground-based forward air controller observation point that is external to the Sensor Training Area, and 3) access roads to the Sensor Training Area and ground forward air controller point.

2. Establish new procedures to address and guide environmental reviews and approvals for reconfiguration of existing air-to-ground tactical range target complexes to create more realistic simulations of today's battlefield.
3. Install a moving vehicle target and track for air-to-ground attack training. Each alternative would utilize existing roads within North TAC.
4. Develop a new (second) target within East TAC for attack training with live air-to-ground missiles.
5. Renegotiate the 1994 Memorandum of Understanding among the Department of the Air Force, Navy and the Interior in order to lower the altitude floor for regular flight training over a portion of the Cabeza Prieta National Wildlife Refuge (Refuge) from 1,500 feet to 500 feet above ground level (AGL).
6. Convert the southern portion of Manned Range 3 into a helicopter gunnery range.
7. Allow additional ground-based training opportunities on BMGR East such as combat search and rescue, clandestine insertions and extractions from helicopters or vehicles driven on existing roads, cross country land navigation, or shooting at targets while traveling on foot.
8. Construct a new taxiway parallel to the airfield runway to increase the safety and capacity of the airfield, and construct a new air traffic control tower at Gila Bend AFAF.
9. Pave approximately 7 miles of the existing graded road from the main tower within Manned Range 1 to the water well and adjacent Range Munitions Consolidation Point 1 located near the boundary of North and South TAC ranges to the west of Manned Range 1.
10. Excavate sand and gravel from 10 sites within BMGR East, and stockpile the materials in 5 alternative sites located near roads, using the materials for on-range road maintenance, target reconstruction, and target maintenance.

3-1

DEPARTMENT RECOMMENDATIONS

General Comments Common to all Proposed Enhancements

The Department recommends adhering to the following guidelines, as appropriate, during the implementation of all proposed enhancement alternatives:

- Prior to any ground disturbing or construction activities, appropriate surveys should be conducted for sensitive wildlife species potentially occurring within the project area. Survey protocols and guidelines for the Sonoran desert tortoise and western burrowing owl can be found at **http://www.azgfd.gov/hgis/guidelines.aspx**.

3-2

- To the extent possible, use existing roads and take other appropriate actions to minimize alterations or negative impacts to existing vegetation and habitat. When project activities are complete, restore and revegetate all affected areas as appropriate and coordinate plant salvage efforts with the Arizona Department of Agriculture, in accordance with the Arizona Native Plant Law.

3-3

- Disturbance to habitat features in desert washes can result in disproportionate negative impacts to wildlife due to the high importance of these habitats for foraging, breeding, cover, and linkage areas. If implementing scenarios as part of any proposed enhancement in the DEIS involves work within desert washes or wetlands, we recommend contacting the U.S. Army Corps of Engineers regarding Clean Water Act issues. 3-4 3-5
- Recent mitochondrial DNA studies (Culver et al. 2000) and an exhaustive morphological study of all available specimens (McIvor et al. 1995) indicate that a "Yuma puma" subspecies has never existed. Therefore, the Department recommends removing this species from the text and Table 3-3 of the DEIS. 3-6

Proposed Enhancement 1

The Department recommends Alternative 1C. Alternatives 1A, 1B, and 1C would each involve the construction, operation, and maintenance of a Sensor Training Area within the 640-acre target array, additional features beyond the target array such as air controller sites and microwave controller stations, road maintenance and improvements, and increased vehicle and human presence in the area.

Alternative 1A would be located in a largely pristine area within the mostly-undisturbed San Cristobal Valley. The proposed enhancements for Alternative 1A may significantly impact wildlife and their habitats due to displacement near road and facilities construction, direct mortality from collisions with vehicles, avoidance of areas with increased concentration of human activity, and the loss of habitat value and spread of exotic/invasive species (primarily plants) due to an increase in frequency and extent of wildfires and soil disturbance. The increased infrastructure, vehicle traffic, and other human activity would likely impact Sonoran pronghorn by negatively affecting their use of portions of the San Cristobal Valley. Similarly, this area of the San Cristobal Valley is high-quality habitat for the Le Conte's thrasher. Additionally, habitat for the Yuma (Colorado) Desert fringe-toed lizard exists in dune areas in the north part of the valley and to the east of Mohawk Gap, as described in the DEIS. And although the location for Alternative 1A, as shown in the DEIS, seems to avoid dunes, the proposed access road along the west side of the Mohawk Mountains passes through fringe-toed lizard habitat on the north and could result in increased road kill. Similar concerns exist for the proposed access road from Stoval Field, which could pass through or near fringe-toed lizard habitat in the north area San Cristobal Valley. Finally, implementing Alternative 1A could result in the reduction of access for sheep hunters in the Mohawk and Granite Mountains east and west of the proposed Sensor Training Area site. Under this alternative, desert bighorn sheep hunters would only be allowed to access areas within the safety footprint if the laser use ceased during the desert bighorn sheep hunting season, typically during December. Given the rare opportunity for obtaining a desert bighorn sheep permit, the Department believes that restricting access to these huntable areas would result in significant negative impacts to wildlife-oriented outdoor recreation. 3-7

Alternative 1B would be located within the target area of an existing tactical range and the site has already been disturbed and subjected to various training activities; however; it is in an area

regularly utilized by Sonoran pronghorn. Increasing roads, infrastructure, and other human activity could negatively impact the ability for pronghorn to use this area.

Alternative 1C would be located outside the current range of Sonoran pronghorn, and outside the relatively undisturbed and high-quality habitat areas that exist in the vicinity of Alternative 1A.

Proposed Enhancement 2

3-8 The Department recommends that the DEIS more accurately and precisely define the various levels of environmental compliance and review that would be required prior to implementing a target reconfiguration. Further, we believe that any target reconfiguration requires an appropriate NEPA review (for example, Categorical Exclusion, Environmental Assessment, EIS, or other). The decision processes for determining the appropriate NEPA review need to be well defined in the DEIS in order to adequately understand how the potential impacts to biological resources and outdoor recreation would be analyzed on a site-specific basis.

Proposed Enhancement 3

3-9 The Department recommends Alternative 3C. Alternative 3A is co-located with Target 104/106 (the old main airfield) and has thus been previously disturbed for target features associated with the complex. Location alternatives for 3B and 3C have not been disturbed for simulated target infrastructure. However, the locations for both Alternatives 3A and 3B experience substantially higher use by Sonoran pronghorn than does the Alternative 3C location. As a result, utilizing a moving vehicle target system at the Alternative 3A or 3B locations would result in negative impacts to Sonoran pronghorn currently using those areas due to the increase in vehicle traffic, use of live fire munitions, etc. Additionally, selecting Alternatives 3A or 3B would increase the likelihood that military training missions would have to be cancelled or rescheduled more frequently due to the presence of Sonoran pronghorn.

Proposed Enhancement 4

3-10 The Department recommends Alternative 4A. The Department concurs with analysis in the DEIS that impacts to desert wash vegetation may negatively impact the California leaf-nosed bat, while impacts to saguaros may negatively impact the lesser long-nosed bat. The Department also concurs with the analysis for the Sonoran pronghorn, which does not occur east of State Route 85, and is considered outside the current range of the species. However, impacts to Sonoran pronghorn may occur if, in the future, Sonoran pronghorn are found to occupy areas east of State Route 85, either through dispersal or active translocation by wildlife and land management agencies.

Proposed Enhancement 5

3-11 The Department recommends Alternative 5C (the No Action Alternative). Lowering the flight training altitude floor over a portion of the Refuge from 1,500 feet to 500 feet AGL may negatively impact various species of wildlife, including the Le Conte's thrasher, California leaf-nosed bat, lesser long-nosed bat, and Sonoran pronghorn, as described in Alternatives 5A and 5B of the DEIS. Additionally, the Department has serious concerns over the potential implications

for wildlife management on the Refuge. Under Alternatives 5A and 5B, considerable scheduling conflicts could occur between the Department and BMGR-related missions. Currently, Department personnel regularly utilize air space below 1,500 feet AGL to conduct wildlife population and habitat surveys, telemetry flights, and to check and maintain wildlife water catchments and tinajas. All of these activities take place concurrently with BMGR-related missions taking place above 1,500 feet AGL. Alternative 5C, the No Action Alternative, would allow the Department to continue to effectively manage wildlife and avoid the potentially numerous airspace scheduling conflicts on the Refuge that would result under Alternative 5A and 5B.

3-11

Proposed Enhancement 6

The Department recommends Alternative 6A. The Department believes that potential impacts to wash vegetation may negatively impact the California leaf-nosed bat while impacts to saguaros may negatively impact the lesser long-nosed bat. The Department also concurs with the analysis for the Sonoran pronghorn, which does not occur on the BMGR East, east of State Route 85, and is considered outside the current range of the species. However, impacts to Sonoran pronghorn may occur if in the future, Sonoran pronghorn are found to occupy areas east of State Route 85, either through dispersal or active translocation by wildlife and land management agencies.

3-12

Proposed Enhancement 7

The Department recommends Alternative 7B (the No Action Alternative). The Department would support Alternative 7A, if all stipulations described in the DEIS are adhered to (including, Area B not being closed to public access during on-the-ground training activities, and all vehicles being driven only on existing open roads), and if the Air Force required all small special tactics teams to adhere to the following:

3-13

- On-the-ground training would be restricted to areas east of State Route 85, which is considered outside the current range of the Sonoran pronghorn, to avoid impacts to this species. Sonoran pronghorn are negatively affected by increased human activity, which include personnel travelling on foot, all-terrain and other small vehicles, and helicopters. All of these disturbances would increase substantially under Alternative 7A, resulting in significant negative impacts to the Sonoran pronghorn.
- On-the-ground training would be restricted to areas outside of mountain habitats occupied by desert bighorn sheep during: 1) the desert bighorn sheep hunting season – typically December, and 2) the lambing season – typically January through April.
- On-the-ground training would be restricted to areas outside of dune habitats occupied by Colorado Desert fringe-toed lizards.
- Troops would not enter caves or mines prior to appropriate surveys being conducted to verify the presence/absence of California leaf-nosed or lesser long-nosed bats.

Proposed Enhancement 8

The Department has no comment on this proposed enhancement.

Proposed Enhancement 9
The Department has no comment on this proposed enhancement.

Proposed Enhancement 10
As described in the DEIS, some of the ephemeral surface drainage ways in BMGR East, including major wash systems, may be considered jurisdictional waters of the United States and possibly subject to the Clean Water Act (CWA). Activities in and around jurisdictional waters require adherence to the CWA. Activities with the potential to impact such waters may require state water quality certification under Section 401 and/or federal permit under Section 402 and/or 404 of the CWA. The U.S. Army Corps of Engineers, Environmental Protection Agency, and Arizona Department of Environmental Quality, as authorized by the Environmental Protection Agency, administer these permits.

3-14

Thank you for the opportunity to review and comment on this DEIS. If you have any questions regarding the comments provided in this letter, please contact me at (928) 341-4068.

Sincerely,

Troy G. Smith
Habitat Program Manager
Region IV, Yuma

TGS:tgs

cc: Pat Barber, Regional Supervisor, Region IV
Laura Canaca, Supervisor, Project Evaluation Program
Ron Fowler, Regulatory Branch, U.S. Army Corps of Engineers
Curtis McCasland, Refuge Manager, Cabeza Prieta National Wildlife Refuge
Steve Spangle, Field Supervisor, U.S. Fish and Wildlife Service

AGFD #M09-07105732

LITERATURE CITED

Culver, M., W.E. Johnson, J. Pecon-Slattery, and S.J. O'Brien. 2000. Genomic ancestry of the American puma (*Puma concolor*). The Journal of Heredity 91:186-197.

McIvor, D.E., J.A. Bissonette, and G.S. Drew. 1995. Taxonomic and conservation status of the Yuma mountain lion. Conservation Biology 9(5):1033-1040.

Comment Letter #4

SHPO-2008-0004(40447)
GC

DEPARTMENT OF THE AIR FORCE
AIR EDUCATION AND TRAINING COMMAND

July 2009

James R. Uken
Director
56th Range Management Office
7224 N. 139th Dr
Luke AFB AZ 85309-1420

RECEIVED
JUL 10 2009
ARIZONA STATE PARKS/SHPO

Dear Interested Individuals

I am pleased to send you the enclosed *Draft Environmental Impact Statement for Barry M. Goldwater Range Enhancements*. This Draft EIS has been prepared in compliance with the National Environmental Policy Act and addresses environmental effects of proposed enhancements and alternatives within the eastern portion of the Barry M. Goldwater Range (BMGR East), Arizona.

Three public hearings will be held in southern Arizona communities, allowing interested persons to review displays and ask questions regarding the analysis, and to provide comments on the Draft EIS. Each hearing will begin at 6 p.m. with an open house, include a short presentation at 6:30 p.m. with the opportunity for the public to make oral comments after the presentation, and conclude by resuming the open house until 8 p.m.

The three hearings will be conducted at the following locations on the dates indicated:

- Monday, July 27, 2009, Gila Bend High School, cafeteria
  308 N. Martin Ave., Gila Bend, AZ
- Tuesday, July 28, 2009, Glendale Adult Center, Room 104
  5970 W. Brown St., Glendale, AZ,
- Wednesday, July 29, 2009, Arizona Game and Fish Department
  555 N. Greasewood Rd., Tucson, AZ,

Written comments on the Draft EIS may be submitted at any of the public hearings or may be mailed to: Lisa McCarrick, 56 FW/RMO, 7224 N. 139th Drive, Luke AFB, AZ 85309-1420. Comments must be received no later than August 24, 2009, to ensure full consideration in the Final EIS.

James R. Uken
JAMES R. UKEN
Director, 56th Range Management Office

Enclosure

4-1

We look forward to reirewing the agency's Section 106 consultation for this undertaking. Thank you.
Ann S. Howard 8-3-09
for AZSHPO

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

1110 West Washington Street • Phoenix, Arizona 85007
(602) 771-2300 • www.azdeq.gov

Janice K. Brewer
Governor

Benjamin H. Grumbles
Director

August 21, 2009

Ms. Lisa McCarrick
56 FW/RMO
7224 N. 139th Drive
Luke AFB, AZ 85309-1420

Re: Barry M. Goldwater Range Enhancements

Dear Ms. McCarrick:

The Arizona Department of Environmental Quality Water Quality Division (ADEQ) appreciates the opportunity to comment on the draft environmental impact statement (EIS) for the Barry M. Goldwater Range East (BMGR). The Water Quality Division is responsible for ensuring the delivery of safe drinking water to customers of regulated public water systems under the Safe Drinking Water Act, permits for proposed discharges to surface waters of the United States under the federal Clean Water Act (CWA), permits under the State aquifer protection program, and water quality certifications of certain federal licenses and permits. With the information provided, ADEQ would like to make you aware of some water quality issues that may need to be addressed.

Aquifer Protection Program

Certain mining operations that discharge wash water, such as sand and gravel operations, can be covered under an Aquifer Protection Permit (APP) Type 1 General Permit, specifically the 1.01 General Permit. Permit coverage exists if only physical processes are employed and only hazardous substances at naturally occurring concentrations in the sand, gravel, or other rock material are present in the discharge. No notification is required, however, best management practices must be followed to reduce or prevent the discharge of pollutants. An operation that is unable to meet the Type 1 General Permit requirements must have coverage under an individual APP. 5-1

Permit coverage under the APP also is required for wastewater and sewage treatment facilities. The EIS notes that for project aspects involving temporary troop movement, human sewage will be removed by a commercial contractor to be placed in approved sewage treatment facilities. However, it is not clear how domestic sewage is addressed with the new air traffic control tower. It is our recommendation that BMGR consult closely with ADEQ's Engineering Review section staff as ADEQ is responsible for any permitting if the federal government owns or operates wastewater facilities. For questions, please contact David Burchard in the Wastewater and Subdivision Review Unit at (602) 771-4298 or via e-mail at db2@azdeq.gov for more information. 5-2

If the daily design flows of an on-site wastewater treatment facility are anticipated to be in excess of 24,000 gallons per day, then an individual APP will be needed. For questions, please contact Mr. Asif Majeed in the APP unit at (602) 771-4683 or via e-mail at akm@azdeq.gov for more information on the individual APP process. 5-2

Drinking Water

The EIS notes that for project aspects involving temporary troop movement, drinking water will be provided. However, it is not clear how drinking water is addressed with the new air traffic control tower. A water system that has at least fifteen service connections or regularly serves an average of at least twenty-five individuals daily at least 60 days out of the year must comply with state drinking water regulations. ADEQ is responsible if the federal government owns or operates a public water system. For further information or questions, please contact Donna Calderon in the Drinking Water Unit at (602) 771-4641 or via e-mail at dml@azdeq.gov. 5-3

Surface Waters and Stormwater

The EIS recognizes the requirements for two permits: the Construction General Permit, under the Arizona Pollutant Discharge Elimination System (AZPDES) program, and a CWA section 404 permit (a.k.a. dredge and fill permit) from the U.S. Army Corps of Engineers, if project activities will occur inside the Ordinary High Water Mark of a water of the U.S. The Construction General Permit, Stormwater Pollution Prevention Plan (SWPPP) checklist, and associated forms are available on ADEQ's website at: http://www.azdeq.gov/environ/water/permits/st~~orm~~water.html#const. For questions, please contact Chris Henninger in our Stormwater and General Permits Unit at (602) 771-4508 or by e-mail at cph@azdeq.gov. The CWA 401 application form can be downloaded from ADEQ's website at: http://www.azdeq.gov/function/forms/appswater.html#dredge. For questions relating to CWA 401/404, please contact Bob Scalamera at (602) 771-4502 or by e-mail at rs3@azdeq.gov.

Our records indicate that Luke AFB and a "Gila Bend Auxiliary Field" owned by the United States Air Force, have coverage under the Multi-Sector General Permit (MSGP) for the industrial sector of "airport". The MSGP is a stormwater permit that is required of industrial sites that discharge stormwater associated with industrial activity to, among other things, implement control measures and develop site-specific SWPPPs to comply with AZPDES requirements. The MSGP contains industry sector-specific requirements that vary depending on the industry. It is not clear from our records that BMGR has MSGP coverage for the industrial sector of airport. Regardless, BMGR will need to seek permit coverage for the industrial sector of sand and gravel operations. 5-4

ADEQ is developing a new Arizona-specific MSGP, which is based in part on the U.S. Environmental Protection Agency's (EPA) MSGP 2008, issued on September 29, 2008. Facilities in Arizona with coverage under the previous MSGP 2000 before it expired on October 30, 2005 continue to be granted an administrative continuance. The administrative continuance remains in effect until ADEQ issues a new permit. Those facilities already covered under the MSGP 2000 must continue to implement their SWPPP and comply with the requirements in the

MSGP 2000. All facilities in Arizona (excluding Indian Country lands) must reapply for permit coverage when ADEQ issues a new MSGP.

Public review and comment on the new proposed MSGP has begun, with a new MSGP expected to be issued in January 2010. Only MSGP 2000 permittees of record will be directly notified when the new permit becomes effective. Updates on the status of the 2009 MSGP can be found at: http://www.azdeq.gov/environ/water/permits/msgp.html. For questions on MSGP coverage, please contact Dennis Turner at (602) 771-4501 or by e-mail at dt1@azdeq.gov."

We appreciate the opportunity to review and provide comments. If you need further information, please contact Wendy LeStarge of my staff at (602) 771-4836 or via e-mail at wl1@azdeq.gov, or myself at (602) 771-4416 or via e-mail at lc1@azdeq.gov.

Sincerely,

Linda Taunt, Deputy Director
Water Quality Division

AK-CHIN INDIAN COMMUNITY

42507 W. Peters & Nall Road · Maricopa, Arizona 85138 Telephone: (520) 568-1000 · Fax: (520) 568-1001

July 20, 2009

Mr. James R. Uken, Director
56th Range Management Office
7224 N. 139th Dr.
Luke AFB, AZ 85309-1420

Re: *Draft EIS for Barry M. Goldwater Rage Enhancements*

Dear Mr. Uken:

The Ak-Chin Indian Community is in receipt of the *Draft Environmental Impact Statement for Barry M. Goldwater Range Enhancements* CD. Based on the location of the project, we will defer comments to the Tohono O'Odham Nation.

The Ak-Chin Indian Community is in support of the concerns addressed in the public scoping meetings, regarding the cumulative impacts to the following:

- Cabeza Prieta Wilderness
- Sonoran Desert National Monument,
- Explosive Ordinance Disposal (EOD), which were addressed in the report.

If you should have any questions, please contact Mrs. Caroline Antone, Cultural Resources Manager at (520) 568-1372 or Mr. Gary Gilbert, Cultural Resources Technician II at (520) 568-1369.

Sincerely,

Louis J. Manuel Jr., Chairman
Ak-Chin Indian Community

Cc: Cultural Resources

White Mountain Apache Tribe Heritage Program
PO Box 507 Fort Apache,AZ 85926
1 (928) 338-3033 Fax: (928) 338-6055

To: Lisa McCarrick, Department of the Air Force / Air Education and Training Command.
Date: August 5, 2009
Project: Draft Environmental Impact Statement for Barry M. Goldwater Range Enhancement.

The White Mountain Apache Historic Preservation Office (THPO) appreciates receiving information on the proposed project, dated July 2009 In regards to this, please attend to the checked items below.

► ***There is no need to send additional information unless project planning or implementation results in the discovery of sites and/or items having known or suspected Apache Cultural affiliation.***

☐ The proposed project is located within an area of probable cultural or historical importance to the White Mountain Apache Tribe (WMAT). As part of the effort to identify historical properties that maybe affected by the project we recommend an ethno-historic study and interviews with Apache Elders. The Cultural Resource Director, ***Mr. Ramon Riley*** would be the contact person at (928) 338-4625 should this become necessary.

☐ The proposed project is located within or adjacent to a known historic property of cultural concern and/or historical importance to the White Mountain Apache Tribe and will most likely result in adverse affect to said property. Considering this, please refrain from further steps in project planning and/or implementation.

► Please refer to the attached additional notes in regards to the proposed project:

We have received and reviewed the information regarding the *Draft Environmental Impact for Barry M. Goldwater Range Enhancement* within the eastern portion of the Barry M. Goldwater Range (BMGR East) Arizona, and we've determined the proposed action and/or evaluation ***will not have an effect*** to the White Mountain Apache tribe's Cultural Heritage Resources and/or historic properties. The project may proceed with the understanding that any ground disturbance should be monitored ***if*** there are reasons to believe that human remains and/or funerary objects are present, if they are encountered all construction activities are to be stopped and the proper authorities and/or affiliated tribe(s) be notified to evaluate the situation.

We look forward to continued collaborations in the protection and preservation of places of cultural and historical significance.

Sincerely,

Mark T. Altaha
White Mountain Apache Tribe
Historic Preservation Officer
Email: markaltaha@wmat.nsn.us

SIERRA CLUB
FOUNDED 1892

Grand Canyon Chapter • 202 E. McDowell Rd, Ste 277 • Phoenix, AZ 85004
Phone: (602) 253-8633 Fax: (602) 258-6533 Email: grand.canyon.chapter@sierraclub.org

August 19, 2009

Lisa McCarrick
56 FW/RMO
7224 N. 139th Drive
Luke AFB, AZ 85309-1420

Dear Ms. McCarrick:

Thank you for the opportunity to provide comments on the *Draft Environmental Impact Statement for Barry M. Goldwater Range Enhancements*. Please accept these comments on behalf of the Sierra Club's Grand Canyon Chapter and The Wilderness Society.

The Sierra Club's mission is "to explore, enjoy, and protect the wild places of the earth; to practice and promote the responsible use of the earth's ecosystems and resources; and to educate and enlist humanity to protect and restore the quality of the natural and human environments." The Sierra Club has over 750,000 members nationwide, 12,000 of whom are in Arizona. Grand Canyon Chapter members have a significant interest in the Barry M. Goldwater Range (BMGR) and surrounding areas, including the Cabeza Prieta National Wildlife Refuge. Our members use and enjoy many of the lands in the area, including for hiking, backpacking, camping, wildlife viewing, photography, and more, and have been working to protect them for many years.

Founded in 1935, The Wilderness Society (TWS) is a not-for-profit conservation organization devoted to preserving wilderness and wildlife, protecting America's prime forests, parks, rivers, deserts, and shorelines, and fostering an American land ethic. TWS has over 500,000 members and supporters, with nearly 4,000 in Arizona. We have a long-standing interest in the protection of our nation's outstanding wilderness areas and in the wise management of the National Wildlife Refuge System.

Our comments focus primarily on four proposed actions: the Sensor Training Area (Proposal 1), Target Reconfiguration (Proposal 2), Lower Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge (Proposal 5), and the Sand and Gravel Excavation, Stockpiling, and Use on BMGR East (Proposal 10). We also provide general comments about the Draft Environmental Impact Statement (DEIS).

General Comments

The BMGR is part of a network of one of the most important and relatively undisturbed Sonoran Desert ecosystems in North America. As such, it houses hundreds of species of plants and animals and their associated habitats, many of which are not found outside of this vital network. Numerous important archaeological sites are also found on the BMGR, some of which date back to over 10,000 years ago. The rich biodiversity of life and resources found within BMGR and neighboring lands must be protected. We

appreciate the efforts that the U.S. Air Force (USAF) has made to ensure that this network remains intact, and we believe that the USAF goals can be achieved while protecting the natural and cultural resources at BMGR.

Of particular concern are the endangered Sonoran pronghorn and lesser long-nosed bat. The BMGR provides important habitat for both of these species – in fact, one of the largest remaining tracts of land in the U.S. The USAF should not pursue any actions that could further imperil these species, including any actions that could result in disturbance, injury, or mortality. We appreciate the efforts that the USAF has made to protect these species, particularly with regards to the Sonoran pronghorn, but we fear that some of the actions proposed in this DEIS could negatively impact the species. Any adverse effects on sensitive species should be considered significant.

8-1 The DEIS asserts that the new expansions and improvements are necessary to provide realistic combat situations. However, as recently as March 2005, a Congressionally-appointed task force found that, although operating within the environmental guidelines in place at the time resulted in some loss of training flexibility, the BMGR was still able to provide realistic and adequate training scenarios. In the same report, biologists examining the effects of military activity in the range recommended restricting the alteration of current training sites.[1]

Missing information

We appreciate the amount of information provided in the DEIS. However, several of the proposed actions are missing important details necessary to fully understand the impacts of the action and in order to inform a final decision. For example, the length of track for each alternative in Proposal 3 is not provided. As

8-2 another example, Proposal 8 mentions that it may be necessary to relocate the existing helicopter landing pads, but no further information is provided. This lack of information makes it difficult to fully understand the impacts of each proposal, which prevents interested parties from providing detailed comments and also precludes a fully informed decision.

8-3 Similarly, some of the proposals occur in areas where biological or cultural resources have not been adequately surveyed. For example, suitable habitat for the western burrowing owl "may occur" in the Alternative 1.C project area, but "there is little site-specific data available on this species" (pg. 4-53). Cultural resources have only been 100 percent surveyed at a few of the proposed project locations. Full biological and cultural surveys must be completed prior to making an informed decision. Where potential impacts of an action are not well understood but could be harmful, that action should not be permitted to occur until all information has been gathered and assessed.

Lack of mitigation efforts

8-4 Some of the proposals also discuss potential impacts without providing any mitigation options. For example, Alternative 4.A mentions the potential for disturbance and mortality to bat species, including the federally-listed lesser long-nosed bat, but no possible mitigation plans are discussed. Alternative 7.A presents possible dangers for acuña cactus, desert tortoise, western burrowing owl, both bat species considered, and Sonoran pronghorn. No possible mitigation efforts are mentioned. For both the desert tortoise and the California leaf-nosed bat in this proposal, the DEIS mentions that "if, counter to regulations," troops disturb these animals, injury or mortality may occur (pg. 4-78 and 4-79).

[1] Barry M. Goldwater Range: Military Training and Protection of Endangered Species. A report of the Congressionally Appointed Task Force. March 7, 2005.

8-5 Are troops trained not to disturb plant and wildlife species? Proper training of all troops involved in these exercises is vital to ensure protection of sensitive plant and wildlife species. They should be trained on how to identify the various species as well as how to minimize disturbance or destruction. In addition to ensuring the safety for both the troops and the species, additional information about species abundance and distribution on the range can be provided via the on-the-ground troops.

Proposal 1: Sensor Training Area

We recommend Alternative 1.B over the proposed action as the area has been previously disturbed and most of the necessary infrastructure is already in place. In contrast, the proposed action, Alternative 1.A, is outside of existing tactical ranges and "occurs within a largely pristine area" (pg. 4-42). Additional roads and infrastructure would need to be built, further degrading this important area. Additional cultural surveys would also need to be completed, whereas Alternative 1.B has been fully surveyed.

8-6 Initial Explosive Ordnance Disposal (EOD) clearance of the site may extend beyond the 640-acre site described in the DEIS, depending on final target configuration. The DEIS only discusses impacts to the 640-acre site and does not mention potential effects to the surrounding area. EOD clearance can be quite intensive and can cause severe degradation to the landscape.[2] Biological and cultural surveys would need

8-7 to be completed on the extended site, and any potential impacts to the affected environment would need to be identified and mitigated.

8-8 We strongly encourage the use of solar panels as opposed to the diesel-powered generator to provide electrical power. Use of solar panels will significantly decrease noise, air quality, and potential contaminant impacts, as well as reduce ground disturbance due to minimal maintenance and no refueling needs. The DEIS mentions that, if feasible, solar panels will be used. However, it does not provide reasons why solar might not be an option, nor does it discuss the solar array set-up and maintenance requirements.

Proposal 2: Target Reconfiguration

8-9 Overall, the information provided for this proposal is vague and difficult to understand. Use of descriptors such as "very limited," "minimal," "some," and "more likely" environmental review are ambiguous and subjective. The parameters need to be clearly defined, including what type of environmental review is necessary. Similarly, the definition of a target reconfiguration is very broad and includes construction of a new target where one does not currently exist or elimination of an existing target, neither of which should qualify as "reconstruction."

8-10 We agree that reconfigurations of existing targets that occur within the Active Intensive Use Category that meet the five parameters listed likely would not need extensive environmental review. Reconfigurations that occur in this area would likely not extend the impact area or the EOD clearance area. However, any *new* targets that are constructed in this area must go through the environmental review process to assess the cumulative impacts of the new target with the existing, unless the existing is removed beforehand.

Any reconfigurations or construction of new targets that occur outside of the Active Intensive Use Category should receive a full environmental review as the impact area and EOD clearance areas would change, therefore impacting a larger area than was previously subjected to such a level of disturbance.

[2] Unexploded Ordnance (UXO): An overview. U.S. Army Environmental Center SFIM-AEC-PC. Aberdeen Proving Ground, Maryland. October 1996.

8-10 Existing targets that are expanded into this area should also receive a full environmental review as the footprint would change.

8-11 Many of the targets were constructed almost 20 years ago. The proposal indicates that previous evaluations of project-specific analyses will be used to identify parameters that should be assessed. However, much can change in this time period, such as plant and wildlife presence. The EIS states that effects of reconfiguration on listed species identified in the previous assessment as well as any newly listed species in the county would be considered. Would impacts to other wildlife *not* be considered? What about effects on listed species that were not previously known from the target area but have since moved into the area?

8-12 Any time ordnance used is switched from training to live, a review must be completed as live ordnance generally has a much greater environmental effect than training. Similarly, when the materials used or the type of ordnance changes, such as inclusion of Smokey Surface-to-Air Missiles (SAMs), a review should be completed. The different materials used could contain hazards to the proposed area – for example, Smokey SAMs contain perchlorate, which is harmful to humans and wildlife and can also contaminate water resources.[3,4]

Proposal 5: Lower Flight Training Altitude over a Portion of the Cabeza Prieta National Wildlife Refuge

We support Alternative 5.C, the No-Action Alternative, as we are strictly opposed to lowering the flight altitude over any portion of Cabeza Prieta National Wildlife Refuge (NWR). Our opposition is due to impacts on wildlife (particularly Sonoran pronghorn and lesser long-nosed bats), wilderness values, and recreation.

The mission of the National Wildlife Refuge System is as follows:

> *"To administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans."*[5]

The Cabeza Prieta NWR was "reserved and set apart for the conservation and development of natural wildlife resources," and its management goals include to ensure that wildlife conservation comes first, to assure system-wide consideration of public recreation, and to protect wilderness character of the refuge lands.[6]

Wildlife

8-13 The lower-level flight has the potential to affect a variety of wildlife species, including the endangered Sonoran pronghorn and lesser long-nosed bat.

In previous biological opinions, the U.S. Fish and Wildlife Service anticipated that proposed activities involving Cabeza Prieta NWR were not likely to jeopardize the continued existence of Sonoran pronghorn

[3] Urbansky, E. T. 2002. Perchlorate as an Environmental Contaminant. ESPR 9(3): 187-192.
[4] William E. Motzer. 2001. Perchlorate: problems, detection, and solutions. Environmental Forensics 2(4): 301-311.
[5] National Wildlife Refuge System Improvement Act of 1997. Public law 105-57. October 9, 1997.
[6] U.S. Fish and Wildlife Service. 2006. Cabeza Prieta National Wildlife Refuge: Comprehensive Conservation Plan, Wilderness Stewardship Plan, and Environmental Impact Statement. Albuquerque, New Mexico.

because low-level flights would be limited to four designated flight corridors that would be aligned and timed to minimize potential effects.[7] This proposal, however, will open up a much greater area to low-level flights, and these flights will not be timed to reduce adverse impacts to the pronghorn. The DEIS claims that approximately 4,200 to 6,200 sorties would use the airspace from 500–1500 feet annually. This amounts to an average of 11–17 flights *per day* using this lower airspace, in addition to the sorties using the airspace above 1500 feet. This number could be much higher on some days throughout the year. One of the critical components of the Sonoran pronghorn recovery plan[8] is reduction of disturbance at critical times of the year. However, this proposal would greatly increase disturbance throughout the year, including during the critical fawning season.

8-13

A report by Landon et al.[9] showed that pronghorn prefer areas with lower levels of noise. Krausman et al.[10] demonstrated that noise generated by flights *above* 1000 feet resulted in changes to pronghorn behavior that reduce fitness, including breeding, habitat use, and increased energy expenditure. This report also addressed the fact that studies have not been conducted to determine the long-term effects of an increased number of overflights – particularly at low altitudes or at night. Therefore, the true impact to Sonoran pronghorn cannot be assessed.

8-14

In addition to increased disturbances to Sonoran pronghorn, the DEIS claims that lowering the flight floor over a portion of the Cabeza Prieta NWR has the potential to disturb and/or kill lesser long-nosed bats. Lower-level flights could disrupt the roost site in the Growler Mountains, and bats are susceptible to collisions with both fixed-wing aircraft and helicopters operating at night (pg. 4-71).

8-15

Helicopter flights are of particular concern for both the Sonoran pronghorn and lesser long-nosed bat. Reports have shown that helicopters typically cause a greater flight/fright response and higher heart rates in wildlife when compared to fixed-wing aircraft.[11,12] Additionally, the noise and downward rotor-wash from helicopters operating at night has the potential to disrupt or kill foraging bats.

Wilderness values

Over 90 percent of the refuge was designated as wilderness under the Arizona Desert Wilderness Act of 1990, making it the largest refuge wilderness in the contiguous 48 states. The refuge seeks to protect and conserve wilderness characteristics throughout this area, including natural quiet.

The refuge, including its wilderness areas, is under siege from many fronts – border activities, proposed walls and fences, illegal roads, invasive plant species, ongoing drought and possible long-term issues of climate change, to name a few. The USAF should not seek to further endanger this important area by increasing the area available for low-level overflights, especially when this proposal is not necessary to complete the training goals at BMGR.

---

[7] See Barry M. Goldwater Range: Military Training and Protection of Endangered Species.

[8] U.S. Fish and Wildlife Service. 2002. Recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplemental and amendment to the 1998 final revised Sonoran pronghorn recovery plan. Albuquerque, New Mexico.

[9] Landon, D.M., P.R. Krausman, K.K.G. Koenen, and L.K. Harris. 2003. Pronghorn use of areas with varying sound pressure levels. The Southwestern Naturalist 48(4): 725-728.

[10] Krausman, P.R., L.K. Harris, and J. Francine. 2001. Noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater Range, 56th FW/RMO, Arizona. Final Report. Prepared for the Air Force Center for Environmental Excellence.

[11] Gladwin, D.N., D.A. Asherin, and K.M. Manci. 1987. Effects of aircraft noise and sonic booms on fish and wildlife: results of a survey of U.S. Fish and Wildlife Service Endangered Species and Ecological Services Field Offices, Refuges, Hatcheries, and Research Centers. NERC-88/30. U.S. Fish and Wildlife Service, National Ecology Research Center, Fort Collins, Colorado. 24 pp.

[12] Workman, G.W., T.D. Bunch, J.W. Call, R.C. Evans, L.D.S. Neilson, E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (Antilocapra americana). Air Force Contract: F42650-87-C-0349. Logan, Utah.

Recreation

8-16 The demand for recreational opportunities in southern Arizona has been steadily increasing and will continue to increase as the state's population grows. Many of the recreationists seek quiet and solitude, which will become increasingly difficult to find with additional recreationists in the area. The USAF should seek to maintain and enhance opportunities for quiet and solitude, especially in areas designated for this purpose, such as wilderness areas. A number of people who visit Cabeza Prieta NWR, including our members, enjoy recreating in the proposed project area. The significant increase in noise and disturbance from low-level overflights would greatly diminish their recreation experience.

8-17 Studies have shown that people who are exposed to low-altitude flight noise suffer annoyance, long-term health risks, and acute functional reactions and health risks even with short-term overflight disturbances.[13] Extreme anxiety can occur in small children. Additionally, low-altitude flights at night can cause sleep disturbances, leading to additional health risks. The DEIS proposes significant numbers of annual low-level overflights, in addition to the sorties that will fly above 1500 feet. The number of flights per day will vary greatly throughout the year, but the average number of 11-17 sorties per day flying from 500–1500 feet has the potential to greatly disrupt recreationists in the area.

Proposal 10: Excavation and Use of Sand and Gravel on BMGR East

We support Alternative 10.B, the No-Action Alternative. Sand and gravel operations have the potential to negatively impact air quality, water resources, and wildlife. We believe that the USAF should continue to use resources from off-site operations that have already gone through environmental review and that are not located in such sensitive areas as those on the BMGR.

8-18 Sand and gravel extractions can significantly impact air quality in the form of PM-10 pollution.[14] The DEIS states that the PM-10 emissions would primarily be due to trucks traveling to and from storage locations. However, the removal of the materials from the wash will also generate significant amounts of dust and other small debris.

8-19 Extraction of sand and gravel can significantly alter the physical, chemical, and biological characteristics of streams and washes.[15] The DEIS states that the wash system is expected to return to pre-excavation conditions as storm events fill the excavated areas. How will the appropriate fill level be determined after the first excavation to ensure that future excavations do not go deeper than the three feet proposed? What happens if storm events are not significant enough to refill the area? The time needed to refill the excavation sites could be considerable and could further impact downstream runoff as well as wildlife habitat.

This proposal also has the potential to significantly alter the water quality and flows within the wash as well as increase downstream erosion. Removal of materials from a wash can greatly affect water quality by altering downstream turbidity during rain events. Additionally, the use of machinery to remove materials from the washes increases the potential for contamination in these sensitive areas. Erosion potential is also greatly increased. As solid materials settle out of the water and fill the excavated area, the

[13] Ising, H., E. Rebentisch, F. Poustka, and I. Curio. 1990. Annoyance and health risk caused by military low-altitude flight noise. International Archives of Occupational and Environmental Health 62(5): 357-363.
[14] Dulla, R.G., W. Liu, and E. Withycombe. 2008. PM-10 source attribution and deposition study. Report No. 2008-03-01, prepared for Maricopa Association of Governments.
[15] Meador, M. R., and A. O. Layher. 1998. Instream sand and gravel mining: environmental issues and regulatory process in the United States. Fisheries 23(11): 6-13.

8-19 water heading downstream is relatively clean and tends to pick up more sediment, causing further downstream erosion.[16]

Desert washes are remarkably important to wildlife. The DEIS states, "Wildlife, especially birds, large mammals, and invertebrates, make disproportionate use of the resources within the desert wash habitat when compared with surrounding communities" (pg. 3-22). Numerous studies have supported this statement and have also demonstrated the importance of minimizing disturbance to this critical habitat.[17,18] One of the most important aspects of desert wash ecosystems is the relatively abundant vegetation that provides food and shelter for various wildlife species. The DEIS states that no vegetation will be removed, yet disturbance to the substrate could result in vegetation disturbance and thus impact the species that depend on it.

8-20

8-21 One of the most impacted areas in this proposal would be Tenmile Wash. The DEIS asserts that "Tenmile Wash is an important area for wildlife, providing habitat for much of the breeding bird diversity on BMGR, and providing critical habitat components…for an array of mammals, reptiles, amphibians, and insects" (pg. 4-59). The USAF should seek to minimize disturbance to this important wildlife habitat.

Thank you again for the opportunity to comment on the Draft Environmental Impact Statement. Please contact us with any questions or to discuss these comments in further detail. We appreciate being involved in this process and look forward to reviewing the final EIS.

Sincerely,



Sandy Bahr
Chapter Director
Sierra Club – Grand Canyon Chapter

Tiffany Sprague
Chapter Coordinator
Sierra Club – Grand Canyon Chapter

Maribeth Oakes
Director
The Wilderness Society Wildlife Refuge Program

---

[16] The Flood Control District of Maricopa County. Frequently asked questions – sand and gravel. Available online at http://www.fcd.maricopa.gov/Permitting/Gravel/faq.aspx.

[17] England, A.S., L.D. Foreman, and W.F. Laudenslayer. 1984. Composition and abundance of bird populations in riparian habitats of the California deserts. *In* Warner, R.E. and K.M. Hendrix. California riparian systems: ecology, conservation, and productive management. University of California Press, Berkeley.

[18] Brooks, M.L. 15 years of research on disturbance effects in desert tortoise habitat. Presented at 29th Annual Meeting and Symposium of the Desert Tortoise Council, February 2004.

Comment Sheet

Public Hearing

July 2009

Thank you for attending tonight's public hearing. We would appreciate your comments on the draft Environmental Impact Statement addressing proposed enhancements to Barry M. Goldwater Range East. You may use this form to provide your comments. Comments may be left with us tonight, or you may fold, tape, and mail this form or send a letter to Ms. Lisa McCarrick, 56 FW/RMO, 7224 N. 139th Dr., Luke Air Force Base, AZ 85309-1420. Comments may also be sent by fax (623) 856-8409. Written comments must be received by **August 24, 2009** to be fully considered in the preparation of the Environmental Impact Statement.

Letters or other written comments will become part of the project record. Names and addresses on comment sheets will be added to our mailing list. Personal home addresses, e-mail addresses, and phone numbers will not be published in the Environmental Impact Statement, but as part of the project record, may be accessible to the public through the Freedom of Information Act. Comments may be submitted without personal information. If you want to be added to the mailing list, you may provide personal information separately.

Name: EARL E. RUNTE

Organization (if applicable): GUNSIGHT DEVELOPMENT CORP

Address: 17238 N 66TH LN, GLENDALE AZ 85308

E-mail: earlrunte@cox.net

Would you like to be included on our mailing list? ☒ Yes ☐ No

Comments: Thanks Lisa - good meeting - Please keep me informed!

Recently hearings were held on Gila Bend and Tucson I believe.

9-1 I would like to have a list of attendees in Gila Bend if possible so I can coordinate and build some enthusiasm — NOT EASY

Thanks Earl

3. RESPONSES TO COMMENTS

3.1 Responses to Letter #1 - Department of the Interior

No substantive comments.

3.2 Responses to Letter #2 – Environmental Protection Agency

Response 2-1

Section 1.2.1 of the EIS has been modified to clarify the interrelationship between existing and proposed training enhancements at BMGR East with ongoing training activities at BMGR West and Yuma Proving Ground. Additionally, Table 5-1 and associated analysis in Section 5.3 of the EIS addresses cumulative impacts associated with the proposed actions, BMGR West, and Yuma Proving Ground.

Response 2-2

Section 4.3.10.1 of the EIS has been revised to indicate that the U.S. Army Corps of Engineers has determined that the proposed sand and gravel excavation would not be subject to U.S. Army Corps of Engineers jurisdiction under Section 404 of the Clean Water Act and would not require a Section 404 permit or Section 401 State Water Quality Certification.

Response 2-3

Section 3.3.8 of the EIS has been modified to clarify that the existing Arizona Pollutant Discharge Elimination System (AZPDES) Multi-Sector General Permit is specific to Gila Bend Air Force Auxiliary Field (AFAF) and Section 4.3.10.1 of the EIS has been revised to indicate that under proposal 10, Luke Air Force Base would obtain an AZPDES Multi-Sector General Permit under the industrial sector of sand and gravel operations for BMGR East.

Response 2-4

Section 3.10.5 of the EIS has been revised to add clarification and include additional data from the 2004 Limited Field Study and 2005 Qualitative Assessment of munitions constituents at BMGR East. These revisions emphasize that the qualitative assessment was conducted in accordance with Department of Defense (DoD) Instruction 4715.14, *Operational Range Assessments*, dated 30 November 2005 and the Air Force Operational Range Assessment Plan, which is based on EPA's Conceptual Site Model and Data Quality Objective processes. The revised text clarifies that the qualitative assessment concluded no quantitative assessment was warranted at BMGR East due to incomplete source/receptor interaction pathways.

Response 2-5

Sections 4.2.4.1 and 4.3.4.1 of the EIS have been modified to note the proximity of the proposed air-to-ground missile target to Quilotosa Wash and provide additional analysis of the potential for munitions constituent migration via the surface soil (i.e., wind dispersion), surface water/sediment (i.e., stormwater) and groundwater pathways. Supplemental information was added to Section 3.10.3 of the EIS to

addressing how the potential for munitions constituent migration at BMGR East would continue to be managed in accordance with DoD Instruction 4715.14 and the Air Force's Operational Range Assessment Plan, under which:

- BMGR East would be periodically re-evaluated to determine if there is a release or substantial threat of a release of munitions constituents of concern from a BMGR East operational range to an off-range area at least every 5 years, or whenever significant changes (e.g., changes in range operations, site conditions, applicable statutes, regulations, DoD issuances, or other policies) occur.
- The Air Force will report a release or substantial threat of a release of munitions constituents of concern from a BMGR East operational range to an off-range area that creates an unacceptable risk to human health or the environment to the appropriate regulatory authorities.
- Upon finalization of an assessment, the Air Force will make the documentation of findings available to the public.

Response 2-6

Section 4.4.10.1 and the associated Appendix B, Air Quality Calculations in the EIS have been modified to include PM_{10} and $PM_{2.5}$ emissions from sand and gravel processing.

Response 2-7

Section 4.4.10.1 of the EIS has been modified to include control measures that would reduce particulate emissions.

Response 2-8

Although the 56th Fighter Wing, Range Management Office (FW/RMO) is committed to adherence to pollution prevention policies and regularly excels in meeting pollution prevention goals, DoD's development and deployment of green ammunition in training use is an action that is independent and distinct from the actions under evaluation in this EIS. As a point of clarification, the primary composition of most munitions delivered at BMGR East are inert materials (e.g., cast iron and steel casing with a mixture of concrete and vermiculite filling for inert bombs) rather than lead.

3.3 Responses to Letter #3 - Arizona Game and Fish Department

Response 3-1

As a point of clarification, a portion of each alternative for the moving vehicle target system track would use an existing road within North TAC, but new roadway would be developed to complete each track.

Response 3-2

Section 4.5 of the EIS has been revised to state that where required, surveys will be conducted for western burrowing owls, and desert tortoise prior to ground disturbing or construction activities.

Response 3-3

Ongoing 56 FW/RMO policy calls for the use of existing roads and other measures to minimize ground disturbing activity wherever possible. For example, all vehicles are restricted to designated roads except as required for EOD clearance, maintenance, emergency response, and environmental sciences personnel. Section 4.5 of the EIS was revised to indicate that plant salvage and revegetation efforts would be conducted in accordance with the Arizona Native Plant Law, which is also standard practice for the 56 FW/RMO.

Response 3-4

Section 4.5.10 of the EIS identifies the potential impacts to general wildlife associated with implementation of proposal 10 and notes that these impacts would be temporary. Because sand and gravel excavation and stockpiling would occur adjacent to or near existing roads, vegetation removal would not be required for equipment access to the sand and gravel resources. Section 4.5.1 of the EIS notes the impacts to washes associated with the establishment of the Sensor Training Area (STA) at alternative sites. Section 4.5.3.1 notes the washes that would be disturbed with implementation of Alternative 3.C. No other proposals or alternatives would result in direct disturbance to wash habitats.

Response 3-5

Section 4.3 of the EIS has been revised to reflect requirements for coordinating with U.S. Army Corps of Engineers for potential impacts to jurisdictional waters of the U.S. for each proposal. Also see Response 2-2.

Response 3-6

The EIS has been revised to eliminate discussion of the Yuma puma as a special status species.

Response 3-7

Section 4.7.1.1 of the EIS has been modified to clarify that sizable portions of the Mohawk Mountains, including but not limited to the whole western side, and the Granite Mountains would likely not be affected by the laser hazard area. Additionally, the EIS was amended to state that the laser hazard footprint is not expected to include the road along the southern end of the Mohawk Dunes that is now open to the public for drive-through use only or into the adjacent Management Unit 3 portions of R-2301W that are generally open for public recreational use.

Response 3-8

Unlike the other actions proposed in the Draft EIS, Proposal 2 regarding target reconfiguration is programmatic in nature; that is, it addresses a program rather than a site-specific project. Consequently, it is challenging to identify the specific type of NEPA document that would be prepared for a specific target reconfiguration project because the type of target proposed and the proposed location of the target could influence the environmental sensitivity of the action. However, Section 2.3.1 of the EIS has been revised

to more fully explain the types of environmental documentation that would be anticipated when site-specific target reconfiguration projects are proposed.

Response 3-9

As noted in the comparative analysis of impacts to general vegetation and wildlife with Alternatives 3.A, 3.B, and 3.C in Section 4.5.3.1 of the EIS, activities adjacent to Tenmile Wash at the Alternative 3.C site could disrupt the ability of wildlife to effectively use this important habitat area to safely move across the landscape. Increased potential for cancellation/rescheduling of missions due to Sonoran pronghorn occurrence is balanced with the susceptibility of the Alternative 3.C site to flash flooding and erosion, which could increase downstream sedimentation, result in vegetative losses, increase potential for dust, and affect the mission availability of the moving target.

Response 3-10

Section 5.3.5 of the EIS has been revised to include a more specific discussion of the potential cumulative impacts of the BMGR East component of the U.S. Fish and Wildlife Service (USFWS) proposal for re-establishment of Sonoran pronghorn within their historic range in southern Arizona (proposal 77 in Table 5-1 of the EIS). Should the species naturally disperse east of State Route 85, the Air Force would participate in an evaluation of impacts of ongoing activities in coordination with other members of the Sonoran Pronghorn Recovery Team.

Response 3-11

Section 3.6.4.2 of the EIS has been revised to emphasize that AGFD uses low-level airspace overlying the Cabeza Prieta National Wildlife Refuge (NWR) to execute its mission. Section 4.6.5.1 of the EIS has been revised to supplement the analysis that authorized users may experience minor inconveniences associated with having to more closely schedule the airspace and to be more flexible about the dates and times when flights are scheduled. This section also notes that the Air Force is committed to working with AGFD to schedule the airspace so that authorized flights may continue in a manner that supports the AGFD mission.

Response 3-12

See Response 3-10.

Response 3-13

Foot traffic associated with Combat Search and Rescue (CSAR) and small tactical team training would generally be light as the training objectives would generally include keeping the teams small so that they may travel as stealthily as possible and leave minimal traces of their passing. The on-the-ground troop training associated with larger team exercises, such as the Weapons Tactics Instructor course that is conducted twice a year, would generally be within the tactical ranges, involve shorter travel distances, and less time on the ground. Like the CSAR operations, these exercises require stealthy movements and minimal trace. While some training could be within habitat suitable for Sonoran pronghorn, monitoring

protocol would minimize the potential for the tactical teams and Sonoran pronghorn to encounter one another; this had been noted in Section 2.8.1 of the EIS. Section 4.5.7.1 of the EIS has been revised to note that ground personnel are provided with pre-coordinated locations, access, allowable operations during maneuvers (such as walking, camping, length of time on the Range, etc.) to avoid or minimize environmental impacts by keeping the teams from maneuvering within sensitive habitat, including dune habitat occupied by Colorado Desert fringe-toed lizards and caves and mines occupied by California leaf-nosed and lesser long-nosed bats.

Response 3-14

See Response 1-2.

3.4 Responses to Letter #4 - Arizona State Historic Preservation Office

Response 4-1

Each of the 10 actions analyzed in the EIS may be undertaken independently and would enhance the capabilities of the BMGR East to support essential military training. Their potential impacts have been analyzed in a single EIS to facilitate identification of aggregate and cumulative effects; however, they are separate, independent undertakings for purposes of review under Section 106 of the National Historic Preservation Act. The 56 FW/RMO will complete Section 106 review of each proposal before it is implemented. Reviews of Proposals 4, 6, 8, 9, and 10 have been completed. In each case, the SHPO concurred with a finding of *no historic properties affected*. Review of Proposal 1 under section 106 is underway.

3.5 Responses to Letter #5 - Arizona Department of Environmental Quality

Response 5-1

Section 4.3.10.1 of the EIS was revised to clarify that no discharge of wash water would occur with the proposed sand and gravel excavation activities and, therefore, ADEQ aquifer protection permit requirements would not apply.

Response 5-2

Sections 2.9.1 and 4.3.8.1 of the EIS has been modified to clarify that wastewater service for the proposed air traffic control tower would be integrated with the existing Gila Bend AFAF wastewater treatment system and would have no discernible impact to the function or capacity nor change the regulatory status of the system.

Response 5-3

Sections 2.9.1 and 4.3.8.1 of the EIS have been modified to clarify that the proposed air traffic control tower would be connected to the existing potable water service and supplemented with a point-of-use filter.

Response 5-4

See Response 2-3.

3.6 Responses to Letter #6 - Ak-Chin Indian Community

No substantive comments.

3.7 Responses to Letter #7 - White Mountain Apache Tribe Heritage Program

No substantive comments.

3.8 Responses to Letter #8 - Sierra Club, Grand Canyon Chapter

Response 8-1

The cited report prepared in accordance with Section 322 of the National Defense Authorization Act for Fiscal Year 2004 found that the environmental guidelines prevailing in 2005 did not prevent realistic and adequate training scenarios from being conducted at the BMGR. The task force did not, however, assess the adequacy of the air-to-ground target complexes or other training or support infrastructure at BMGR East to provide for realistic and adequate training either at that time or into the future. The proposed improvements to the training and support infrastructure at BMGR East are necessary to address specific and evolving tactical training requirements (many that have either emerged or increased in urgency since the 2005 report was completed).

Although the proposed actions were not designed to address the effects of environmental management guidelines on training; changes in the size, distribution, and movement dynamics of the Sonoran pronghorn population have in fact reduced the availability of South and North tactical ranges beyond that experienced and in ways unanticipated prior to the issuance of the 2005 report. As is appropriate, these endangered species management issues are being addressed through Endangered Species Act Section 7 consultations with the USFWS, Arizona Ecological Services.

Response 8-2

Sections 2.4.2, 2.4.3, and 2.4.2 of the EIS have been modified to include the length of each alternative track.

Section 2.9.1 of the EIS has been modified to add that if the helicopter landing pads need to be relocated to comply with Uniform Facilities Criteria (UFC) siting criteria, they would be moved to previously disturbed and environmentally cleared areas.

Response 8-3

As stated in Section 4.9 of the EIS, 56 FW/RMO will conduct intensive cultural resource surveys prior to implementation of any proposed ground disturbing activities in areas where cultural resource surveys have not been completed. With regard to biological resource surveys, see Response 3-2.

Response 8-4

As noted in the EIS in Table 2-3 and Tables 2-4 through 2-12 and applicable discussions in Section 4.5, Air Force consultation with USFWS regarding Section 7 of the Endangered Species Act was completed under a programmatic consultation that addressed the sum of actions conducted by the Air Force on BMGR East that may affect two listed species: Sonoran pronghorn and lesser long-nosed bat. The consultation included, but was not limited to the 10 proposed actions address in this EIS. This programmatic consultation was initiated by the submittal of a Biological Assessment on 10 December 2009 and was completed with the issuance of a Final Biological Opinion by the USFWS on 4 May 2010. The Biological Opinion provided specific terms and conditions for implementation to minimize the potential of incidental take of listed species. These terms and conditions are binding on the part of the Air Force. Conservation measures, authorization of incidental take, terms and conditions, and conservation recommendations are described in Section 4.5 of the EIS.

Response 8-5

Section 2.8.1 of the EIS has been modified to state that ground personnel are given basic training in conducting maneuvers in compliance with environmental laws and regulations, and that ground personnel would be provided with pre-coordinated locations, access, and allowable operations during maneuvers (such as walking, camping, length of time on the Range, etc.) to avoid or minimize environmental impacts. While incidental reports of species observations may occur, formalized species abundance and distribution data gathering by troops is unrealistic given the military training emphasis for on-the-ground troop training activities.

Response 8-6

As noted in Section 2.2.1 under the subheading "Explosive Ordnance Disposal (EOD) Clearance," the initial clearance procedure prior to the development of the proposed STA would involve clearance of 1,217 acres and trucks would be used to haul identified ordnance. Historically used targets may not be fully documented and known so an EOD clearance operation is required for the safety of the personnel involved in the development of the STA. Because the STA would be a "no-drop" target, EOD clearance requirements for the operational phase could be handled through the use of lighter vehicles with a smaller footprint than what is required at most other targets within the tactical ranges. Chapter 4 assessed the impacts of EOD clearance for the STA alternatives, which includes not only the clearance requirements for operations but also the clearance requirements prior to construction.

Response 8-7

See Responses 3-2 and 8-4.

Response 8-8

As noted in Section 2.2.1 under the subheading "Unmanned Threat Emitter," solar panels may be used if economically and operationally feasible, but a "worst case" scenario of using diesel-powered generators is assessed to disclose the potential environmental effects in case solar panels cannot be used for power. Solar panels may not be compatible with laser-score targets if the panels reflect the light back at pilots, and project funding constraints could limit the use of solar energy if there is a substantial cost difference. If solar power is used, environmental impacts would be less than those disclosed for diesel-powered generators, particularly with regard to air quality.

Response 8-9

Proposal 2, regarding target reconfiguration, is programmatic in nature rather than specific and, therefore, the terminology used must be more general to reflect a range of possible target reconfiguration opportunities and the types of environmental effects that might be expected. The term reconfiguration (rather than reconstruction) is used because some new targets could be replacing old targets but constructed in locations where targets did not previously exist. Such new targets would be in former military impact areas so that the overall military footprint would not be expected to increase in size.

Response 8-10

See Response 3-8.

Response 8-11

While some of the existing targets used today were constructed many years ago, their environmental effects were evaluated along with other military operations in the 1999 EIS for the proposed renewal of the BMGR land withdrawal. As specific target reconfiguration projects are identified, a current species list would be compiled for the project area and impacts to those species would be identified and addressed accordingly as part of the environmental review process.

Response 8-12

As noted in Section 2.3.1 in the descriptions of Environmental Review Parameters 1 (Active Intensive Use Category) and 2 (Active Moderate Use Category), a condition of making the decision that limited environmental compliance documentation would be required includes that there would be no change from training ordnance to live ordnance. If there is a change in the type of ordnance used, the review parameter would be elevated to at least the Infrequent Moderate Use Category as described in Section 2.3.1.

Response 8-13

To clarify, when the Marine Corps Air Station Yuma conducts low-level overflights i during the Spring Marine Corps Weapons Tactics Instructor course, there is overlap with the Sonoran pronghorn fawning season in the latter half of March and sometimes the first week of April. During the remainder of the Sonoran pronghorn fawning season; however, the non- Weapons Tactics Instructor course helicopter flights must remain west of 113° 53' west longitude, or on designated transit routes, or above 1,000 feet

above ground level. The designated flight corridors in place were established in coordination with the USFWS and in consideration of the historic locations in which Sonoran pronghorn and lesser long-nosed bat roosts have been known to occur. Potential impacts to lesser long-nosed bats associated with low-level flight corridors used during the Spring Marine Corps Weapons Tactics Instructor course are minimized because there is minimal overlap between the timing of the course and the seasonal presence of these bats in southwestern Arizona

Response 8-14

The analysis presented in Section 4.5.5.1 of the EIS is based on best available data and is not lacking data essential to a reasoned choice among alternatives, as required by NEPA and the regulations implementing NEPA. The conclusion stated in this section, that the implementation of Alternative 5.A or 5.B may result in adverse effects to Sonoran pronghorn due to disturbance associated with low-level military overflights and helicopter activity, is based on the reports cited in the comment. Relevant empirical data as to the potential level of adverse effect include the conclusion by Krausman et al. (2001) that Sonoran pronghorn have habituated to their exposure to low-level military flight activity and the recent increase in their occurrence within the tactical ranges.

Response 8-15

Lowering the flight floor could potentially disturb or kill individual lesser long-nosed bats; however, as described in Section 4.5.5.1 of the EIS, low-level flights would probably not occur over the Growler Mountains and therefore the roost site is not likely to be disrupted.

Section 2.6.1 of the EIS has been revised to note that the proposed lowered flight floor over the Cabeza Prieta NWR is to accommodate fixed-wing sorties. While currently established low-level flight tracks for helicopters would continue to be used, Alternatives 5.A and 5.B would not include a proposal to introduce additional rotary-wing sorties in the low-level airspace.

Response 8-16

Section 4.6.5.1 of the EIS details how the 1990 Wilderness Act addresses ongoing military use of the airspace overlying Cabeza Prieta NWR and Section 4.7.4.1 of the EIS addresses the context of Military Lands Withdrawal Act of 1999 and potential for increased annoyance levels for recreation users of Cabeza Prieta NWR and Wilderness. The purpose and need for Proposal 5 is for execution of the military mission and is consistent with this legislation, which address both the ongoing military mission and Wilderness designation.

Response 8-17

Studies regarding the types of noise exposure impacts cited are for cumulative noise exposure levels well in excess of those assessed in Section 4.12.5.1 of the EIS. Sleep disturbance impacts apply to long-term exposure in residential-type settings, of which there are none within the study area. Impacts to recreation users of the Cabeza Prieta NWR and Wilderness are noted in Section 4.7.4.1 of the EIS.

Response 8-18

See Response 2-6.

Response 8-19

Section 3.3.3 of the EIS has been supplemented with additional baseline data regarding the infrequent, high-energy nature of sand and gravel redeposition in desert washes and Section 4.3.10.1 of the EIS has been revised to refer back to these data in the analysis of potential return to pre-excavation conditions and to address potential equipment contamination. In addition, Sections 2.11.1 and 4.3.10.1 of the EIS have been modified to indicate that the sand and gravel excavation contractor would operate under established guidelines and be subject to periodic monitoring. Finally, these sections were revised to note that the volumes of sand and gravel extraction analyzed in the EIS are highly conservative and exceed the capabilities of the 56 FW/RMO maintenance contractors.

Response 8-20

Some vegetation may be unintentionally disturbed by the sand and gravel removal, but as noted in Section 2.11.1 of the EIS, the source sites would be along or near existing roads and in areas open enough to provide reasonable access for a loader and where trees along the banks of the washes can be avoided. In addition, disturbance to vegetation does not necessarily equal an impact to species. Section 4.5.10.1 of the EIS documents the potential impacts of this proposal to vegetation, habitat, and wildlife including special status species.

Response 8-21

Tenmile Wash would be used as the source site in two of the ten potential excavation site and use would be dispersed amongst these ten sites. As noted in Section 4.5.10.1 of the EIS, potential impacts to wildlife would be temporary and would not be expected to inhibit or preclude movement of wildlife through the general area.

3.9 Responses to Letter #9 - Gunsight Development Corp.

Response 9-1

The requested list was provided by e-mail.

3.10 Response to Oratory Comment #1 - Sandy Bahr, Sierra Club, Grand Canyon Chapter

Response 10-1

See Responses 8-13 through 8-17.

Response 10-2

See Responses 8-20 and 8-21.

3.11 Response to Oratory Comment #2 - Earle Runte, Gunsight Development Corp.

No substantive comments.

Response 10-2

See Responses 8-20 and 8-21.

3.11 Response to Oratory Comment #2 - Earle Runte, Gunsight Development Corp.

No substantive comments.