Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions

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Draft Environmental Impact Statement

for

Fort Carson Grow the Army Stationing Decisions

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Organization of the Draft Environmental Impact Statement for Fort Carson Grow the Army Stationing Decisions

Consistent with Council of Environmental Quality regulations for implementing the National Environmental Policy Act (42 USC 4321 et seq.) regulations, this Draft Fort Carson Grow the Army Stationing Decisions Environmental Impact Statement (Fort Carson GTA EIS) is organized into the following sections and chapters:

Executive Summary briefly summarizes the Proposed Action, the project alternatives analyzed; the affected environment and environmental consequences to the physical, natural resources, cultural and socioeconomic environment, cumulative impacts and mitigation measures on Fort Carson and Piñon Canyon Maneuver Site presented in this EIS.

Chapter 1 Purpose, Need, and Scope describes the purpose and need for the Proposed Action and outlines the scope of the analysis presented in this EIS.

Chapter 2 Alternatives describes the Proposed Action and identifies alternatives to achieve the Proposed Action.

Chapter 3 Fort Carson Affected Environment and Environmental Consequences describes the existing physical, natural, cultural, and socioeconomic environment at Fort Carson and within the region of influence; and identifies and describes the environmental impacts of implementing the project alternatives, and mitigation measures.

Chapter 4 Piñon Canyon Maneuver Site Affected Environment and Environmental Consequences describes existing environmental and socioeconomic conditions at and within the region of influence; and identifies and describes the environmental and socioeconomic impacts of implementing the project alternatives; and presents available mitigation measures.

Chapter 5 Cumulative Impacts identifies and describes the impacts of the Proposed Action when combined with other past, present, and reasonably foreseeable future actions.

Chapter 6 References provides bibliographic information for sources cited in this EIS.

Chapter 7 List of Preparers identifies the individuals who prepared this EIS and their disciplines.

Chapter 8 Acronyms provides a list of all acronyms and abbreviations used in this EIS.

Chapter 9 Index provides definitions of selected terms used in the document and lists the pages on which key terms are used.

Appendices provide information and studies used to support the analysis in this EIS.

Appendix A-Regulation Management Plans
Appendix B-Fort Carson Construction Projects
Appendix C-Air Quality Supporting Documentation
Appendix D-Noise Supporting Documentation
Appendix E-Stormwater Simulations *(Note: This report is being prepared and thus is not included in this Draft EIS but will be available for the public meetings and will be included in the Final EIS.)*
Appendix F-Biological Resources Supporting Documentation
Appendix G-Cultural Resources Comprehensive Agreement
Appendix H-Socioeconomic Economic Impact Forecast System

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E. Executive Summary

E.1. Introduction

The Army identified the need to increase its overall size while continuing to restructure its forces, in order to meet increased national security and defense requirements, while maintaining a sustainable balance between training readiness and operational mission requirements. On December 19, 2007, the Army signed a Record of Decision (ROD) documenting its decision to proceed with growth of the Active and Reserve components of the Army by 74,200 Soldiers through establishment of several new Brigade Combat Teams (BCTs) and Combat Support and Combat Service Support (CS/CSS) units. The Army growth decision will result in Fort Carson receiving an Infantry BCT (IBCT) and additional CS/CSS personnel.

Fort Carson may also receive a Combat Aviation Brigade (CAB) in the future as it is a divisional Army post that will have five BCTs. Most installations in the Army with four or more BCTs also have aviation assets such as a CAB. Therefore, the Army is including analysis of the impacts of implementing the stationing of a CAB in this Environmental Impact Statement (EIS). Prior to actually stationing a CAB at Fort Carson, the Army will make an official decision as to the location of such a unit, supported by required analysis under the *National Environmental Policy Act* (NEPA).

Fort Carson is preparing this EIS in compliance with its responsibilities under NEPA to assess the environmental direct, indirect, and cumulative impacts of implementing this growth at Fort Carson. The Proposed Action would involve constructing new facilities to support additional Soldiers and their Families, constructing and/or upgrading ranges, and supporting additional training of the IBCT, CAB, and CS/CSS units.

E.2. Installation Setting and Mission

Fort Carson is located south of Colorado Springs, Colorado, east of the Rocky Mountain Front Range, and occupies portions of El Paso, Pueblo, and Fremont counties. Fort Carson is generally bounded by State Highway 115 on the west and by Interstate 25 and mixed development on the east. The City of Pueblo lies approximately 10 miles south of Fort Carson's southern boundary. The City of Fountain is located east of Fort Carson. Fort Carson comprises approximately 137,000 acres and ranges from 2 to 15 miles from east to west and up to 24 miles from north to south.

Fort Carson is responsible for supporting the living and training requirements of Army troops stationed at the installation. Soldier support facilities are provided in the cantonment area, which contains most of the

facilities on Fort Carson such as troop and family housing; and administrative, maintenance, community support, recreation, classroom, supply, and storage facilities. Fort Carson's downrange area is used for weapons qualification and field training. The downrange area comprises the land area outside the cantonment area, including firing ranges, training areas, and impact areas. Training lands at Fort Carson are actively managed to maintain sustainability of the area for continued use in supporting the Army's training mission.

Piñon Canyon Maneuver Site (PCMS) is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson. PCMS is bounded by US Highway 350 (US 350) to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast. PCMS includes a small cantonment area at the entrance gate on US 350, containing austere facilities to support training

E.3. Proposed Action

The Proposed Action is to implement the Fort Carson portions of the December 2007, ROD for the 2007 Programmatic EIS for Army Growth and Force Structure Realignment and the possible stationing of a CAB at Fort Carson. The Proposed Action includes three primary components: supporting increased troop levels, facility demolition and construction, and training the additional IBCT, CS/CSS units, and CAB. Implementation of the Proposed Action would commence as soon as possible after a decision is made to do so and would finish by 2012. Changes associated with each of these are summarized as follows. The Proposed Action is the Army's preferred alternative.

Fort Carson would gain approximately 6,700 Soldiers under the Proposed Action; 3,500 in the IBCT, 400 in the CS/CSS units, and 2,900 in the CAB (Further references in this EIS to the additional IBCT include the CS/CSS units and personnel unless otherwise indicated). Fort Carson's end-state military population would be approximately 29,000 Soldiers (without a CAB) and 32,000 Soldiers (with a CAB) by the end of 2012. Military Families, civilian, and contractor worker populations supported by Fort Carson would also increase. In total, Soldiers, their Families, and Fort Carson support personnel would increase by approximately 11,000 (without the CAB) or about 19,000 (with CAB) at the end of the implementation of the Proposed Action.

Twenty construction and renovation projects at Fort Carson are included as part of the Proposed Action for the IBCT; no construction at PCMS is involved. Most of the construction would occur at the

Operational Readiness Training Center (ORTC) area, which is several kilometers south of Fort Carson's cantonment area, with only two of the projects occurring within the cantonment area. Demolition of several buildings (total of approximately 52,000 square feet [SF]) would be necessary as part of this action. Most of the construction would be anticipated to be completed by March 2011. There is no construction projects programmed to support a CAB, as the final determination for stationing of the CAB has not yet been made; however, the general area that is proposed to support the construction of CAB facilities was included in the analysis of this EIS. If Fort Carson is determined to be the installation to receive the CAB, supplemental NEPA analysis would be completed prior to implementation of that decision.

The training of the additional IBCT and a CAB is also part of the Proposed Action. The types of training and maneuver activities that would occur under this action would be consistent with Fort Carson's current training activities. Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability). Support of training will include live-fire weapons qualification, maneuvers, and construction of additional training ranges.

This action does not include expansion of PCMS. This action can be accomplished without the expansion of PCMS; possible expansion of PCMS would be the subject of separate NEPA analysis.

E.4. Alternatives

E.4.1. No Action Alternative

Under the No Action Alternative, the addition of the IBCT and the CAB at Fort Carson would not be implemented. Force structure, personnel, and equipment would be as they exist after the implementation of the Transformation activities studied in the 2007 Fort Carson and PCMS Transformation EISs (i.e., Base Realignment and Closure [BRAC] 2005, Global Defense Posture Realignment [GDPR], and Army Modular Force [AMF]). Therefore, the No Action Alternative does not include construction of new facilities to support the IBCT or CAB. The No Action Alternative provides a baseline condition from which to assess the comparative environmental impacts of alternatives.

E.4.2. Alternatives With Different Locations for the Infantry Brigade Combat Team Complex

In terms of training and location of the facilities for the CS/CSS units and the CAB, these alternatives are the same as the Proposed Action. The one component that is different in these alternatives is the location

for construction of IBCT facilities. Screening criteria used to identify a range of potential construction locations included sufficient size to construct the facilities within reasonable cost parameters, provision for unit cohesiveness, consideration of Fort Carson's sustainability principles, and land and environmental constraints. Two alternatives met these criteria and were assessed in this EIS (Figure EX-1).

- Alternative 1 proposes construction of the IBCT facilities within the cantonment area at Training Area Bravo; and
- Alternative 2 would place the IBCT facilities downrange, west of the ORTC area, at a location referred to as Tent City.

E.5. Public Outreach

Fort Carson has invited public participation in the NEPA process. The Fort Carson and PCMS NEPA Coordinators have been available throughout the process to answer questions about the scope, status, and progress of the EIS. Contact information is:

- Fort Carson NEPA Coordinator - phone number (719) 526-4666; fax number (719) 526-1705; or carsdecamnepa@conus.army.mil.
- PCMS NEPA Coordinator – phone number (719) 526-0912; fax number (719) 526-1705; or pcmsdecamnepa@conus.army.mil.

On May 7, 2008, the Department of the Army issued in the *Federal Register* (FR) a Notice of Intent (NOI) to prepare an EIS for Grow the Army (GTA) Actions at Fort Carson, Colorado (73 FR 25686). In addition, individual letters invited agencies to a scoping meeting, and notice of a public meeting was publicized in local papers and a public service announcement.

Agencies with permitting review responsibilities and other interested parties were invited to the agency scoping meeting held at Fort Carson, Colorado, on May 19, 2008, from 1:00 to 3:00 p.m.

Three public scoping meetings were held; one each in Trinidad, La Junta, and Colorado Springs, Colorado. Approximately two weeks before these meetings, a notice was published in general circulation newspapers on the background and purpose of the Proposed Action, requesting public comment, and providing information about the meetings. In addition, Fort Carson released a public service announcement to all local major media on May 8, 2008 regarding these meetings.

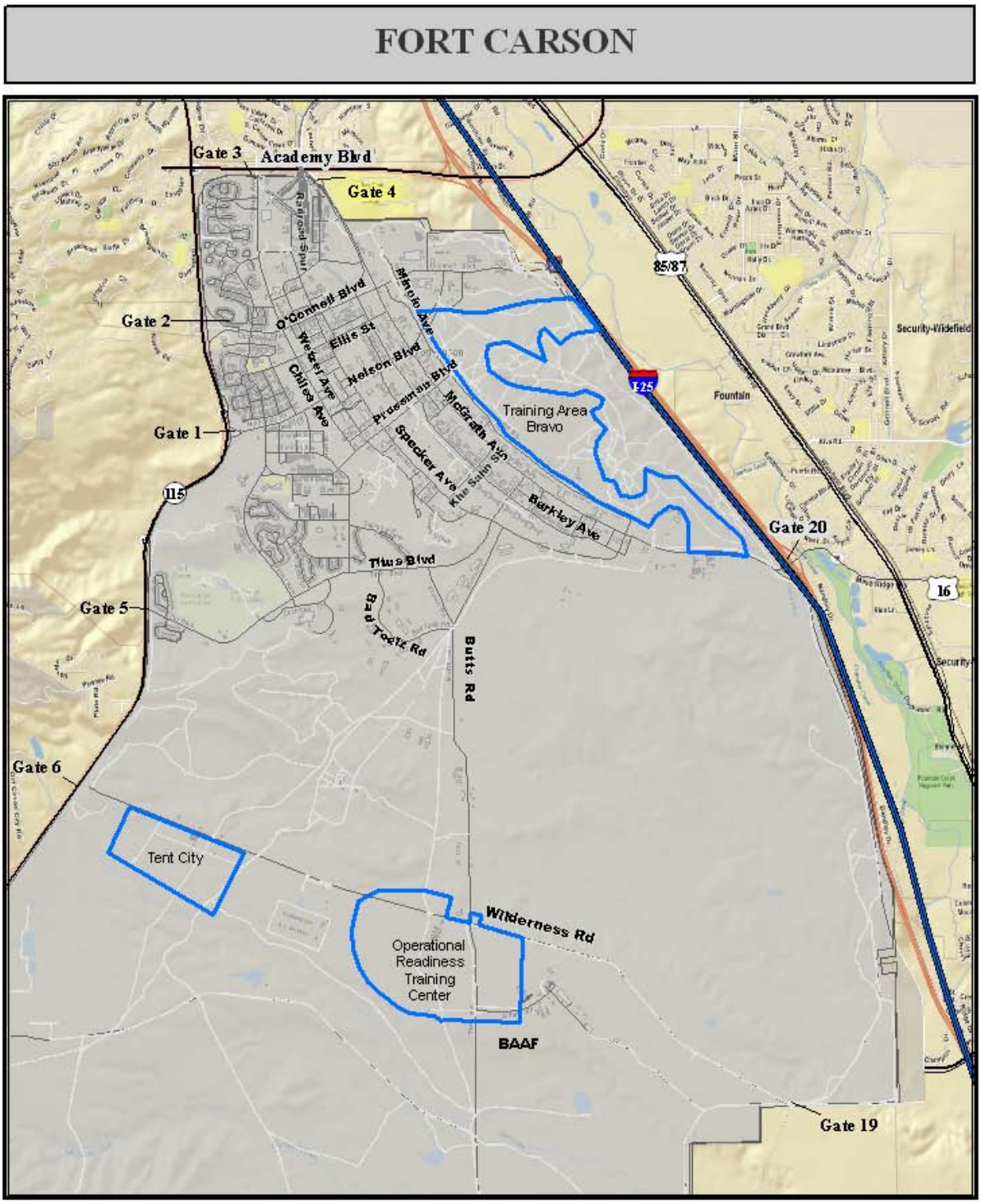

Figure EX-1 Fort Carson

During the public scoping period, comments and questions were related to water quality and quantity, economic and recreational impacts to the Front Range, additional monitoring to ensure proper management of resources, necessity to bring more Soldiers to Fort Carson, inclusion of reasonable alternatives, changes in training due to the potential CAB, more virtual training opportunity, traffic congestion, noise, dust, and inclusion of Tribal consultation.

E.6. Environmental Consequences and Mitigation

The Proposed Action would have significant impacts to noise at the ORTC site due to proposed IBCT construction activities; however, mitigation measures would be implemented to minimize these impacts.

E.7. Land Use

E.7.1. Fort Carson

Under the Proposed Action, 200 acres currently designated as training area would be converted to unit administrative buildings and barracks. Training activities such as the mock Patriot missile site, National Guard training, dismounted land navigation, parachute drop zone "Range Control" dismounted maneuver, heavy maneuver, field training exercises, and Tactical Unmanned Aerial Vehicle (TUAV) training would be moved elsewhere. Aviation operations and the buildup of the Wilderness Road site could cause conflicts between use of Butts Army Airfield (BAAF) to support aviation operations and sensitive noise receptors such as the child development center proposed for construction in that area. All land use changes would be within the boundaries of Fort Carson.

E.7.2. Piñon Canyon Maneuver Site

Training elements of the IBCT and the potential CAB at PCMS would not change land use under the Proposed Action or the alternatives.

E.8. Air

E.8.1. Fort Carson

Air quality impacts would occur from the construction and operation of stationary sources for the IBCT and CAB facilities, and the associated tactical equipment sets and weapons systems involved in the training requirements for the new units under the Proposed Action and alternatives. Air emissions from construction activities would include construction traffic and equipment and would be temporary in nature. The impacts of implementing the Proposed Action and alternatives are predicted to be less than significant.

Operations of the IBCT and CAB (excluding the above-mentioned training) would result in air emissions from boilers, emergency generators, equipment maintenance, and traffic from employees and deliveries. The region that Fort Carson's main cantonment area lies within is classified as a maintenance area for carbon monoxide, and so this federal action would need to comply with the general conformity rule and the SIP to maintain air quality standards in the region.

Additionally, if the IBCT or the CAB were to be considered a major modification under the *Prevention of Significant Deterioration* (PSD) rules, then Fort Carson would be subject to the full PSD permitting requirements. The direct and cumulative air impacts of implementing the Proposed Action and alternatives would not contribute significantly to the degradation of air quality in the region.

E.8.2. Piñon Canyon Maneuver Site

There would be no air quality impacts under the Proposed Action or alternatives at PCMS.

E.9. Noise

E.9.1. Fort Carson

There would be significant noise impacts on the ORTC site facility occupants. Most of the proposed construction footprint, including barracks, for the IBCT and CAB is located within Noise Zone (NZ) II and III (65-75, and >75 decibel A-weighted DNL [ADNL], respectively) of the BAAF noise contour. A proposed chapel and child development center would be located within NZ II. The noise level within NZ III is considered so severe that noise-sensitive land uses should not be considered therein. Exposure to noise within NZ II is considered significant, and use of land within this zone should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. Noise mitigation features would be incorporated into the siting and construction of the main receptor facilities such as the barracks, chapel, and child development center.

E.9.2. Piñon Canyon Maneuver Site

Frequency in use of the small arms ranges would most likely increase; however, there would be no change to the small-caliber weapons noise contours under the Proposed Action or the alternatives because of the distance between the proposed range facilities and PCMS boundary. The additional training of a CAB would increase the frequency in use of the combat assault landing strip; however, peak noise levels would remain the same and the noise contours would not change.

E.10. Soils

Impacts to Fort Carson and PCMS soils are anticipated to be significant, but mitigatable for all alternatives considered in this EIS. Temporary impacts to soils are anticipated as a result of construction activities at Fort Carson. Under Alternative 1, the temporary loss of soils during construction at the Training Area Bravo site is expected to be greater than at the ORTC or Tent City construction sites. The steeper slopes of the Training Area Bravo construction site are more susceptible to water erosion and would require more soils disturbance to shape the site for facilities construction. This site disturbance would destabilize soils and lead to increased wind and water erosion. The ORTC and Tent City construction sites both have low erosion potential. Best management practices (BMPs) for stormwater management and restoration of vegetative cover would be implemented, as a part of each construction project to establish and cover exposed sites to limit erosion sedimentation.

The primary impacts to soils are predicted to result from maneuver training of the IBCT and aviation maneuvers of the CAB at both Fort Carson and PCMS. To mitigate impacts to soils in training areas, the installation would continue to implement the *Integrated Natural Resource Management Plan* (INRMP) and *Integrated Training Area Management* (ITAM) program to monitor and manage the installation's vegetative cover to retain soil stability and implement land rehabilitation projects within the installations training areas. The installation would continue to manage fuel loads and work to prevent wildfires to prevent exposure of soils to erosion effects.

E.11. Geology

Implementation of the Proposed Action or any of the alternatives is not predicted to cause significant impacts to the geological character of Fort Carson or PCMS.

E.12. Water

E.12.1. Fort Carson

The hydrologic impacts of the Proposed Action and alternatives set forth in this EIS are being evaluated through a hydrologic modeling effort. Analysis of three scenarios are based on the proposed building sites. The baseline conditions represent discharge upstream from the boundary of Fort Carson, the current conditions represent discharge from the area as of September 2007, and the proposed *Master Plan* conditions represent the proposed conditions of future construction of the *January 2008 Master Plan*. Each scenario will evaluate the impact each proposed site would have on the stormwater runoff in their respective watersheds for a 100-year rainfall event. Water quality will be evaluated in more detail as the project designs become finalized.

Based on preliminary review of the data, it is anticipated that, if the facilities are located and designed in a manner that reflects the hydrologic model results and if all of the regulatory requirements are followed, direct impacts to the watershed should be minimal.

E.12.2. Piñon Canyon Maneuver Site

There would be no significant impacts associated with the ranges and training areas due to the Proposed Action or the alternatives.

E.13. Biological Resources

E.13.1. Fort Carson Construction

The Fort Carson cantonment area and BAAF are highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping. Wildlife species that occur within the cantonment area are mostly urban-adapted species such as red fox and pigeons. The potential CAB facility construction would remove poor wildlife habitat (except for roosting trees for common species) at BAAF. Additional aircraft on the installation would increase the chances of an aircraft-wildlife strike, which could result in loss of life or significant damage to aircraft. A wildlife hazard assessment and a *Bird Air Strike Hazard Plan* (BASH), if required, would be developed. No significant impacts to biological resources are anticipated under the Proposed Action or the alternatives for these areas.

Construction at the ORTC area under the Proposed Action and at the Tent City area (Alternative 2) would have some impact to existing native vegetation. Vegetation at the proposed ORTC and Tent City areas is considered fair (0.25 to 0.49 seedlings per square foot). The affected wildlife habitat is a common habitat type on Fort Carson; thus, effects to wildlife would not be significant. There are no federally-protected species or Species of Special Concern that use the sites on a regular basis. No construction activities would occur within wetlands. Minor indirect impacts from surface water flow and sedimentation could occur.

The construction of facilities for the IBCT at Training Area Bravo under Alternative 1 would have minor impacts to vegetation and wildlife. The area is highly disturbed. The current condition of the existing native vegetation is considered fair or poor (0.25 to 0.49 seedlings or less than 0.25 seedlings per SF, respectively). Training Area Bravo supports a colony of more than 2,000 prairie dogs. Construction activities at this site could indirectly impact the burrowing owl (a sensitive species) by removing nesting habitat (prairie dog burrows). Active management of the Training Area Bravo colony would be required

to prevent costly construction delays due to compliance conflicts with the *Migratory Bird Treaty Act* and state laws protecting the owls. No wetlands would be affected by this alternative.

Under the Proposed Action and alternatives, there would be no construction at PCMS and, therefore, no impacts to biological resources.

E.13.2. Fort Carson and Piñon Canyon Maneuver Site Training

Direct disturbance to plants and wildlife occurs at both Fort Carson and PCMS as a result of both maneuver and live-firing exercises. This disturbance is caused by human and vehicular activity, weapons firing, noise, and fire. Under the Proposed Action and alternatives, these training activities would increase, as would the potential for disturbance to plants and wildlife. Current management practices such as restrictions on training, observance of buffer zones, compliance with management plans, controlling fleas (vectors of plague), and using prescribed burns would be continued. As a result, the effects of the impacts on plants and wildlife are not expected to be significant.

E.14. Cultural Resources

Construction activities at Fort Carson under the Proposed Action and the alternatives are not expected to involve adverse effects to cultural resources. Necessary evaluation and consultation have been accomplished. There will be no construction at PCMS.

Any training at either Fort Carson or PCMS under the Proposed Action and the alternatives that would occur in areas that have not been surveyed for cultural resources would be restricted until surveys have been completed.

Current management measures such as the *Integrated Cultural Resources Management Plan* and 36 *Code of Federal Regulations* (CFR) Part 800 consultation process, plus the Army Alternate Procedures when completed, will continue to be used to avoid adverse effects and to mitigate any that may inadvertently occur.

E.15. Socioeconomics

E.15.1. Fort Carson

The *Economic Impact Forecast System* (EIFS) analyses indicated that the Proposed Action will produce no major adverse socioeconomic effects in the Region of Influence (El Paso, Fremont, and Pueblo counties). The stationing of a CAB cannot currently be analyzed as the amount and timing of construction

expenditures and employee relocations cannot currently be defined. If the decision is made to station a CAB at Fort Carson, a new EIFS model would be conducted at that time.

E.15.2. Piñon Canyon Maneuver Site

Local purchases of goods and services may potentially increase and could have a beneficial economic impact.

E.16. Transportation

E.16.1. Fort Carson

The growth at Fort Carson under the Proposed Action would contribute approximately 5 percent of the projected overall regional population increase and would result in several short-term, minor impacts to include: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, increased transit ridership, and potential increase in rail and aviation for deployment. The current and future transportation improvement projects to the Fort Carson and regional roadway systems would provide sufficient infrastructure to accommodate the expected regional growth including the growth under the Proposed Action.

E.16.2. Piñon Canyon Maneuver Site

IBCT convoys to PCMS would not cause significant traffic increases above those discussed in the 2007 PCMS Transformation EIS. Some wheeled support vehicles would accompany CAB helicopters that would fly to PCMS to train, which is also not expected to have significant impacts.

E.17. Utilities

E.17.1. Fort Carson

Implementation of the Proposed Action or alternatives would not cause significant impacts to the infrastructure for potable water, wastewater, energy sources, communications and solid waste management. Upgrades and extensions would be required to meet the increased utility demands from additional population and facilities. The Proposed Action would require the following utilities upgrades:

- Extension of potable water lines and a new water storage facility;
- Extension of wastewater lines and new treatment facilities;
- Extension of electrical lines and a new electrical substation;
- Extension of natural gas lines and a new looping connection to the existing gas line along Butts, Road; and
- Extension of communication lines and a new duct system.

E.17.2. Piñon Canyon Maneuver Site

The Proposed Action or alternatives would not impact utilities at PCMS.

E.18. Hazardous and Toxic Substances

Construction and operation of new facilities (at Fort Carson only) and increased training as projected under the Proposed Action and the alternatives would result in an increase in the use of hazardous materials and petroleum-based products. The generation of lead, asbestos, polychlorinated biphenyls (PCBs), and chlorofluorocarbon wastes at the BAAF would also increase. An increased use of hazardous materials and the subsequent generation of hazardous waste would occur at live-fire training ranges. Continued implementation of current management practices to reduce and manage both hazardous materials and wastes is expected to avoid any significant adverse impacts.

E.19. Sustainability

Implementation of the Proposed Action or the alternatives would not cause a significant negative impact on *Fort Carson's 25-Year Sustainability Goals*. Sustainability initiatives will be implemented as part of all alternatives.

E.20. Cumulative Impact Summary

Cumulative impacts include past, present, and reasonably foreseeable future actions that are discussed in Chapter 5. The actions considered in the cumulative impact analysis included actions both within Fort Carson and PCMS and from the neighboring civilian communities. As a result of the uncertainties in Section 2.1.6, potential expansion of PCMS is not, at this time, reasonably foreseeable. Thus, it is not included in the analysis in Chapter 5. At Fort Carson, cumulative impacts to soils, water resources (surface water), and biological resources (wildlife and vegetation), are predicted to be significant. Impacts to sustainability is also predicted to be potentially significant. At Fort Carson, the economic benefit from the Proposed Action and alternatives would be significant but short-term, with the most benefit occurring during the construction period. At PCMS cumulative impacts to soils are predicted to be significant.

1. Environmental Impact Statement for Fort Carson Grow the Army Stationing Actions

1.1. Introduction

This Environmental Impact Statement (EIS) documents the site-specific analysis of stationing an Infantry Brigade Combat Team (IBCT) (consisting of approximately 3,500 Soldiers), Combat Support (CS) units (totaling approximately 400 Soldiers), and the potential stationing of a Combat Aviation Brigade (CAB) (consisting of approximately 2,800 Soldiers), at Fort Carson. This EIS includes the construction of the facilities necessary to support these units and the siting alternatives of the Proposed Action. The decision to station the IBCT at Fort Carson was analyzed in the 2007 Final Programmatic EIS (PEIS) for Army Growth and Force Structure Realignment (Reference Number [No.] 1), and was one of the implementing stationing actions announced in the December 2007 Record of Decision (ROD) (Reference No. 2). The ROD stated that the Army will proceed with its preferred alternative identified in the PEIS, Alternative #3, to:

1) Implement realignments and associated activities between fiscal years 2008-2013 to support the Army's Modular Transformation and Global Defense Posture Realignment (GDPR) decisions;
2) Add approximately 30,000 CS and Combat Service Support (CSS) Soldiers to the Active and Reserve components of the Army to address critical shortfalls in high-demand military skills; and
3) Grow the Army (GTA) by up to six Active Brigade Combat Teams (BCTs).

In its discussion of specific stationing decisions, the GTA ROD stated:

> Fort Carson is being selected for this stationing action because it ranks favorably in possessing the capabilities and attributes the Senior Army Leadership has determined to be necessary to support this stationing action. Key capabilities the Army assessed as part of this stationing decision included the ability to support growth, training, Soldier and Family well being, and power projection. While most Army installations are experiencing considerable training land deficits, Fort Carson's deficit is smaller than a majority of Army installations, allowing it to best support the additional training requirements of this IBCT. It has the capability to support current and future operations of this IBCT and provides a robust and modernized training range and training simulations infrastructure. Moreover, Fort Carson has the ability to handle increased communications traffic required to support military operations and has considerable potential to support future military training requirements. The installation is also one of the most highly requested stationing locations in the Army, has adequate schools and medical facilities, and supports a high quality of Soldier and Family life. These reasons have led the Army to select Fort Carson as the stationing location for the Growth IBCT #5 (Reference No. 2).

The stationing actions analyzed in the GTA PEIS were made with the understanding that site-specific National Environmental Policy Act (NEPA) analysis to implement those decisions would be undertaken at affected installations. This EIS provides decision-makers, regulatory agencies, and the public information on the potential environmental and socioeconomic effects of the implementation of the stationing decision. Decision-makers will be able to compare implementation alternatives and assess environmental and socioeconomic impacts from the stationing actions at Fort Carson and hence make informed decisions.

On October 12, 1999, the Secretary of the Army and the Army's Chief of Staff articulated a vision for the Transformation of the Army to ensure it remained an effective and relevant operational force in the 21st century. The leadership of the Army recognized the emerging need to shift from a Cold War focus to meet new unconventional threats to national security. A decision was made to begin the 30-year process of transforming the Army, which is described in the 2002 ROD for the PEIS for Army Transformation. Since that decision, the Army has completed the initial phases of this Transformation effort and is continuing to implement those actions which are needed to field a force that is best configured to meet the evolving national security and defense requirements of the 21st century.

As part of the overall Army Transformation effort, the Army has transitioned to a modular, or standardized, force structure. That is, transition from large, powerful, fixed organizations constituted at the Division level (10,000 to 12,000 personnel) to smaller, standardized, self-contained, and rapidly deployable BCTs. There are three types of BCTs with differing equipment, training, maneuver, and support needs: Heavy BCTs (HBCTs), IBCTs and Stryker BCTs (SBCTs).

Since 2002, a series of programs have affected the composition and location of Army forces, in addition to the wars in Iraq and Afganistan. These programs have included Base Realignment and Closure (BRAC), GDPR, and implementation of the Army Modular Force (AMF). The 2007 Fort Carson and Piñon Canyon Maneuver Site (PCMS) Transformation EISs discussed the implementation of these initiatives at each location. Decisions made and the resulting conditions described in those EISs generally serve as the baseline conditions for this EIS.

The 2007 GTA PEIS analyzed the environmental effects of an addition of units (Army Modularity and GDPR, and growth of new units by up to six Active component BCTs). This growth is intended to mitigate shortages in units, Soldiers, and time to train that would otherwise inhibit the Army from meeting readiness goals and supporting strategic requirements.

In December 2007, following completion of the PEIS, the Deputy Chief of Staff of the Army, G-3/5/7 (Operations, Plans, and Training), signed the ROD validating the Army's plan to grow by approximately 74,200 Active and Reserve component Soldiers and to station these additional Soldiers at various specified installations. This growth decision included the stationing at Fort Carson of an additional IBCT consisting of approximately 3,500 additional Active Duty Soldiers.

Also included in the PEIS and the ROD was the decision to station the 2nd BCT, 2nd Infantry Division (2BCT-2ID) permanently at Fort Carson. (The 2BCT-2ID was reflagged to become the 4th BCT, 4th ID [4BCT-4ID] in March 2008.) The 2BCT-2ID had been stationed at Fort Carson temporarily in 2005, and NEPA analysis for the impacts of stationing it at Fort Carson was included in the 2007 Fort Carson and PCMS Transformation EISs. As a result, in this EIS, the stationing of 2BCT-2ID (reflagged as 4BCT-4ID) will be considered as part of the baseline conditions rather than as part of the Proposed Action.

This EIS will also analyze the potential restationing of a CAB (approximately 2,800 Soldiers) to Fort Carson.

1.2. Purpose and Need for the Proposed Action

The purpose of the Proposed Action is to implement the decisions made in the 2007 GTA PEIS ROD. Fort Carson must provide for the training readiness, deployments, administrative functions, and Soldier and Family quality of life elements for those Soldiers slated for stationing at Fort Carson. The Army has established October 2010 as the effective date for standing up the new IBCT. This date reflects the urgent need to balance training readiness with mission requirements while allowing the Army to improve Soldiers and Family quality of life, and other goals defined in the GTA PEIS.

The GTA PEIS ROD directed the stationing at Fort Carson of a new IBCT, plus the following units:

- 573rd Transportation Detachment (Movement Control Team)
- Area Test, Measurement, and Diagnostic Equipment Support
- 52nd Engineer Battalion Headquarters (Horizontal Construction)
- 615th Engineer Company (Horizontal Construction)
- 46th Engineer Detachment (Concrete)
- 497th Horizontal Engineer Company
- 544th Vertical Engineer Company
- 40th Engineer Survey Design Team
- 167th Transportation Detachment (Movement Control Team)
- Quartermaster Company
- Engineer Company

The stationing of most of the units listed above was analyzed in the 2007 Fort Carson and PCMS Transformation EISs. The Quartermaster Company and the Engineer Company, however, were not known stationing actions at the time or were actions that were to occur after the time analyzed in those EISs. Therefore, these two support units will be included with the new IBCT in the analysis throughout this EIS. Like the 4BCT-4ID, the other support units listed above will be considered as part of the baseline conditions, rather than as part of the Proposed Action.

In addition to these new unit stationing actions at Fort Carson, the growth of the installation may include the restationing of a CAB. The CAB is the standard design for Army aviation brigades under the modular force plan. Formerly called the multi-functional aviation brigade, the CAB is part of Army Transformation. Fort Carson would be the home station of five BCTs, the 10th Special Forces Group (Airborne) (hereafter referred to as Special Forces), and various support units. Fort Carson is the only installation with four or more BCTs without a CAB. The stationing of a CAB to support these units would support and enhance integrated training at Fort Carson. The Army is considering Fort Carson and several other locations for the stationing of a CAB in the 2008-2013 timeframe. Because of this, the Army has included an evaluation of the potential impacts of stationing a CAB at Fort Carson in this EIS.

Implementing these requirements would involve constructing new facilities to support additional Soldiers and their Families, upgrading and constructing ranges, and continuing the use of training ranges and maneuver areas. Facilities for training, garrison operations, and Soldiers' quality of life are critical for supporting the operations of the new units that would be stationed at Fort Carson. Adequate facilities do not currently exist at Fort Carson and PCMS to accommodate the new units; therefore, construction of facilities would be required.

1.2.1. Army Training Strategy and Doctrine

Current training needs have been shaped by AMF and Transformation, operational experience in Afghanistan and Iraq, and new equipment capabilities. Training requirements are outlined in Training Circular (TC) 25-1, *Training Land* (Reference No. 3), and TC 25-8, *Training Ranges* (Reference No. 4).

Training in the current operational environment requires large maneuver or training areas of varying characteristics with complex terrain. The Army also has an increased need to conduct urban training operations. Trends toward greater urbanization in operational theaters across the globe require the Army to provide security, stability, and counterinsurgency operations in populated urban environments. The military's experiences from Iraq and Afghanistan have demonstrated that Special Forces operations,

intelligence gathering, and the use of joint multi-service and multinational (sister service and coalition) assets are also critical to mission success and defeat of a dispersed and poorly defined enemy force. It should be noted, however, that the progress the Army is making efforts to emphasize urban, Special Forces, intelligence gathering, and joint and multinational training at Fort Carson and PCMS to ensure current and future mission success. In addition to these increased training requirements, the Army must retain its ability to train on mechanized force-on-force training tasks.

Training needs must also consider contingencies that Soldiers may face in future conflicts, taking into account weapons and communications capabilities and the full range of potential enemies.

High-quality training that prepares Soldiers for the operational environment is essential to ensuring the success of the nation's strategic defense objectives, national security, and the safety of Soldiers. Home stations, such as Fort Carson, must prepare Soldiers for operational deployments and missions. This preparation includes live-fire mission support and maneuver training, each of which is discussed as follows in the context of needs of an IBCT and a CAB.

1.2.2. Installation Sustainability

On October 1, 2004, the Secretary of the Army and the Army Chief of Staff issued the *Army Strategy for the Environment* (Reference No. 5), which focuses on the interrelationships of mission, environment, and community. A sustainable installation simultaneously meets current and future mission requirements, safeguards human health, improves quality of life, and enhances the natural environment. A sustained natural environment is necessary to allow the Army to train and maintain military readiness. This strategy is implemented by Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, which reinforces the Army's commitment to applying sustainable policies and practices to safeguard the environment. It builds upon the numerous environmental plans and policies that have been developed and implemented to protect environmental resources at Fort Carson. As an installation, Fort Carson has developed *Master Planning Strategy Smart Growth Principles* that provide ten specific goals for facility siting and usage that guide conservation at Fort Carson. Appendix A summarizes key plans and policies, including the *Smart Growth Principles*, in place at Fort Carson.

Fort Carson has implemented numerous voluntary programs to achieve a more sustainable installation. Several goals have been established, both for short-term and long-term implementation, in areas such as energy/water, transportation, air quality, buildings, green procurements, zero waste, and training ranges.

Fort Carson has received numerous awards and recognition from both the military community and external organizations for its commitment to the environment and its sustainability program.

Fort Carson has committed to achieving a higher level of environmental performance through continued progress toward its sustainability goals. The progress toward implementation of these voluntary measures depends on available funding.

Additional information regarding Fort Carson's sustainability achievements and future goals can be found at http://sems.carson.army.mil/.

The Army recognizes that a unit executing training for its current mission, or to doctrinal standards to maintain its overall readiness, affects training lands. To manage training lands in a sustainable manner, the Army has instituted land and environmental management programs to support sound natural resource management practices and provide stewardship of its training lands.

The impacts to land from military training are a particular focus of Fort Carson's sustainability effort. The *Integrated Training Area Management* (ITAM) program establishes a uniform land management program, elements of which include inventorying and monitoring land condition, integrating training requirements with land carrying capacity while training to standard, educating land users to minimize adverse impacts, and prioritizing and implementing rehabilitation and maintenance projects. ITAM is governed by AR 350-19, *The Army Sustainable Range Program* and Fort Carson (FC) Regulation 350-9, *Integrated Training Area Management*. Other important resource management programs and procedures are provided in Fort Carson's *Integrated Natural Resource Management Plan* (INRMP) (Reference No. 6), and *Integrated Cultural Resource Management Plan* (ICRMP) (Reference No. 7). These programs seek to optimize training while providing sustainable land management that will ensure that training lands continue to be available to support the Army's mission.

1.3. Scope of the Analysis

This EIS addresses environmental and socioeconomic impacts at Fort Carson and PCMS as a result of stationing additional units at Fort Carson. This site-specific EIS has been developed in accordance with NEPA; the regulations issued by the *Council on Environmental Quality* (CEQ), 40 *Code of Federal Regulations* (CFR) (42 USC 4321 et seq.); and the Army's implementing procedures published in 32 CFR Part 651, *Environmental Analysis of Army Actions*. The potential stationing of a CAB is also analyzed in this document for the reasons stated in Section 1.2. Any decision by the Department of the Army to

station a CAB at Fort Carson would have to be preceded by NEPA analysis, and, depending on how much time passes, its implementation at Fort Carson could require additional NEPA analysis. The Army is actively preparing to make a decision concerning the stationing of a CAB and the effects of stationing such a unit at Fort Carson can be meaningfully evaluated.

This EIS incorporates the analysis of the 2007 GTA PEIS and 2007 Fort Carson and PCMS Final Transformation EISs, by reference, and provides the baseline conditions of the No Action Alternative. The scope of the EIS does not include potential land acquisition for expansion of PCMS. The relationship of this Proposed Action and potential PCMS expansion is discussed in Chapter 2.

1.4. Public Involvement

As required by NEPA regulations, the Army invites public participation in the EIS process. Comments from all interested persons are considered to promote open communication and enable better decision-making. All agencies, organizations, and members of the public with a potential interest in the Proposed Action, including minority, low-income, disadvantaged, and Native American groups, will be provided the opportunity to participate in the decision-making process.

1.4.1. Overview of the Public Involvement Process

Public participation opportunities for this EIS and decision-making on the Proposed Action are guided by 32 CFR Part 651. The EIS process begins by involving the public, agencies, and other interested parties in the scoping process to identify the issues to be addressed in the EIS. Subsequently, a Draft EIS (DEIS) is prepared and filed with the US Environmental Protection Agency (EPA), and the Army publishes a Notice of Availability (NOA) in the *Federal Register* (FR) and in newspapers near Fort Carson and PCMS.

A 45-day comment period begins on the date EPA announces the availability of the DEIS in the FR. During the 45-day comment period, but after at least 15 days following publication of the NOA, a public meeting is held to provide an opportunity for the public, organizations, and regulatory agencies to provide comments on the DEIS. A Final EIS (FEIS) is then prepared that addresses all comments received on the DEIS. The FEIS is filed with EPA and made available to the public through an NOA published in the FR.

A final decision on the Proposed Action is documented in a ROD. The Army issues the ROD after a 30-day waiting period. The NOA of the ROD is then published in the *FR*.

Throughout this process, the NEPA Coordinator (phone number: 719-526-0912; fax number: 719-526-1705; or email: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil) is available to answer questions regarding the scope, status, and progress of the EIS and to receive comments.

1.4.2. Scoping and Public Notice

On May 7, 2008, the Department of the Army issued in the FR a Notice of Intent (NOI) to prepare an EIS for GTA actions at Fort Carson, Colorado (73 FR 25686). In addition, individual letters were sent to invite agencies to an agency scoping meeting, and notices of three public scoping meetings were publicized in local papers and through a public service announcement made available to local news media outlets.

1.4.2.1. Agency Scoping

Agencies with permitting review responsibilities and other interested parties were invited to the agency scoping meeting held at Fort Carson, Colorado, on May 19, 2008, from 1:00 to 3:00 p.m. Of the 28 invited organizations, representatives from the following nine agencies attended the scoping meeting:

- US Army Corps of Engineers (USACE), Southern Colorado Regulatory Office
- US Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)
- USDA, Forest Service (USFS)
- Colorado Division of Wildlife (CDOW)
- El Paso County Department of Health and Environment (EPC Health)
- US Department of Interior (DOI), US Geological Survey (USGS)
- DOI, US Fish and Wildlife Service (USFWS)
- DOI, US Bureau of Land Management (BLM)
- EPA

The Fort Carson Program Manager for this EIS briefed the attendees on the general nature of the Proposed Action and the process for the EIS.

Attendees raised general questions or issues for consideration in the EIS during a question and answer period following the presentation. Specific comments or concerns were related to water impacts (i.e., stormwater, water quality, water runoff, wastewater, wetlands, etc.), continued agency access through PCMS to USFS lands, additional monitoring of resources (i.e., wildlife, air quality, erosion control), and socioeconomic impacts on the Front Range to include recreation (e.g., campgrounds, Pikes Peak National Forest, Arkansas River). No written agency comments were received.

1.4.2.2. Public Scoping

Public scoping meetings were held at Trinidad Community College in Trinidad, Colorado, on May 20, 2008, the Crowne Plaza Hotel in Colorado Springs, Colorado, on May 21, 2008, and at Otero Junior College in La Junta, Colorado, on May 22, 2008. All three scoping meetings were conducted during the hours of 6:30 to 8:30 p.m. Approximately two weeks before the public scoping meetings, notices of the meetings were published in the following ten general circulation papers: *The Gazette, Fountain Valley News, Pueblo Chieftain, La Junta Tribune-Democrat, Bent County Democrat, Fowler Tribune, Trinidad Chronicle, Rocky Ford Daily Gazette, Ordway New Era,* and *Ag Journal*. These public notices provided information on the background and purpose of the Proposed Action, requested public comments, and provided information on the public scoping meetings. In addition, on May 8, 2008, Fort Carson released a public service announcement to all local major media outlets (newspapers, television, and radio) regarding the public scoping meetings.

At each meeting, the Army was represented by Fort Carson staff. Approximately 78, 52, and 70 members of the public, including local media representatives, attended the three meetings, respectively.

At each of the meetings, the members of the public were greeted upon arrival, requested to sign an attendance record form listing their name, address, affiliation (if any), and given an information sheet. All attendees were provided with comment forms to provide written comments or concerns that they would like addressed in the EIS. They were asked to either complete and return the forms before leaving the meeting or return the forms to the Army no later than the close of the scoping period on June 6, 2008. The meetings were conducted in a roundtable discussion format and lasted approximately two hours each. Individuals and organizations provided written or verbal comments on the scope of the EIS during the public scoping period. Comments received generally addressed potential effects regarding water supplies and biological resources on and around the installation, and noise effects from aircraft on private landowners. Additional details regarding the meeting, as well as transcripts of all public comments, are available in the *Fort Carson Grow the Army EIS Scoping Meeting Summary Report* (Reference No. 8).

1.4.3. Review of the Draft Environmental Impact Statement

The NOA for the DEIS was published in the FR. The publication of the NOA initiates a 45-day comment period, during which the Army invites the general public, local governments, other federal agencies, and state agencies to submit written comments or suggestions concerning the analyses and alternatives addressed in the DEIS. During the comment period, copies of the DEIS are made available for public review.

Copies of the DEIS can be obtained from the NEPA Coordinator or online at http://aec.army.mil. The DEIS is also available at local libraries.

Comments on the DEIS may be submitted via email, mail, or at the public hearings. For further information, contact:

NEPA Coordinator
1638 Elwell Street, Building 6236
Fort Carson, Colorado 80913-4000
Telephone: 719-526-0912 or 719-526-4666
Fax: 719-526-1705
Email: carsdecamnepa@conus.army.mil or pcmsdecamnepa@conus.army.mil

Following the DEIS public review period, the Army will produce a FEIS, which will include responses to comments on the DEIS and revisions resulting from these comments. The FEIS will be made available for public review. The Army will publish a ROD documenting its decision.

1.5. Legal Framework

The scope of this EIS is to evaluate the environmental and socioeconomic impacts of the Proposed Action (Section 1.2). The timing for implementing the Proposed Action is contingent on numerous factors, such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations at Fort Carson and PCMS, AR 200-1, *Environmental Protection and Enhancement*, mandates compliance with all applicable federal, state, and local environmental regulations and requirements of environmental permits; Executive Orders (EOs) that establish standards and provide guidance on environmental and natural resources management and planning; and Army and Fort Carson regulations that define overall management of the land at Fort Carson and PCMS. Many of these guiding statutes and regulations are discussed throughout Chapter 3, where applicable, for the resources evaluated in this EIS.

2. Alternatives

2.1. Introduction

This section describes the alternatives considered and the alternative selection criteria used for this EIS. The No Action Alternative, as required by NEPA (40 CFR 1508.25[b]), is also described.

2.1.1. General

The range of alternatives for this EIS is dictated in large part by the preceding events. As described in Section 1.1, the decision to station the IBCT and the support units at Fort Carson has already been the subject of a PEIS and final decision. The Department of the Army has not yet made a stationing decision for the CAB. This EIS analyzes the effects of implementing the stationing of the IBCT, the two support units, and the CAB at Fort Carson (i.e., the impacts of bringing the units and Soldiers to Fort Carson).

2.1.2. Limited Alternatives

For many aspects of the stationing, there are no true alternatives. For example, increased numbers of Soldiers and Families, the need for and location of new facilities, and the need for training, are all necessary elements or results of the stationing actions. There are, however, alternative building locations for necessary construction on the Fort Carson cantonment area, which are described in this EIS. Analysis of alternatives focuses on the impacts on the natural and human environments from these actions. Appropriate mitigation measures are also presented in this EIS.

2.1.3. Essential Character of Fort Carson and Piñon Canyon Maneuver Site

It is important to note that implementing the Proposed Action would not alter the essential nature of Fort Carson or PCMS, which would remain as military installations on which Soldiers train, work, and live, and on which there are facilities to support those activities.

2.1.4. Location

Fort Carson is located south of Colorado Springs, Colorado, east of the Rocky Mountain Front Range, and occupies portions of El Paso, Pueblo, and Fremont counties (Figure 2-1).

Fort Carson is generally bounded by State Highway (SH) 115 on the west and by Interstate 25 (I-25) and mixed development to the east (Figure 2-2). The City of Pueblo lies approximately 10 miles south of Fort Carson's southern boundary. The City of Fountain is located east of Fort Carson. Fort Carson comprises approximately 137,000 acres and ranges from 2 to 15 miles in width from east to west and up to 24 miles in length from north to south.

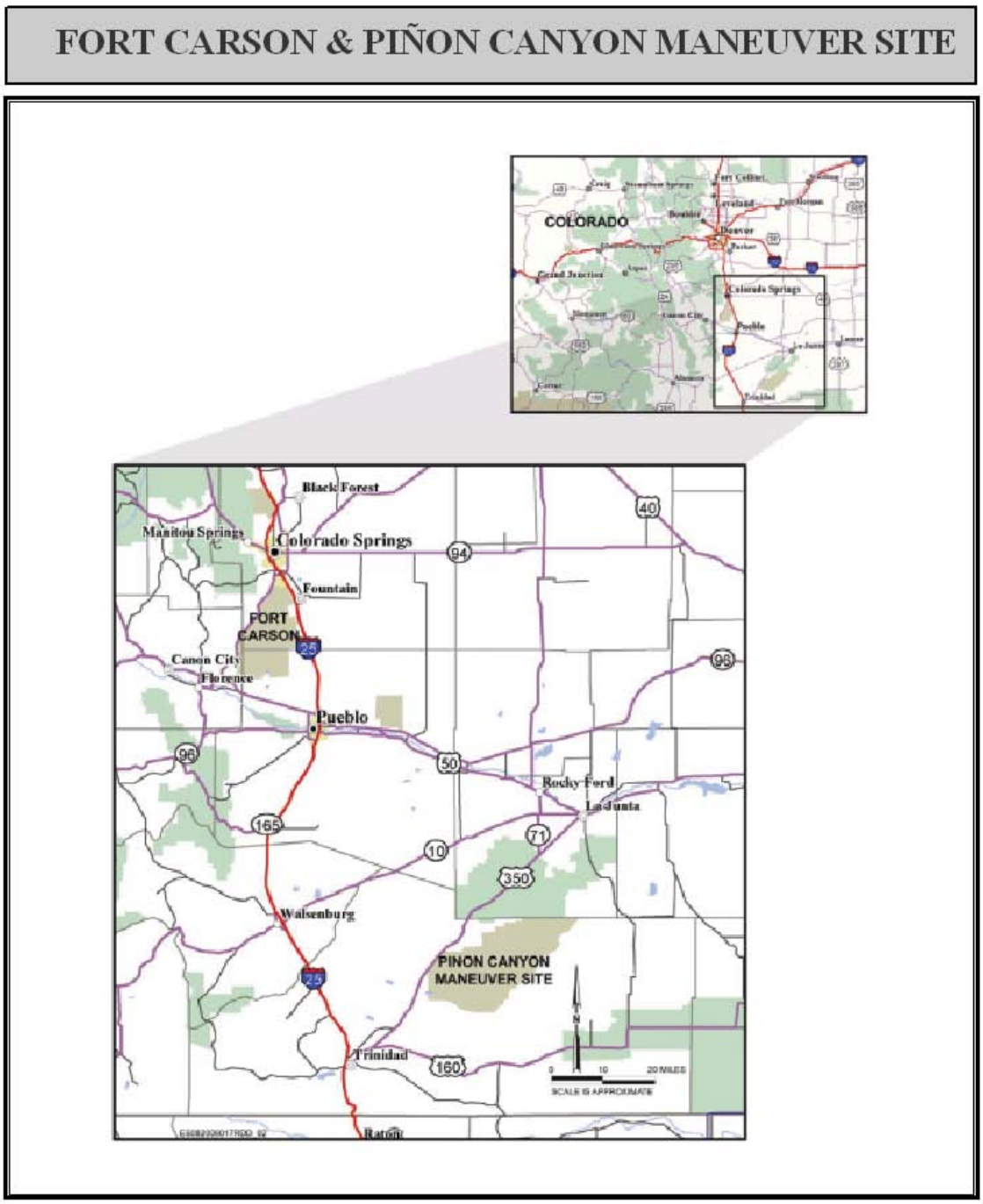

Figure 2-1 Fort Carson and Pinon Canyon Maneuver Site

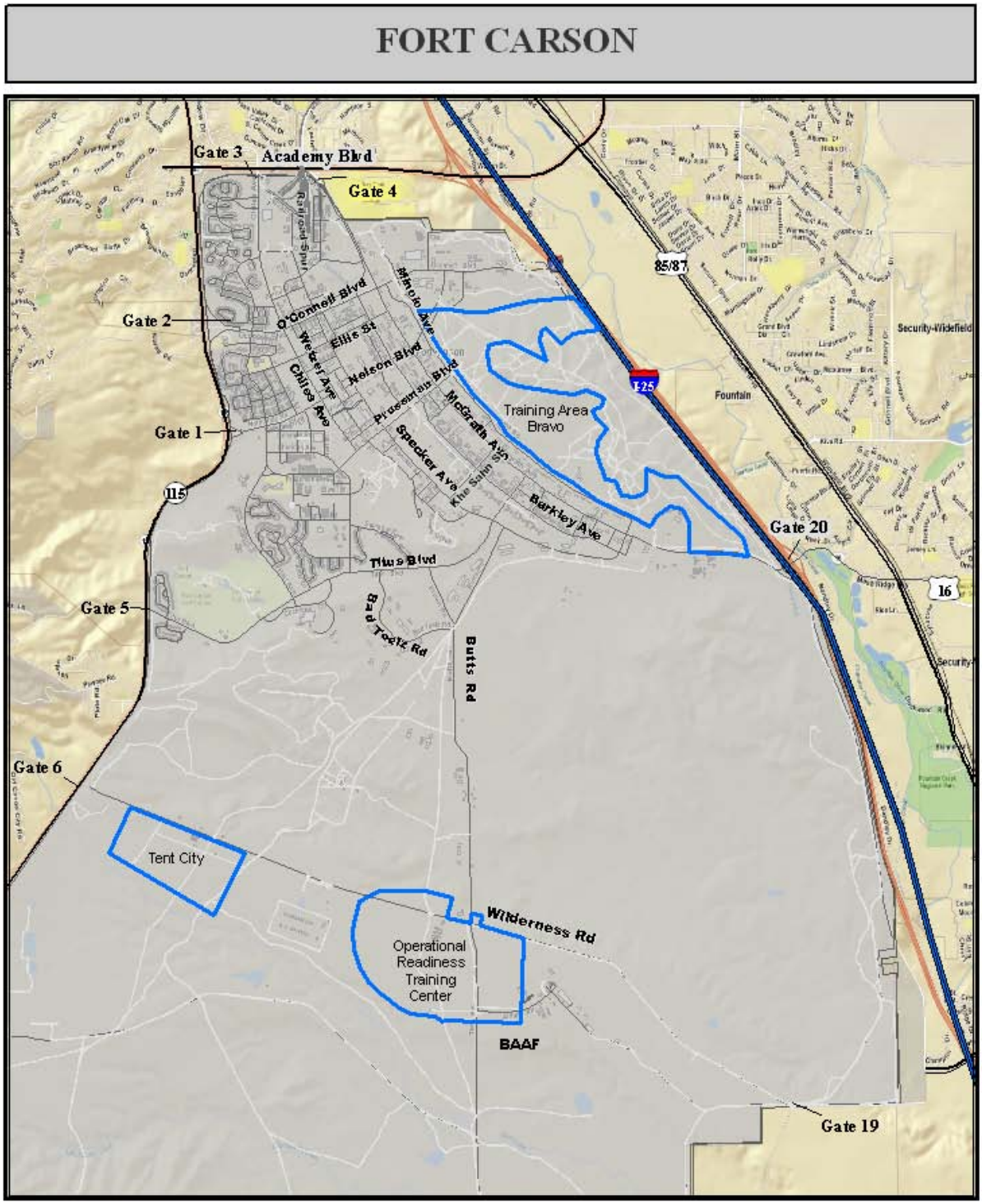

Figure 2-2 Fort Carson

Soldier support facilities are provided in the cantonment area. This built-up area, located in the northern tip of Fort Carson, contains troop and family housing, administrative, maintenance, community support, recreation, supply and storage facilities, utilities, and classroom and simulation training facilities. Fort Carson's downrange area serves as an active military training facility for both weapons qualification and field training. The downrange area comprises the land area outside the cantonment area, including firing ranges, training lands and impact areas.

PCMS is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson (Figure 2-1). PCMS is bounded by US Highway 350 (US 350) to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast.

PCMS includes a small cantonment area at the entrance gate on US 350, containing austere facilities to support training.

2.1.5. Study Area

The majority of construction associated with the Proposed Action and alternatives would occur outside the Fort Carson cantonment area along Wilderness Road, with additional construction of several small-scale range projects planned for the downrange area.

The primary study area includes all land within the Fort Carson and PCMS boundaries. Baseline conditions and impacts to areas surrounding Fort Carson and PCMS are described and considered as appropriate in Chapters 3 and 4, respectively, based on the Region of Influence (ROI) for environmental resource areas. For instance, impacts to biological and cultural resources would primarily occur within the boundaries of Fort Carson and PCMS, but impacts to other resource areas, such as socioeconomics, utilities, and transportation, could be regional in nature. Cumulative impacts involve a more extensive analysis of resource areas, combining a historic perspective with present and anticipated future impacts for each resource area. Cumulative impacts consider Fort Carson, PCMS, and surrounding areas.

2.1.6. Relationship between Army Growth and the Potential for Future Expansion of Piñon Canyon Maneuver Site

GTA decisions, including the assignment of the IBCT to Fort Carson, were made in light of the overall Army training land shortfall on all installations and on the premise that receiving installations would be limited to their existing lands to accommodate these additional units. The GTA PEIS states:

> This analysis examines installations in their current boundaries. It does not consider possible expansion of land holdings at installations. The process of land acquisition for Federal Agencies is a long one, requiring multiple approvals, a series of environmental and real estate planning studies, and funding of appropriations. Because of these uncertainties, there are no installation expansion actions that are included in the scope of this analysis.

The Army's position is that the present facilities at Fort Carson and PCMS marginally provide sufficient land to train assigned Soldiers and units adequately, including the IBCT and CAB being studied in this EIS, for *current* missions. As stated in the 2007 Fort Carson Transformation EIS, however, even with just the assignment of the baseline units and Soldiers, it will be necessary for the Army to deviate from its doctrinal training standards, which are designed to address the multiple contingencies that its forces may face, both now and in the future, not just current missions. With the addition of the new units at Fort Carson, the Army would have to introduce more work-arounds and deviate further from doctrinal training standards, which would have associated costs and implications. These could include greater environmental impacts, less time for Soldiers with their Families at home station, increased expenses, and sub-optimal training.

Thus, the Proposed Action is a stand-alone action within the rules set out in CEQ regulation 40 CFR 1508.25. That is, the contemplated expansion of PCMS is not a connected action to the Proposed Action because the Proposed Action will not automatically trigger expansion, the Proposed Action can proceed without expansion, and the Proposed Action and expansion are not interdependent parts of a larger action.

The need to implement the GTA ROD stationing decisions expeditiously is similar to the situation the Army faced in the 2007 Fort Carson Transformation EIS. In that document, the Army stated:

> Because of the immediate need for implementing the transformation actions, expansion is neither a reasonable component of the [proposed action] nor a reasonable and feasible alternative to it. . . . The transformation . . . can be implemented as a stand-alone action . . . that does not require expanding the PCMS boundaries. That is, land acquisition is not necessary or proposed to implement the [proposed action].

After due consideration in the GTA PEIS, and as stated in the GTA ROD, the Army determined that a new IBCT and other units were to be stationed at Fort Carson. A main justification for creation of the new GTA units was to provide relief to existing forces from the demands of the current operational tempo,

particularly short turn-around times between deployments. Thus, implementation of the decisions recorded in the GTA ROD, including the Proposed Action, must occur quickly. In contrast, any potential expansion of PCMS will have to await a longer period of consideration and execution.

Whether, when, where, to what extent, and how PCMS expansion may occur are, at present, not determined. This uncertainty results largely from the considerable community and political concern that has been expressed about this issue, including several legislative measures at both the state and federal level. In light of this uncertainty, the Army has not yet been able to formulate either a proposed action or a set of reasonable alternatives for potential expansion. Both of these are required before the Army may publish a NOI to start the EIS process. Thus, potential PCMS expansion simply has not arisen to the level of a "proposal" within the meaning of NEPA and is not ripe for NEPA analysis.

For all of the reasons discussed above, potential PCMS expansion is not analyzed in this EIS. The Army is not trying to avoid the environmental impact scrutiny required by NEPA. If and when PCMS expansion arises to the level of a proposal that is ripe for NEPA analysis, it will be the subject of separate NEPA analysis with all required opportunities for public participation. Should that point be reached, the analysis would consider the cumulative effects of the Proposed Action in combination with the effects of potential expansion.

2.2. Proposed Action

The Proposed Action is to implement the stationing of an additional IBCT and the two support units (as decided in the Fort Carson portions of the GTA ROD) and the CAB (anticipating its possible stationing at Fort Carson). The Proposed Action is the Army's preferred alternative and would include the following:

- **Troop-Level Increase.** Accommodate an overall increase in Soldiers who would work, live, and train at Fort Carson and PCMS. Under the Proposed Action, approximately 3,900 Soldiers (a new IBCT plus support units) or approximately 6,700 Soldiers (the new IBCT and support units plus a CAB) would be stationed at Fort Carson.
- **Facility Removal and Construction/Renovation.** Remove facilities and infrastructure that are no longer needed, relocate facilities to support new construction, construct new facilities and infrastructure, and renovate existing facilities and infrastructure to support the new population and training activities. All construction under the Proposed Action would take place at Fort Carson. See Appendix B for further information.
- **Live-Fire Training and Maneuvers.** Provide for training activity for existing and new units stationed at Fort Carson, which incorporates the need to balance any additional or different maneuver training, live-firing, and environmental management to meet the Army's integrated

goals of maintaining military training readiness and sustaining lands for continued use (Section 1.2.2). Live-fire training and maneuver activities under the Proposed Action would be similar to those described for the No Action Alternative (Section 2.4.4). The training requirements of an additional IBCT, however, could result in increased frequency of use of training ranges. PCMS is anticipated to support the maneuver training requirements at the battalion level and above.

- **Training Strategy.** Training under the Proposed Action would occur throughout Fort Carson and PCMS in accordance with the suitability of the land for different training activities (e.g., maneuver or live-fire) and the ability to sustain the land.
- **Staged Stationing of Troops.** The restationing and Transformation of Fort Carson's force structure are expected to continue (Reference No. 9). Implementation of the full restationing and Transformation is expected to be complete by 2012. As the Army proceeds with Transformation planning, the total unit strength may vary throughout the implementation period (although these variations relate to smaller units below the BCT level). Troop arrival schedules at Fort Carson from restationing, deployment, and standing up the new IBCT would affect the timing of implementing new training requirements.
- **Timing of Construction Projects.** The timing of construction projects would be contingent upon funding availability and priorities, and projects would likely be constructed in phases throughout the implementation period.
- **Environmental and Training Conditions.** Factors beyond the Army's control, such as world stability, troop deployments, and climatic conditions, affect the implementation of training. Because environmental and training conditions are dynamic, training activity under the Proposed Action is a process, by which the Army would monitor and respond to changing conditions, to sustain the land for training and provide maximum troop readiness.

2.2.1. Changes in Force Structure and Population

This section presents changes in force structure and population that would be the result of implementation of the Proposed Action. These are additions to the force structure anticipated as the end state determined in the 2007 Fort Carson Transformation EIS.

As announced in the GTA ROD, Fort Carson was selected to receive a new IBCT recently named as the 5th Brigade, 4th ID (5BCT-4ID). For purposes of this EIS, this unit will be referred to as the IBCT. Fort Carson will also gain new support units beyond those studied in the 2007 Fort Carson and PCMS Transformation EISs; a Quartermaster Company and an Engineer Company, for a combined total of about 400 Soldiers.

2.2.1.1. Infantry Brigade Combat Team

The existing force structure at Fort Carson is described in Section 2.4.1 in the No Action Alternative. Under the Proposed Action, the addition of the IBCT would result in an increase of approximately 3,900 Soldiers and their Families. The IBCT stationing is expected to be completed by 2012. Fort Carson would experience a net gain of units and personnel under the Proposed Action.

Based on data from the May 2008 Army Stationing and Installation Plan and information obtained from the Fort Carson Force Integration Office, Table 2-1 shows the projected population increases for the IBCT and their Families, as well as civilian personnel. Families are estimated using the multiplier supplied by the 2008 Pikes Peak Area Council of Government (PPACG) Regional Growth Plan.

Table 2-1 Summary of Projected Fort Carson Population Increase for Infantry Brigade Combat Team

Personnel	No Action Alternative	Proposed Action (End of Implementation in 2012)	Total Population Increase
Military	25,100	29,000	3,900
Civilian Employees/Contractors	5,124	5,140	16
Military Family Members	46,937	54,230	7,293
Total	**77,161**	**88,370**	**11,209**

Source: Families: Reference No. 10
All Others: Reference No. 11

2.2.1.2. Combat Aviation Brigade

There is also the potential for the stationing of a CAB. This would result in an additional increase of approximately 2,800 Soldiers and their Families.

Table 2-2 shows the projected combined population increases for the IBCT and the CAB, their Families, and civilian personnel.

Table 2-2 Summary of Projected Fort Carson Population Increase for Infantry Brigade Combat Team and Combat Aviation Brigade

Personnel	No Action Alternative	Proposed Action (End of Implementation in 2012)	Total Population Increase
Military	25,100	31,800	6,700
Civilian Employees/Contractors	5,124	5,151	27
Military Family Members	46,937	59,466	12,529
Total	**77,161**	**96,417**	**19,256**

Source: Families: Reference No. 10
All Others: Reference No. 11

2.2.2. Equipment

The IBCT is divided primarily into two infantry battalions, a reconnaissance and surveillance battalion, a fires battalion, a support battalion, and a special troops battalion consisting of CS units. Authorized major equipment includes towed M119A1 105-mm artillery, light engineer equipment, light tactical equipment, and medium/large cargo trucks. All vehicles are capable of on-road and off-road maneuver. See Section 2.2.4.2 for a more comprehensive description of an IBCT's equipment.

The equipment used by the new IBCT would not differ substantially from that used by currently assigned units. More of the same types of equipment, however, would be maintained and stored at Fort Carson because each BCT is assigned their own equipment (i.e., units do not share equipment).

A CAB is divided primarily into two attack/reconnaissance battalions, an assault battalion, a general support aviation battalion, an aviation support battalion (medium), and an air traffic service company. The CAB is authorized 116 helicopters. Additionally, a CAB is accompanied by approximately 700 tactical vehicles (e.g., light trucks, fuelers, and transport vehicles).

2.2.3. Construction of Support Facilities at Operational Readiness Training Center

2.2.3.1. Infantry Brigade Combat Team

To support the IBCT stationing, the Army would construct facilities at the Operational Readiness Training Center (ORTC) along Wilderness Road at Fort Carson. An IBCT complex, including infrastructure, would be constructed. This would include facilities such as battalion headquarters, barracks, company operations, tactical equipment maintenance facilities, and a dining facility. The proposed location would also require construction of support facilities to include a fire station, a central vehicle wash facility, a physical fitness center, a child development center, a dental clinic, and access control improvements at Gate 6, Gate 19, and relocation of the Crow's foot access control point. The total acreage analyzed for this action, which encompasses existing ORTC facilities and a portion of Butts Army Airfield (BAAF), is approximately 575 acres, of which about 130 acres consists of previously disturbed ground. The IBCT footprint is estimated to be approximately 200 acres.

The area of the construction projects is displayed in Figure 2-3, and additional details regarding the scope and projected timing of these construction projects are included in Appendix B.

2.2.3.2. Combat Aviation Brigade

As part of the Proposed Action, if the CAB were stationed at Fort Carson, the Army would co-locate facilities at the ORTC site along with the proposed IBCT facilities as well as within the BAAF to support this unit. The CAB complex would include headquarters, barracks, company operations, classrooms, and vehicle maintenance facilities, as well as renovation to existing facilities. The construction of the CAB facilities would be located within the approximate 575 acres indicated for the IBCT in the ORTC (Figure 2-3).

2.2.3.3. Combat Support Units

To support the Quartermaster Company, facilities would be constructed in two locations on previously disturbed ground within the cantonment area (approximately 289,000 square feet [SF] total). Company Operations facilities would be constructed north of Barger Street and west of Specker Avenue. The Tactical Equipment Maintenance facilities and hardstand would be constructed between Magrath and Minick Avenues, south of O'Connell Boulevard, and north of Ellis Street. The proposed location of these construction projects is displayed in Figure 2-4.

To support the Engineer Company, facilities would be constructed within the cantonment area south of Barger Street and between Wetzel Avenue and Specker Avenue on previously disturbed ground. Facilities would include Company Operations facilities, organizational vehicle and Privately Owned Vehicle (POV) parking, oil and deployed equipment storage, Tactical Equipment Maintenance facilities, and covered hardstand (for a total of approximately 326,000 SF). Construction of the new facilities would also include the removal of approximately 41,000 SF of existing facilities. The proposed location of these construction projects is displayed in Figure 2-4.

These locations facilitate administrative control of these units and they support the Army's new standard for how companies operate with their facilities tied with maintenance facilities. These facilities are co-located with existing parent units and allow for effective command and control. There are no other locations for these units in the Fort Carson cantonment area that meet these requirements.

2.2.3.4. Ground Disturbance for Facility Construction

Permanent ground disturbance would include all impervious areas, including buildings, sidewalks, and parking lots. Temporary disturbance would include areas likely to be affected by construction activities, such as staging and trenching areas. Much of the large areas of temporary disturbance in the downrange and airfield areas would be attributed to installation of new utilities. All utilities would be underground, and disturbed areas would be restored after completion of construction. The construction of and/or upgrades to ranges are described in Section 2.2.4.3.1 and are listed in Appendix B.

Figure 2-3 Approximate Area of Disturbance near the Butts Army Airfield and Operational Readiness Training Center

Figure 2-4 Facilities to Support the Engineering Company & Quartermaster Company

2.2.4. Training

As part of the Proposed Action, the Army would increase its live-fire training activities by approximately 27 percent through the stationing of the IBCT, CAB, and select CS units. The stationing of the IBCT would account for approximately 20 percent of the increased live-fire activities at Fort Carson and the CAB would account for an additional 6.5 percent increase in the firing activities at Fort Carson. All firing would take place on designated range facilities or into existing impact areas. The vast majority (more than 95 percent) of increased firing activities would be small arms and machine gun munitions from qualification activities that Soldiers must conduct twice per year.

As part of the Proposed Action, the Army would increase the frequency of its maneuver training activities by approximately 20-25 percent through the stationing of the IBCT, CAB, and select CS units. Implementation of maneuver training as part of the Proposed Action would result in an approximate 15 percent increase in the aggregate number of Maneuver Impact Miles (MIMs) at Fort Carson. The stationing of the IBCT and other support units would result in an approximate 9-percent increase in relative MIMs and the CAB would result in an additional 6.5-percent increase. GTA units would conduct battalion and brigade level training at PCMS and would conduct company level and smaller unit training at Fort Carson. A majority of the eastern portion of Fort Carson would be dedicated to supporting the live-fire activities. Because of this, a majority of maneuver activities associated with the Proposed Action would occur on the western half of the installation south of Turkey Creek. In 2008, a decision was made to conduct training exercises for battalion- and brigade-size units primarily at PCMS to help alleviate overcrowding at Fort Carson.

The IBCT would be projected to conduct its maneuver training in the more ruggedly contoured areas of PCMS to the northern and western portions of the maneuver training site and in the eastern canyon areas. The IBCT would conduct additional dismounted maneuvers in the dismounted maneuver areas depicted in Figure 4.2-1. The flat plains areas are not ideally suited for executing mounted or dismounted infantry tasks and are more suitable for conventional force on force training exercises of heavy armored vehicles. The IBCT is capable of conducting mounted and dismounted operations in areas with more contour and steeper slopes and would utilize more rugged terrain not accessible or capable of supported mounted operations of armored vehicles. The central and southern plains areas would be more heavily utilized by HBCT units to support mechanized armored engagements.

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited

training resources (e.g., maneuver area and firing range availability). To support additional training requirements of new units, existing land and environmental management programs would continue to be implemented. The ITAM program would continue to monitor training activities, institute projects to minimize training damage, and educate units to limit damage to training lands. In addition, installation environmental managers would continue to coordinate with range managers and units to ensure training requirements are balanced with environmental sustainability and compliance.

Because the condition of training lands is highly variable, depending on the amount and type of training and the climatic conditions during training, the ITAM program does not set specific ratios for land rest to sustain training lands. Instead, the ITAM program provides a process by which the post directorates work together to provide input regarding the training needs and the environmental condition of the training lands.

Environmental plans would continue to be followed to manage environmental resources in conjunction with increased unit training requirements in a manner that complies with environmental laws and regulations and avoids unnecessary environmental damage. Decisions on training activities would continue to balance current training needs and protection measures to maximize the training mission and sustainability of training lands.

The process for balancing training requirements and sustainability does not differ across alternatives evaluated in this analysis.

Training is an Army unit's highest priority when not deployed, and commanders train their units to be combat ready. The Army trains Soldiers in individual skills, units on collective tasks, and different levels of units through multi-echelon training. The Army trains as it fights, as a combined arms team. Training ranges and training lands are the Army's classroom, and "Commanders take every opportunity to move Soldiers out into the field, to fire weapons, maneuver as a combined arms team and incorporate protective measures against enemy actions." (Reference No. 12).

"Battle Focus" is a concept used to derive training requirements, and units train according to their *Mission Essential Task List* (METL). This is derived from wartime operational plans (why they fight); unit-specific combat capabilities (how they fight); the operational environment (where they fight); directed missions (what they must do); and any higher headquarters training guidance. Battle focus recognizes that a unit may not attain proficiency to standard on every task possible due to time or other resource constraints. Commanders can, however, achieve a successful go-to-war training program by narrowing the training focus to the tasks essential to wartime mission accomplishment.

Army doctrinal training for all BCTs is based on developing the basic skills to meet the needs of the Army for any battle, and changes as Army units, weapons systems, and need for resources change (Reference No. 13). Training requirements are outlined in TC 25-1, *Training Land* (Reference No. 3), and TC 25-8, *Training Ranges* (Reference No. 4). The 2007 Fort Carson and PCMS Transformation EISs addressed training by all units at Fort Carson under general Army doctrinal guidance.

As described above, METL training centers on current missions. Doctrinal training, in contrast, addresses the broader range of all potential missions upon which the Army may be called.

2.2.4.1. Infantry Brigade Combat Team

Infantry training involves training with a variety of weapons as individual Soldiers, crews, teams, and squads practice and qualify with a variety of weapons. Weapons in an infantry battalion include: pistols, rifles, shotguns, sniper rifles, grenade launchers, light-medium-heavy machine guns, anti-tank weapons, grenades, demolitions, and mortars. Weapons qualification is a semi-annual requirement. Practice firing is completed as time, ammunition, and other resources permit. This weapons firing occurs on fixed ranges, as described in Army TC 25-8, *Training Ranges*. Infantry units, from squad to company, also participate in quarterly and semi-annual live-fire exercises that include all weapons systems on a large and more complex range.

The broad categories of infantry collective (unit) maneuver training events include reconnaissance and security (patrolling and security operations), offense, defense, and stability and support operations. Infantry units can incorporate airborne, airmobile, and air assault operations into their training. The IBCT's smaller subordinate units will train on a specific event up to four times per 12 months; the larger units such as the battalion may train up to twice per 12 months. Smaller units will break a training event, as an entire unit, down into situational training exercises or drills that are focused on a specific task and can be repeated until the unit achieves proficiency. When the smaller units train, they may not have an opposing force of similar size; larger units usually will.

It is anticipated that a majority of platoon and company IBCT maneuver training would be conducted in training areas 20, 24, 25, 28, and 29, which consist of more ruggedly contoured terrain. Collectively, these training areas are referred to as the "California Strip." The California Strip consists of training areas located along the western boundary of the installation (Figure 2-5). IBCT company and platoon maneuvers could each occur up to five weeks per year.

Training areas 30, 31, 39, and 40 are collectively known as Sullivan Park (Figure 2-5). Sullivan Park is more suitable for mounted armored maneuver training activities than IBCT training and is not anticipated to be the primary training area that would be used to support IBCT squad, platoon, and company training. Much of the maneuver training capacity of Sullivan Park is projected to be needed to support training of Fort Carson's HBCTs.

An IBCT is already stationed at Fort Carson thus, the stationing of an additional IBCT would not qualitatively change the types of maneuver training that currently take place at Fort Carson and PCMS, though the frequency of training events could increase. On- and off-road maneuvers of units company-sized and below would continue using IBCT types of equipment and vehicles already found at Fort Carson. The same would be true for battalion and brigade maneuvers at PCMS. Current training activities include the use of light and medium trucks and other tactical military vehicles on trails, unimproved roads, and off-road areas.

2.2.4.2. Combat Aviation Brigade

Aviation units must train to fight collectively with supported and supporting units in joint and combined arms environments. Likewise, to support or be supported efficiently by aviation forces, non-aviation forces need the requisite training. A critical aspect of the battle-focused concept is understanding the responsibility for and linkage between collective, mission-essential, crew, and individual tasks.

Training would involve execution of day-to-day support operations and routine joint military training at nearby training lands and ranges (Reference No. 12). Units perform primarily three modes of flight:

- Low-level flight is conducted at a selected altitude at which detection or observation of an aircraft is avoided or minimized. The route is preselected and conforms generally to a straight line and a constant air speed and indicated altitude.
- Terrain or Contour is at low altitude conforming generally to the contours of the earth. This type of flight takes advantage of available cover and concealment in order to avoid observation or detection of the aircraft and/or its points of departure and landing.
- Nap-of-the-earth (NOE) requires flight as close to the earth's surface as vegetation or obstacles will permit. Air speed and altitude are varied as influenced by the terrain, weather, and enemy situation.

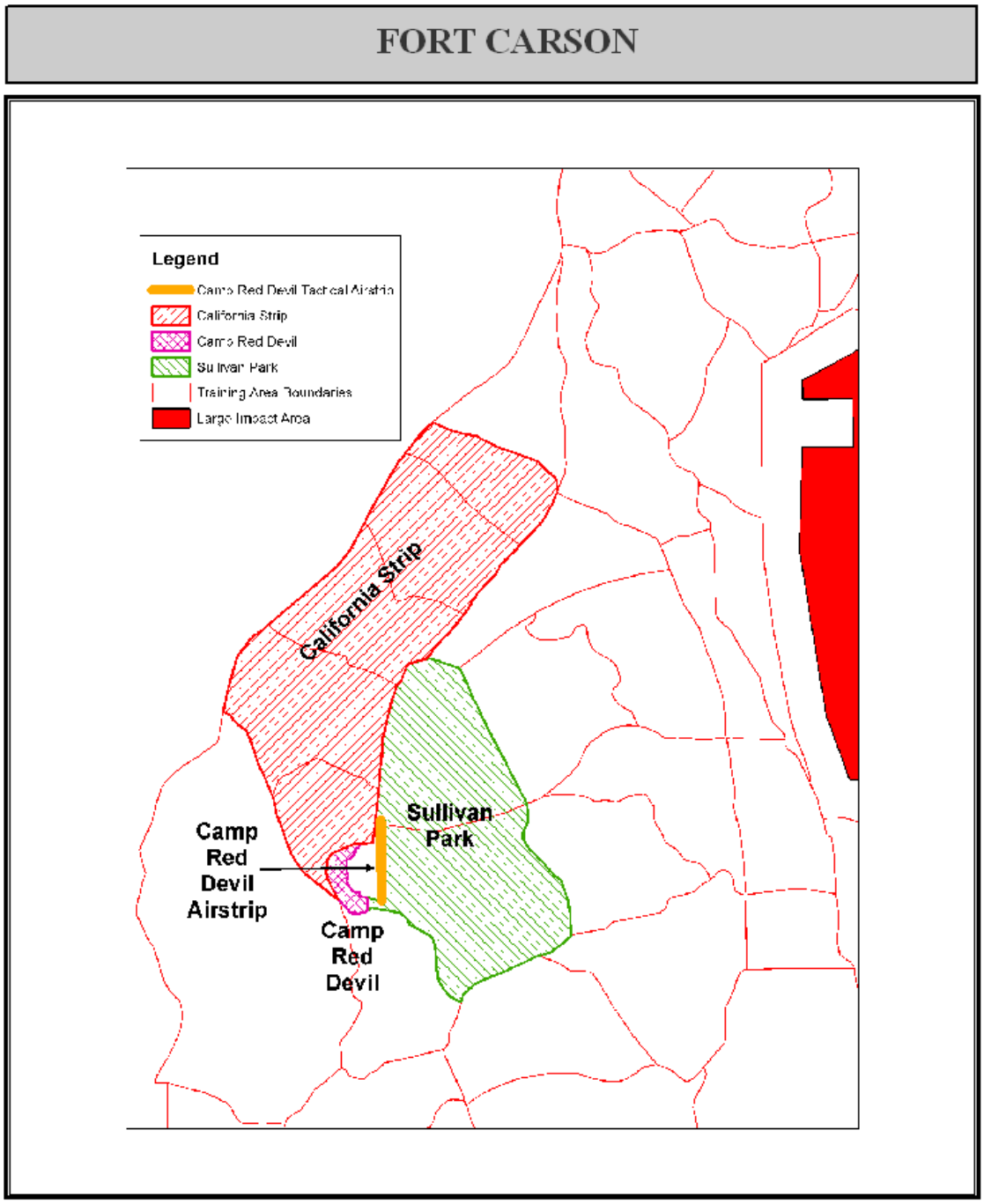

Figure 2-5 Selected Training Areas and Facilities
Map Provided by Fort Carson Range Control ITAM

Units conduct aerial gunnery at the ranges with the Observation Helicopter (OH)-58D (Kiowa) and the Attack Helicopter (AH)-64 (Apache). Door gunnery live-fire training tasks would be conducted from the Cargo Helicopters (CH)-47 (Chinook) and Utility Helicopters (UH)-60 (Blackhawk). The Chinook and Blackhawk helicopters are used to conduct sling load operations (delivering munitions), assault landings, rappelling, etc., and conduct flight training under day, night, and night-vision goggle conditions. Field exercises involve establishing Forward Area Rearming and Refueling Points (FARRPs) and tactical areas for field environments. Weaponry, which is used primarily for Force Protection perimeter guarding, includes the Mark 19, 40-mm grenade launching machine gun, (MK19), M2 .50 Caliber, M240B machine gun, Squad Automatic Weapon, and personal weapons (i.e., M16 rifle, 9-mm Pistol, and .45 Pistol). Table 2-3 provides a more complete description of this weaponry and Figure 2-6 presents some representative photographs. Gunnery training is conducted at least twice per year, but training is conducted throughout the year, to include personal weapon training as well as aircraft gunnery. Field exercises could be combined with gunnery training. Training includes convoying to site, perimeter security, FARRP Operations, and Forward Tactical Operations.

The CAB logistics and command and control elements include ground unit vehicles from the Family of Medium Tactical Vehicle (FMTV), Heavy Expanded Mobility Tactical Truck (HEMTT), High Mobility Multipurpose Wheeled Vehicle (HMMWV), and wheeled support element vehicles (Table 2-3).

Table 2-3 Equipment Assigned to Fort Carson

Category	Equipment	Mission	Type of Training
Tracked Vehicles	M1 Abrams Main Combat Tank	Provides heavy armor superiority on the battlefield (120mm main gun)	Maneuver and Live-fire
	M2/M3 Bradley Fighting Vehicle	Provides protected transport of an infantry squad and over watching fires to support the dismounted infantry (25mm main gun)	
	M109 Paladin Self-Propelled Howitzer	Provides the primary artillery support for armored and mechanized units (155mm artillery round)	
	M113 Armored Personnel (Mortar) Carrier. This includes the variant M-577 command post vehicle.	Provides a highly mobile, survivable, and reliable tracked-vehicle platform that is able to keep pace with Abrams and Bradleys. The M577 provides a mobile command capability.	
	M1117 Armored Security Vehicle	Fills the Army's armored wheeled vehicle requirements for one with a turret and armament system designed to meet the security mission requirements of the Military Police Corps.	
Wheeled Vehicles	FMTV	Fills the Army's medium tactical vehicle requirements for mobility and resupply, and transportation of equipment and personnel	Maneuver
	Heavy Expanded Mobility Tactical Truck	Provides heavy transport capabilities for re-supply of combat vehicles and weapons systems	

Table 2-3 Equipment Assigned to Fort Carson (continued)

Category	Equipment	Mission	Type of Training
	High-Mobility Multipurpose Wheeled Vehicle	Provides a common light tactical vehicle capability	
	Palletized Loading System	Performs line haul and unit resupply Rapid movement of combat configured loads of ammunition and all classes of supply, shelters and containers	
Engineer Equipment	Dozers, Scrapers, Loaders, Excavators, Dump Trucks	Performs horizontal construction to ensure mobility and base support for strike, sustainment, and logistics forces	Maneuver; Engineering (excavation, clearing, grubbing)
Aerial Vehicles	TUAVs	Used to support integral intelligence, reconnaissance, and target acquisition at distances of up to 125 km; detects and identifies targets from a range of 3-5 km and offers automatic target tracking	Maneuver
Aerial Systems	UAS	Provides real-time data, intelligence, surveillance, and reconnaissance support for base perimeter defense and convoy protection	Maneuver
Indirect Fire	Towed Howitzer	Provides long-range destructive, suppressive and protective indirect and direct field artillery fires	Maneuver and Live-fire
	Mortars	Provides long- and medium-range indirect fire support	
Anti-Armor Weapons	Javelin Anti-Tank Missile	Provides a man-portable, highly survivable medium anti-tank weapon system	Maneuver and Live-fire
	Tube-launched, Optically-Tracked, Wire-Guided Missile System	Defeats threat armored vehicles and urban enclosed threats at extended ranges in all expected battlefield conditions	
Individual and Crew-Served Weapons	M2 .50-Caliber Machine Gun	Engages targets with accurate automatic direct fire (.50 caliber)	Live-fire
	MK19 Automatic Grenade Launcher	Engages targets with accurate automatic indirect fire (40mm grenades)	
	M240B Machine Gun	Engages targets with accurate direct automatic fire (7.62mm)	
	M249 Squad Automatic Weapon	Engages targets with accurate direct automatic fire (5.56mm)	
	M4 Carbine	Engages targets with accurate direct fire (5.56mm)	
	M9 Pistol	Engages targets with accurate direct fire (5.56mm)	
	M16 Rifle	Engages targets with accurate direct fire (5.56mm)	
	M203 Grenade Launcher	Engages targets with accurate grenade fire (5.56mm)	

Source: Reference No. 9
FMTV = Family of Medium Tactical; km = kilometer; mm = millimeter; TUAV = Tactical Unmanned Aerial Vehicle Systems; UAS = Unmanned Aircraft System

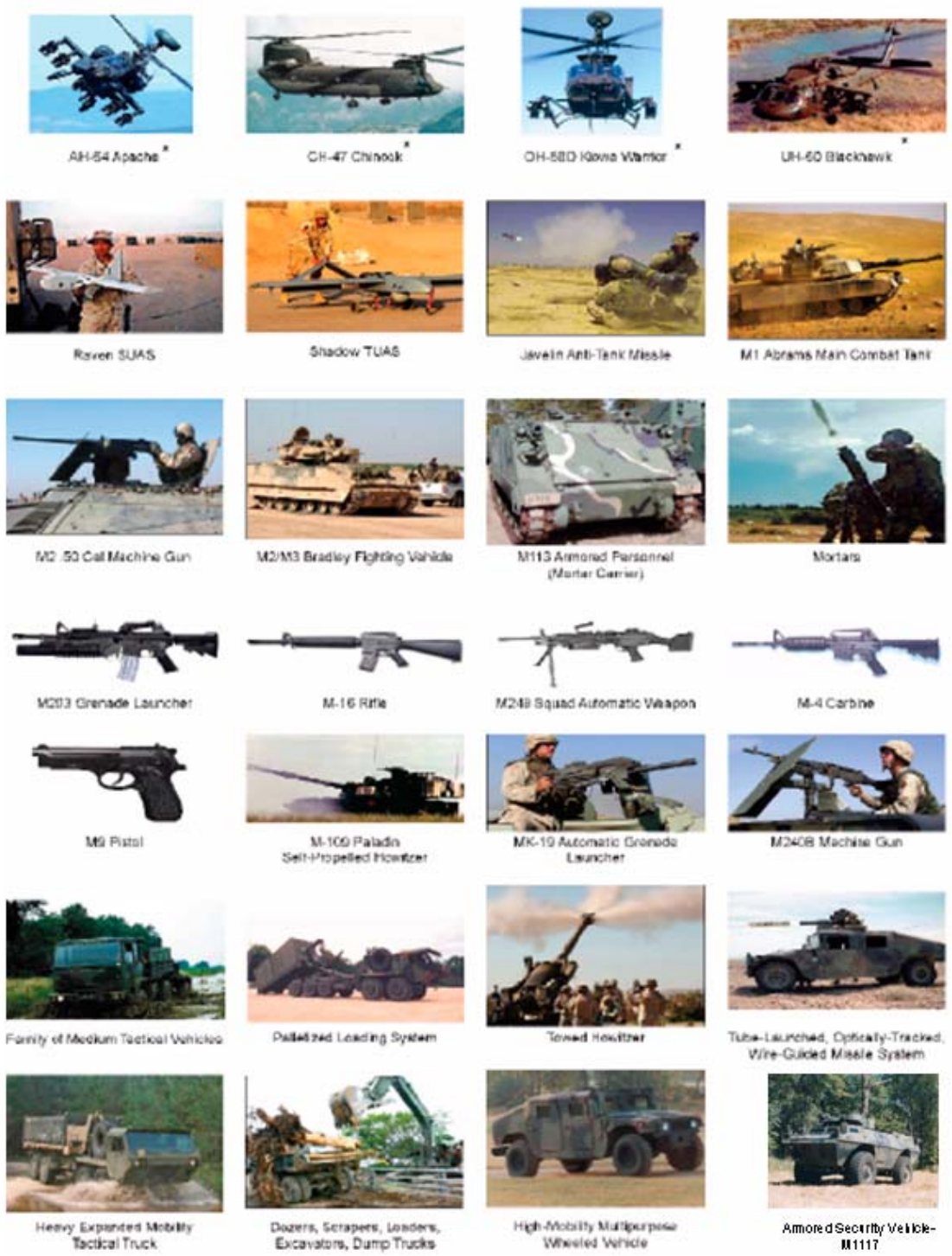

Figure 2-6 Equipment Used at or Assigned to Fort Carson and Piñon Canyon Maneuver Site

2.2.4.3. Training Facilities and Range Construction/Upgrades

The implementation of Army Transformation has required the Army to overhaul and modernize its training lands and training facilities infrastructure. TC 25-8, *Training Ranges*, describes the standard designs and requirements of the Army's Sustainable Range Program for training modular Army units to standard. A suite of ranges, as discussed in the GTA PEIS, is required to support Army BCTs and ensure that they can meet all pre-deployment training requirements.

Live-fire training is an essential component of Army training. Fort Carson has approximately 92 ranges and facilities in its range inventory for use by all units that train there. The range types span from individual weapons qualifications to heavy artillery live-fire. To be operationally effective, Soldiers must have the skills and experience necessary to operate and maintain their weapons. Live-fire involves both munitions and explosives that would be used in combat and non-explosive training rounds designed to meet Soldiers' training needs. All Soldiers qualify with their individual weapon (rifle or pistol) at least twice annually. Crew-served weapons (machine guns and other automatic weapons) qualification varies by type of unit. This training is usually accomplished at the company level on fixed ranges described in TC 25-8, *Training Ranges*. Weapons system training (Abrams Tank, Bradley Fighting Vehicle, and AH) consists of a series of "tables" and occurs on large range complexes.

In addition, platoons, companies, and battalions of BCTs must conduct collective live-fire training exercises on firing ranges to ensure they have rehearsed and coordinated battle procedures and are prepared to deploy to support wartime operations. Various weapons systems use different types of munitions. Where possible, weapons systems use inert training rounds, which have less environmental impact, as a substitute for the firing of live rounds.

Every range on which live-fire exercises are conducted has a surface danger zone (SDZ), also called "range safety fan," associated with it, and is active whenever that range is in use. The safety fan comprises the entire surface area in which munitions could possibly land, taking into account the whole spectrum of stray rounds. When Fort Carson and PCMS ranges are in use on any given day, their safety fans often effectively stop the capability to provide maneuver training on the open expanses and can also impact training on adjacent ranges when range safety fans are activated and overlap, as shown in Figure 2-7. The Proposed Action would increase use of live-fire ranges which would in turn increase the frequency of activation of SDZs. There would be no new SDZs created other than those shown on Figure 2-7.

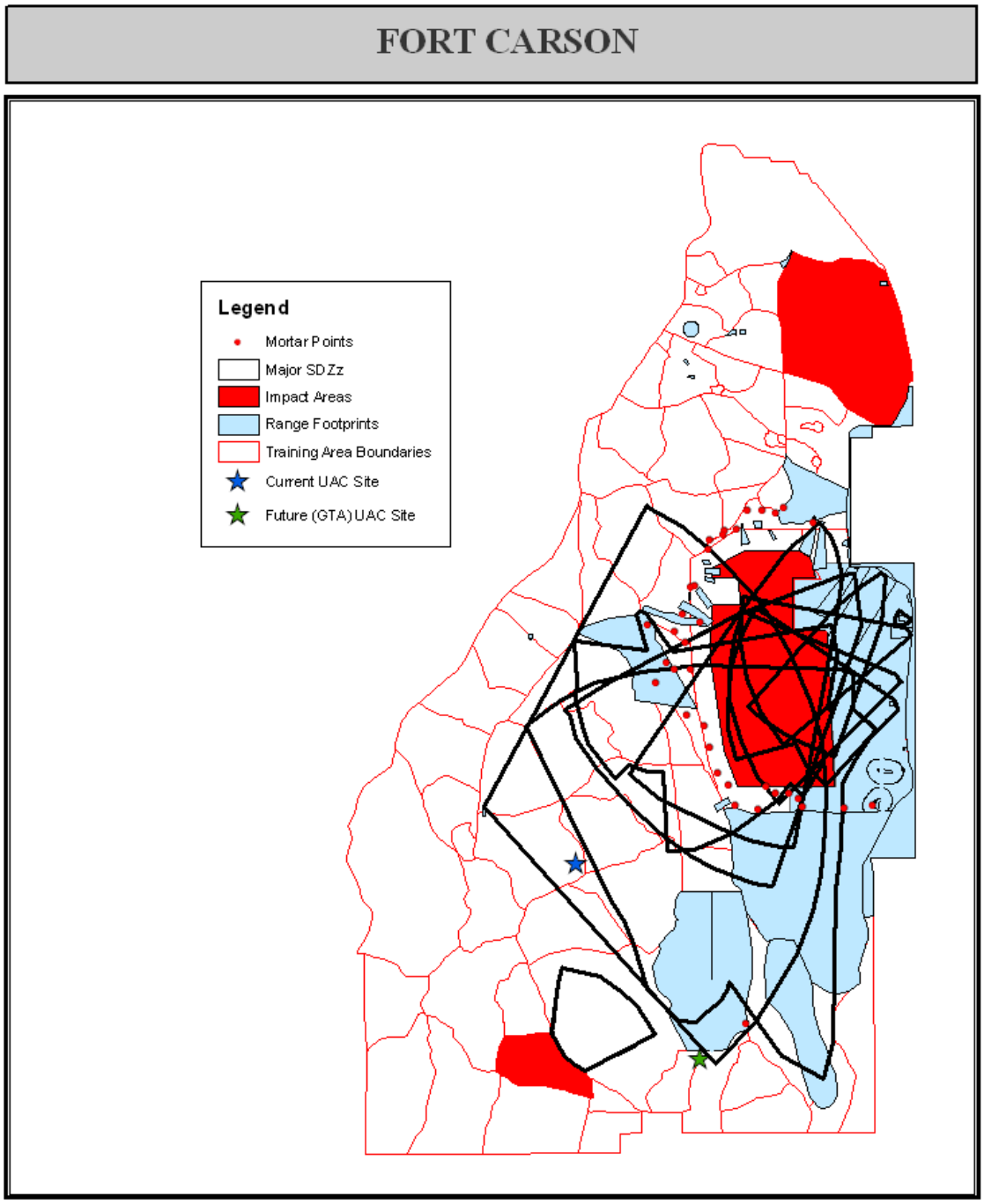

Figure 2-7 Surface Danger Zones on Live Fire Ranges on Fort Carson
Map Provided by Fort Carson Range Control ITAM

2.2.4.3.1. Infantry Brigade Combat Team and Range Facilities

The Proposed Action would include constructing and/or upgrading several ranges and range facilities at Fort Carson required to meet training readiness standards of the additional units. The Proposed Action does not include any new construction of ranges at PCMS. Existing ranges to be upgraded and newly constructed ranges/range facilities at Fort Carson would include:

- Qualification Training Range (QTR) - Range 115
- Scout Reconnaissance (RECCE) Gunnery - Upgrade Range 127
- Convoy Live-Fire Training Facility - Upgrade Range 127A and Range 129
- Modified Record Fire (MRF) Ranges - Upgrade Range 65 and Range 63
- Automated Multi-Purpose Machine Gun (MPMG) - Upgrade Range 121C
- Urban Assault Course (UAC) - Training Area 51

A brief description of each proposed range construction/upgrade and how the range would be used is listed below. The location of each proposed range project is shown in Figure 2-8. Due to land constraints new ranges have been sited on existing outdated ranges with the exception of the UAC, which was sited to accommodate Army training requirements.

Qualification Training Range. A QTR is a multi-functional range that can meet the weapons qualifications requirements for IBCT weapons systems. This range combines the capabilities of the MRF Range, Sniper Field Fire Range, Combat Pistol Qualification Course, MK-19 (Automatic Grenade Launcher/Machine Gun) Range, and the MPMG Range to centralize training and reduce land, maintenance, and unit overhead requirements. Under the Proposed Action, this would overlay Range 115. Primary features would include stationary infantry targets, Combat Pistol Qualification lanes, stationary armor targets, Sniper Field Fire lanes, moving infantry targets, MRF lanes, stationary infantry emplacements with target mechanisms, MPMG lanes, and Rifle/Machine Gun Zero lanes. All targets would be fully automated and the event-specific target scenario, computer-driven.

Scout Reconnaissance Range. A RECCE range provides combat platforms with all constituent elements in digital war fighting operations. It is used to train and evaluate crews and dismounted infantry squads on the skills necessary to detect, identify, engage, and defeat stationary infantry and stationary/moving armor targets in a tactical array. In addition to live-fire, this complex can also be used for training with subcaliber and laser training devices. Under the Proposed Action, this would be an upgrade to Range 127, to include one lane with two course roads with crossover capability, target maintenance access roads, site development, improvements, and drainage, electrical power, and targetry data cabling. Supporting facilities for the project would include electrical, access road, and associated site development and improvements.

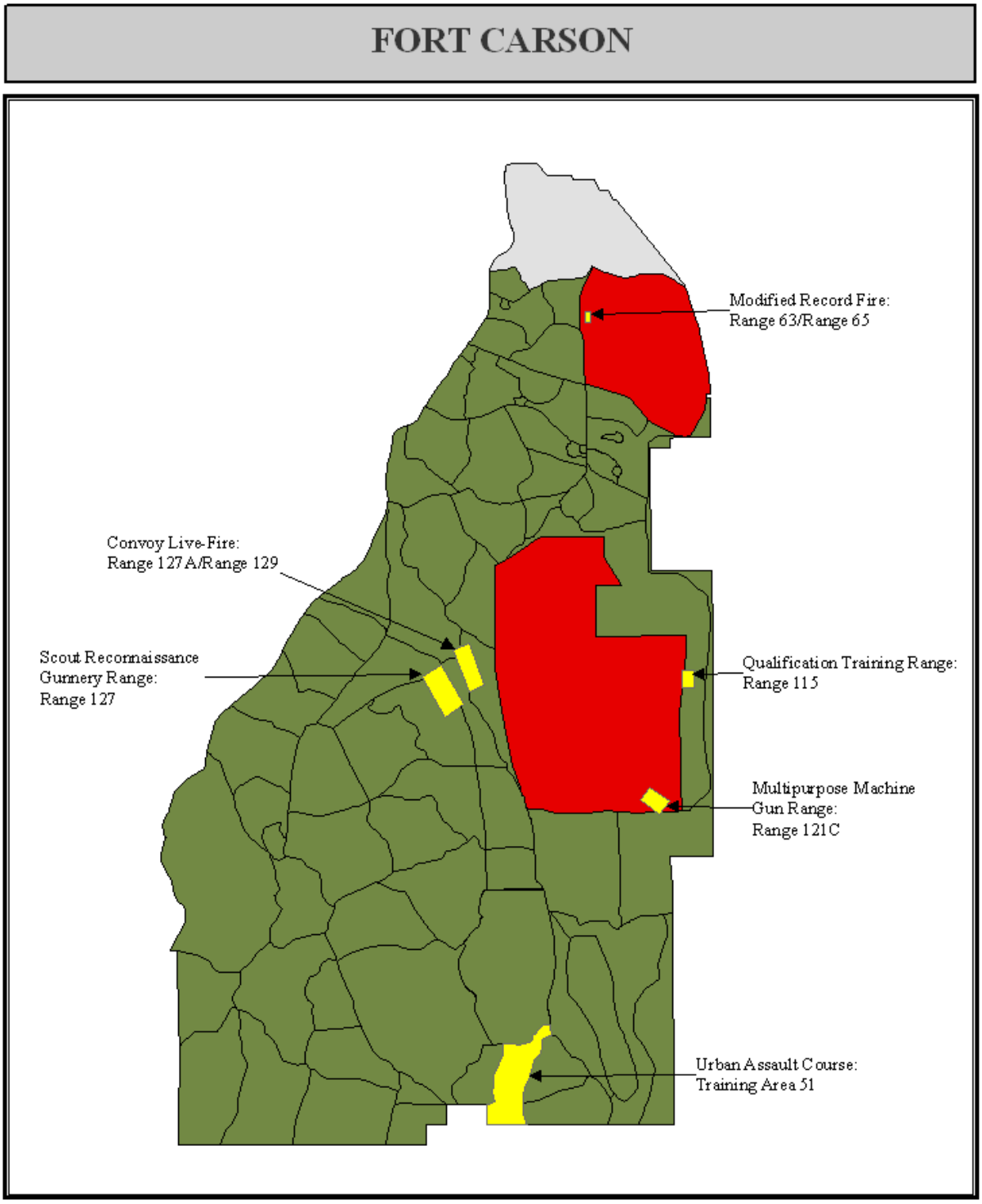

Figure 2-8 Location of Proposed Range Projects at Fort Carson

Convoy Live-Fire Training Facility. This facility provides the ability to train and evaluate the unit during a live-fire exercise. Units are trained and evaluated on their ability to move tactically, engage targets, react to improvised explosive devices, and practice target discrimination. Under the Proposed Action, a Convoy Live-fire training facility would be constructed on Range 127A and Range 129. Primary facilities would include the convoy route, roads, drainage, multiple stations, operations and storage building, vault latrine, and building information systems. Supporting facilities for the project would include electric service, information systems, and site improvements.

Modified Record Fire Range. The MRF range is used to train and evaluate individual Soldiers on the skills necessary to identify, engage and defeat stationary infantry targets for day/night qualification requirements with the M16 & M4 rifles. This range combines the capabilities of Automated Field Fire, Automated Record Fire, and the Automated Night Fire to reduce land and maintenance requirements and increase efficiencies. All targets are fully automated and the event specific target scenario is computer driven. The Proposed Action includes the need for two MRF ranges. This would be accomplished by upgrading the targetry at Range 65 and Range 63. Range upgrades would include a range operation and control area, range control tower, range operations and storage building, classroom building, latrine, covered mess shelter, ammunition breakdown building, bleacher enclosure, and building information systems.

Multipurpose Machine Gun Range. The MPMG range is designed to train Soldiers to engage stationary infantry and mobile vehicular targets with the full range of Army machine guns to include the M249, M60, M240, and .50 caliber machine guns. Under the Proposed Action, this would be an upgrade to Range 121C to include site development, a general instruction building, ammunition breakdown building, bleacher enclosure, range operations tower, range operations and storage building, latrine, covered mess and building information systems.

Urban Assault Course. The UAC is used to train individual Soldiers, squads, and platoons on tasks necessary to operate within a built-up/urban area. Under the Proposed Action, construction would occur at Training Area 51 and would include range operations and control area, downrange electrical, operations and storage building, ammunition breakdown building, latrine, and building information systems.

In summary, TC 25-8, *Training Ranges*, clearly defines the training range infrastructure required to ensure the IBCT can adequately prepare for operational deployment. Provision of the proper training range infrastructure is a critical component of need for the Proposed Action.

2.3. Alternatives with Different Locations for the Infantry Brigade Combat Team Complex

As stated in Section 2.1.2, many of the elements of the Proposed Action are not amenable to the development of alternatives. The one component that does include alternatives is the location for construction of the IBCT support facilities.

2.3.1. Screening Criteria Used to Identify Range of Potential Construction Locations

2.3.1.1. Military Construction Limitations

Reasonable alternatives must:

1) Include sites that have the space capable to construct the facilities within reasonable cost parameters;
2) Provide unit cohesiveness;
3) Consider Fort Carson's sustainability principles (Section 1.2.2); and
4) Consider feasibility of timely completion of Military Construction (MILCON).

2.3.1.2. Land/Environmental Constraints

Reasonable alternatives must consider:

1) Topography (buildable space and ability to train);
2) Wetlands;
3) Threatened and endangered species and/or habitat;
4) Cultural resources;
5) Contaminated sites under the management of the Installation Restoration Program;
6) Off-limits training/restriction areas;
7) Unexploded ordnance (UXO); and
8) Impacts to existing infrastructure and maneuver lands.

Figure 2-9 depicts known major land and/or environmental constraints for future development on the Fort Carson cantonment area.

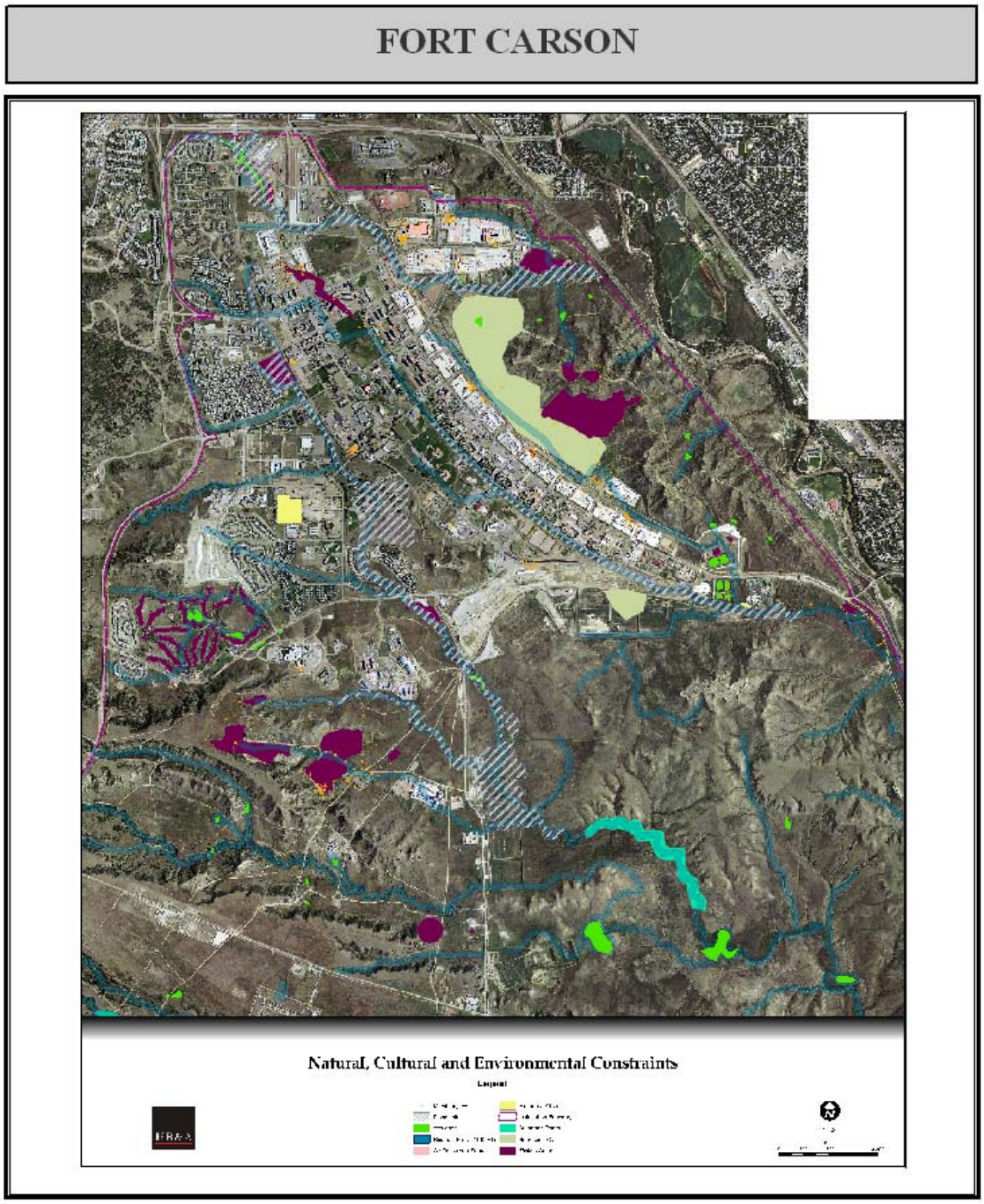

Figure 2-9 Constraints on Future Development on the Fort Carson Cantonment Area
Map Provided by HB&A

2.3.2. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo

Under Alternative 1, the Proposed Action would be conducted as described in Section 2.2.3, except that the IBCT support facilities would be constructed at Training Area Bravo (Figure 2-10) instead of the ORTC site described in Section 2.2.3. Currently, five hot refuel pads are located within the footprint of the proposed construction. Under this alternative, the two northern hot refuel pads would have to be demolished. The total acreage analyzed for Alternative 1 is approximately 700 acres, of which approximately 80 acres is a landfill site and approximately 250 acres is previously disturbed ground. Approximately 200 acres within this Area of Interest (AOI) would be required to support the construction of the IBCT Complex.

2.3.3. Alternative 2 – Construction of Infantry Brigade Combat Team Support Facilities at Tent City

Under Alternative 2, the Proposed Action would be conducted as described in Section 2.2.3, except that the IBCT support facilities would be constructed at Tent City[1], near Gate 6 (Figure 2-11) instead of the ORTC site described in Section 2.2.3., and would require the removal of two shower/latrine facilities (vault latrine), four single-story, pre-engineered metal buildings, and six tuff sheds. The total area analyzed for Alternative 2 is approximately 250 acres, of which approximately 50 acres is previously disturbed ground. It would require approximately 200 acres within the AOI to support the construction of the IBCT complex.

2.4. No Action Alternative

Under the No Action Alternative, the addition of a new IBCT and support units and the potential CAB at Fort Carson would not be implemented. Force structure, assigned personnel, and equipment would be as they exist after the implementation of the Transformation activities studied in the 2007 Fort Carson and PCMS Transformation EISs (i.e., BRAC 2005, GDPR, and Army Modular Force). Facility construction and training activities would occur as needed to support those Transformation activities and would undergo separate NEPA review if such analysis has not already occurred prior to implementation in accordance with regulations and current practice. Therefore, the No Action Alternative does not include construction of new facilities to support the IBCT, support units, or potential CAB.

[1] The Tent City alternative includes the Wilderness Road Complex.

Figure 2-10 Area of Interest for Alternative 1, Training Area Bravo

Figure 2-11 Area of Interest for Alternative 2, Tent City

This alternative is included as required by CEQ and Army NEPA-implementing regulations. The No Action Alternative, however, is not feasible. The decision to increase the size of the Army has been made, after NEPA review. That decision included the study of the possible locations within the Army for stationing of the new units. Fort Carson was chosen as a stationing location as part of that process. The additional GTA units and Soldiers will be coming to Fort Carson, and actions must be taken to accommodate their requirements. Likewise, if the Army decides to station a CAB at Fort Carson, the installation must implement that decision. Therefore, the No Action Alternative is included in this EIS only to provide a benchmark to compare the magnitude of the environmental effects of the Proposed Action and the other alternatives.

2.4.1. Force Structure

Force structure and population is based on the best information currently available. However, the number of Soldiers assigned to Fort Carson may vary on a daily basis based on unit movements, personnel actions, and other factors. The Army is in a constant state of flux (e.g., deployments, restationing, modularizing, converting, activating), and population changes are to be expected. Therefore, the baseline for the No Action Alternative considers the force structure that will be in place following implementation of Transformation as stated in the 2007 Fort Carson Transformation EIS.

This baseline establishes a measure to compare the No Action Alternative with the Proposed Action. The baseline is realistic in terms of overall troop levels and training needs. The stationing of units, however, is dynamic, and the description of the force structure described here might not depict the actual conditions at Fort Carson and related training schedules at PCMS at any given time. Additionally, deployments in Iraq and Afghanistan mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS. Despite these overseas deployments, some Families of deployed Soldiers continue to be supported by Fort Carson and civilian employees and contractor personnel continue working at the installation.

Under the No Action Alternative, the following major units would be assigned to Fort Carson:

- Headquarters, 4th Infantry Division (4ID) with 3BCT-4ID, 2BCT-4ID, 4BCT-4ID (formerly 2BCT-2ID), and 1BCT-4ID
- 43rd Sustainment Brigade
- 10th Special Forces Group (Airborne)
- 10th Combat Support Hospital
- Headquarters, 71st Explosive Ordnance Disposal Group

- 4th Engineer Battalion
- 759th Military Police Battalion
- 1st Squadron 6th Cavalry (Moving to Fort Riley in 2009)

The force structure under the No Action Alternative equates to a total military troop population of approximately 25,100. The baseline total population of Fort Carson under the No Action Alternative is 77,161, which includes the 25,100 military troops, along with 5,124 civilian and contract employees, and 46,937 military Family members.

The units stated above were either included in the 2007 Fort Carson and PCMS Transformation EISs or have been the subject of subsequent separate NEPA review since. The numbers of the respective types of personnel are based on the most current information and, thus, for the reasons stated above, vary somewhat from the approximate numbers cited in the 2007 Fort Carson and PCMS Transformation EISs. All such numbers are stated as approximate figures and are subject to some variation throughout the implementation period.

2.4.2. Equipment

Under the No Action Alternative, three HBCTs (armored BCT) and an IBCT are stationed at Fort Carson. The equipment authorized for one HBCT consists of approximately 360 tracked vehicles, 900 wheeled vehicles, 380 trailers, four TUAVs, and other non-combat vehicles. Tracked vehicles, such as tanks, use rotating tracks for mobilization, whereas wheeled vehicles use rubberized tires on wheels for travel. An IBCT is authorized approximately 930 wheeled vehicles, two tracked vehicles, 430 trailers, and four TUAVs. The types and equipment used at Fort Carson are described in Table 2-3 and shown in Figure 2-6.

2.4.3. Construction

Under the No Action Alternative, maintenance and repair of Fort Carson's existing infrastructure would continue. Other projects planned for or under construction would be completed. The Army has conducted environmental review under NEPA for these planned and under-construction facilities and determined that no significant impact on the environment would occur from completing these projects (e.g., 2007 Fort Carson Transformation EIS). Any new facility construction in support of the IBCT or the potential CAB would not be accomplished on Fort Carson under the No Action Alternative. Any new facility construction unrelated to the Proposed Action would be subject to separate NEPA review.

2.4.4. Training

This section discusses factors that influence how training is implemented and describes the typical training activities with the potential to result in impacts to the environment.

2.4.4.1. Training Needs

Under the No Action Alternative training would be conducted as outlined in the 2007 Fort Carson and PCMS Transformation EISs. Fort Carson would primarily continue to support maneuver training of platoon and company-sized units assigned to Fort Carson and other units as required. PCMS would continue to support the maneuver training of higher-level units.

2.5. Alternatives Considered but Dismissed

2.5.1. Train Troops at Other Locations

The GTA ROD decision to station an IBCT at Fort Carson was based on the training resources at Fort Carson and PCMS. Studying an alternative to conduct regular installation-level training at locations other than Fort Carson and PCMS would essentially constitute re-examining the GTA ROD stationing decision and, therefore, is not within the scope of this EIS.

Supplementing training at Fort Carson and PCMS with training at other Department of Defense DoD installations or facilities was determined not to be efficient or practical. Those other areas are already being used at capacity.

Some small-scale, specialized training already occurs on non-DoD lands, such as the Pike National Forest. For the majority of training activities conducted at Fort Carson and PCMS, there are no suitable non-DoD lands of sufficient size or proximity to Fort Carson with routine availability to address safety, security, and environmental concerns.

Fort Carson's primary mission is to meet the live-fire and small-unit maneuver requirements for units up to the company level (and primarily for the platoon-level training). These units have limited numbers of vehicles, minimal logistical support requirements, and a small amount of equipment. No training sites are present in the vicinity of Fort Carson, with the exception of PCMS, that can be reached by a convoy of tactical vehicles of combat units to meet maneuver requirements. In addition, even if there were training timing available, it would not be practical to transport equipment by rail to other, more distant training facilities because of lost training time and inefficient use of training dollars spent on extensive logistics and substantial transportation costs.

Home station training is extremely important both to prepare Soldiers for combat and for morale. Utilization of Fort Carson and PCMS training ranges allows Soldiers to learn the basic skills necessary to meet qualification standards to travel to larger training events elsewhere for their pre-deployment training or to deploy directly. Utilization of Fort Carson and PCMS training ranges also reduces the time Soldiers are away from their Families, a particularly important factor in times, like present, when Soldiers are subjected to frequent deployments to combat.

2.5.2. Construction of Infantry Brigade Combat Team Support Facilities in the Area of the Ammunition Supply Point

The Ammunition Supply Point (ASP) is the designated facility for the distribution of ammunition to Units preparing to train. The current ASP facility is located directly south of Wilderness Road, between Tent City and BAAF and includes ammunition storage igloos. The surrounding area is large enough to support construction of the IBCT complex and a potential CAB complex. Relocation of the ASP would be necessary. The relocation site would need to meet the requirements of an ASP, to include safety distances, accessibility to the Soldiers, and security. The ASP has an "exclusion zone" around it for safety reasons, where development cannot take place. This exclusion zone extends above the ASP into airspace, and effectively creates a column around which aircraft have to fly. The ASP would have to be moved elsewhere outside the cantonment area or built-up area of Fort Carson, for safety reasons.

Thus, the relocation would displace valuable training or maneuver area downrange. The ASP requires sufficient size and proximity to an external gate to receive shipments of ammunition. Its relocation further downrange would likely require creating an additional gate, involving extensive construction and additional security costs. Construction of a new ASP would cost approximately $37 million. For all of these reasons, this alternative is not considered feasible.

2.5.3. Lease/Purchase Land Near Fort Carson

Acquiring land to eliminate the problems of land constraints is an alternative that would meet the demand for construction of facilities, increased training, and avoid the encroachment on BAAF and ranges. There are, however, no large areas of undeveloped lands adjacent to Fort Carson that could be easily acquired. The area surrounding Fort Carson is populated and developed, and expansion of training land at Fort Carson would be incompatible with this surrounding development due to safety concerns, community impacts, and encroachment on training values such as low light levels necessary for effective night training. Even if satisfactory land were available, the timeframe involved in purchasing land would not meet the Purpose and Need as described in Section 1.2. The Army does not have the authority, funding, or plans to expand Fort Carson.

2.5.4. Construction of Facilities for the Combat Aviation Brigade at Different Sites

Due to the aviation mission requirements and new standard Army operational requirements (Unified Facilities Criteria 4-140-01), the CAB must be either co-located with or within close proximity to the airfield. This siting requirement is needed to ensure that Soldiers can adequately maintain their equipment and administrative control of the unit. Therefore, other locations for siting facilities to support the CAB will not be analyzed. The configuration of the CAB in the Proposed Action is the only one possible. This is due to wetlands to the south of the BAAF, an impact to the north, and the installation boundary to the east.

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3. Fort Carson Affected Environment and Environmental Consequences

3.1. Introduction

This chapter describes the affected environment and environmental consequences of implementing the Proposed Action and No Action Alternative. This chapter qualitatively and quantitatively evaluates the potential environmental impacts of proposed unit siting alternatives on Fort Carson. The affected environment and associated environmental impacts have been determined using the criteria in the Army NEPA Guidance Manual 2007 (Reference No. 14).

3.1.1. Resources Analyzed

This chapter analyzes and discloses the direct and indirect impacts for the following resource areas (Cumulative Impacts are addressed in Chapter 5):

- Land Use (Section 3.2)
- Air Quality (Section 3.3)
- Noise (Section 3.4)
- Geology and Soils (Section 3.5)
- Water Resources (Section 3.6)
- Biological Resources (Section 3.7)
- Cultural Resources (Section 3.8)
- Socioeconomics, including Environmental Justice (Section 3.9)
- Transportation (Section 3.10)
- Utilities (Section 3.11)
- Hazardous and Toxic Substances (Section 3.12)
- Sustainability (Section 3.13)

Potential effects to the visual and aesthetic resources on and around Fort Carson were considered but not included for detailed analysis. Construction of new facilities and implementation of increased training frequency could introduce new elements to the visual landscape, but these changes either would not be visible from off-post or are consistent with the character of a military installation. Therefore, there would be no adverse visual or aesthetic impacts resulting from increased density of buildings or frequency and duration of training activities, and visual and aesthetic impacts are not discussed further in the EIS. The potential for decreased visibility or increased fugitive dust emissions (which has potential for visual and aesthetic impacts) is addressed under the Air Quality analysis (Section 3.3 of the EIS).

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3.2. Land Use, Plans, and Policies

This section discusses land use in and around Fort Carson and management plans that provide guidance on operations, and also identifies the environmental consequences to land use and compliance with management plans resulting from additional troops, training, construction, and operation on the cantonment and downrange areas.

The affected environment discussion addresses current military uses of live-fire and maneuver training and non-military uses involving recreational, wildlife habitat, and mining. Additionally, land use planning, surrounding off-post land use, and prime farmlands are addressed.

3.2.1. Affected Environment

3.2.1.1. Geographic Setting and Location

Fort Carson is located in central Colorado at the foot of the Rocky Mountains in El Paso, Fremont, and Pueblo counties (Figure 2-1). Fort Carson covers approximately 137,000 acres, and extends between 2 and 15 miles east to west and approximately 24 miles north to south. The cantonment area, located in the northern portion of the installation, covers approximately 6,000 acres. Fort Carson is bounded by I-25 and mixed development to the east and SH 115 to the west. Colorado Springs and Denver lie approximately 8 miles and 75 miles, respectively, to the north, while the City of Pueblo is located approximately 35 miles south of the cantonment area.

3.2.1.2. Climate

Fort Carson is located near the border of the Great Plains and the Front Range of the Rocky Mountains. The climate is moderate and semi-arid, with an average July temperature of 71 degrees Fahrenheit (°F) and an average January temperature of 29°F. Mean precipitation is about 17 inches per year. Rainfall ranges from approximately 12 inches (southern Fort Carson) to 15 inches (northern Fort Carson) per year, with about 80 percent falling between early April and late September. Average annual snowfall is approximately 36 inches. Snow and sleet usually occur from September to May, with the heaviest snowfall registered in March and trace accumulations recorded as late as June (Reference No. 6).

3.2.1.3. Existing Land Use

Land is used almost exclusively for military purposes and non-training uses. In addition, the Army maintains easements and special use permits on private lands. These easements and permits allow Fort

Carson to maintain water rights, conduct monitoring on buffer lands, and use other federal properties for military purposes.

3.2.1.3.1. Military Uses

Fort Carson is an active military training facility for both weapons qualification and field training. Land use falls generally into one of two broad categories: the cantonment area, which consists of developed land and a high density of urban uses; and the downrange area, which consists of open land used for training purposes; and land specified for non-training uses, which are designated in various areas and are accessible by the public.

Cantonment Area

The cantonment area comprises approximately 6,000 acres and contains most of the infrastructure, such as Soldier and family housing; administrative, maintenance, community support, recreation, supply, and storage facilities; utilities; and classroom and simulation training facilities. Principal industrial operations include the repair and maintenance of vehicles. These operations mostly occur within the vicinity of the "banana belt" (so called because it is a banana-shaped arc of brick buildings) located within the north and east sides of the cantonment area (Reference No. 15).

Downrange Area

The downrange area consists of approximately 131,000 acres of unimproved or open lands that are used for large caliber and small-arms live-fire individual and collective training; aircraft, wheeled and tracked vehicle maneuver operations; and mission readiness exercises. Additionally, BAAF is located in the northeast quadrant of the downrange area and is used for command and control of flight operations as well as maintenance and repair of aircraft. Remaining land is used for recreation and other purposes (Reference No. 6). The primary training activities that occur within the downrange area include live-fire and maneuver training. Other areas within the downrange area are restricted from training. Each of these categories is described as follows.

- **Live-Fire Training.** Live-fire training is conducted at firing ranges. Exclusion areas, such as SDZs, are identified to protect personnel during weapons training, and are based on the maximum possible distance traveled by each weapon system's munition. Areas outside of established SDZs would be available for maneuver training when live-fire activities are not occurring. In addition, the installation has designated impact areas that are comprised of approximately 30,000 acres that cannot be used for any other purpose.

- **Maneuver Training.** Maneuver training is conducted to train and reinforce small and large unit movement techniques in a simulated battlefield environment. The magnitude of a maneuver area ultimately effects the size of a maneuver unit that can effectively use the area (i.e., brigade-sized maneuvers will require more area than a company-sized maneuver). Maneuver training occurs in areas based on topography and other environmental conditions. Many of the training areas within Fort Carson are limited in size and not appropriate for large maneuver activities. The largest contiguous area appropriate for maneuver training, known as Sullivan Park, is located in the southwestern portion of the downrange area in Training Areas 30, 31, 39, and 40 (Figure 2-5). Land rest and rehabilitation are required in areas where maneuver training occurs, and these areas are not continuously available to support training activities. Maneuver training activities also can be limited during live-fire exercises, which are incompatible (because of safety) with maneuver training. Some developed areas, such as Camp Red Devil and the Military Operations on Urban Terrain, are used for maneuver training, but mechanized travel is generally restricted to existing roads and trails. Some maneuver training areas are only appropriate for dismounted (non-mechanized) training. Dismounted training includes Soldiers moving on foot only and conducting activities such as surveying, placing of communication equipment, bivouacking, and rappelling.
- **Restricted Areas.** Portions of the downrange area are restricted from use or are available for limited training to protect natural and cultural resources, fragile soils, recreation areas, or other environmental concerns.

3.2.1.3.2. Non-Training Areas

Although Fort Carson's primary land use is for military training, the lands also support recreational activities, wildlife habitat, and the operation of two small clay mines near Stone City. Two permits have been issued by the State of Colorado to mine refractive clay on Fort Carson, near the Stone City site. Fort Carson is required by law to allow mining at existing sites provided permit conditions continue to be met by permittees (Reference No. 6).

Recreational uses include hunting, fishing, dog training, and activities such as picnics and trail rides. Recreational uses occur at the following locations:

- Bird Farm Recreation Area
- Wildlife Demonstration Area
- West Haymes Wildlife Conservation Area
- Turkey Creek Recreation Area

- Turkey Creek Protected Species Area
- Townsend, Northside, Teller, and Womack Reservoirs
- Large and Small Bird Reservoirs
- Camp Falcon

Figure 3.2-1 depicts the location of the recreational areas within Fort Carson.

Military training is generally off limits at these sites, and the intensity, level, and type of recreational activities vary by site. Most of the sites that support recreational uses are also waterfowl nesting refuges; some sites also protect other species, including fish. Hunting is allowed in designated training ranges during regulated seasons (Reference No. 6).

3.2.1.3.3. Land-Use Planning

Land-use planning is the responsibility of the Directorate of Public Works (DPW) Master Planning Division. This Division continuously assesses the need for new facilities and how these facilities can be sited to complement existing land uses. Fort Carson has developed Master Planning Strategy Smart Growth Principles that provide ten specific goals for facility siting and usage that guide conservation. Relevant environmental management plans are referenced in Appendix A.

3.2.1.3.4. Surrounding Off-Post Land Use

Developed land and land planned for future development border the northern one-third of Fort Carson. These lands are part of unincorporated El Paso County to the west, the City of Colorado Springs to the north and west, and Security-Widefield and the City of Fountain to the east. The Town of Penrose is located to the west of the southwest corner of Fort Carson.

Land bordering the southern and southeastern portion of Fort Carson is generally comprised of undeveloped agricultural and ranch land. Under the *Army's Compatible Use Buffer* (ACUB) Program, a collaborative effort among the Army, The Nature Conservancy (TNC), El Paso County, and the USFWS, a number of conservation real estate interests have been obtained from willing sellers in this area. These interests minimize land use that is incompatible with Fort Carson's mission and enhance preservation of valued environmental aspects associated with the land involved.

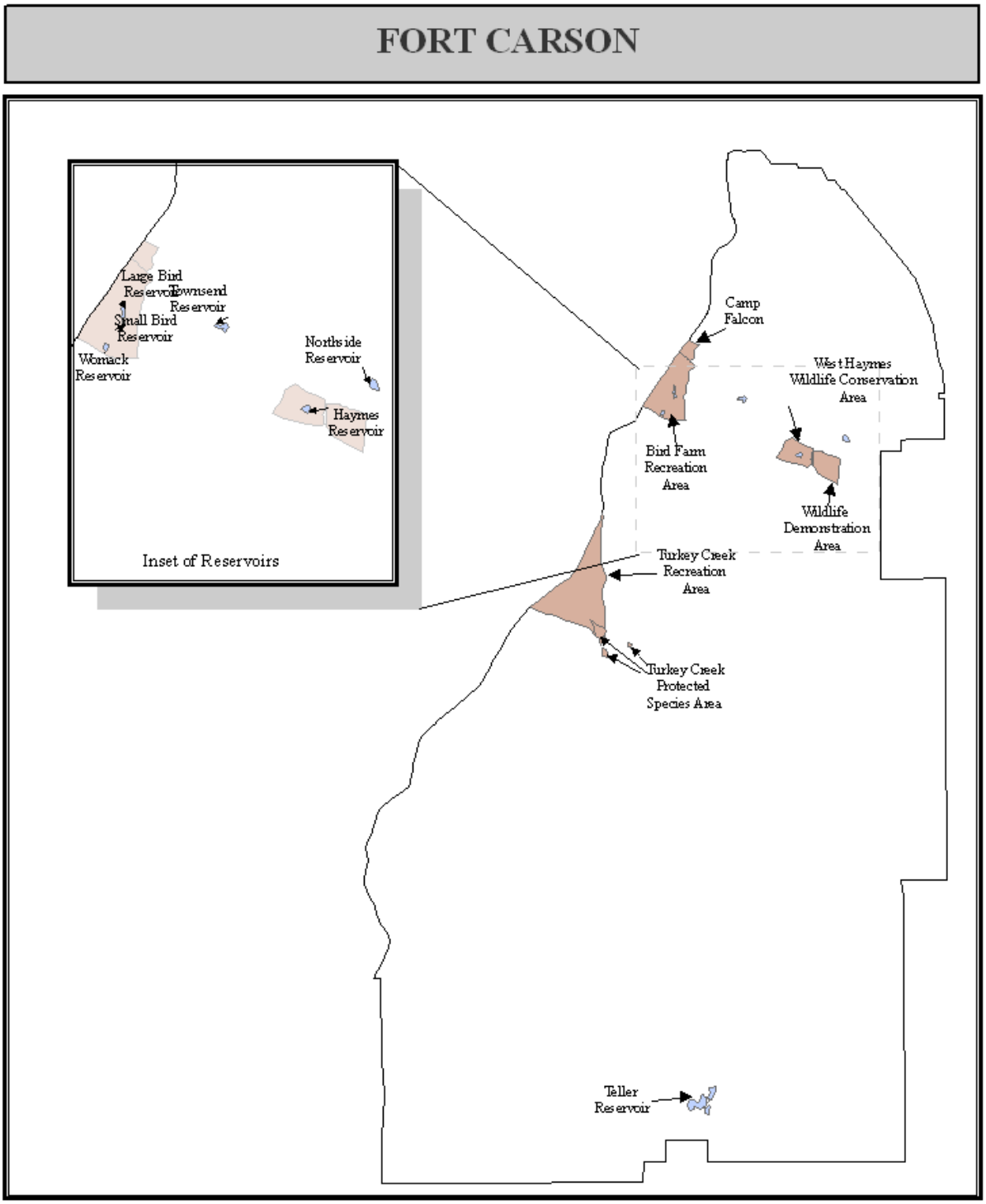

Figure 3.2-1 Recreation Map

The ultimate goal of Fort Carson's ACUB efforts is to establish a buffer zone against encroachment around as much of the installation perimeter as possible. The City of Pueblo is located southeast of Fort Carson and extends up to the agricultural and ranch land previously mentioned.

El Paso County recognizes Fort Carson as a special land use dedicated for military training. Several areas in El Paso County including Turkey Canyon Ranch, Red Rock Valley Estates, El Rancho, and Midway Ranch are located adjacent to Fort Carson and zoned as a residential land use. These areas are considered noise-sensitive land uses and are described in further detail in Section 3.4 of this EIS. El Paso County is responsible for regulating land use in these communities.

The City of Colorado Springs future land-use plan indicates that the City plans to annex land adjacent to the western boundary of Fort Carson near Gate 2. Land uses planned include general residential use to the west and north of Fort Carson, existing park/open space, and community activity centers (Reference No. 16).

The City of Fountain's future land-use plan indicates that business park, industrial, and parks and open-space uses will abut the east boundary of Fort Carson. While several small pockets of residential land use will be maintained near Fort Carson according to this plan, most of the existing land zones for residential use near the installation's eastern boundary will be changed to industrial or open-space uses in the future (Reference No. 17).

The City of Pueblo's comprehensive future land-use plan indicates that future development will potentially abut the southeast boundary of the conservation easements. This area is currently designated for country residential development, and is not planned to be one of Pueblo's two long-term growth areas. One growth area is located northeast of Pueblo around the Baculite Mesa, and the other wraps around southwest of Pueblo from the Arkansas River to I-25, and includes portions of South Pointe (Reference No. 18). Neither of these two areas is located in the vicinity of Fort Carson.

Federal, state, and other public lands provide recreational uses near Fort Carson, including Pike National Forest (USFS), the Beaver Creek Wilderness Study Area (BLM), Cheyenne Mountain State Park [Colorado Department of Natural Resources (CDNR)], Fountain Creek Regional Park (El Paso County), North Cheyenne Cañon Park (City of Colorado Springs), and Bear Creek Regional Park (El Paso County).

3.2.1.4. Prime Farmland

The *Farmland Protection Policy Act* (FPPA) of 1981 requires federal agencies to consider the impact of any activity that would convert prime or unique farmlands to non-agricultural uses. The NRCS regulates compliance with the law (7 CFR Part 658). According to the NRCS (Reference No. 19), prime farmland designations occur within El Paso, Fremont, and Pueblo counties. Historic records indicate that farming has never occurred on Fort Carson. Between 1960 and 1973, Fort Carson leased approximately 35,000 acres of land for grazing but grazing leases have not been issued since 1974 because of potential conflicts with proper land management criteria and the military mission (Reference No. 6). Because Fort Carson has not used land for agricultural use since 1973, farmlands would not be converted as part of the Proposed Action. Therefore, no action is required under the FPPA, and prime farmland is not analyzed further in this EIS.

3.2.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all the scenarios. Land use changes included in the Proposed Action and alternatives would impact internal military land use only and are not anticipated to impact public land use. The impacts from these changes would be expected to be less than significant.

3.2.2.1. Proposed Action and Alternatives

The facility construction for the CS units would occur within the cantonment area as described in Section 2.2.3 for the Proposed Action and Alternatives 1 and 2. There would be no change in land use from this construction.

3.2.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.2.2.2.1. Cantonment Area

The land use within the cantonment area would not change under the Proposed Action.

3.2.2.2.2. Downrange Area

Operational Readiness Training Center

The Proposed Action would change the current land use from training area to administrative and operational use. Both the IBCT and potential CAB facilities sets would be placed in the vicinity of the

ORTC, which is located southwest of the Wilderness Road and Butts Road intersection (Figure 2-2). Buildup of Wilderness Road at ORTC site would directly remove approximately at least 200 acres of training area due to facilities location. The following training land use changes would occur due to the Proposed Action:

- TUAV facility relocation;
- Loss of maneuver training area; and
- Reduction of current training areas and flight corridors due to light encroachment.

Past training that has occurred in that area includes mock Patriot missile site, National Guard training, dismounted land navigation, parachute drop zone "Range Control" dismounted maneuver, heavy maneuver, field training exercises and TUAV training.

Fort Carson continues to deploy the ACUB program with the operational premise of preventing encroachment and incompatible land use adjacent to training areas. The Proposed Action would expand and encroach on the training areas by cantonment sprawl.

Indirect training impacts from buildup at the ORTC area are discussed as follows.

Butts Army Airfield

Land use at BAAF would not change as a result of the Proposed Action. The BAAF complex would require new construction and renovation activities to support the potential CAB and its equipment. The current airfield complex land use and size would remain unchanged and be used for additional airfield-related facilities such as maintenance facilities, hangars, and office buildings for the CAB. The buildup of the Wilderness Road ORTC site, however, would impact operations at BAAF due to light encroachment and creating the presence of sensitive noise receptors such as barracks, child development center and chapel. BAAF operations will impact Wilderness Road residents due to flight patterns and safety zones, noise, dust and night training.

Ranges and Training Areas

There would be some change to land use on the range and training areas under the Proposed Action (as described in Section 3.2.2.2.2). The indirect impacts from implementing the Proposed Action would be:

- Increased utilization of range facilities, which in turn would decrease the availability of maneuver land area at Fort Carson due to range surface danger zone activation while the ranges are in use.

This in turn pushes the need to PCMS to support all battalion and above exercises, significantly adding to costs, land management requirements and staffing levels.

- The need to move several training facilities in the Wilderness Road area would create a domino effect with the loss of more training lands as these facilities would be relocated downrange to accommodate the buildup. For example, the existing TUAV facility (would impact training capability in that the new TUAV facility would have to be constructed within restricted airspace further downrange and would impede field artillery training and create conflicts with aviation routes and altitudes while the TUAVs were in use), the ASP (which removes entire blast zone and airspace above it and the ability to fire artillery over it, from training), BAAF night vision range, and the ORTC function would likely be moved to the Tent City area.
- The need for more housing in the cantonment area would cause other facilities to be pushed downrange, creating "cantonment sprawl" and more loss of training lands.
- The buildup of Wilderness Road and the possibility of moving the security fence (necessary for securing the cantonment area) would create isolation of maneuver Training Areas 1, 2, 3, and 4, Korean Valley, Range 60 (instrumented Military Operations on Urban Terrain site), Improvised Explosives Device-Defeat (IED-D) training lanes, Range 71 Land Mine Detection range, and would create logical future infill of additional training areas that have been made non-contiguous.
- Traffic pattern changes would impact use of training areas.
- Physical training (PT) running routes could present safety concerns and could potentially adversely affect traffic patterns through road closures or tank trail closures during PT times. Physical training routes could also present a conflict to urban operations, land mine detection and IED-D lane training in Training Areas 1 through 4 if utilized for PT.

3.2.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, the Army would construct the IBCT facilities set within the cantonment area at Training Area Bravo (Figure 2-2). The potential CAB facilities set would remain at the ORTC site. Range construction, live-fire, and maneuver training activities would be the same as those described for the Proposed Action.

3.2.2.3.1. Cantonment Area

The land use at Training Area Bravo would change from training area to administrative use under this alternative, but only within the proposed construction footprint (approximately 200 acres). Training Area

Bravo would still be used for light impact training (e.g., road marching, individual movement techniques, and signal operations) for small units in areas unaffected by construction.

Under this alternative, Landfill Number 2 would be considered for remediation and potential reuse either in whole (approximately 80 acres) or in part.

3.2.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would change the current land use from training area to administrative and operational use, but only within the proposed construction footprint (200 acres). Only the CAB facility set would be placed in the vicinity of the ORTC under this alternative and would require less than an approximate 50-acre construction footprint. The proposed footprint lies within the vicinity of the TUAV training area, and would have the same impacts as for the Proposed Action as described in Section 3.2.2.2.2.

Butts Army Airfield

Land use at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

There would be some change to land use on the range and training areas under this alternative as described under the Proposed Action in Section 3.2.2.2.2.

3.2.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, the Army would construct facilities for the IBCT at Tent City, near Gate 6, also located on Wilderness Road. The location and facilities are further discussed in Section 2.3.3 (Figure 2-11). The potential CAB would remain at the ORTC site.

3.2.2.4.1. Cantonment Area

Under this alternative, land use in the cantonment area would not change.

3.2.2.4.2. Downrange Area

Operational Readiness Training Center

Land use would change as described under the Proposed Action in Section 3.2.2.2.2.

Butts Army Airfield

Land use at BAAF would not change.

Ranges and Training Areas

Under this alternative, impacts would be the same as the Proposed Action, but would include additional impacts to training areas and the additional loss of a parachute drop zone. The Tent City site is currently used as a bivouac area for units to stage prior to moving downrange for maneuvers or other training operations. The land use for this site would change to administrative and operational use to support the IBCT; this would create an indirect impact by requiring its current function to be moved elsewhere on the installation.

3.2.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Implementation of the No Action Alternative would result in no change to land use.

3.2.2.6. Mitigation Measures

Fort Carson would continue to implement land use practices in order to accomplish its military mission consistent with applicable laws and regulations and without adversely affecting public land use.

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3.3. Air Quality

This section describes the affected environment and environmental consequences to air quality associated with the Proposed Action on Fort Carson. Also described in this section are the various air quality analyses that were performed for different pollutants that will be emitted during the construction and operation phases associated with the stationing actions of the IBCT and a potential CAB. Minimal comments or concerns regarding regional air quality were raised at the 2008 public scoping meetings for this EIS; however, public and regulatory comments received during the 2007 Fort Carson Transformation EIS process in 2006 were reviewed and integrated in this section.

3.3.1. Regulatory Background

In Colorado, air quality is regulated by the Colorado Department of Public Health and Environment (CDPHE) and the EPA Region VIII. The *Clean Air Act* (CAA) of 1970, 42 United States Code (U.S.C.) 7401 *et seq*., amended in 1977 and 1990, is the primary federal statute governing air pollution. The CAA established the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) to protect human health and welfare, allowing for an adequate margin of safety (Table 3.3-1). Primary and secondary NAAQS have been established for six air pollutants, known as criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and two types of particulate matter (PM_{10} is coarse particulate matter [10 micrometers or less in diameter] and $PM_{2.5}$ is fine particulate matter [2.5 micrometers or less in diameter]). Federal regulations designate Air Quality Control Regions, or airsheds, that cannot attain compliance with the NAAQS as non-attainment areas; areas meeting NAAQS are designated as attainment areas. Areas that have improved air quality from former non-attainment status to attainment are designated maintenance areas for a certain time period. Areas that lack monitoring data to demonstrate attainment or non-attainment status are designated as unclassified, although they are treated as attainment areas for regulatory purposes.

Table 3.3-1 Federal National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS	NAAQS Violation Determination [PPACG 2008(a)][3]
O_3	8-hour	0.075[1] ppm	3-year average of the annual 4th highest daily maximum 8-hour average concentration
CO	8-hour	9.0 ppm	Not to be exceeded more than once per calendar year
	1-hour	35.0 ppm	Not to be exceeded more than once per calendar year
NO_2	Annual arithmetic mean	0.053 ppm	Annual average

Table 3.3-1 Federal National Ambient Air Quality Standards (continued)			
SO_2	Annual arithmetic mean	0.03 ppm	Not to be exceeded more than once per calendar year
	24 hour	0.14 ppm	Not to be exceeded more than once per calendar year
	3 hour	0.5 ppm	Not to be exceeded more than once per calendar year
PM_{10}	Annual arithmetic mean	Revoked[3]	Expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 cannot be exceeded more than once per year on average over a three year period
	24-hour	150 µg/m^3	
$PM_{2.5}$	Annual arithmetic mean	15 µg/m^3	Three year average of annual arithmetic mean
	24-hour	65 µg/m^3	Three year average of 98th percentile of the 24-hour values determined for each year
Pb	Quarterly average	1.5 µg/m^3	Quarterly arithmetic mean

[1]New 8-hour standard effective May 30, 2008.

[2]A NAAQS violation results in the re-designation of an area; however, an exceedance of the NAAQS does not always mean a violation has occurred.

[3]Revoked annual PM_{10} standard December 2006.

µg/m^3 = micrograms per cubic meter
CO = carbon monoxide
NA = not applicable
NAAQS = National Ambient Air Quality Standards
NO_2 = nitrogen dioxide
O_3 = ozone
PPACG = Pikes Peak Area Council of Governments
Pb = lead
$PM_{2.5}$ = particulate matter (≤ 2.5 µm)
PM_{10} = particulate matter (≤ 10 µm)
ppm = parts per million
SO_2 = sulfur dioxide

Although the Colorado Springs Urbanized Area in El Paso County is currently in attainment for all criteria pollutants, it was classified as a maintenance area for CO in October 1999 due to a previous violation of the 8-hour CO standard in 1988 (Reference No. 20). This designation is currently set to run through 2015 (Figure 3.3-1).

Both Fremont and Pueblo Counties are in attainment for all criteria pollutants (Reference No. 21).

The CAA, as amended in 1990, mandates that states with regions that violate the NAAQS submit State Implementation Plans (SIPs) to EPA. These plans detail the steps that the state is taking to bring their air quality into compliance with the standards. The applicable SIP for Colorado Springs is the *Carbon Monoxide Maintenance Plan for the Colorado Springs Attainment/Maintenance Area*, approved by EPA on November 8, 2004 (Reference No. 22).

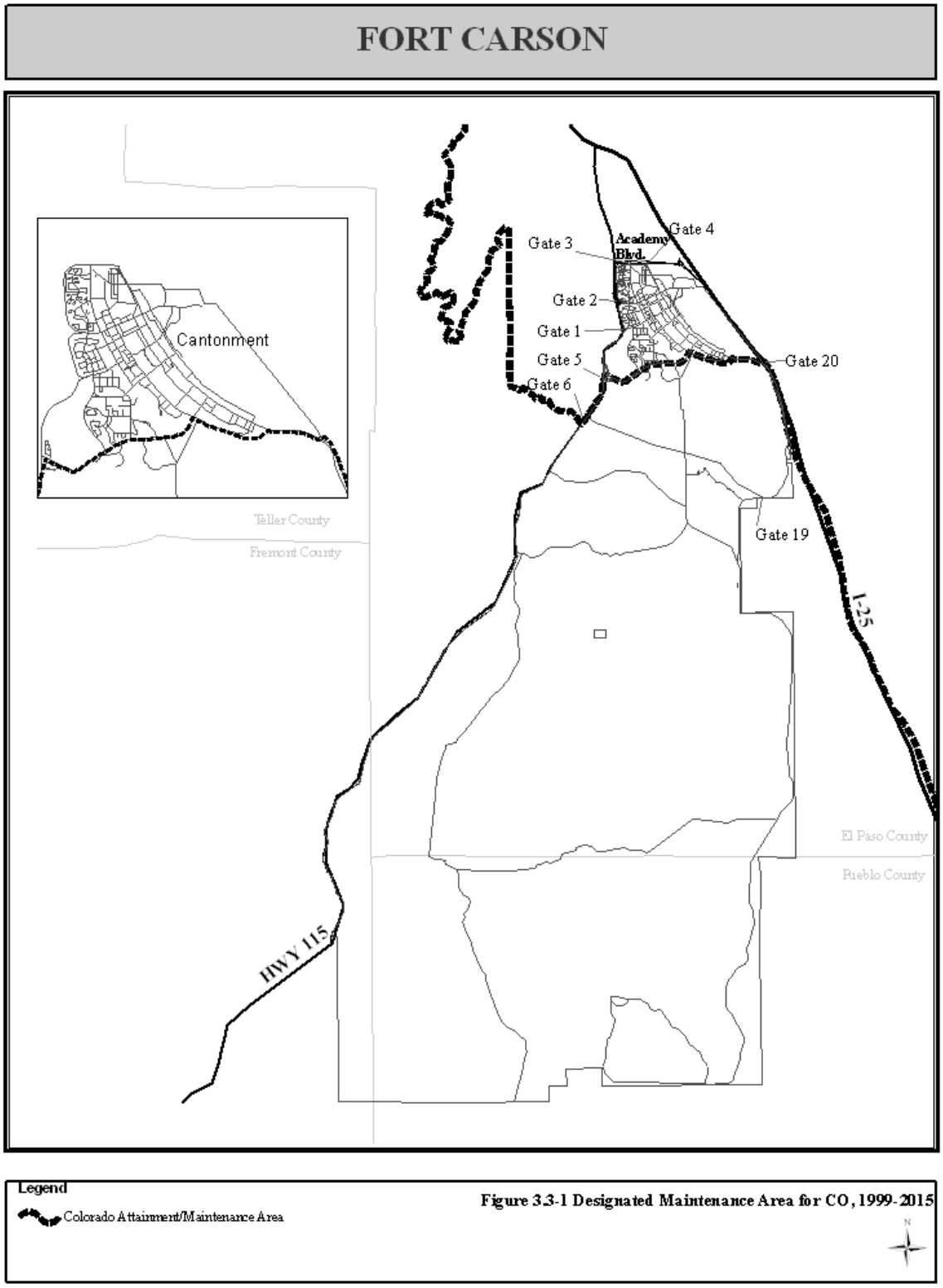

Figure 3.3-1 Designated Maintenance Area for CO, 1999-2015

Section 176(c) of the CAA requires that federal actions in any non-attainment or maintenance areas conform to a SIP to ensure the actions do not interfere with achieving attainment of the NAAQS. In 1993, EPA established two conformity regulations (40 CFR Parts 51 and 93) for transportation and non-transportation projects, which are incorporated by reference in the CDPHE Air Quality Control Commission Regulation 10, *Criteria for Analysis of Conformity*. If the action is not exempt under the rule, then its emissions must be analyzed to ensure conformity with the applicable SIP; this is called a Conformity Applicability Analysis. If the emissions exceed either the *de minimis* or regional significance level, then a Conformity Determination must be performed.

Conformity to a SIP, as defined in the CAA, means the proposed activity would not:

- Cause or contribute to a new violation of the NAAQS;
- Increase the frequency or severity of an existing violation; or
- Delay attainment of any standard, interim emission reduction, or milestone.

To continue to protect air quality in designated attainment areas for criteria pollutants, a Prevention of Significant Deterioration (PSD) applicability analysis must be conducted. Any significant net increase of criteria pollutants for which the area is designated attainment would subject Fort Carson to the PSD review requirements per Colorado Air Quality Control Commission (AQCC) Regulation No. 3, Part D, *Stationary Source Permitting and Air Pollutant Emission Notice Requirements* (40 CFR 52.21; 5 Colorado Code of Regulations [CCR] 1001-5). Section 3.3.2.3 provides further details on PSD.

The emissions of PM, CO, and SO_2 are regulated by Colorado AQCC Regulation No. 1, *Emission Control For Particulate Matter, Smoke, Carbon Monoxide, and Sulfur Oxides*, which contains opacity limits (5 CCR 1001-3). These limits are set to help ensure that visibility is not impacted in the long-term. Part IID of the regulation pertains to Fort Carson's military training with smokes and obscurants.

Non-criteria pollutants, which include but are not limited to pollutants that impair visibility, total suspended particulates, nitric oxide, and air toxics, do not have any current NAAQS.

In 1990, the Colorado AQCC established a visibility standard for the Front Range cities from Fort Collins to Colorado Springs based on the public's definition of unacceptable amounts of haze. The standard applies from 8:00 a.m. to 4:00 p.m. and is a measure of atmospheric extinction with a value of 0.1223 per mile. This means that 12.23 percent of the light in a mile of air is absorbed or scattered and essentially

never reaches the viewer. Visibility, meteorological conditions, and pollutant concentrations that have NAAQS, are all used to determine the need for mandatory and voluntary restrictions (Reference No. 23).

Although there is no quantitative visibility standard for Colorado's pristine and scenic rural areas, Section 169a of the 1977 CAA Amendments, requires EPA to create regulations to make progress towards the national goal of the "prevention of any future, and the remedying of any existing impairment of visibility in mandatory Class I Federal areas which impairment results from man-made air pollution." As such, EPA is responsible for monitoring visibility trends in mandatory federal Class I and sensitive Class II areas (i.e., applicable national parks and wilderness areas that have varying levels of protection from air pollutants). These trends are created using a haze index for the annual average of the 20 percent worst and best visibility days. EPA requires states with mandatory Class I areas to amend their SIP to include visibility protection.

In 2005, the EPA issued the final Regional Haze Rule to provide guidance for determining implementation of Best Available Retrofit Technology (BART). However, Fort Carson is not a BART-eligible source as it was constructed prior to the rule's applicable 1962-1977 timeframe.

3.3.2. Regional Air Emissions

Regional air quality is a function of the emission sources, amount of pollutants emitted, size and topography of the air basin, and prevailing meteorological conditions. Although Colorado does not identify airsheds (geographical areas that share the same air mass due to topography, meteorology, and climate), it divides the state into five multi-county monitoring areas based on topography: the Eastern Plains, the Northern Front Range, the Southern Front Range, the Mountain Counties, and the Western Counties (Reference No. 23).

There are twelve non-attainment or attainment/maintenance areas in Colorado. Colorado Springs, Longmont, Greeley, and Fort Collins have been re-designated attainment/maintenance for CO. Metropolitan Denver has been re-designated attainment/maintenance for CO, sulfur oxides (SO_x), and PM_{10}, and non-attainment for the ozone 8-hour standard. Aspen, Steamboat Springs, Pagosa Springs, Lamar, Telluride, and Canon City are attainment/maintenance for PM_{10}.

Most criteria pollutants are emitted directly from sources; however, ground-level O_3 is formed by complex photochemical reactions in the atmosphere among nitrogen oxides (NO_x), volatile organic compounds (VOCs), and the hydroxyl radical (OH). Additionally, acid deposition is the result of gaseous

emissions of SO_2 or NO_x that undergo complex reactions in the atmosphere resulting in the formation of sulfuric and nitric acid, respectively. The primary man-made sources of SO_2 are the burning of fossil fuels (e.g., coal, fuel oil and diesel) and of NO_x are motor vehicles, electric utilities, and other industrial, commercial, and residential sources that burn fuels. Visibility-affecting pollutants include NO_x, SO_2, PM, VOCs, and ammonia.

$PM_{2.5}$ is formed mostly in the atmosphere when gases from motor vehicles and industrial activities undergo chemical reactions. PM_{10} is directly emitted into the atmosphere from crushing or grinding operations, dust from construction sites, landfills and agriculture, wildfires and brush/waste burning, windblown dust from open lands and unpaved roads, etc.

CO is produced by the partial combustion of carbon compounds in environments with reduced available oxygen. Nationwide, over 50 percent of all CO emissions come from motor vehicles. Other significant sources of CO emissions include industrial processes such as metals processing and chemical manufacturing, residential wood burning, and natural sources such as forest fires. Approximately 3,000 to 10,000 acres on Fort Carson are affected annually by prescribed burns, which support training, ground maintenance, and the health of surrounding forest areas (Reference No. 24).

Ammonia gas (NH_3) can react to form ammonium (NH_4) particles that when combined with sulfate and/or nitrate cause visibility impairment. NH_4 may travel over long distances before being deposited. The primary sources of NH_3 emissions include native soil processes, livestock waste, fertilizer application, biomass burning, and fossil fuel combustion.

Based on the most recent data available from regional county emission inventories, the following emissions of criteria pollutants were reported from both point and non-point sources (Reference No. 25), as presented in Table 3.3-2.

Table 3.3-2 2001 Air Emissions Data from Point and Non-Point Sources in Counties Near and Far[1] to Fort Carson

County	CO	NO_X	SO_2	VOC	PM_{10}	$PM_{2.5}$
El Paso	148,257	23,499	14,020	20,658	18,928	5,815
Fremont	18,633	4,741	5,030	2,185	5,007	1,551
Pueblo	61,114	13,624	16,717	6,399	8,018	2,771
Las Animas	20,966	2,861	164	1,684	2,823	1,328
Larimer	93,079	13,528	1,942	11,851	18,250	4,614
Saguache	8,417	639	67	827	2,924	906

Table 3.3-2 2001 Air Emissions Data from Point and Non-Point Sources in Counties Near and Far[1] to Fort Carson (continued)						
Pitkin	10,043	1,059	101	1,147	2,023	551
Gunnison	11,312	824	109	1,277	2,410	916
Alamosa	6,592	823	104	862	2,453	550
Eagle	31,880	4,239	241	2,486	5,598	1,381
Summit	17,607	2,090	120	1,622	4,008	931
Montrose	20,581	2,874	1,556	1,781	6,399	1,670
Teller	9,239	859	58	1,123	2,921	854
Moffat	14,791	20,583	9,779	1,799	5,419	3,381
Huerfano	11,635	1,777	109	889	1,045	399

Source: Reference No. 25
[1] Near is defined as less than 31 miles and far as less than approximately 125 miles .
CO = carbon monoxide; NO_x = nitrogen oxide; PM = particulate matter; SO_2 = sulfur dioxide; VOC = volatile organic compound

3.3.2.1. Regional Ambient Air Monitoring Results

Sources of O_3 are a concern in El Paso County (Reference No. 26); however, local monitoring results demonstrate that this region is in attainment with the new 8-hour O_3 standard that was promulgated in March 2008. (CDPHE will issue attainment designations in March 2009.)

There are no air quality monitoring stations located on Fort Carson, but ambient air quality data for criteria pollutants are measured actively at seven locations in the Colorado Springs Urbanized Area (Table 3.3-3). For CO, The Woodmen Valley and US 24/I-25 monitoring stations are the only two that currently monitor this pollutant on a daily basis. The local Metropolitan Planning Organization, PPACG, reports that pollutant concentrations are below the current standards. CO concentrations have been less than 50 percent of the standard for approximately the last five years and seem to have stabilized (i.e., no discernible upward or downward trend). Although O_3 levels have increased in this urbanized area (1998-2003), the concentrations appear to have also stabilized over the last five years (2003-2007). Local data shows that SO_2 levels are well below all three NAAQS and are less than 10 percent of the annual standard. Similarly, NO_2 levels are currently less than 30 percent of the annual standard; current levels of Pb are less than 5 percent of the standard; PM_{10} concentrations are less than 50 percent of the national standard; and $PM_{2.5}$ levels are also below the standard.

Table 3.3-3 Active 2008 Air Quality Monitoring Stations in Colorado Springs							
Site Name	**Pb**	**CO**	**SO_2**	**NO_2**	**O_3**	**PM_{10}**	**$PM_{2.5}$**
Nixon Base[1]			X	X			
Woodmen Valley[1]		X	X	X			
Colorado College[2]						X	X
Regional Bldg	X					X	X
Manitou Springs					X		
Air Force Academy					X		
US 24 & I-25		X					

Source: Reference No. 27
[1] Collected CO, SO_2 and NO_2 until 2004.
[2] Started collecting $PM_{2.5}$ and PM_{10} in 2008. This monitor is a continuous read monitor.
CO = carbon monoxide; I = Interstate; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter (≤ 2.5 µm); PM_{10} = particulate matter (≤ 10 µm); SO_2 = sulfur dioxide; US = US Highway

Furthermore, PPACG believes that the air quality trends show that of all the pollutants, O_3 will likely be the pollutant of most concern, due also to the pending change in the standard. Its recommendation is for dispersion modeling for O_3 to occur for the Colorado Springs Urbanized Area to assist with identifying such sources to target effective mitigation programs (Reference No. 28). Real-time information for all of the pollutants can be found at: http://colorado.gov/airquality/air_quality.aspx and http://colorado.gov/airquality/aqi.aspx. Additionally, Tables 3.3-4 and 3.3-5 provide information on all of Colorado's ambient air quality monitors.

Table 3.3-4 Statewide Continuous Monitors in Operation for 2006							
County	**Site Name**	**Location**	**CO**	**SO_2**	**NO_X**	**O_3**	**Met**
Eastern Plains Counties							
Prowers	Lamar - POE	7100 Hwy 50					X
Northern Front Range Counties							
Adams	Commerce City	7101 Birch St.					X
	Welby	3174 E. 78th Ave.	X	X	X	X	X
Arapahoe	Highland Res.	8100 S. University Blvd.				X	X
Boulder	Boulder	1405½ S. Foothills Hwy.				X	
	Longmont	440 Main St.	X				
Denver	Auraria Lot R	12th St. & Auraria Parkway					X
	Denver CAMP	2105 Broadway	X	X	X	X	X
	Denver Carriage	2325 Irving St.	D			X	X
	Denver NJH	14th Ave. & Albion St.	D				
	DESCI Building	1901 13th Ave. (Visibility)					
	Firehouse #6	1300 Blake St.	X				
Douglas	Chatfield Res.	11500 N. Roxborough Pk. Rd.				X	X

Table 3.3-4 Statewide Continuous Monitors in Operation for 2006 (continued)							
Jefferson	Arvada	9101 W. 57th Ave.	D			X	X
	NREL	2229 Old Quarry Rd.				X	
	Rocky Flats	16600 W. Hwy. 128				X	X
		9901 Indiana St.					X
	Welch	12400 W. Hwy. 285				X	X
Larimer	Fort Collins	708 S. Mason St.	X			X	X
		300 Remington St. (Visibility)					
		4407 S. College Ave.	X				
		3416 LaPorte Ave.				X	
Weld	Greeley	905 10th Ave.	X				
		3101 35th Ave.				X	
Southern Front Range Counties							
El Paso	Colorado Springs	1098 Glenn Ave.	D				
		USAFA Rd. 640				X	
		690 W. Hwy. 24	X				
	Manitou Springs	101 Banks Pl.				X	
Teller	Cripple Creek	2nd St. & Warren Ave.					D
Western Counties							
Mesa	Grand Junction	645¼ Pitkin Ave.	X				X

Source: Reference No. 23
X = Monitors continued in 2006; D = Monitors discontinued in 2006;
CO = carbon monoxide; SO_2 = sulfur dioxide; NO_X = nitrogen oxide; O_3 = ozone; Met = meteorological

Table 3.3-5 Statewide Particulate Monitors in Operation for 2006						
County	**Site Name**	**Location**	**TSP**	**Pb**	**PM_{10}**	**$PM_{2.5}$**
Eastern Plains Counties						
Elbert	Elbert	Wright-Ingraham Inst.				X
Prowers	Lamar	100 2nd St.			X	
		104 Parmenter St.			X	
Northern Front Range Counties						
Adams	Brighton	22 S. 4th Ave.			D	
	Commerce City	7101 Birch St.	D	D	X	X/H/S
	Globeville	5400 Washington St.	D	D		
	Welby	3174 E. 78th Ave.			X/H	
Arapahoe	Arapahoe Comm. College	6190 S. Santa Fe Dr.				X
Boulder	Longmont	350 Kimbark St.			X	X/H
	Boulder	2440 Pearl St.			X	X
		2102 Athens St.				H
Denver	Denver CAMP	2105 Broadway	D	D	X/H	X/H
	Denver NJH	14th Ave. & Albion St.				H
	Denver Visitor Center	225 W. Colfax Ave.			X	
	Lowry	8100 Lowry Blvd.			D	
	Denver Animal Shelter	678 S. Jason St.	A	A	A/H	A
	Swansea Elementary Sch.	4650 Columbine St.				X

Table 3.3-5 Statewide Particulate Monitors in Operation for 2006 (continued)						
Douglas	Chatfield Reservoir	11500 Roxborough Rd.				X/H
Larimer	Fort Collins	251 Edison St.			X	X
Weld	Greeley	1516 Hospital Rd.			X	X/H
	Platteville	1004 Main St.				X/S
Southern Front Range Counties						
Alamosa	Alamosa	208 Edgemont Blvd.			X	
		425 4th St.			X	
El Paso	Colorado Springs	3730 Meadowlands			D	D
		101 W. Costilla St.	D	D	X	X/S
Fremont	Cañon City	128 Main St.			X	
Pueblo	Pueblo	211 E. D St.			X	X
Teller	Cripple Creek	209 Bennett Ave.			D	
Mountain Counties						
Archuleta	Pagosa Springs	309 Lewis St.			X	X
Gunnison	Crested Butte	603 6th St.			X	
	Gunnison	221 N. Wisconsin St.			D	
	Mt. Crested Butte	19 Emmons Rd.			X	X
Lake	Leadville	510 Harrison St.	D	D		
Pitkin	Aspen	120 Mill St.			X/H	
Routt	Steamboat Springs	136 6th St.			X	
Summit	Breckenridge	501 N. Park Ave.			X	
Western Counties						
Delta	Delta	560 Dodge St.			X	D
Garfield	Parachute	100 E. 2nd St.			X	
	Rifle	144 E. 3rd Ave.			X	
	New Castle	402 W. Main St.			X	
	Silt – Bell Ranch	512 Owens Dr.			X	
	Silt – Daley Ranch	884 County Rd. 327			X	
	Silt – Cox Ranch	5933 County Rd. 233			X	
	Glenwood Springs	109 8th St.			X	
La Plata	Durango	1060 2nd Ave.			D	
		56 Davidson Creek Rd.			D	
		1235 Camino del Rio			X	
		117 Cutler Dr.			D	
Mesa	Grand Junction	650 South Ave.			X	X/H/S
		645 ¼ Pitkin Ave.			H	
San Miguel	Telluride	333 W. Colorado Ave.			X	D

Source: Reference No. 23
X = Monitors continued in 2006; A = Monitors added in 2006; D = Monitors discontinued in 2006;
H = Hourly particulate monitor; S = Chemical Speciation;
Pb = iron; $PM_{2.5}$ = particulate matter (≤ 2.5 µm); PM_{10} = particulate matter (≤ 10 µm); TSP = total suspended particular

3.3.3. Affected Environment

The majority of Fort Carson, including all of the cantonment area is located in El Paso County, although portions of the installation lie within Pueblo and Fremont Counties. The majority of Fort Carson's cantonment area (north of Titus Boulevard and Specker Avenue) is located within the Colorado Springs maintenance area for CO.

3.3.3.1. Sources of Air Pollutants

Pollutants affecting air quality in any region can be characterized as being emitted from either stationary sources (e.g., fuel burning equipment and chemical processing operations), mobile sources (e.g., cars), or are fugitive (i.e., emissions that could not reasonably pass through a stack or tailpipe). Annually, Fort Carson prepares an emissions inventory for its stationary and fugitive emission sources, which can be generalized as follows: boilers, high temperature hot water generators, furnaces/space heaters, emergency generators, paint spray booths, fuel storage and use operations, facility-wide chemical use, and military smoke/obscurants.

3.3.3.2. Current Air Permit Requirements

Title V Operating Permit. Facilities located in an attainment area and have the potential to emit (PTE) (i.e., the maximum emissions a facility could emit given physical, enforceable, and permitting constraints) more than 100 tons per year (tpy) of a criteria pollutant must obtain a Title V Operating Permit. Since 1998, Fort Carson's PTE has exceeded this threshold for several pollutants, therefore the facility has a Title V permit (No. 95OPEP110) (Table 3.3-6). As a major Title V source, Fort Carson must submit a permit application for renewal every five years and recently received a new permit in July 2007.

The Title V permit limits the amount of pollutants from significant emission sources in various ways, depending on the source type (such as restricting operating hours, fuel type and throughput amount, emission rates, etc.).

Table 3.3-6 Fort Carson Stationary Sources Baseline Potential to Emit

Emission Unit	Pollutant (tpy)				
	PM_{10}	NO_x	CO	SO_x	VOC
Boilers, Hot Water Generators, and Exempt Miscellaneous External Combustion Units [1]	26.58	261.88	241.17	38.91	16.15
Internal Combustion Units[1]	4.81	113.00	29.24	7.61	7.07
Paint Booths	1.13	0.00	0.00	0.00	17.15

Table 3.3-6 Fort Carson Stationary Sources Baseline Potential to Emit (continued)					
Categorically Exempt Storage Tanks and Associated Operations	0.00	0.00	0.00	0.00	19.68
Military Smoke Training	31.82	0.00	0.00	0.00	31.82
Abrasive Blasting	0.07	0.00	0.00	0.00	0.00
Fire Training	0.02	0.11	0.04	0.00	0.06
Installation-Wide Total Stationary Source PTE	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**

[1] Includes units that are categorically exempt from permitting requirements under AQCC Regulation 3, Part A. PTE includes permit restrictions, size, and hours-run operational exemptions, and 24 hours × 365 days maximum fuel input operational scenarios. The baseline represents the No Action Alternative.

CO = carbon monoxide
NO_x = nitrogen oxides
O_3 = ozone
PM_{10} = particulate matter (≤ 10 µm)
tpy = tons per year
SO_x = sulfur oxides
VOC = volatile organic compounds

Hazardous Air Pollutants (HAPs), also regulated by the Title V Operating Permit, are pollutants that are known or suspected to cause cancer or other serious health effects or adverse environmental effects. The CAA Amendments of 1990 originally proposed that 188 HAPs should be regulated under the National Emission Standards for Hazardous Air Pollutants Program (NESHAPs); currently, there are 186 regulated HAPs. Due to Fort Carson's efforts in its air quality management, sustainability, and pollution prevention programs, the installation continues to be permitted as a minor (area) source of HAPs as it does not emit more than 8 tons of any single HAP or 20 tons of total HAPs per year.

New Source Review. New Source Review (NSR) this is a CAA permitting program that regulates the construction of new major stationary sources of air pollution and major modifications to existing major sources (e.g., boiler replacement, addition of new equipment). It has two components: the PSD permitting program for criteria pollutants in attainment areas and the non-attainment NSR permitting program applicable to pollutants in non-attainment areas. Sources that trigger either major modification threshold must obtain an air pollution permit prior to the construction of new stationary sources or modification of existing sources, and must comply with applicable pollution control technology and other requirements.

Fort Carson is considered a major stationary source under PSD review requirements (40 CFR Part 52.21) as its installation-wide stationary source PTE for NO_x is greater than 250 tpy (Table 3.3-6). Furthermore, the boilers and hot water generators are also considered a major listed source category because they are in one of the 28 individually regulated PSD categories (i.e., fossil fuel boilers [or combination thereof]

totaling more than 250 million British thermal units [MMBtu] per hour heat input), which has a PTE of 100 tpy. As such, Fort Carson's boilers are a major stationary source because they have a PTE of more than 100 tpy for NO_x and CO (40 CFR 52.21[b][1][i][a]).

Minor Source Permits. The AQCC Regulation No. 3, Part B requires facilities to obtain construction permits for new stationary emission sources if emission rates will be exceeded (10 tpy for CO, SO_2, NO_x, 5 tpy for VOC and PM_{10}, and 200 pounds per year for Pb). Sources with emissions less than these emission rates are generally exempt from the requirements to obtain a construction permit. An Air Pollutant Emission Notice (APEN) however, may need to be filed for those sources if emissions exceed 2 tpy. Typically, APENs are renewed every five years or when there is significant change in emissions.

Prescribed Burn Permits. Prescribed fire is used as a management tool to support the installation's readiness mission and ecosystem health. Fort Carson submitted a *Prescribed Fire Planning Document* to CDPHE, which expires in ten years based on the Colorado AQCC Regulation No. 9 (Reference No. 24). This regulation requires significant users (those who own or manage more than 10,000 acres per year and plan to use prescribed fire that will generate more than 10 tons of PM_{10}) to submit a planning document.

Annually, Fort Carson staff prepares the CDPHE and El Paso County prescribed burn permit applications in the first quarter and submits the applications to the respective regulatory agency. The required notifications are filed with the state, prior to and after each burn. The state then invoices Fort Carson each year for the previous year's actual acreage of burns and subsequent PM emissions.

Also, Fort Carson has an *Integrated Wildland Fire Management Plan* (IWFMP), "to reduce wildfire potential, effectively protect and enhance valuable natural resources, integrate applicable state and local permit and reporting requirements, and implement ecosystem management goals and objectives on Army installations" (Reference No. 28). This plan must be updated annually and revised at a minimum once every five years.

Other Permits. Fort Carson oversees numerous other permits that project proponents obtain, such as CDPHE/El Paso land development permits for excavation, land clearing, road grading, and construction activities (depending on the size and duration of the project); open burning; demolition; abrasive blasting; and asbestos permits.

3.3.3.3. Air Compliance Status

CDPHE conducts an inspection of Fort Carson's air program annually. This inspection may involve a field inspection, a records review, or both. CDPHE delegates some compliance inspections to the county health departments (e.g., El Paso County conducts biennial O_3 depleting chemical inspections and frequent inspections on demolition and land development projects). Any type of enforcement action is taken seriously by the installation personnel and acted upon immediately. The EPA Enforcement and Compliance Online (ECHO) website records the compliance status for each permitted facility. In the last three years, Fort Carson has been in compliance and has not been subject to formal enforcement actions in the last five years (Reference No. 29).

3.3.4. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.3.4.1. Proposed Action and Alternatives

Due to activities associated with IBCT and potential CAB, the number of personnel at Fort Carson and constructed support facilities would increase. Consequently, emissions would increase as a result of the following activities:

- Installation of new emission sources consisting of boilers, miscellaneous external combustion equipment, and stationary internal combustion engines;
- Training an additional IBCT and CAB; and
- Increased travel on paved and unpaved roads in the downrange areas.

Personnel. Additional military personnel (approximately 6,700) and their family members (approximately 12,500) would be relocated to Fort Carson over a period of several calendar quarters as a result of the Proposed Action (Reference No. 30). The increase in Soldiers and Families would cause increased vehicle travel and an anticipated increase in traffic congestion if no transportation/road infrastructure mitigation efforts are implemented. Increases in population, excess fuel consumption/engine idling due to congestion, and additional vehicles are all factors that can impact air quality (Reference No. 30).

In support of the 2007 Fort Carson Transformation EIS, a detailed transportation study was performed in 2005 and updated in 2008, which used a larger increase in population than what was included in the 2007 Fort Carson Transformation EIS Proposed Action. The results of the 2005 study indicated that areas with

the highest traffic congestion would be below the thresholds that would trigger an air quality analysis and therefore, off-post traffic increases would not exceed regulatory thresholds (Reference No. 31). The 2008 study considered changes in population and proposed land development. The goal of that study was to provide recommendations on ways to improve traffic flow and safety, and to assist in future planning efforts. One such recommendation highlighted the importance of maintaining traffic control (e.g., signs, traffic signals, pavement markings to sustain safe and efficient traffic flow). Maintaining traffic control adequately is critical as for instance, faulty traffic signals can lead to degraded air quality and increased fuel consumption (Reference No. 32).

Construction and Operation of Emission Sources. Emissions from mobile and stationary sources were evaluated in the General Conformity and PSD analyses for activities associated with the stationing of IBCT and the potential re-stationing of the CAB. Pollutants would be emitted from these sources during the construction and operation of new facilities, such as from vehicular exhaust, unpaved areas/roads, boilers/emergency generators etc. Construction-related impacts are expected to be short-term and limited to the duration and area of the construction activities. All disturbed areas greater than one acre must have, and comply with, an El Paso County land development permit; if a construction site/project is more than 25 acres or disturbed for more than six months then a state permit is required. For the construction activities associated with this EIS, the construction contractor would be held responsible for preparing and filing land development permit applications prior to beginning the land development work, and complying with all permit conditions. Permit conditions typically include dust suppression methods, such as daily watering of disturbed surfaces and soil stockpiles, covering stockpiles, temporary chemical stabilization, and track-out controls to minimize windblown and vehicular born fugitive dust from construction sites.

For the proposed stationary source activities associated with this EIS, Fort Carson would be responsible for preparing and filing permit to construct applications prior to installing any stationary sources, and complying with all permit conditions. Fort Carson must include these units in its Title V operating permit as a significant activity. An application to revise the Title V operating permit must be submitted no later than twelve months after startup (Regulation No. 3, Part C.III.B.2). Based on similar construction that is occurring in support of Fort Carson Transformation activities, it is anticipated that most of the construction associated with this EIS would involve APEN-exempt boilers and water heaters, along with a few emergency generators. Due to the State of Colorado's recent adoption of New Source Performance Standards (Subpart IIII—*Standards of Performance for Stationary Compression Ignition Internal Combustion Engines*), the exemptions for such units in Regulation 3 (Stationary Source Permitting) are

no longer available for any source subject to Part A of Regulation No. 6 (*New Source Performance Standards*). Therefore, the diesel-fired emergency generators will require APENs, construction permits, and inclusions in the Title V operating permit.

Due to the construction activities (and associated land preparation work), installation/operation of stationary sources, military training maneuvers and vehicular traffic associated with the IBCT and CAB stationing/re-stationing activities, there would be impacts to the regional and local air quality. Therefore, in accordance with federal and state air laws and regulations, several analyses were performed to assess these short- and long-term impacts from the air emissions associated with these activities, as well as cumulative impacts from numerous other Army directives/initiatives that have occurred or would occur in the foreseeable future. The No Action Alternative is the baseline for comparison of air quality impacts.

General Conformity. For federal actions occurring on Fort Carson within the CO maintenance area, the installation must assess, prior to the action occurring, if an action is subject to the Conformity Rule. Since the Proposed Action would not receive federal highway funds, the transportation conformity regulations do not apply. However, the general conformity regulations described in the rule for *Determining Conformity of Federal Actions to State or Federal Implementation Plans* do apply. A General Conformity Analysis was performed to estimate both direct and indirect actual CO emissions from all mobile, stationary, and area sources associated with the Proposed Action. In order to account for the worst case actual CO emissions and to follow conformity criteria, the potential re-stationing of a CAB, which is reasonably foreseeable and has known activities, was included in this analysis with IBCT (i.e., they were considered as one federal action for the purposes of this analysis).

Three possible locations were considered for the federal action. The IBCT is the only unit to change location between the siting alternatives; its facilities could be set either:

1) South of Titus Boulevard and the CO maintenance area, on Wilderness Road at the ORTC site, identified as the Proposed Action;
2) Within the main cantonment area (i.e., at Training Area Bravo on the eastern side), referred to as Alternative 1; or
3) South of Titus Boulevard and the CO maintenance area, on Wilderness Road at the Tent City site, referred to as Alternative 2.

For each alternative scenario, the CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the CO maintenance area) and the CAB facilities would be constructed outside these areas, at the ORTC site and BAAF (directly adjacent to the ORTC site).

To determine if the impacts from the Proposed Action and alternatives would exceed the regulatory *de minimis* threshold, the CO emissions were calculated using various tools and data. Emissions from mobile, stationary, and area sources were quantified using AP-42 emission factors (Reference No. 33) and by employing two versions of the Air Conformity Applicability Model (ACAM), version 4.3.3 (Reference No. 34) and version 4.3.31 (Reference No. 35). The latest vehicular emission model, MOBILE6.2 (Reference No. 36), was used as an input file to ACAM.

PSD Applicability Analyses. Two PSD applicability analyses were performed for the potential emissions associated with the stationary sources anticipated for IBCT and CAB activities. The analyses yielded results indicating that neither IBCT nor CAB activity would be subject to PSD permitting requirements under NSR regulations as the emissions increase from each activity would be less than the applicable major modification threshold for all criteria pollutants (Table 3.3-8 and Table 3.3-9 in Section 3.3.4.2.2). For additional details of the PSD applicability determinations, see Appendix C.

Air Dispersion Modeling. Air Dispersion Modeling (ADM) was completed to assess the cumulative impacts on ambient air quality from existing, proposed, and recently added emission sources at Fort Carson, and also includes quantification of particulate matter emissions from maneuvers training. The modeling includes new and proposed emissions from transformation, GTA, and ongoing Army MILCON and DPW projects. The models of choice were EPA's preferred near field (i.e., less than 31 miles) regulatory model AERMOD, and the long range transport model California Puff Model (CALPUFF). Analysis by the models included criteria pollutant concentrations at critical receptor distances, visibility, and PSD increment consumption at Class I and II designated airsheds. For additional details on the ADM analysis and results, see Chapter 5 and Appendix C.

Training. Due to Fort Carson's topography, semi-arid climate conditions, soil types, and training requirements based on Army doctrine to train Soldiers to specific readiness standards, long-term impacts can be expected from the increased personnel and their equipment and therefore, increased training activities in the downrange area (in terms of frequency, additional vehicles, and type of training). Fort Carson's ability to provide a wide variety of training causes a military-unique problem of generating PM from non-traditional sources. Such sources include PM from training activities (e.g., extensive mounted

and dismounted maneuver training and military convoy travel on unpaved roads, airborne training, cannon artillery practice, gunnery ranges, mortar firing, weapons impact testing, smoke and obscurant training), open burning/open detonation, and prescribed burning (although the latter is an ecosystem management tool that assists training). Since the nature of training activities post 9/11 has shifted towards an increase in urban warfare training and is not smoke/obscurant intensive, it is anticipated that there would not be a need to increase the use of smoke/obscurants in excess of the existing permit limits, which provides sufficient buffer to account for increased training loads.

To determine the effect that training an additional IBCT and potential CAB would have on air quality, PM near-field concentrations were estimated using air dispersion modeling to assess the cumulative impacts from existing, proposed, and recently added emission sources on Fort Carson (Chapter 5). Additionally, military personnel increases were used to estimate expected increases in small arms munitions use from training activities, and thus extrapolate HAPs emissions increases.

3.3.4.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.3.4.2.1. Cantonment Area

CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the CO maintenance area). The Proposed Action includes the necessity to demolish six buildings.

General Conformity

The construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in POV/government-owned vehicle (GOV) traffic were evaluated under the General Conformity requirements. Downrange area construction would cause indirect impacts to the maintenance area (Figure 3.3-1). The duration of construction activities was estimated and the various associated phases (site preparation, grading, facility construction, and the first year of facility operation) were analyzed.

Building space was estimated for this alternative based on the most current Department of Army planning documents.

Maximum CO emissions for this alternative are estimated to occur in calendar year 2012 (Table 3.3-7). These maximum emissions are well below the *de minimis* threshold for CO emissions, which is 100 tpy. Furthermore, as these maximum emissions are not considered regionally significant, as the established

emissions inventory for 2015 in the SIP is 409.35 tpy (Reference No. 22), no further analysis (i.e., a Conformity Determination) was required for the Proposed Action. A Record of Non-Applicability was prepared and is in Appendix C.

3.3.4.2.2. Downrange Area

Operational Readiness Training Center

Facilities and support facilities for the IBCT and CAB would be constructed outside the main cantonment area (outside of the CO maintenance area) at the ORTC site. PSD Applicability Analysis Results from the construction of stationary sources are illustrated in Tables 3.3-8 and 3.3-9.

Table 3.3-7 Summary of Total CO Emissions from Federal Action Scenario 1 at Fort Carson Cantonment Area (tpy)

Emissions Source[1]	**2009**	**2010**	**2011**	**2012**	**2013**
Construction (worker trips, mobile equipment, stationary equipment, dust-generating equipment)	30.59	13.06	11.67	6.74	0
Mobile (POV)	0	0	0	53.99	53.99
Mobile (GOV)	0	0	0	3.49	3.49
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	0.13	0.13	0.39	0.64
Total Estimated CO Emissions	**30.59**	**13.19**	**11.8**	**64.66**	**58.18**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

[1]Categories of emergency generators and miscellaneous are not in this table because in this scenario they are outside of the CO maintenance area.
GOV = government-owned vehicle
POV = privately owned vehicle
tpy = tons per year

Table 3.3-8 Potential to Emit Increase from Proposed GTA Stationary Sources at Fort Carson (tpy)

Potential Point Source Emissions	**PM_{10}**	**NO_x**	**CO**	**SO_x**	**VOC**	**Pb**
Proposed Stationary Point Sources	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

CO = carbon monoxide
NO_x = nitrogen oxides
Pb = lead
PM_{10} = particulate matter (≤ 10 µm)
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds

Table 3.3-9 Potential to Emit Increase from Proposed Combat Aviation Brigade Stationary Sources at Fort Carson (tpy)						
Potential Point Source Emissions	**PM_{10}**	**NO_x**	**CO**	**SO_x**	**VOC**	**Pb**
Proposed Stationary Point Sources	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

CO = carbon monoxide
NO_x = nitrogen oxides
Pb = lead
PM_{10} = particulate matter (≤ 10 µm)
SO_x = sulfur oxides
tpy = tons per year
VOC = volatile organic compounds

Butts Army Airfield

The CAB facilities would be constructed at the ORTC site and at BAAF. Renovations to existing buildings at BAAF would also occur under the Proposed Action. Both areas are located outside of the CO maintenance area.

Ranges and Training Areas

The construction/upgrades to ranges under the Proposed Action would occur downrange (outside the CO maintenance area).

3.3.4.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.3.4.3.1. Cantonment Area

General Conformity

The direct impacts to the CO maintenance area involving the construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in POV/ GOV traffic were evaluated under the General Conformity requirements. The duration of construction activities was estimated and the various associated phases (site preparation, grading, facility construction, and the first year of facility operation) were analyzed. Building space was estimated for this alternative based on the most current Department of Army planning documents.

Table 3.3-10 shows the total direct and indirect CO emissions for each applicable source for Alternative 1. The maximum CO emissions from all emissions sources are expected to occur in 2012 at 153.23 tpy.

The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory *de minimis* levels. Since the threshold for CO emissions under General Conformity is 100 tpy, the maximum emissions do exceed this threshold however, Fort Carson can demonstrate that Alternative 1 complies with the General Conformity Rule requirements in the following ways:

Table 3.3-10 Summary of Total CO Emissions from Federal Action Scenario 2 at Fort Carson Cantonment Area (tpy)

Emissions Source	2009	2010	2011	2012	2013
Construction	92.2	43.09	11.51	6.74	0
Mobile (POV)	0	0	0.16	96.43	96.43
Mobile (GOV)	0	0	0	34.09	34.09
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	1.68	2.97	3.23	3.49
Emergency Generators	0	0	0.21	0.27	0.27
Miscellaneous	0	0	0	15.23	15.23
Total Estimated CO Emissions	**92.2**	**44.77**	**14.85**	**156.05**	**149.57**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

GOV = government-owned vehicle POV = privately owned vehicle
tpy = tons per year

- The *FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area* allows a "sufficient margin of safety to the mobile source emissions budget[2] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Reference No. 30). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by calendar year 2015 (Reference No. 37). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active

[2] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

duty troop population for Fort Carson after this proposed action (fiscal year 2013) is estimated to be 32,000 Soldiers. However, "…deployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Reference No. 38). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and criteria for demonstrating conformity (per 40 CFR 93.158[a][5][ii]), as those emissions will be certified as accounted for in the TIP by PPACG.

- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant; therefore, demonstration of conformity is not required and is documented on a Record of Non-Applicability.

See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

3.3.4.3.2. Downrange Area

Operational Readiness Training Center

Facilities for the CAB would be constructed outside the main cantonment area (outside of the CO maintenance area) at the ORTC site. Support facilities (e.g., chapel, child development center) would not be necessary under this alternative because Soldiers would have access to nearby facilities already existing within the cantonment area. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

Butts Army Airfield

The CAB facilities would be constructed at the ORTC site and at BAAF. Renovations to existing buildings at BAAF would also occur under the Proposed Action. Both areas are located outside of the CO maintenance area. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

Ranges and Training Areas

The construction/upgrades to ranges under the Proposed Action would occur downrange (outside the CO maintenance area). Training related activities that would be conducted to support Alternative 1 are the

same as discussed for the Proposed Action. See Tables 3.3-8 and 3.3-9 in Section 3.3.4.2.2 for PSD Applicability Analysis Results from the construction of stationary sources.

3.3.4.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Alternative 2 impacts, for the purposes of air quality analysis, would be the same as those discussed for the Proposed Action. The close proximity of these sites are not predicted to result in different impacts to air quality. Tent City and ORTC sites are less than 1 mile apart.

3.3.4.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, but, their impacts have been included as part of this No Action Alternative.

Construction. Similarly, if the Proposed Action were not to occur, the construction activities would not increase over those existing or currently planned for; therefore, no additional air emissions would be generated from construction.

Training. Training activities would also be expected to remain as described in the 2007 Fort Carson Transformation EIS, which is the basis for the No Action Alternative. This assumes the rotation of units continues at the same rate; current land-based training restrictions would not change; maneuver damage prevention would continue to be implemented (i.e. the same training lands need to be rested to recover between significant military exercises); topography limitations remain; and SDZs (Figure 2-7) for ranges remain unchanged.

Prescribed burn activities would continue and are dependent on uncontrollable climate factors such as drought and meteorological conditions. As required by both CDPHE and El Paso County regulations, Fort Carson would continue to adhere to the regulatory requirements and ensure that conditions are acceptable for prescribed fires and that air quality is not compromised (Reference No. 39).

The use of hand-held smoke grenades and mechanical generators for large area obscurant training would continue to be limited by the Title V Operating Permit emission rates and administrative operational controls would remain in place as per AQCC Regulation No. 1, Part II.D to ensure no off-property transport of visible emissions from any smoke or obscurants.

Consequently, the No Action Alternative would not result in increased air quality impacts from training.

3.3.4.6. Mitigation Measures

Fort Carson is currently performing mitigation strategies, to reduce environmental impacts from ongoing activities. All listed planning and sustainability initiatives would be implemented for the Proposed Action.

All required regulatory permits will include the necessary controls, limits, and appropriate technologies to be implemented and maintained as a condition of source or action operation. Fort Carson will comply with such measures and maintain records to accurately account for emissions control management practices.

Administrative mitigations include all actions that Fort Carson would take beyond required regulatory mitigation to limit impacts to the environment. For example, the PSD analyses listed in Table 3.3-8 and 3.3-9 in Section 3.3.4.2.2 are based on all stationary fuel firing appliances (boilers, hot water heaters, make-up air units [MAUs], etc.) being equipped with low NO_x burners capable of meeting emissions certifications of no more than 30ppm for NO_x. Therefore, for the Proposed Action and all action alternatives, Fort Carson would require all construction to comply with this mitigation requirement.

Fort Carson has imposed and enforces speed limitations down range for tactical vehicle maneuvers to limit fugitive PM emissions. Additionally, Fort Carson employs the use of a dust palliative on the installations dirt roads and tank trails that are in close proximity to the boundaries and critical receptors. The annual application is subject to the availability of funds and is applied to limit off site transport of maneuver born fugitive dust.

3.4. Noise

This section describes the affected environment and environmental consequences of noise generating activities associated with the Proposed Action on Fort Carson.

Noise is generally defined as unwanted sound. It can be any sound that is undesirable because it interferes with communications or other human activities, is intense enough to damage hearing, or is otherwise annoying. Human response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and the receptor, receptor sensitivity, and time of day.

The most widely used metric for noise is the day-night average sound level (DNL), which is the metric recommended by EPA and used by most federal agencies to measure environmental noise. The DNL represents energy-averaged sound levels measured by summing and averaging sound exposure level values during a 24-hour period. A penalty of 10 decibels (dB) is assigned to noise events (including aircraft operations) occurring between 10:00 p.m. and 7:00 a.m. The 10-dB penalty compensates for generally lower background noise levels and increased annoyance associated with events occurring at night.

DNL is a useful descriptor for noise in two respects. First, it is an average, and it fits intuitive concepts when dealing with continuous noise, such as that from a busy highway. Second, because it is a summation of sound energy over a 24-hour period, it is a cumulative metric. For intermittent sound, it represents the total sound being received rather than the sound level at any given time. Noise from transportation sources, such as vehicles and aircraft, and from continuous sources, such as generators, is assessed using the A-weighted DNL (ADNL). The ADNL significantly reduces the measured pressure level for low-frequency sounds while slightly increasing the measured pressure level for some high-frequency sounds. Noise from small arms ranges is assessed using the ADNL. Impulse noise resulting from armor, artillery, and demolition activities is assessed in terms of the C-weighted DNL (CDNL). The CDNL is often used to characterize high-energy blast noise and other low-frequency sound capable of inducing vibrations in buildings or other structures. The C-weighted scale does not substantially reduce the measured pressure level for low-frequency components of a sound.

The Army seeks to minimize the impact or annoyance of unwanted noise produced by military operations on communities surrounding its installations. Under its *Environmental Noise Management Program (ENMP)* (formerly known as the *Installation Compatible Use Zone Program*), the Army evaluates the impact of noise that may be produced by ongoing and proposed Army actions and activities. To evaluate

the potential effects of noise associated with military operations, the Army conducts noise studies and generates noise contours. The ENMP characterizes noise into three primary zones (Noise Zones [NZ] I-III) as shown in Table 3.4-1. NZ I is typically suitable for all types of land uses and is located the furthest from the noise source. NZ II and NZ III are generally considered incompatible for noise-sensitive land uses.

Table 3.4-1 Noise Zones

Noise Zone	Noise Limit				
	Population Highly Annoyed (percent)	Transportation (ADNL)	Large-Caliber Weapons (CDNL)	Small-Caliber Weapons (ADNL)	Small-Caliber Weapons (PK15[met])
LUPZ	9-15	60-65	57-62	60-65	NA
Zone I	<15	<65	<62	<65	<87
Zone II	15-39	65-75	62-70	65-75	87-104
Zone III	>39	>75	>70	>75	>104

Source: Reference No. 40
ADNL = A-weighted day-night average sound level
CDNL = C-weighted day-night average sound level
LUPZ = Land Use Planning Zone
PK15(met) = contours

In addition to the contours discussed above, other metrics used to create noise contours include the *Land Use Planning Zone* (LUPZ) and the PK15(met) contours. The LUPZ encompasses an area during which periods of increased operations can lead to increased community annoyance levels associated with above average training activities. The PK15(met) contour shows the peak noise level that is expected to be exceeded by only 15 percent of the events and gives personnel a truer indication of the maximum level they are likely to hear during training activities. The PK15(met) thresholds of complaints associated with large-caliber weapons noise are shown in Table 3.4-2.

Table 3.4-2 PK15(met) Large-Caliber Weapons Noise Contours

Complaint Level	Decibel Range for Large-Caliber Weapons
Low Risk	<115
Moderate Risk	115-130
High Risk	>130

Source: Reference No. 41

3.4.1. Affected Environment

Noise-sensitive areas adjacent to Fort Carson consist of numerous communities and residential developments. To the north, these areas include Cheyenne Mountain State Park and the communities of Colorado Springs, Security, Widefield, and Fountain. Other noise-sensitive areas include Turkey Canyon Ranch and Red Rock Valley Estates along the western boundary, and El Rancho and Midway Ranch along the eastern boundary. Noise-sensitive locations adjacent to the southern boundary of Fort Carson

include the communities of Penrose and Pueblo, which are located to the southwest and southeast, respectively. Noise-sensitive areas within Fort Carson are limited to the cantonment area.

Sources of noise associated with Fort Carson include aircraft and traffic as well as large- and small-caliber weapons. The primary sources of noise are the firing of weapons, specifically large-caliber weapons such as artillery and tank main guns, as well as the operation of military aircraft at BAAF.

Secondary sources of noise include motor vehicle traffic, consisting of cars, trucks, and tracked vehicles. Fort Carson operates in accordance with the *Installation Environmental Noise Management Plan, Fort Carson,* CO (Reference No. 40) and FC Regulation 95-1, *Army Aviation : General Provisions and Flight Regulations* (Reference No. 42). The ENMP outlines the policies and procedures for managing and limiting noise impacts to the surrounding communities. FC Regulation 95-1 prescribes specific noise abatement requirements for aviation personnel.

In accordance with the ACUB Fort Carson has delineated a 1.5- to 2-mile buffer around the installation boundary. The purpose of the buffer is to limit further development and encroachment in areas adjacent to the installation likely to experience noise impacts. The program provides a natural buffer between military training lands and noise-sensitive residential and commercial land uses, thereby protecting noise-sensitive areas from the negative effects of noise pollution resulting from training activities. El Paso County is responsible for recording noise disclosures and regulating land use on private lands surrounding Fort Carson. A more detailed description of the ACUB program is described in Section 3.2.1.3.4.

3.4.2. Environmental Consequences

The US Army Center for Health Promotion and Preventive Medicine (CHPPM) evaluated potential noise impacts associated with the Proposed Action and alternatives at Fort Carson in June 2008. The evaluation compared Fort Carson's 2006 noise study against potential future actions, and resulted in no significant change. The 2006 study evaluated large and small-caliber weapon noise as well as aircraft noise. The following discussions describe elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.4.2.1. Proposed Action and Alternatives

Noise contours would remain unchanged as a result of the Proposed Action or alternatives. However, there would be increased occurrence of noise generating training activities on the installation. This increased occurrence would occur regardless of the facility siting alternative chosen. The additional noise generating episodes would occur during training events, and are entirely independent of facility set placement.

3.4.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.4.2.2.1. Cantonment Area

Additional building and roadway maintenance and construction would occur under the Proposed Action, potentially resulting in elevated noise levels at noise-sensitive locations adjacent to the construction sites. Elevated noise levels during construction would not be expected to extend outside the boundaries of Fort Carson and would be temporary and short term in duration.

3.4.2.2.2. Downrange Area

Operational Readiness Training Center

Noise levels would not increase at the ORTC under the Proposed Action. Personal, commercial and military vehicle use (both ground and aviation) is authorized and occurs on this site as well as on the adjacent Wilderness Road. Vehicle use in and around the ORTC and Wilderness Road would significantly increase but would not raise overall noise levels within this area.

In contrast, the Proposed Action would have significant noise impacts on facility occupants. Most of the proposed construction footprint for the IBCT and CAB is located within NZ II and III (65-75, and >75 db ADNL, respectively) of the BAAF noise contour (Figure 3.4-1). The noise level within NZ III is considered so severe that noise-sensitive land uses should not be considered therein. Exposure to noise within NZ II is considered significant, and use of land within this zone should normally be limited to activities such as industrial, manufacturing, transportation, and resource production; however, if planners determine that land in NZ II areas must be used for residential purposes, then noise level reduction features of 25 to 30 dB should be incorporated into the design of the construction project (Reference No. 40).

Butts Army Airfield

Noise levels would not change at BAAF under the Proposed Action as existing noise contours for BAAF currently account for similar CAB flight activities.

Ranges and Training Areas

Noise contours would not change as both ground and aviation equipment in the Proposed Action have been accounted for in previous studies.

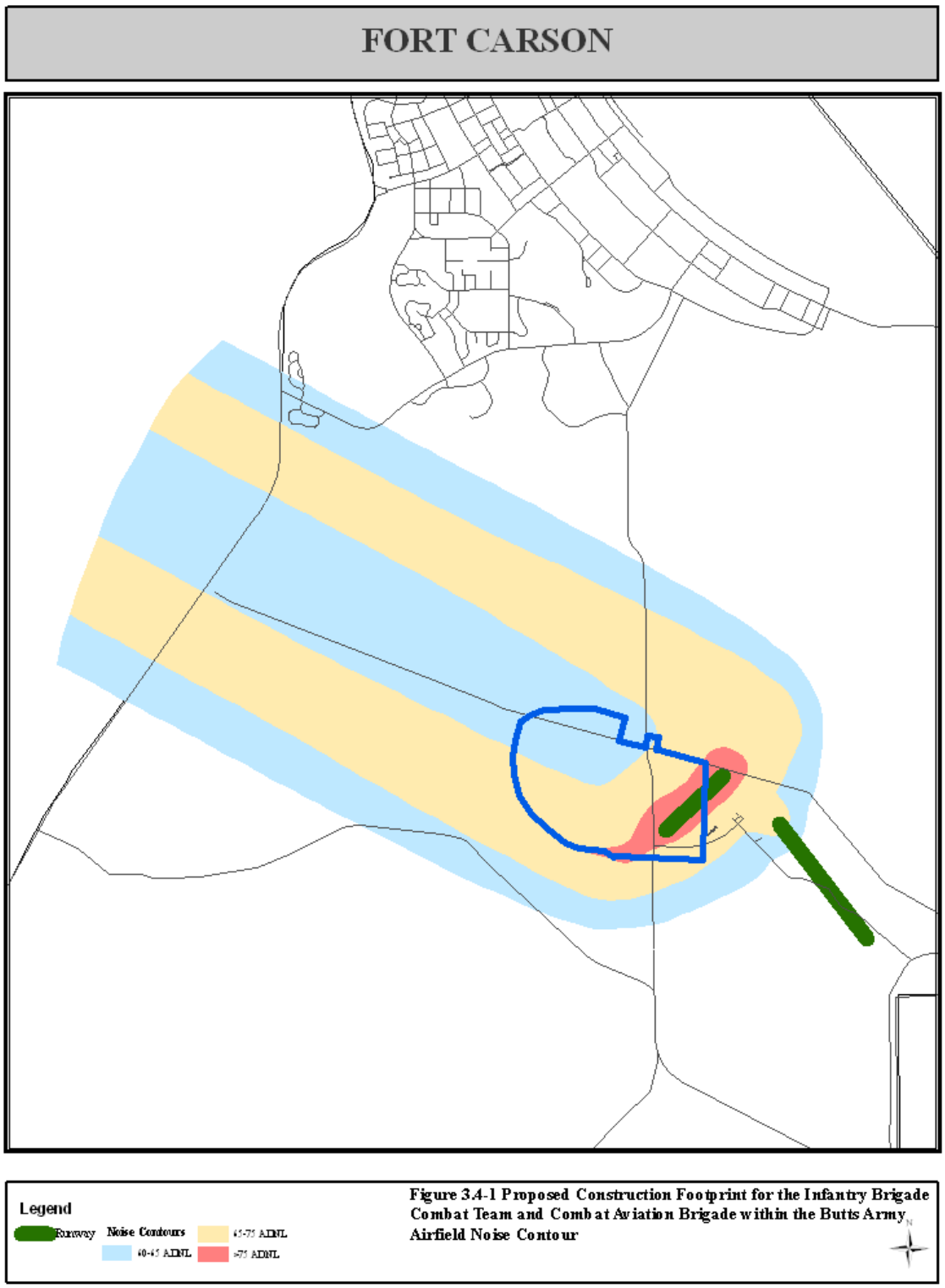

Figure 3.4-1 Proposed Construction Footprint for the Infantry Brigade Combat Team and Combat Aviation Brigade within the Butts Army Airfield Noise Contour

3.4.2.2.3. Large-Caliber Weapons Noise

Noise contours for large-caliber weapons would not change under the Proposed Action. However, noise generating activities associated with live-fire training is expected to increase occurrence by 26.9 percent (IBCT - 20.5 percent, and CAB – 6.4 percent) (Reference No. 43). The projected increase in occurrence would not change existing noise contours, however, because weapon systems, range locations, and SDZs would not differ from those in the No Action Alternative.

Table 3.4-3 provides a summary of existing NZs II and III resulting from large-caliber weapons.

Table 3.4-3 Large-Caliber Weapons Noise Contours

		Distance into Noise-Sensitive Area (meters)	
	Land Use-Planning Zone	**NZ II**	**NZ III**
Noise Sensitive Area	**Existing**	**Existing**	**Existing**
Turkey Canyon Ranch	Completely encompasses	700	400
Fountain	Completely encompasses	1,300	500
El Rancho	Completely encompasses	4,000	400
Midway Ranch	Completely encompasses	4,000	N/I

Source: Reference No. 9
N/I = no impact
NZ = noise zone

3.4.2.2.4. Small-Caliber Weapons Noise

There would be no change in small-caliber weapon use under the Proposed Action. Therefore, the noise contours for the Proposed Action and No Action Alternative are the same.

3.4.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.4.2.3.1. Cantonment Area

Noise levels would not increase within the cantonment area as a result of the Proposed Action. Personal, commercial, and military vehicles routinely travel in and around the Training Area Bravo footprint and are currently subject to low posted speed limits which help mitigate for noise. The Proposed Action may, however, increase the duration of traffic-related noise due to a significant increase in Soldier population density in the area. This noise is not anticipated to travel beyond the cantonment area and installation boundaries, and would only potentially impact areas currently used as motor pools or other industrial operations.

3.4.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would have the same impacts as the Proposed Action, but only for the proposed CAB facilities within the ORTC footprint.

Butts Army Airfield

Noise levels would be the same as for the Proposed Action.

Ranges and Training Areas

Noise levels would be the same as for the Proposed Action.

3.4.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

This alternative would have the same noise related impacts as discussed in the Proposed Action for the cantonment and downrange areas.

3.4.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of this No Action Alternative.

3.4.2.5.1. Aircraft and Traffic Noise

Noise contours generated for BAAF indicate that the NZ III contour (greater than 75 ADNL) does not extend beyond the boundary of Fort Carson or into any noise-sensitive areas within Fort Carson. Noise contours for NZ II (65-75 ADNL) and the LUPZ (60-65 ADNL) extend beyond the western boundary of Fort Carson.

A supplemental annoyance buffer for the NOE flight corridor was generated. The 0.25-mile-wide buffer on both sides of the NOE flight corridor was determined to be sufficient to account for possible annoyances outside the actual NOE flight corridor. The supplemental annoyance buffer extends into

noise-sensitive areas, including El Rancho, Turkey Canyon Ranch, and Red Rock Valley Estates, by as much as 0.25 miles. It should be noted that the buffer does not surround the entire installation because the NOE flight corridor is located at varying distances from the boundary and does not follow the full length of the installation boundary.

There would be no change to the NOE flight corridor under the Proposed Action; therefore, a discussion of noise resulting from the NOE flight corridor is not included in the following analysis. Noise from aerial maneuvers, however, is likely to be more frequent under the Proposed Action because there would be additional permanently assigned aircraft or helicopters associated with the CAB.

3.4.2.5.2. Large-Caliber Weapons Noise

Noise contours were generated for noise associated with the firing of large-caliber weapons (see Appendix D). Under the No Action Alternative, the NZ III (70 CDNL) contour extends beyond the western boundary into Turkey Canyon Ranch. The NZ III contour extends past the eastern boundary into a portion of El Rancho. The NZ II (62 CDNL) and LUPZ (57 CDNL) contours extend beyond the western boundary into Turkey Canyon Ranch and beyond the eastern boundary into Midway Ranch, Fountain, and El Rancho. Specifically, the LUPZ contour nearly encompasses both El Rancho and Midway Ranch.

In addition, the PK15(met) contours for large-caliber weapons noise were generated for Fort Carson and are shown in Appendix D. Under the No Action Alternative, both the PK15(met), 130-dB contour and the PK15(met), 115-dB contour extend past the western, northern, and eastern boundaries into Turkey Canyon Ranch, Red Rock Valley Ranch, Midway Ranch, and El Rancho; the PK15(met), 115-dB contour also extends into the community of Fountain.

The PK15(met) noise levels associated with training activities under the No Action are expected to be the same as the Proposed Action (see Section 3.4.2.4). Although the frequency of training activity would increase as a result of increased training requirements, the types of noise-generating equipment and the noise levels from equipment use would not change (i.e., no new large-caliber firing systems would be used).

3.4.2.5.3. Small-Caliber Weapons Noise

The noise contours for small-caliber weapons shown in Appendix D currently extend outside the eastern boundary; the NZ II (PK15[met], 87-dB) contour extends less than 2,300 feet into the community of

Fountain. The NZ III (PK15[met], 104-dB) contour also extends past the eastern boundary, but barely beyond I-25.

3.4.2.5.4. Construction Noise

Noise from construction activities, such as routine maintenance of buildings and roads, would not extend outside the boundaries of Fort Carson. The majority of these activities would be limited to the cantonment area and would result in temporary and short-term impacts to sensitive locations within that area. These impacts would be minor.

No adverse effects to noise-sensitive areas resulting from routine maintenance of buildings and roadways would occur under the No Action Alternative.

3.4.2.6. Mitigation Measures

Fort Carson would continue to implement the installation "Fly Neighborly" program, of which works to lessen the noise aircraft produce when flying in developed areas.

Noise complaint management procedures would continue to be implemented by logging, investigating, and applying corrective actions where applicable.

Other possible mitigation measures are siting adjustments for noise sentitive facitilties, management of training activities, use of noise reduction technologies for receptors located within NZ II and NZ III.

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3.5. Geology and Soils

This section describes the affected environment and environmental consequences to geology and soils associated with the Proposed Action on Fort Carson.

Several sources of information were used in this analysis of geology and soils impacts. These sources of information included collaboration with the regional branch of the NRCS, soil surveys information from the NRCS web mapper, studies from the Center for Environmental Management of Military Lands (CEMML), information from Army environmental and Geographic Information System (GIS) professionals employed by Fort Carson, and peer reviewed studies. These sources of information were used to predict the impacts to Fort Carson's soils and geology, which may result from GTA stationing actions and the potential stationing of a CAB.

Projected impacts from the Army's Proposed Action would result from four general categories of action that the Army would need to undertake to support new unit stationing as a part of GTA or other actions. These four categories of action include:

1) Cantonment area and downrange area construction;
2) Training range and infrastructure construction/upgrades;
3) Live-fire training activities; and
4) Maneuver training activities.

The analysis of impacts and discussion of environmental consequences are organized by these four categories. Discussion of environmental consequences within this analysis focuses mainly on projected maneuver impacts, as this is the military activity that is projected to have the greatest impact on the existing soils and geologic conditions.

In conducting the analysis of soils and geology impacts within this document, installation range managers provided an overview of the type and geographic extent of live-fire and maneuver training activities that would take place at Fort Carson and PCMS to support the stationing of an IBCT, the CAB, and other GTA units. This information was used to generate 5,000- to 10,000-acre plots to analyze existing conditions and the projected impacts of military maneuvers. The NRCS web mapper tool was used to provide an assessment of compatibility and suitability of soil conditions in relation to military vehicle use associated with stationing actions, projected intensity of use, and location.

The most substantial impacts from stationing of military units (in terms of geographic extent and intensity) to the existing environment would result from maneuver training. The prediction of soil impacts requires the consideration of several variables. These variables include soil texture (fine- vs. coarse-grained material) important to wind and water erosion potential, soil strength, slipperiness in connection with surface shear, stickiness, stone content, aggregation, and slope. The NRCS web mapper tool was used to evaluate lightweight truck, heavy four-wheel truck, aviation, foot traffic, and light digging impacts at plots selected based on likely areas for military training. The analysis assumes repeated (50 passes of a vehicle) use and does not assume one-time use of land for vehicle movement. The geographic areas evaluated in this analysis include, but are not limited to, the central southwestern training areas of Fort Carson referred to as the California Strip, Sullivan Park and training maneuver areas at the extreme southern portion of Fort Carson that are projected to be most intensively used by the IBCT to support training. Analysis of impacts of a CAB at Fort Carson focuses on the use of live-fire training ranges in the south and northeastern portions of Fort Carson. Live-fire training certification in these areas would be the major training activities the CAB would engage in on the installation. Both the IBCT and CAB would engage in maneuvers at PCMS (see Section 4.0).

To make a determination of level of impacts to soils, NRCS soil loss threshold (T) value ratings (maximum tons per acre per year) of soil erosion an area can sustainably lose were used in concert with NRCS hydrologic soils ratings, wind erodibility index values, and soils properties to ascertain whether the proposed Army activities would likely exceed maximum sustainable rates of soil loss. The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting vegetative productivity over a sustained period. The rate is in tons per acre per year. Figure 3.5-1 shows that Fort Carson exhibits high geographic variability in sustainable soil loss thresholds (T factor variation) across the installation.

Significant impacts were assessed if Army training activities were projected to result in the loss of more soils than a training area could sustain. A rating of significant but mitigable was used if mitigating actions were thought to be able to reduce soil loss to within sustainable soil loss parameters. If the proposed Army activities would not cause significant erosion, they were rated as either less than significant, minor, or no impact.

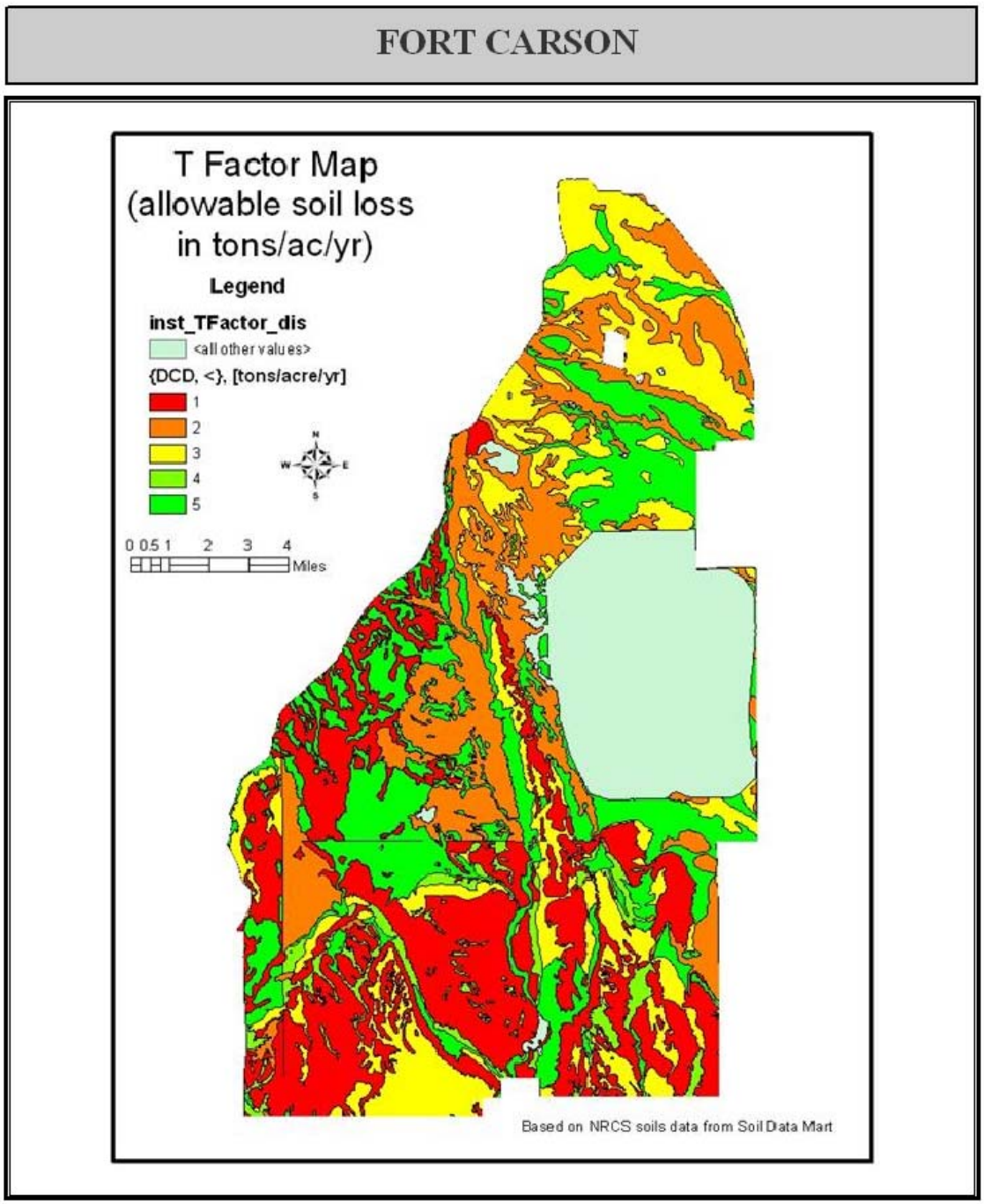

Figure 3.5-1 T Factor Map
Source NRCS

3.5.1. Affected Environment

3.5.1.1. Geology and Physiography

The eastern portion of Fort Carson lies within the Colorado Piedmont section of the Great Plains Province, while the western portion is located in the foothills of the Rampart Range section of the Southern Rocky Mountains Province. The Colorado Piedmont section differs from the High Plains to the east and north by its lack of former Tertiary sedimentary deposits, which have been removed by the alluvial forces of the Platte and Arkansas stream systems when they cut valleys several hundred feet below the level at which they formerly flowed (Reference No. 44).

The Rampart Range section commonly refers to the portion of the Colorado Front Range between the South Platte River and the Colorado Springs area, which is interspersed with fault-bounded blocks of Precambrian granites, schists, and gneisses bordered on the east by a belt of Paleozoic and Mesozoic rock foothills 2 to 4 miles wide that dip steeply eastward toward the Denver Basin. Dominant landforms on Fort Carson consist of high plains on the southeastern, west central, and western portions of Fort Carson (5,400 to 6,400 feet), low plains on the eastern portion of Fort Carson dominated by Fountain Creek and its tributaries (5,400 to 6,200 feet), and steep terrain including Timber Mountain (6,897 feet), Wild Mountain (6,695 feet), and Booth Mountain (6,454 feet) (Reference No. 45).

The region is characterized by rolling plains, tablelands, and occasional valleys, canyons, and buttes. The lowest point on Fort Carson is Beaver Creek Valley. The high plains region consists primarily of gently rolling uplands, sharp crested hills, and rocky outcrops located in the southeast, west-central, and western portions of Fort Carson. The cantonment area is located within the high plains region of the post, while Fountain Creek and its tributaries are located on the eastern portion of Fort Carson within the low plains region. The maximum relief on the installation is 1,840 feet (Reference No. 6). The topography of the western portion of Fort Carson is characterized by moderately rolling and strongly dissected plains interrupted by scattered rocky escarpments. On the eastern portion of the installation, foothills gradually slope to the east to a relatively flat grassland that is characteristic of the western edge of the Great Plains (Reference No. 46). The eastern portion of the post is drained by Fountain Creek and its tributaries (Reference No. 6).

The geology of the area includes Upper Cretaceous (146 million years ago [Ma] to 65.5 Ma) sandstone, shale, and, in some areas, a loose veneer of Pleistocene (1.8 Ma to 12,000 years before the present) gravel overlaying older shale. According to the Colorado Geological Survey (CGS) (1999), the state has approximately 90 potentially active faults (some of which may be located near Fort Carson). A review of USGS and CGS databases indicates that faults in the area could have a low-to-moderate potential for

damaging earthquakes (Reference Nos. 47 and 48). It is estimated that several thousand faults within the state have not been extensively mapped or studied; therefore, an accurate estimation of timing or location of potentially dangerous earthquakes is not possible (Reference No. 48).

Three main faults, Ute Pass, Rampart Range, and Oil Creek, exist within the region (Reference No. 6), although none cross into Fort Carson (Reference Nos. 47 and 49). Small earthquakes are known to occur in the region with generally undetectable effects (Reference No. 6). The Oil Creek fault, located northeast of Fort Carson, is possibly associated with the Divide earthquake that occurred in the vicinity in 1979. The Oil Creek fault may have possible associations with other nearby faults based on its present-day orientation in a northeast-southwest-directed stress regime (Reference No. 50).

Geologic units identified at Fort Carson range in age from the Quaternary period (1 Ma before present to recent) to the Pennsylvanian period (200 to 250 Ma before present) (Reference No. 6). During the Quaternary period, both consolidated and unconsolidated sediments were deposited in the region. Unconsolidated sediments consist primarily of fluvial and alluvial sands, silts, and gravels, as well as wind-deposited silts and sands. Consolidated sediments include shale, limestone, hard sandstone, siltstone, claystone, and conglomerate sandstone and shale (Reference No. 6).

Fort Carson is located with Seismic Zone 1, an area of low seismic risk (Reference No. 6). Since 1973, most earthquakes within 60 miles of Fort Carson registered at a magnitude of less than 4.0. The largest earthquake in the area recorded was at a magnitude 4.0 at a distance of approximately 75 miles from the center of Fort Carson (Reference No. 47). Although some faults are located within the vicinity of Fort Carson, none crosses through the post.

3.5.1.2. Soils

Soil types commonly occurring in the region are aridisols (dry, desert-like soils) and entisols (soils that do not show any profile development and which are largely unaltered from their parent rock) (Reference No. 51). These soil types are characterized by moderate-to-severe erodibility, landslides, and unstable clay formation movement due to variations in moisture content and temperature (Reference No. 51).

NRCS has identified 34 soil categories and 65 soil associations on Fort Carson. The predominant soil categories found on Fort Carson include four complexes; the Penrose-Minnequa, Penrose-Rock, Schamber-Razor, and Razor-Midway (Reference No. 52). Additional information on Fort Carson soil types can be found in the INRMP (Reference No. 6) and information specific to El Paso, Fremont, and Pueblo Counties can be obtained from the NRCS Soil Surveys. Figure 3.5-2 shows the soil types and geographic arrangements of soils within the boundaries of Fort Carson. Table 3.5-1 lists the dominant soil associations and percentages found on the installation.

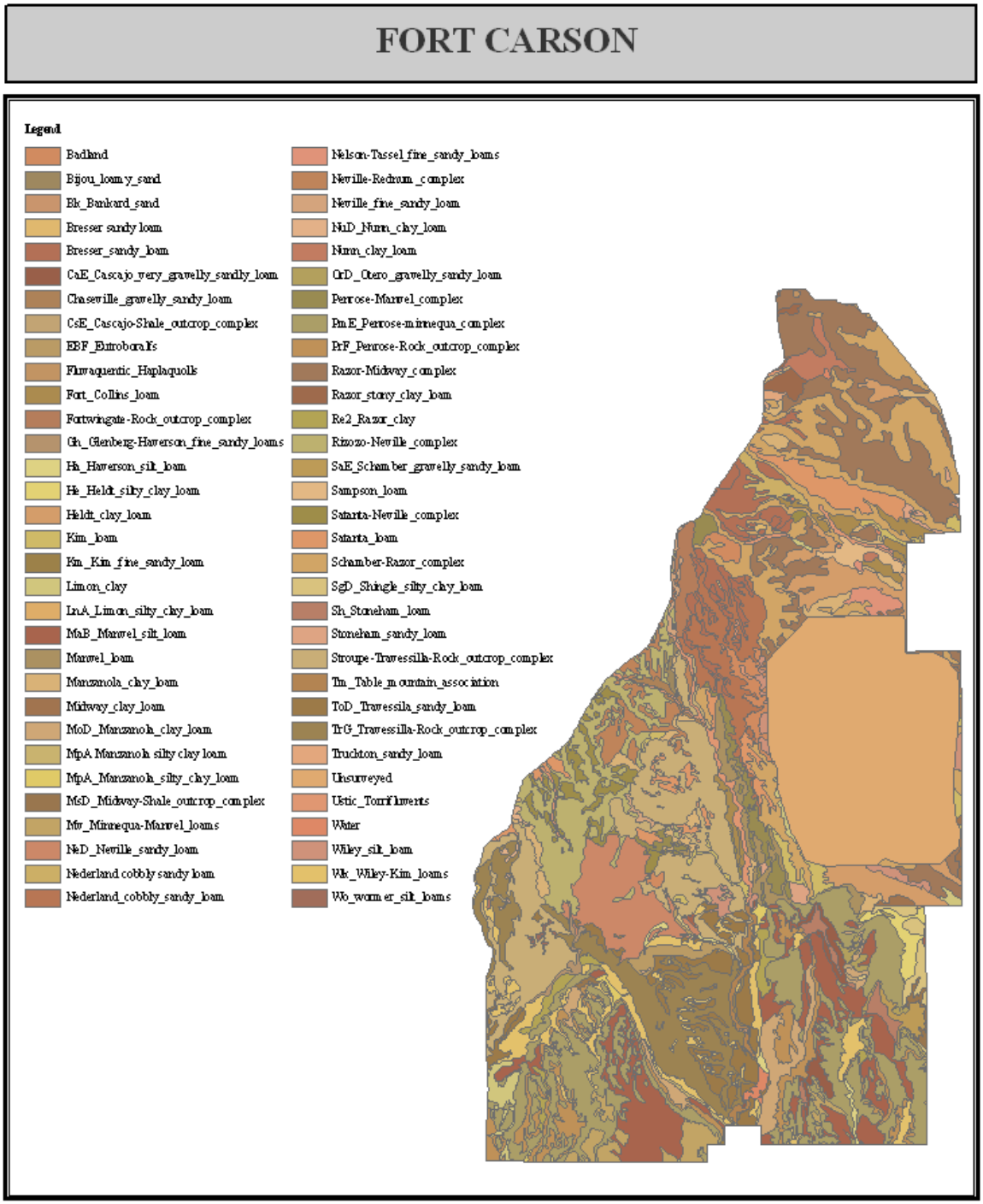

Figure 3.5-2 Soil Associations

Table 3.5-1 Fort Carson Soil Association Category Symbols and Descriptions			
Symbol	**Description and Slope**	**Percent Slope**	**Percent Cover**
4	Badland	N/A	0.82
5	Bijou loam sand, 1-8 percent slopes	1-8	0.11
12	Bresser sand loam	3-5	1.58
13	Bresser sandy loam	5-9	0.66
16	Chaseville gravelly sandy loam	1-8	0.17
29	Fluvaquentic Hapliquolls, nearly level	N/A	0.01
30	Fort Collins loam	0-3	0.52
31	Fort Collins loam	3-8	0.4
32	Fortwingate-Rock outcrop complex	15-60	0.59
33	Heldt clay loam	0-3	2.2
43	Kim loam	1-8	0.81
47	Limon clay	0-3	0.59
50	Manvel laom	3-9	1.03
52	Manzanola clay loam	1-3	0.3
53	Manzanola clay loam	3-9	1.07
54	Midway clay loam	3-25	0.16
55	Nederland cobbly sandy loam	9-25	2.6
56	Nelson-Tassel fine sandy loams	3-18	0.37
57	Neville fine sandy loam	3-9	0.25
58	Neville-Rednum complex	3-9	1.19
59	Nunn clay loam	0-3	0.55
64	Penrose-Manvel complex	3-45	1.12
74	Razor stony clay loam	5-15	0.35
75	Razor-Midway complex	N/A	6.76
76	Rizozo-Neville complex	3-30	4.17
78	Sampson laom	0-3	0.38
79	Satana loam	0-3	1.43
80	Satana loam	3-5	0.53
81	Satana-Neville complex	3-8	1.19
82	Schamber-Razor complex	8-50	6.9
86	Stoneham sandy loam	3-8	0.26
88	Stroupe-Travessilla-Rock outcrop complex	9-90	7.58
97	Truckton sandy loam	3-9	0.07
101	Ustic Torrifluvents, loamy	N/A	0.81
108	Wiley silt loam	3-9	0.62
116-Bk	Bankard sand	N/A	0.01
118-CaE	Cascajo very gravelly sandy loam	5-25	0.57
119-CsE	Cascajo-shale outcrop complex	5-30	0.03

Table 3.5-1 Fort Carson Soil Association Category Symbols and Descriptions (continued)			
Symbol	**Description and Slope**	**Percent Slope**	**Percent Cover**
122-EBF	Eutroboralfs, steep	N/A	0.19
126-Gh	Glenberg-Haverson fine sandy loams	N/A	0.19
127-Ha	Haverson silt loam	N/A	0.24
128-He	Heldt silty clay loam	2-6	0.43
131-Km	Kim fine sandy loam	N/A	0.02
136-LnA	Limon silty clay loam	0-2	0.01
141-MaB	Manvel silt loam	1-5	4.89
144-MoD	Manzanola clay loam	0-2	1.38
145-MpA	Manzanola silty clay	0-2	0.27
146-MsD	Midway-Shale outcrop complex	1-9	0.19
147-Mv	Minnequa-Manvel loams	N/A	1.1
149-NeD	Neville sandy loam	3-9	2.81
152-NuD	Nunn clay loam	5-9	0.1
157-OrD	Otero gravelly sandy loam	3-9	0.27
160-PmE	Penrose-Minnequa complex	1-15	9.14
161-Prf	Penrose-Rock outcrop complex	25-65	2.73
164-Re2	Razon clay, eroded	N/A	0.63
168-SaE	Schamber gravelly sandy loam	5-25	0.34
169-SgD	Shingle silty clay loam	1-9	0.53
170-Sh	Stoneham loam	N/A	0.46
172-Tm	Table mountain association	N/A	0.33
173-ToD	Travessilla sandy loam	1-9	2.43
174-TrG	Travessilla-Rock outcrop complex	30-90	4.75
181-Wk	Wiley-Kim loams	N/A	2.73
182-Wo	Wormer silt loam	N/A	0.06
183	Unserveyed	N/A	14.6
184	Water	N/A	0.17
	Total		**100.00**

Source: Reference No. 52

Soil erosion has been a documented problem on Fort Carson, particularly erosion caused by surface water runoff. Soils that present the greatest potential for runoff erosion are clays, silty clays, and clay loams (Reference No. 53). The eastern portion of Fort Carson, located within the Fountain Creek Watershed, contains soils that have been identified as having a moderate to high potential for erosion. Specific soil types on Fort Carson of greatest concern for erosion are Wiley-Kim, Penrose-Manvel, and Rizozo-Neville (Reference No. 6). The Razor-Midway complex and Schamber-Razor complex soils range from clay to clay loam and are highly erosive (Reference No. 54). The western portion of the installation also consists

of soils on steeper slopes, which have reduced water absorption capacity and, therefore are prone to erosion. Figure 3.5-3 shows the hydrologic soils ratings of existing soils at Fort Carson and provides insight into the ability of soils to absorb surface water runoff from rainfall events and susceptibility of Fort Carson's soils to surface water erosion. Factors influencing surface water absorption capability include soil surface texture (high clay means less absorption) (Figure 3.5-4), depth to bedrock, percent organic matter, and slope (Reference No. 55).

Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. These soils have high surface water absorption potential. Group B soils have moderately low runoff potential. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Group C soils have moderately high runoff potential. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Group D soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is slow or very slow. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas they also have a high shrink-swell potential. Some soils are in this group because the depth to a restrictive layer is less than 20 inches. These soils are capable of absorbing less than 0.14 inches of water per hour.

Soil erosion is greatest in areas where vegetation has been removed and soils have been disturbed due to construction or training activities. Soils occurring at Fort Carson exhibit high shrink-swell potential because montmorillonitic clays dominate the composition of most of the soil associations on the installation. Shrink-swell potential relates to the loss or gain of moisture in soil, which causes the potential for soil to change volume. Increasing soil moisture results in increasing volume and the opposite effect results from decreasing soil moisture. Soils with high shrink-swell potential can result in problems with building foundations and stability (Reference No. 53).

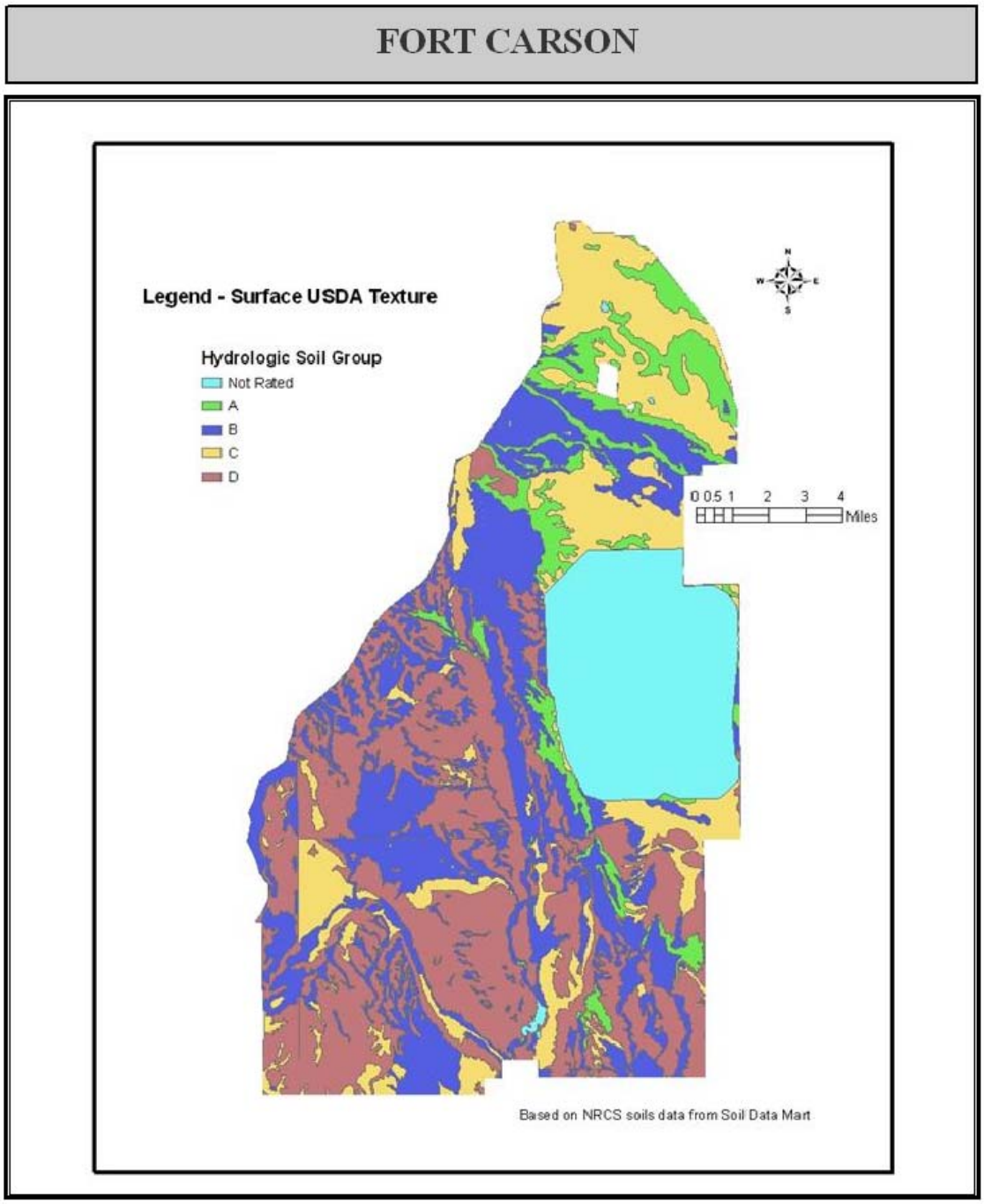

Figure 3.5-3 Hydrologic Soil Ratings of Fort Carson Soils
Source NRCS

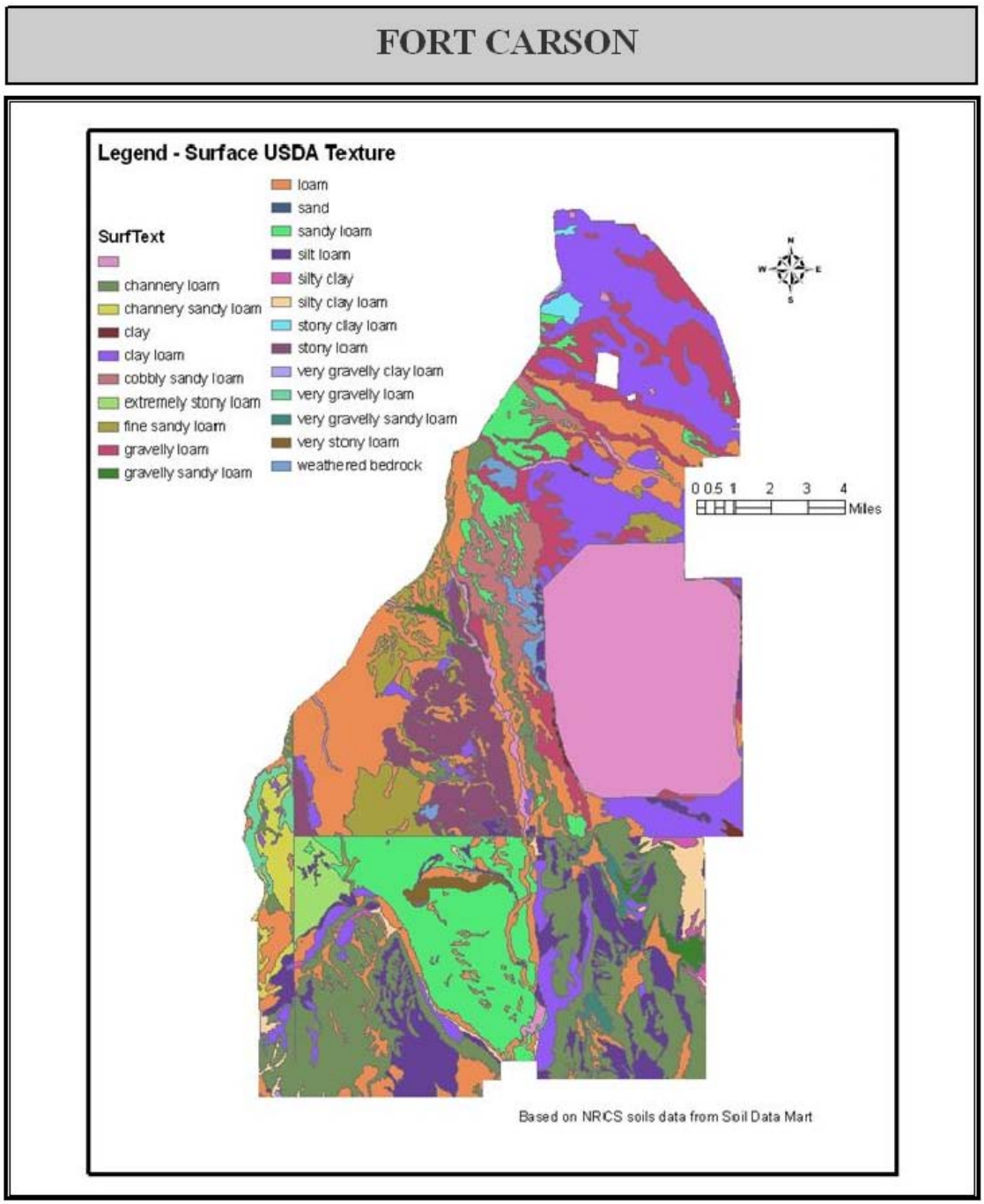

Figure 3.5-4 Surface Texture Map
Source NRCS

3.5.1.2.1. Cantonment Area

Training Area Bravo

Undisturbed soils and native vegetation occur throughout the cantonment area, primarily in the southern end of the cantonment, and are broken up by local areas of disturbed soils resulting from construction of post housing and other support facilities. Figure 3.5-5 depicts the existing soils within the footprint of the proposed construction site in Training Area Bravo (Alternative 1). The proposed construction site consists of two predominant soil types, Razor-Midway complex and Schamber-Razor complex. A majority of construction would be projected to take place on Razor-Midway soils in areas of reduced slope on which these soils are found (blue areas on Figure 3.5-5). The slope of the potential construction site ranges from 3 and 15 percent. Much of the Schamber-Razor soil complexes depicted in red are located in areas with a slope greater than 10 percent.

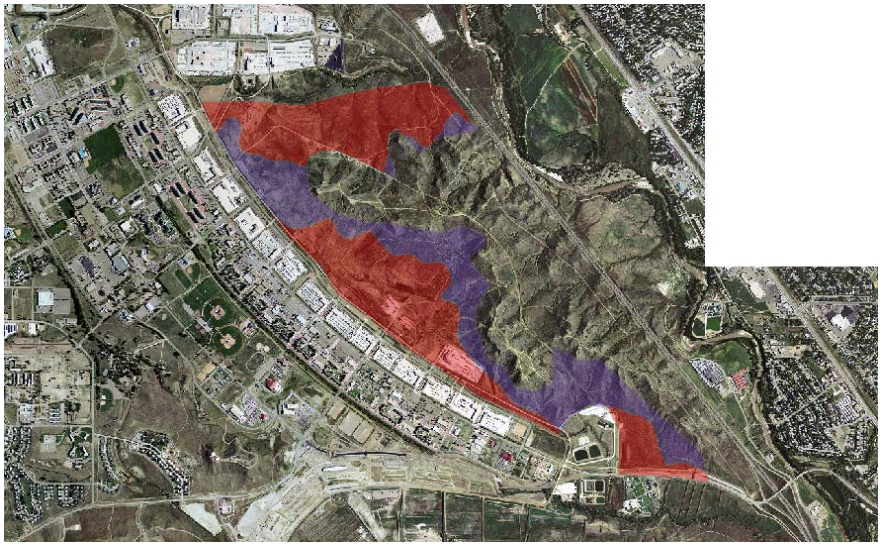

Figure 3.5-5 Soil Associations of the Infantry Brigade Combat Team's Proposed Cantonment Area Construction Footprint, Alternative 1

The Razor-Midway soils are alkaline soils, which exhibit high corrosivity to concrete and steel (Reference No. 56). Soils in the proposed construction site are moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained but the depth to bedrock is typically only 20-40 inches and means the soils have reduced capacity to absorb surface water. In addition, the soil has limited water conductivity because of its high clay content. The Razor-Midway soils are 28.9 percent silt, 28.1 percent sand, and 43 percent clay.

3.5.1.2.2. Downrange Area

The proposed construction sites of the ORTC and BAAF areas consist almost exclusively of a soil association known as Satanta loam represented by the blue shaded area in Figure 3.5-6. The construction area is extremely flat with slopes ranging from 0 to 3 percent in most areas. Satanta loam is a non-acidic soil type, which exhibits low corrosivity to concrete and steel and is ideal for construction. It is moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained and there are no restrictive layers restricting water flow within 80 inches of the soil surface. The Satanta loam soil association consists of 17.5 percent clay; 43 percent sand, and 39.5 percent silt (Reference No. 56).

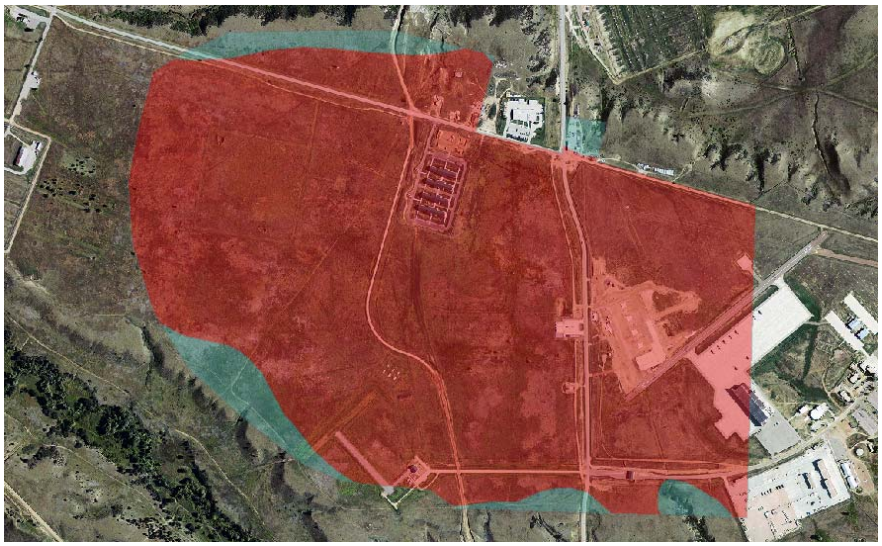

Figure 3.5-6 Existing Soil Associations of the Operational Readiness Training Center and Butts Army Airfield

Butts Army Airfield

BAAF, located on the eastern side of the post adjacent to and south of Wilderness Road, is semi-developed. The airfield contains a landing strip, paved areas, and support facilities. The land surrounding BAAF contains native soils and vegetation that are broken up by local areas of disturbance. The least-disturbed soils at BAAF occur in the southwestern portion of the airfield. Figure 3.5-6 depicts BAAF and shows that a majority of soils in the proposed construction footprint are characterized as Satanta loam soil associations.

Tent City

The Tent City site consists of four predominant soil types, Bresser sandy loam (12), Satanta loam (79), Schamber Razor complex (82), and Nederland cobbly sandy loam (55). Figure 3.5-7 depicts the existing soils associations. Bresser sandy loam complex comprises 121 acres and more than 40 percent of the construction site. A majority of the site is flat, consisting of slopes of between 0 – 5 percent though portions of the site are steeply sloping up to 25 percent slope or more.

Figure 3.5-7 Soil Associations of the Infantry Brigade Combat Team's Proposed Cantonment Area Construction Footprint, Alternative 2

Satanta loam is a non-acidic soil type, which exhibits low corrosivity to concrete and steel and is ideal for construction. It is moderately susceptible to sheet and rill erosion from surface water and is moderately resistant to wind erosion. The soil is well drained and there are no restrictive layers restricting water flow within 80 inches of the soil surface. The Satanta loam soil association consists of 17.5 percent clay; 43 percent sand, and 39.5 percent silt.

Bresser sandy loam is a non-acidic soil, which exhibits low corrosivity to concrete and steel. It is moderately susceptible to sheet and rill erosion. The soil is well drained with more than 6.5 feet to any soil layers that would impede water flow. Bresser Sandy loam has a high sand content (65.2 percent) as the name implies with a moderate silt content of 19 percent and a low clay content of 15.8 percent.

Nederland cobbly sandy loam and Schamber Razor complex occur in more steeply sloped areas depicted in Figure 3.5-7.

3.5.1.2.3. Ranges and Training Areas

The range and training areas on Fort Carson cover the majority of land on-post and have the largest percentages of undisturbed soils on the installation. A description of existing conditions of training areas which may be affected by the Proposed Action and alternatives is provided as follows.

Soil textures of the northern and central range complexes include an array of loams, clay loams, and gravelly loams. The southern end of the central range complex consists predominantly (more than 40 percent) of Heldt clay loam on a topography consisting of slopes of less than 3 percent grade (Reference No. 56). These soils have good depth to restrictive drainage layers and are well drained. In the central range complex, the depth to soil layers preventing migration of water is more than 80 inches and soils are classified as well drained (Reference No. 56). A majority of soils that would be affected by range construction are rated by the NRCS as A-C hydrologic soils meaning that the soil has at least some permeability to impeded surface water flow (Figure 3.5-3).

Soil surveys have not been conducted in the impact areas as potential UXO issues preclude the ability to conduct soil surveys. However, inferences have been drawn from surrounding soil type and topography to generate an assessment of firing activity impacts. A majority of rounds from firing activities are projected to fall in Fort Carson's impact areas where there is a lack of steep slopes and a majority of land is between 0 and 15 percent. A majority of live-fire activities would occur on the eastern side of the installation which receives less precipitation and has a more arid climate which reduces the potential for soil loss from water erosion, though the more arid climate increases wind erosion potential (Reference No. 58). Soils within the northern impact area are not rated as highly erodible by the NRCS (Figure 3.5-9).

The Digital Range Multi-Purpose Range Complex (DMPRC) range to the south of the central impact area consists of predominantly Manvel silt loam soils (approximately 20-25 percent) of the soil association of the range. These soils are susceptible to wind-based erosion because of their fine particle size, though they have at least some permeability and the ability to absorb surface water flow (Figure 3.5-3).

Existing soils of the California Strip maneuver areas consist primarily of loam, fine sandy loam soil, and gravelly sandy loam soil textures (Figure 3.5-8). Over 75 percent of the soils in the area consist of three soil associations. The dominant soil association (approximately 50 percent) is a Rizozo-Neville complex existing on slopes of 3-30 percent. Rizozo is a soil of low strength with sticky slippery properties and an average of 21 percent clay content.

Figure 3.5-8 Physiography of the California Strip

The area has low soil depth to lithic bedrock (10-20 inches) and has a hydrologic soil rating of D, which means it does not have a large capacity to absorb surface water. Neville, which is deeper, consists of less clay and more sand with deeper soil cover to bedrock. This soil association is a well-drained and deep soil with more than 80 inches to restrictive drainage layers. Neville is on shallower slopes and is a calacareous loamy alluvium. Other soil associations in the California Strip include Rednun clay loams and Satanta loams, both of which have good depth to bedrock (more than 80 inches) and are characterized by the NRCS as well-drained soils (Reference No. 56). The California Strip soils are a mix of highly erodible soils, potentially erodible, and non-highly erodible soils (Figure 3.5-9). Ability to absorb water also varies greatly across soil types and land contour in the training areas. Some areas and Rednun clay soil and Rizozo soil associations have limited capacity to absorb water while the loamy soils located in areas of reduced slope areas demonstrate a greater surface water absorption capacity (Figure 3.5-3).

There is already an IBCT stationed at Fort Carson. Thus, the stationing of an additional IBCT would not qualitatively change the types of maneuver training that currently take place in the California Strip. Training activities have resulted in localized soil erosion, particularly in areas underlain by soils on steep slopes adjacent to gulches. Training activities have impaired vegetation growth, resulting in gully erosion, which increases in severity as the gullies broaden. This erosion has resulted in some soil loss, ultimately depositing soils downslope or downstream.

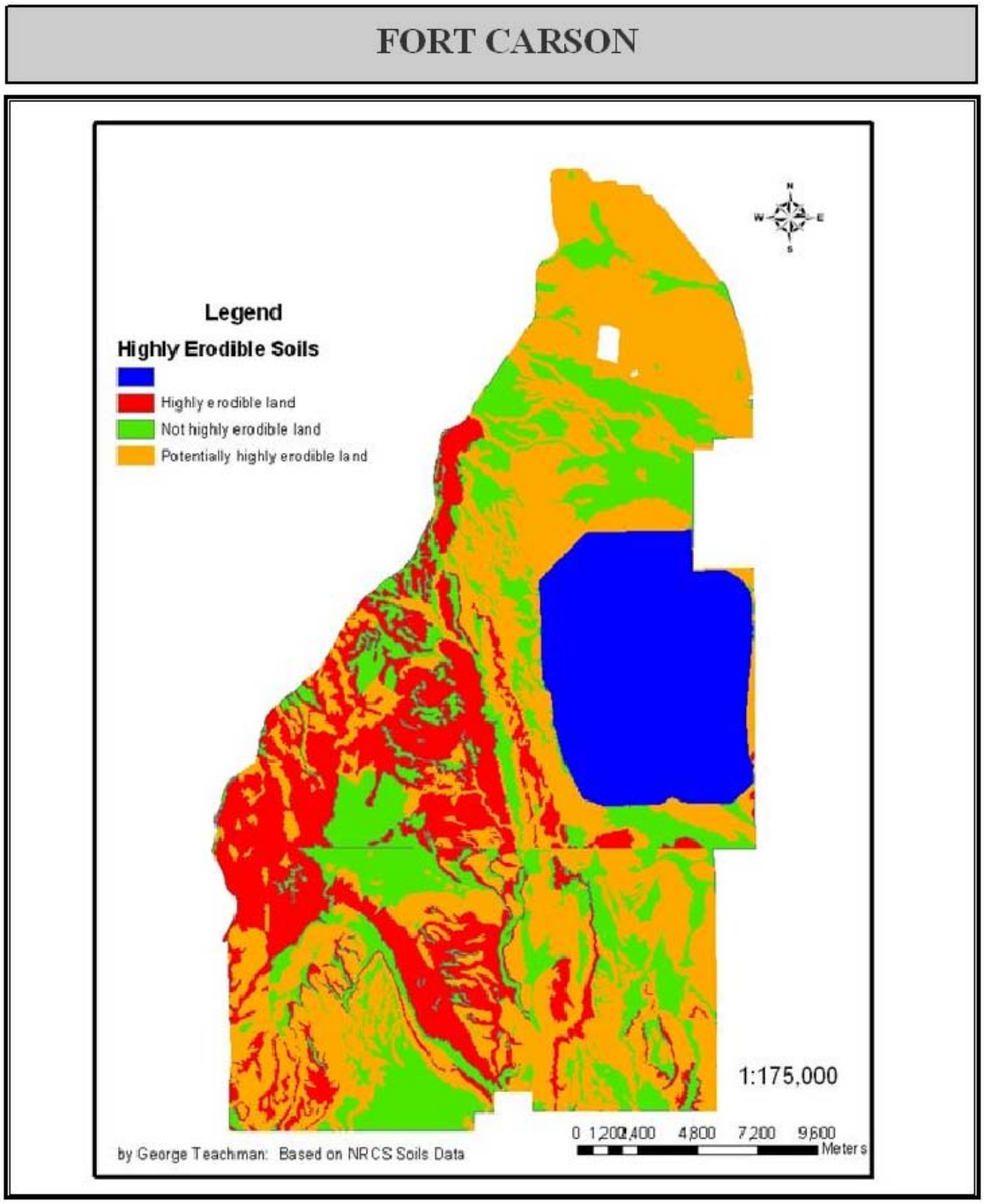

Figure 3.5-9 Classifications of Highly Erodable Soils on Fort Carson
Source NRCS

3.5.1.3. Chemical Constituents in Soils

As described in the INRMP, Fort Carson and the PCMS have some of the highest naturally occurring documented levels of selenium in the US. Naturally occurring selenium can acutely and chronically impact both aquatic and terrestrial wildlife when land disturbances, such as military mechanized maneuvers, and excessive erosion occur. Selenium that has leached into lower soil profiles over millions of years is exposed by land disturbance and taken up by selenium receiving plants that are uniquely adapted to these sites. The two most common plants indicators of selenium are two native species, the desert princess plume (*Stanleya pinnata*), and two-grooved milkvetch (*Astragalus bisulcatus*). When selenium-loaded soils are exposed to water, selenium can directly enter surface water systems and biologically accumulate in the systems of aquatic and terrestrial animals. Deep-rooted, selenium receptor plants can also redistribute selenium onto the ground surface and into the soil. Other heavy metals naturally occurring at high levels on Fort Carson, such as mercury, follow the same geological and biological pathways as selenium.

There are no government standards or regulations for terrestrial and non-point source selenium, because the understanding of selenium distribution in soil and plant communities is complex and studies are limited. The Directorate of Environmental Compliance and Management (DECAM) completed and implemented a selenium reception study in 1998 in conjunction with the University of Wyoming. The study defined the distribution of selenium in soils and vegetation, and subsequent academic work defined the relationship of selenium concentrations to geologic distribution (Reference No. 57). Additional academic study is ongoing, including a study conducted by the University of California, Riverside in 1999, for which known selenium plant receptor tissues collected from all over the US led to the observation that princess plume plant tissues from Fort Carson had the highest levels of selenium accumulation. The university then collected genetic material from Fort Carson princess plume populations in 2000 and 2001 to establish a strain of superior selenium receptors for use in biological soil amendments. Additional academic work has quantified selenium in aquatic systems at Fort Carson. Selenium study results provide DECAM managers with site-specific selenium knowledge. Resulting management decisions ensure that land user activities do not create a selenium environmental reception hazard.

In 1998, the DECAM initiated its first major selenium remediation project that dramatically reduced aquatic selenium reception in Training Area 11. About 136,000 cubic yards of selenium-contaminated soil were buried and stabilized (Reference No. 6). Selenium management is a byproduct of good

watershed management considering current knowledge of the issue. Thus, selenium exposure is controlled through the implementation of projects within watershed management plans.

3.5.1.4. Existing Erosion Management

Evidence of surface water driven soil erosion exists throughout Fort Carson. Gully erosion of approximately 15 feet in depth and 20 feet in width occurs on the installation on watercourses and minor drainages due to degradation of vegetative cover. Sheet and rill erosion also occur on Fort Carson. These erosive features have increased the flow of stormwater runoff, erosion of unstable soils, and the transport of sediments on Fort Carson (Reference No. 59). Erosive locations in the downrange area are generally associated with military training operations that presently occur on the installation, including troop, mechanized, and live-fire training events.

Fort Carson currently follows regulations and implements management plans designed to sustain training resources and offset adverse effects to soils on the post associated with military training. BMPs and mitigation measures implemented to reduce effects to soils are included in these regulations and management plans. For example, 349 erosion control dams have been constructed to mitigate erosion and reduce sediment loads on Fort Carson (Reference No. 6). In addition, the USGS monitors four erosion control reservoirs on Fort Carson, as funding resources are available (Reference No. 60).

The major plans and regulations implemented to reduce the effects of erosion and sediment on Fort Carson are FC Regulations 350-10, 385-63, and 350-19; AR 350-9; the INRMP (Reference No. 6); the *Fugitive Dust Control Plan* (Reference No. 53); and the Section 404 Regional Permit (Reference No. 61). In addition, the Environmental Assessment (EA) for the Erosion and Sediment Control Program at Fort Carson (Reference No. 59) identifies mitigation measures that would minimize erosion on the installation. Under the direction of these plans and regulations, which are briefly described in Appendix A, Fort Carson implements erosion control BMPs and mitigation to reduce adverse effects of erosion on-post.

In addition to the programs described in Appendix A, erosion control management at Fort Carson includes projects that are carried out by Fort Carson's Watershed Management Team under work plans as erosion control needs are identified. Prior to implementing erosion control projects, the work is subject to environmental review and/or permitting. BMPs implemented by Fort Carson include:

- Grading of existing roads to ensure proper drainage;
- Installation and maintenance of erosion control structures, such as erosion control dams, rock check dams, waterbars, and hardened (bed of rock) crossings in existing drainages at intersections with established dirt roads;

- Revegetation of disturbed land;
- Bank sloping to reduce gully erosion and to increase military training opportunities; and
- Installation and maintenance of water diversions.

The main dirt roads in the downrange area are maintained by the DPW through subcontractors.

3.5.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.5.2.1. Proposed Action and Alternatives

In order to understand the potential impacts to soils and geology that would result from the implementation of the Proposed Action and alternatives it is necessary to understand the current configuration of Fort Carson's training areas, how they are currently managed and how they would be managed in the future to support various alternatives. Figure 3.5-10 shows the current configuration of Fort Carson's training areas. It is also necessary to understand the susceptibility of various areas of the installation to wind and water erosion. A brief description of these types of erosion is provided as follows.

Water Erosion

Soil erosion caused by water includes raindrops striking the earth's surface and sheet and rill (channeled) flow of surface water. The rate of water erosion of soils depends primarily on the slope of the area in question, properties of the soil, climate/precipitation patterns, and vegetative cover (Reference No. 55). The greater the slope of the construction site the more force surface water can generate to move soil particles and top soils from naturally occurring locations and the greater potential for channeling and cuts into the soil.

Wind Erosion

Wind movement of soils is often of greater concern than water erosion in the semi-arid southwest (Reference No. 58). Wind erosion of soils occurs when the force of the wind overcomes the stabilizing factors that hold soil in place. Factors influencing wind erosion of soils include natural properties of the soil (stickiness, aggregate content, and organic matter content), climate of an area, and amount of surface disturbance (Reference No. 55). In dry environments, there tends to be less organic matter in the soils and less soils aggregation to prevent loss of soil. Finer soil particles, particularly silt, which lacks cohesion of clays, are prone to wind erosion.

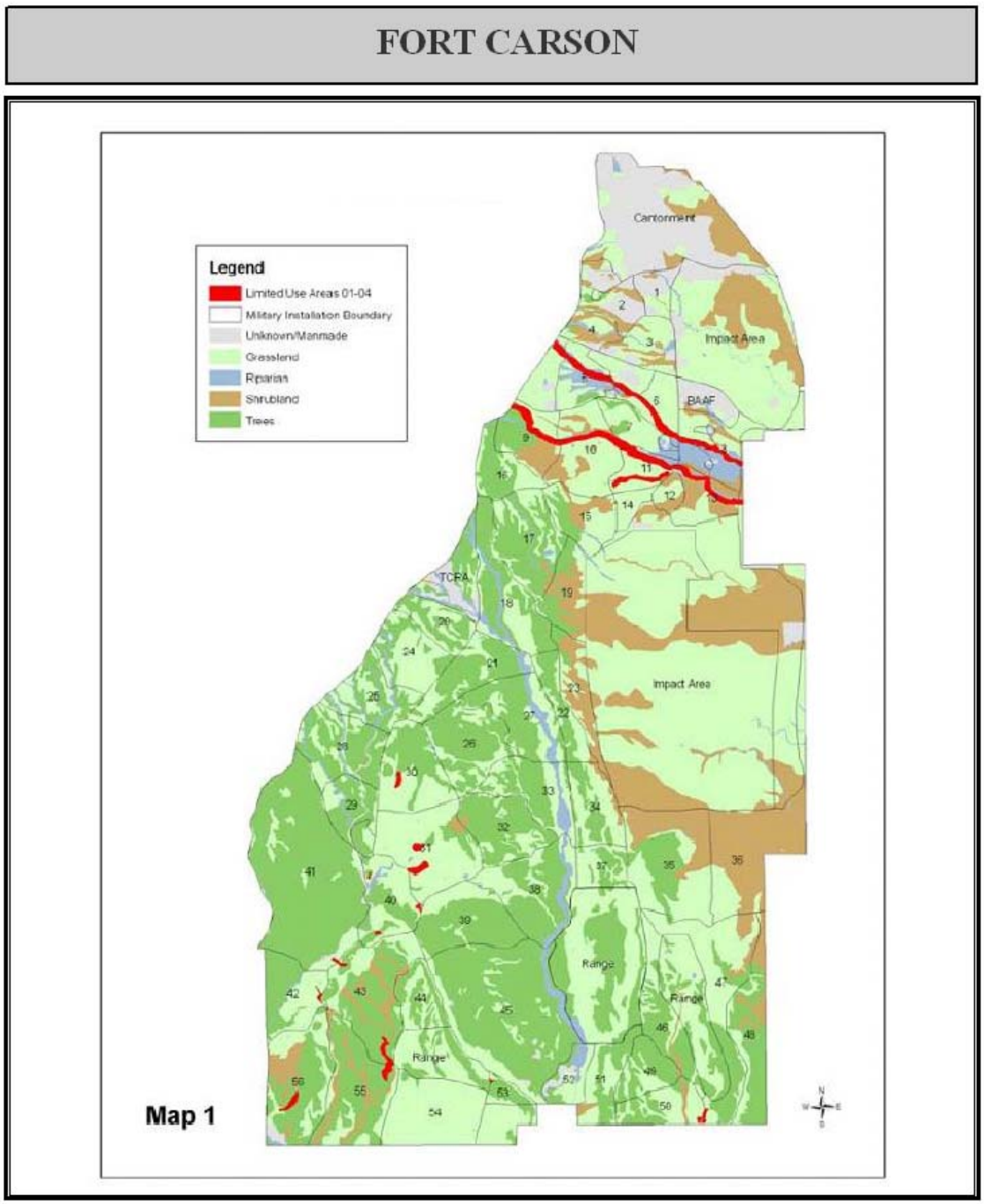

Figure 3.5-10 Fort Carson Training Areas and Vegetative Cover
Source US ARMY

factors that hold soil in place. Factors influencing wind erosion of soils include natural properties of the soil (stickiness, aggregate content, and organic matter content), climate of an area, and amount of surface disturbance (Reference No. 55). In dry environments, there tends to be less organic matter in the soils and less soils aggregation to prevent loss of soil. Finer soil particles, particularly silt, which lacks cohesion of clays, are prone to wind erosion.

3.5.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Bridge Facilities at Operation Readiness Training Center Site

3.5.2.2.1. Cantonment Area

The implementation of cantonment area construction activities, as part of the Proposed Action, is projected to have only minor impacts on soils within the existing cantonment area. Construction would involve the demolition and new construction of facilities within previously disturbed areas in Fort Carson's cantonment area. Disturbance to soils from demolition activities in the existing cantonment area to support CS units would expose soils to wind and water erosion. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction would also result in an increase in water erosion potential at the construction site. The impacts to loss of soils attributed to wind erosion would be temporary impacts during the construction. Following completion of construction, surface vegetation would be restored and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of the Proposed Action is not anticipated to have any significant impacts on Fort Carson's geology or topography within the cantonment area.

3.5.2.2.2. Downrange Area

Operational Readiness Training Center

Under the Proposed Action, construction of barracks facilities, administrative facilities, equipment maintenance facilities and the extension of utilities would be required for new personnel. These facilities for the IBCT and CAB would be constructed in the relatively flat footprint of the current ORTC. Additional administrative and operational facilities for the CAB would be constructed at BAAF in previously disturbed footprints.

The implementation of construction activities as part of the Proposed Action is projected to have only minor impacts on soil erosion as the ORTC site is almost exclusively between 0 and 3 percent slope. This relative flat surface for construction would prevent water from being channeled and carrying off large amounts of soil during rain events. Shallow slopes considerably reduce the potential for water erosion of soils (Reference No. 55), and soils within the construction footprint of the Proposed Action consist primarily of Satanta loam, which is well drained and exhibits ability to hold and conduct water well through soil pores. Other natural properties of the soil to include its aggregation limit the potential for water erosion at the construction site. The ORTC site does not receive excessive precipitation that would lead to soil saturation and consistently high volumes of surface water run-off. Soils within the construction footprint for the Proposed Action are rated as non-highly erodible land by the NRCS (Figure 3.5-9).

Water erosion at the construction site would have some minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction is predicted to result in a minor increase in loss of soils attributable to water erosion.

Butts Army Airfield

The implementation of construction and renovation activities at BAAF as part of the Proposed Action is projected to have only minor impacts on soil erosion. Disturbance to soils from renovation activities in the existing airfield complex to support the CAB would expose soils to wind and water erosion. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover, primarily grasses, during construction would also result in an increase in water erosion potential at the construction site. The impacts to loss of soils attributed to wind erosion would be temporary impacts during the construction timeframe. Following completion of construction, surface vegetation would be reestablished and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of the Proposed Action within the downrange area is not anticipated to have any significant impacts on Fort Carson's geology or topography.

Ranges and Training Areas

In order to understand the potential impacts to soils that would result from the Proposed Action it is necessary to understand the current configuration of Fort Carson's training areas, how they are currently managed and how they would be managed in the future to support various alternatives. Figure 3.5-5 presents a visual depiction of Fort Carson's training land management units. To support the stationing of Soldiers as discussed in the 2007 Fort Carson Transformation EIS and additional Soldiers discussed as part of the Proposed Action, installation training land east of Turkey Creek would primarily be dedicated to live-fire training and the SDZs that must be maintained for safety reasons. With the increase in training requirements from the 2007 Fort Carson Transformation EIS implementation, Fort Carson will have limited options in managing maneuver and live-fire training activities. The Proposed Action and alternatives involve the same activities and will have the same predicted impacts across all alternatives.

Range Construction

As part of the Proposed Action, range construction/upgrades would be built around Fort Carson's two existing impact areas in the northeast and central eastern portions of the installation (Figure 2-6). A majority of range construction would be sited within the footprints of existing outdated ranges to minimize surface disturbance. Range construction activities would include the emplacement of new targetry, grading of roads and trails, and in some cases the emplacement of fiber-optic cable from range control towers to targetry locations.

The implementation of range construction/upgrade activities as part of the Proposed Action is projected to have less than significant impacts on soil erosion. Range construction would take place primarily in areas where slopes are between 0 and 15 percent and have low potential for soil erosion from water run-off. As the proposed range construction areas are on the eastern side of the installation and further removed from the mountains, they receive less precipitation and have a more arid climate further reducing the potential for soil loss from water erosion. The loamy and gravelly textures of the soils are less prone to wind erosion in these areas than silts and other finer textured soils. Given that a majority of ranges would be built on existing range sites, the implementation of the Proposed Action is not projected to result in significant loss of vegetative cover or large amounts of disturbance to previously undisturbed soils. In addition, soils within range construction footprints are not classified as highly erodible.

Water erosion at firing range construction sites would have minor impacts from surface water erosion. The soils at the construction sites would be locally compacted by construction equipment and less infiltration of water during significant rain events would likely occur resulting in higher volumes of

surface water flow and greater rates of soil erosion. Range construction would result in construction of additional tank trails, range maintenance trails, parking areas and other impervious surface, which can increase surface water flows from the sites and lead to sheet and rill erosion. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site.

Wind erosion at the construction site is projected to have some minor impacts. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. This effect would occur only temporarily on the construction site and in the localized area of construction where vehicles operate and vegetation is lost during construction and the soil properties should serve to minimize wind erosion effects.

Wind movement of soils is more likely in the areas of range construction than water based erosion because of the semi-arid climate (Reference No. 58). Soils in the areas of proposed range construction consist predominantly of loams, clay loams, and gravelly loams, which are less susceptible to wind erosion than silts. The balanced surface texture of the loam soils, binding properties of clays and larger particle sizes of gravelly loams would offset some impacts of natural wind erosion at range construction sites. The NRCS classifies a majority of the soils that could be affected by range construction activities as a 4 on a 1-8 rating scale of soil wind erodibility (Reference No. 56).

Live-Fire Training

As part of the Proposed Action, the Army would increase its live-fire training activities by approximately 27 percent through the stationing of the IBCT, CAB and select CS units. All firing would take place on designated range facilities and impact areas.

Range firing activities under the Proposed Action are projected to have less than significant impacts on soil erosion. Impacts to soils from firing activities would occur predominantly as a result of munitions landing or otherwise impacting the soil surface and exposing the soils to sheet and rill water erosion. Increased volume of live-fire activities would marginally increase loss of vegetative cover on ranges and impact areas through the physical impact of munitions. Surface disturbance caused by munitions impact would result in larger areas of bare ground than observed under current conditions. Munitions impact can directly create craters and remove patches of vegetation, which normally protects soil from erosion by slowing runoff, intercepts raindrops before they reach the soil surface, and anchors the soil. Compaction

in the craters caused by larger ordnance explosions can alter the permeability and water-holding capacity of the soils and harden silty clays affecting the ability of vegetation to recover in those areas. The areas of bare ground and exposed soils are susceptible to wind and water erosion, which can indirectly lead to removal and redeposition of soils, gullying, or unstable slopes in areas of steep slopes and rapid runoff. Although weapons training events would be periodic, long-term impacts would be expected because soil disturbance typically requires time and effort to amend. In addition to these impacts, increased live-fire activities on Fort Carson's ranges would increase potential for fires from training activities to remove vegetative cover. Indirectly, fires caused by live-fire training could result in loss of vegetative cover, which would increase susceptibility of the soils to water and wind erosion (Reference No. 55).

Potential for soil loss would be amplified on Fort Carson's maneuver and live-fire ranges such as the DMPRC, MPTR (Ranges 109 and 111) and other maneuver live-fire ranges. The DMPRC range to the south of the central impact area consists of Manvel silt loam soils, which are projected to be more severely impacted by water and wind erosion. Aviation training on the DMPRC would be projected to further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash.

Despite the potential impacts, existing soils, topography, and climate conditions are such that significant impacts are not anticipated. A majority of rounds from firing activities are projected to fall in Fort Carson's impact areas where there is a lack of steep slopes and a majority of land is between 0 and 15 percent. A majority of live-fire activities would occur on the eastern side of the installation which receives less precipitation and has a more arid climate which reduces the potential for soil loss from water erosion, though the more arid climate increases wind erosion potential (Reference No. 58). Most soils, with the exception of some soils associations of the DMPRC, are of loamy or gravelly soil texture and are less prone to wind and water erosion than silts and finer textured soils. Soils within the northern impact area are not rated as highly erodible by the NRCS (Figure 3.5-9). In the central range complex, the depth to soil layers preventing migration of water is assumed to be more than 80 inches and soils are assumed to be well drained like the surrounding soil types, though soil surveys in the impact area have not been conducted due to potential UXO issues. A majority of soils have at least some permeability and the ability to absorb surface water flow to prevent excessive water erosion of soils.

Maneuver Training

Implementation of maneuver training as part of the Proposed Action or alternatives would result in an approximate 15 percent increase in the aggregate number of MIMs at Fort Carson. The stationing of the

IBCT and other support units would result in an approximate 9 percent increase in relative MIMs and the CAB would result in an additional 6.5 percent increase. GTA units would conduct battalion and brigade level training at PCMS and would conduct company level and smaller unit training at Fort Carson

Implementation of maneuver training as part of the Proposed Action and alternatives is predicted to result in significant but mitigable impacts to Fort Carson's soils. Maneuver training of the CAB would increase the susceptibility of Fort Carson's soils to wind erosion, but this is predicted to be mitigable to less than significant though the implementation of measures identified in Section 3.5.2.6.

Infantry Brigade Combat Team Maneuver Training

The maneuver training of the IBCT is predicted to result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased intensity of use of the California Strip by the IBCT for maneuvers would result in increased ground surface disturbance and would result in an increase in the loss of vegetative cover. A majority of IBCT off-road maneuvers would occur in topographic areas of reduced slope that permit wheeled vehicle maneuvers. Elevated locations might experience isolated surface disturbance events because of construction of individual fighting positions and establishment of observation points on areas of observation with good fields of view. Loss of vegetative cover and surface disturbance would make soils in the California Strip more prone to wind and particularly water erosion given the steep slopes and topography of the area.

Soil Compaction and Rutting. Soils in training areas would be subject to similar levels of compaction as under the No Action Alternative. Most of these effects have already occurred and in most cases, the IBCT units would follow existing trails and pathways. However, continued maneuver training would reduce the ability of soils to recover from these effects.

Reduced Infiltration. The ability of water to infiltrate soils would be somewhat reduced because of the additional training load the training areas would experience. With less recovery time and increase loss of vegetation, less root matter and organic matter would be available to absorb water and reestablish soil pores. Reduced infiltration would lead to increased surface water erosion of soils (NRCS, 2001).

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic (man-made) fire. Use of artillery simulators, smoke obscurants, and catalytic converters from use of vehicles would have some potential to start fires. The

increased frequency of maneuver training would elevate the risk of anthropogenic fire and the potential for loss of vegetative cover. This would indirectly increase the potential for wind and water erosion of soils.

Combat Aviation Brigade Maneuver Training

Aviation maneuver training at Fort Carson would occur primarily in the vicinity of the DMPRC to the south of the central impact area, in Sullivan Park (Figure 3.5-10), and in support of infantry and special operations exercises in the California Strip. The CAB would engage in troop transport and insertion, equipment transport, and combat aviation gunnery tasks. The CAB would include ground vehicles and light and medium tactical trucks for logistics support and command and control operations.

Maneuver Training of the proposed CAB would result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency and intensity of use of the DMPRC, Sullivan Park and the California Strip training areas by the CAB would result in increased ground surface disturbance from rotor wash in flat areas designated as helicopter landing areas. In addition, this rotor wash would result in an increase in the loss of vegetative cover. Potential for soil loss would be amplified on Fort Carson's DMPRC, which has soils of finer consistency and texture, such as silt are more prone to impacts from wind erosion. Approximately 20-25 percent of soils in the DMPRC consist of Manvel silt loam soils. Aviation training on the DMPRC would be projected to further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash. Loss of vegetative cover and surface disturbance would make soils in the California Strip and Sullivan Park more prone to wind and water erosion. This is particularly true of the California Strip given the steep slopes and topography of the area. Sullivan Park is less prone to erosion because of better-drained soils of more resilient texture, which is on flat ground or gently rolling slopes.

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. The use of training simulators, smoke obscurants, and catalytic converters from use of the CAB's ground vehicles would have some potential to start fires. The increased frequency of maneuver training would elevate the risk of anthropogenic fire and the potential for loss of vegetative cover. This would indirectly increase the potential for wind and water erosion of soils. Chapter 4 discusses a vast majority of CAB maneuver activities that would take place at PCMS to support BCT battalion and brigade-level maneuver training.

The implementation of the Proposed Action at Fort Carson from construction activities would not have significant negative impacts on Fort Carson's geology or topography.

3.5.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.5.2.3.1. Cantonment Area

Under Alternative 1, the additional CS personnel facilities would be the same as the Proposed Action. Facilities for the IBCT would be constructed in the Fort Carson cantonment area referred to as Training Area Bravo.

The implementation of construction activities as part of this alternative is projected to have significant but mitigable soil erosion impacts. The potential impacts from surface water erosion to soil from cantonment area construction activities are moderately high. This is true for several reasons. First, the footprint for the IBCT construction site is located in an area with slopes of between 3 and 15 percent and ridges and steeper slopes leading into the proposed construction site in certain areas. The steeper slopes would result in channeling of surface water into the construction site during rainfall events which would move more soils off site. Secondly, soils within the construction footprint of Alternative 1 would consist primarily of Razor-Midway complex. This soil association at this alternative site has a reduced depth to bedrock (20-40 inches) and higher clay content, which has reduced capacity to hold and conduct water through soil pores. This would mean that more of the surface water in the area would flow over the construction site and reduce absorption.

Despite these factors, the climate of the site experiences a lack of precipitation that would offset some of the less desirable soils characteristics of the construction site and would limit loss of soils through water erosion. Water erosion at the construction site would have minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site. Disturbance to soils from demolition activities in the existing cantonment area to support CS units would expose soils to wind and water erosion.

The Schamber-Razor soil association with its high silt and low clay content is considerably more vulnerable to wind erosion than the high clay soils of Razor-Midway complex. A majority of construction would take place on Razor-Midway soils in areas of reduced slope, thus reducing this

vulnerability. These soils are rated as moderately susceptible to wind erosion by the NRCS (rating of 4 on scale of 1-8).

The loss of soils attributed to wind erosion would be a temporary impact during the construction timeframe, which is expected to last 1-2 years. Following completion of construction, surface vegetation would remain in place and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease. Wind erosion at the construction site would have temporary minor impacts. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. This effect would occur in the localized area of construction where vehicles operate and vegetation is lost during construction and the soil properties should serve to minimize wind erosion effects.

The implementation of Alternative 1 is not anticipated to have any significant impacts on Fort Carson's geology or topography.

3.5.2.3.2. Downrange Area

Operational Readiness Training Center

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Butts Army Airfield

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Ranges and Training Areas

Elements of training construction and training activities under Alternative 1 would remain the same as for the Proposed Action.

3.5.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Support Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.5.2.4.1. Cantonment Area

Under Alternative 2, the construction of facilities in the cantonment area for engineer and quartermaster units would take place as discussed as part of the Proposed Action.

3.5.2.4.2. Downrange Area

Under this alternative, facilities for the IBCT would be constructed in the area of Fort Carson south of Wilderness Road referred to as Tent City. Minor impacts to soils from surface water erosion resulting from construction activities would occur. This is true for several reasons. First, the footprint for construction site would mostly consist of land which is between 0 and 5 percent slope, meaning that surface water would not be channeled or generate force required to move significant amounts of soil. Secondly, soils within the construction footprint of this alternative consist primarily of Satanta loam and Bresser sandy loam, which are well-drained soils and exhibit ability to hold and conduct water well through soil pores. Other natural properties of the soil to include its aggregation limit the potential for water erosion at the construction site. Finally, the area does not receive excessive precipitation that would lead to soil saturation and consistently high volumes of surface water run-off. Soils within the construction footprint for this alternative are rated as non-highly erodible land by the NRCS (Figure 3.5-7).

Water erosion at the construction site is predicted to have minor impacts. Construction equipment traffic would result in some compaction of soils and would temporarily increase amounts of surface water run-off from the site. Loss of vegetative cover during construction would also result in an increase in water erosion potential at the construction site.

While the Satanta loam soil association is a high percentage (39.5 percent) silt, the NRCS wind erodibility index classifies the soil as moderately resistant to wind erosion (rated a 5 on a 1-8 scale, with 8 being least susceptible to wind erosion). Bresser Sandy loam in the southern half of the construction site is moderately susceptible to wind erosion, however (rated 3 on a 1-8 scale by NRCS).

The loss of soils attributed to wind erosion would be a temporary impact during the construction timeframe, which is expected to last 1-2 years. Construction equipment traffic and construction activities would result in a loss of vegetative cover in the construction footprint. Soils at the construction site

would be more susceptible to wind erosion because of the temporary disturbance caused by construction activities and vehicle traffic, which would expose individual soil particles, and soil aggregates to wind erosion. Following completion of construction, surface vegetation would remain in place and vehicle construction traffic and other surface disturbing construction activities exposing surface soils to wind erosion would cease.

The implementation of Alternative 1 is not anticipated to have any significant impacts on Fort Carson's geology or topography.

Operational Readiness Training Center

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Butts Army Airfield

Elements of construction activities for the CAB under Alternative 1 would remain the same as for the Proposed Action.

Ranges and Training Areas

Elements of training construction and other training activities under Alternative 2 would remain the same as for the Proposed Action.

3.5.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of this No Action Alternative.

Under the No Action Alternative, Fort Carson stationing decisions connected with growth and realignment of the Army would not occur. Construction projects and training activities needed to support these actions would also not occur. Levels of live-fire and maneuver training at Fort Carson would not increase in comparison to training levels that would be realized at the installation following implementation of stationing actions in support of BRAC 2005, GDPR, and AMF decisions. Therefore,

under the No Action Alternative, there would be no impacts to geology or soils above those assessed in the 2007 Fort Carson Transformation EIS (Reference No. 9).

3.5.2.6. Mitigation Measures

During project construction, the Army would minimize erosion through the implementation of BMPs for stormwater management and restore vegetative cover on the construction site as quickly as would be practicable to reduce soil erosion and sedimentation.

The Army continually funds and implements land management practices and procedures described in the ITAM annual work plan to reduce soil erosion and maintain sustainable use of its training areas (Sustainable Range Program AR 350-19). ITAM will implement additional land and vegetation rehabilitation projects to support increased training as funding is made available. ITAM will implement erosion management measures, site restoration, and continue to monitor training areas to mitigate damage from unit training.

The Army would implement increased maintenance of its trail networks to account for additional use by the stationing of new units as part of the Proposed Action and alternatives. This additional maintenance would assist in maintaining drainages off of roads and trails and preventing erosion of the soils surrounding the trail network.

The Army would minimize and avoid cut slopes during range and facility construction, where practicable. Cut slopes would be blended into the landscape by rounding the edges of the slope and by differentially orienting the slope and the roadbed/trail alignments where practicable. Use of these techniques would be varied based on the specific conditions, including depth of the cut, orientation of the slope, and type of material (e.g., dirt slope and rock slope). In accordance with Army design standards, potential mitigation measures for this impact also include, where practicable, selecting the least failure-prone route, geotechnically testing soils where necessary along the route to identify problems, designing the roadbed, slope and surface to avoid slope failure, properly sizing drainage systems, designing storm drainage outfalls for efficient performance, and properly monitoring and maintaining the road. This mitigation measure would be undertaken during construction of proposed roads and trails and would reduce soil erosion impacts.

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3.6. Water Resources

This section describes the affected environment and environmental consequences to water resources, including surface water, stormwater, groundwater, hydrogeology, and floodplains, within the Fort Carson cantonment area, BAAF, and downrange area.

3.6.1. Affected Environment

As outlined in FC Regulation 200-1, it is the policy of Fort Carson to eliminate or minimize the degradation of all water resources on Fort Carson and ensure compliance with all applicable federal, state and local water quality standards. As described in the INRMP (Reference No. 6) water resources at Fort Carson are managed in coordination with the USGS, NRCS, USFWS, US Department of Justice, USACE, and the Colorado State Division of Water Resources. The *Water Resources Management Program* (Reference No. 62) on Fort Carson includes watershed/sedimentation monitoring and management, and project reviews to address erosion and sediment control issues.

3.6.1.1. Surface Water

The northern and eastern portions of the installation are located within the Fountain Creek watershed of the Arkansas River Basin and drain southeasterly into Fountain Creek.

Stormwater runoff in the northern portion of the installation flows into one of four main drainages: B-Ditch, Clover Ditch, Unnamed Ditch, or Rock Creek, which are all tributaries to Fountain Creek. The southern and western portions of the installation drain directly into the Arkansas River to the south (Figure 3.6-1).

These drainages have historically been considered ephemeral or intermittent, in which no flow occurs in some reaches of these drainages for long periods of time during the year, and with the high flow occurring between April and September. Modern day conditions within the watershed, however, have changed the system dynamics, which now typically exhibit perennial flows in most areas of these northern-most drainages. The majority of flows in these drainages consist of runoff from precipitation and snowmelt, which has been increased due to the higher percentages of impervious areas within the watershed. Groundwater seepage and return flows also contribute to baseflows in these drainages.

The cantonment area is located in the Lime Kiln Valley watershed, a sub-watershed to the Fountain Creek watershed.

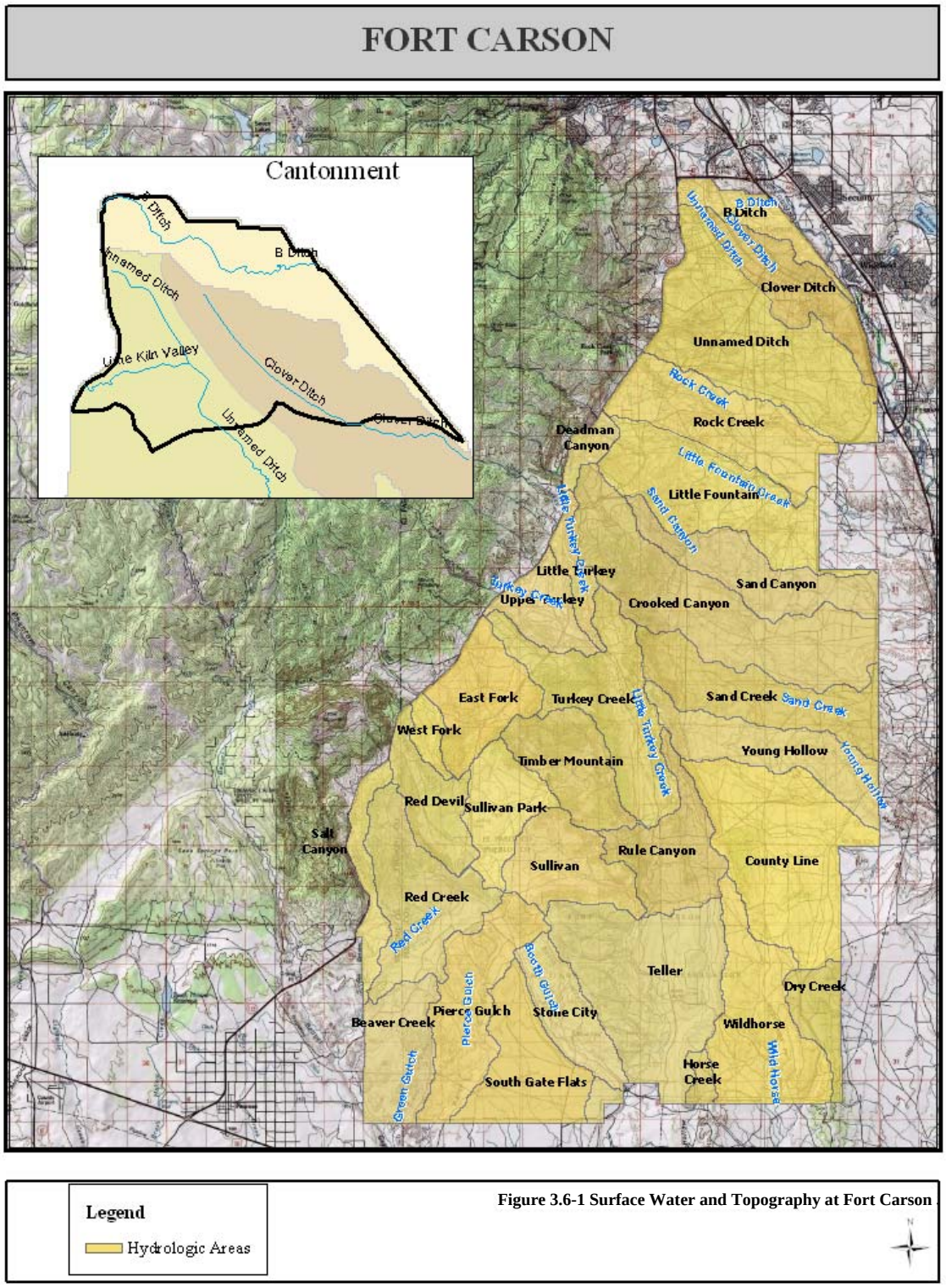

Figure 3.6-1 Surface Water and Topography at Fort Carson

For downrange projects, the installation implements BMPs and Fort Carson's Watershed Management Program. Erosion control activities and BMPs implemented or that could be implemented on the installation to control sediment loading in surface water are identified and described in detail in the Section 404 regional permit issued by the USACE (Reference No. 63). The Section 404 regional permit includes standard operating procedures (SOPs) for erosion control methods, including:

- Erosion control and stock watering impoundments;
- Bank sloping of erosion courses;
- Check dams;
- Rock armor;
- Hardened crossings;
- Culverts and bridges;
- Erosion control terraces and water diversions; and
- Water turnouts.

This permit streamlines coordination and reporting requirements and improves accomplishment of erosion control projects. The regular Section 404 permitting process is used for nonstandard projects (Reference No. 61). To address potential sedimentation issues and avoid violations of regulatory limits, Fort Carson has installed 349 major sediment control structures.

Teller Reservoir, the largest downrange water body, has been listed as an impaired water body on Colorado's Section 303(d) list and has recently been placed on a *Colorado's Monitoring and Evaluation List* to be reevaluated. The impairment is the result of a fish consumption advisory that has been imposed because of a biological accumulation of mercury in soil, plants, and fish tissues. Fort Carson has mandated a catch-and-release fishing program in this body of water to reduce the potential for a public health issue. Although the Teller Reservoir has a capacity of approximately 2,600 acre-feet, it frequently contains no water and had been dry since 2002. Recent observations indicate the reservoir currently contains approximately two feet of water as a result of baseflow (ground water seepage). Water levels in the Teller Reservoir will continue to be monitored.

Fort Carson retains 34 surface water rights as specified by the Colorado Division of Water Resources. Of these surface water rights, 20 are surface diversion ditches and 14 are reservoir storage rights (Reference No. 6). The USGS installed ten surface water-gauging stations on or near Fort Carson streams and reservoirs for continuous monitoring of the water flow. By October 1989, however, surface water gauging was discontinued at five of these stations. Year-round monitoring is conducted at Rock Creek

above Fort Carson, Rock Creek near Fort Carson, Turkey Creek near Fountain, Turkey Creek above Teller Reservoir, and Turkey Creek near Stone City (Reference No. 6). Wild Horse Creek, on the southern border of the installation has been identified as warranting monitoring and evaluation for nitrite/ nitrate as prescribed in the Section 303(d) listing for impaired waters for Colorado. In addition, this creek has been listed for selenium and *E.coli* on the 303(d) list.

Although the quality of the surface water on Fort Carson is good, it is not a source of domestic water at Fort Carson (Reference No. 6). Water from most streams and surficial aquifers on the western portion of the installation is suitable for irrigation. Surface water that flows eastward across Fort Carson accumulates sediments (i.e., suspended solids) that are then concentrated through evaporation. Water from the eastern portion of Fort Carson, however, is still suitable for irrigation with proper management practices.

3.6.1.2. Stormwater

3.6.1.2.1. Modeling/Program Background

Baseline hydrologic models have recently been completed for the B- Ditch, Clover Ditch, Unnamed Ditch, and Rock Creek watersheds. This information provides the installation with a realistic representation of floodplains and peak flows for pre-development, existing, and future proposed conditions. Modeling has been conducted for the three alternatives being considered in this EIS. The analysis is not yet completed as some recently received data still needs to be incorporated into the modeling effort. This hydrologic information will be available for the public meetings planned for later this year and prior to inclusion in the final document as Appendix E.

3.6.1.2.2. Regulations

The 1972 amendments to the *Federal Water Pollution Control Act* (FWPCA, also referred to as the *Clean Water Act* or [CWA]) prohibited the discharge of any pollutant to waters of the US from a point source, unless the discharge was authorized by a *National Pollutant Discharge Elimination System* (NPDES) permit. Early on, efforts to improve water quality under the NPDES program focused on reducing pollutants in discharges of industrial process wastewater and from municipal sewage treatment plants. In response to the need for more comprehensive NPDES requirements for stormwater discharges, Congress amended the CWA in 1987, which required the EPA to establish phased NPDES requirements for stormwater discharges. To implement these requirements, EPA published the initial permit application requirements for storm water discharges associated with certain types of industrial activity and for discharges from municipal separate storm sewer systems located in municipalities with a population of

100,000 or more on November 16, 1990 (55 FR 47990). The municipalities impacted by these initial NPDES requirements are referred to as "Phase I" or "Large" Municipal Separate Storm Sewer Systems (MS4) facilities. In addition, EPA promulgated a final rule addressing Phase II sources on August 7, 1995 (60 FR 40230) (Reference No. 64). Fort Carson is considered a "Phase II" or "Small" MS4 permitted facility.

The Fort Carson Stormwater Program increased efforts in response to EPA's Phase II requirements and the initiation of the NPDES General Permit for Stormwater Discharges from Federal Facility "Small" MS4 in Colorado MS4 Permit in 2003. The program's main objective is to protect surface waters from pollution when precipitation from rain or snowmelt flows over the ground, as stormwater runoff can pick up debris, chemicals, dirt, and other pollutants and flow untreated into a storm sewer system or directly to a pond, creek, river or wetland. In addition, stormwater controls, floodplains, and drainage structures are also assessed on a watershed level scale during project planning phases.

Three permit types are utilized at Fort Carson under the EPA NPDES stormwater program: the Construction General Permit, the Multi-Sector General Permit, and the MS4.

Construction General Permit

Construction projects on Fort Carson are authorized to discharge stormwater runoff from construction sites under a NPDES Construction General Permit. To obtain coverage under the general permit, contractors performing work at Fort Carson must submit a NOI for each construction project that disturbs one acre or more of land. In addition, contractors must develop and implement a *Stormwater Pollution Prevention Plan* (SWPPP) for each project and comply with the additional Best Management Practices (BMPs) set forth in Fort Carson's *Stormwater Management Plan*.

Multi-Sector General Permit

The Multi-Sector General Permit provides facility-specific requirements for many types of industrial facilities within one overall permit. The permit outlines steps that facility operators must take prior to being eligible for permit coverage, including development and implementation of a SWPPP. Some types of industrial facilities at Fort Carson covered under this permit are motor pools, the airfield, and the wastewater treatment plant.

Municipal Separate Storm Sewer System

Under the NPDES stormwater program, operators of large and small regulated MS4s require authorization to discharge pollutants under a NPDES permit. Fort Carson is a regulated small MS4. The EPA's Phase II MS4 permit for federal facilities in Colorado expired in June 2008. A new individual permit is anticipated to be issued to Fort Carson in December 2008, so this expired permit has been administratively continued.

The federal stormwater regulations and Fort Carson's MS4 permit require development, implementation, and enforcement of a *Stormwater Management Program and Plan* designed to reduce the discharge of pollutants from the installation stormwater system to the maximum extent practicable to protect water quality. EPA has determined that the program must implement six minimum control measures, as listed below:

- Public Education and Outreach – distributing educational materials and performing outreach to inform citizens about the impacts polluted stormwater runoff discharges can have on water quality;
- Public Participation/Involvement – providing opportunities for citizens to participate in program development and implementation, including effectively publicizing public hearings and/or encouraging citizen representatives on a stormwater management panel;
- Illicit Discharge Detection and Elimination – developing and implementing a plan to detect and eliminate illicit discharges to the storm sewer system;
- Construction Site Runoff Control – developing, implementing, and enforcing an erosion and sediment control program for construction activities that disturb one or more acres of land;
- Post-Construction Runoff Control – developing, implementing, and enforcing a program to address discharges of post-construction stormwater runoff from new development and redevelopment areas; and
- Pollution Prevention/Good Housekeeping – developing and implementing a program with the goal of preventing or reducing pollutant runoff from municipal operations, including municipal staff training on pollution prevention measures and techniques.

3.6.1.3. Hydrogeology and Groundwater

Groundwater at Fort Carson exists in both alluvial and bedrock aquifers. Alluvial aquifers are formed from unconsolidated deposits of stream alluvium, colluvium, and residuum derived from Pierre Shale that are moderately permeable. The alluvial aquifers can provide well yields from 10 to more than 100 gallons per minute (gpm) (Reference No. 65). In much of the Arkansas River Basin, hydraulic heads are lower in

the deep bedrock aquifers than those in the shallow formations, which indicates that deep bedrock aquifers are not in hydrological connection with the shallow formations. The primary bedrock aquifer at Fort Carson is the Dakota-Purgatoire aquifer, which can yield 10 gpm, although local fracturing can increase permeability and yield more than 200 gpm. Precipitation and stream flow infiltration recharge the bedrock aquifers (Reference No. 65).

In general, the quality of groundwater on Fort Carson is good with the exception of localized areas of elevated nitrates, high dissolved solids, and sulfates exceeding secondary drinking water standards. Nitrates have recently been detected in the groundwater at multiple locations greater than the regulatory standard of 10 milligrams per liter (mg/L). Currently, Fort Carson and CDPHE are collaborating to evaluate the possibility that elevated concentrations of nitrates may be naturally occurring as a result of groundwater coming in direct contact with the shale bedrock (Reference No. 66). This work is ongoing and may not be completed for this environmental evaluation.

The Army has 16 subsurface water rights, including nine wells for domestic or military use, at Fort Carson. Seven wells classified as future wells are planned to be installed when needed (Reference No. 6). Water rights directly support the training mission by ensuring adequate water supplies for the support and rehabilitation of natural resources on Fort Carson, and to provide training capabilities and fire suppression.

3.6.1.4. Floodplains

Fort Carson is located near the border of the Great Plains and the Front Range of the Rocky Mountains. The climate is moderate and semi-arid, with an average July temperature of 71 °F and an average January temperature of 29°F. Mean precipitation is about 17 inches per year. Rainfall ranges from approximately 12 inches (southern Fort Carson) to 15 inches (northern Fort Carson) per year, with about 80 percent falling between early April and late September. Average annual snowfall is approximately 36 inches. Snow and sleet usually occur from September to May, with the heaviest snowfall registered in March and trace accumulations recorded as late as June (Reference No. 6). Typical storms that occur at Fort Carson correlate to the Soil Conservation Service's Type II storm event, which tend to be brief and intense.

100-year floodplains are associated with all three of the drainages within the cantonment area. Details on how the EIS alternatives relate to these areas can be found in the stormwater simulations document, located in Appendix E.

3.6.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all the scenarios.

3.6.2.1. Proposed Action and Alternatives

Effects to the water supply are addressed in Section 3.11 of this EIS.

3.6.2.1.1. Surface Water, Stormwater, and Floodplains

The threshold of significance for impacts to water resources would be if the Proposed Action or the Alternatives would cause a violation of state water quality criteria, a violation of NPDES discharge permits, potential degradation of an aquifer, and/or non-compliance with Fort Carson's MS4 Permit conditions.

The threshold of significance for adverse impacts to the floodplains would be if the Proposed Action or the alternatives were to be constructed within a known floodplain and without following protocol outlined in EO 11988.

There would be no significant impacts associated with the ranges and training areas, due to the Proposed Action or any of the alternatives.

3.6.2.1.2. Hydrogeology and Groundwater

Dewatering could be necessary during construction but impacts associated with dewatering activities would be mitigated through BMPs and guidance from Fort Carson. As with training, construction and operation of new facilities would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which could result in an indirect effect to groundwater if accidentally released into the environment. Fort Carson, however, would require that all handling and storage of hazardous and toxic substances be performed in accordance with established procedures and policies as described above.

3.6.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.6.2.2.1. Cantonment Area

Hydrogeology and Groundwater

Construction and operation of new facilities would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which could result in an indirect effect to groundwater if accidentally

released into the environment. Fort Carson, however, would require that all handling and storage of hazardous and toxic substances be performed in accordance with established procedures and policies as described as follows.

Surface Water, Stormwater, and Floodplains

This assessment will be addressed in the *Stormwater Simulations for Grow the Army EIS Fort Carson*, which will be available prior to the public meetings taking place later this year.

3.6.2.2.2. Downrange Area

Hydrogeology and Groundwater

Groundwater from nine existing wells is used at Fort Carson for natural resource support and rehabilitation, support of training capabilities, and fire suppression. With increased training activities under the Proposed Action, groundwater use may increase. The increase, however, can be accommodated under existing subsurface water rights, including seven wells that are classified as future wells to be installed when required. The Proposed Action would not release any water, which demonstrates poor water quality directly into the aquifers at Fort Carson. Therefore, the Proposed Action would have no direct adverse effect on groundwater at Fort Carson.

Increased training would increase the use of fuels, solvents, and other hazardous and toxic substances (Section 3.12), which might result in an indirect effect to groundwater if released into the environment in an area where infiltration to groundwater could result. Fort Carson would continue to implement all applicable hazards management plans to address leaks or spills of hazardous materials as described in Section 3.6.1.2.2.

The types of impacts associated with the Proposed Action would be the same for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the ORTC, BAAF, and Range and Training Areas.

3.6.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Site

3.6.2.3.1. Cantonment Area

Hydrogeology and Groundwater

The types of impacts associated with construction and operational activities would be the same as those described for the Proposed Action. Shallow groundwater conditions may exist in this area, which would require additional planning and management to avoid adverse impacts to this resource.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the cantonment area.

3.6.2.3.2. Downrange Area

Hydrogeology and Groundwater

The types of impacts associated with training an additional IBCT and potential CAB activities would be the same as for the Proposed Action for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the ORTC, BAAF, and the Range and Training Areas.

3.6.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.6.2.4.1. Cantonment Area

Hydrogeology and Groundwater

The types of impacts associated with construction and operational activities would be the same as for the Proposed Action.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the cantonment area.

3.6.2.4.2. Downrange Area

Hydrogeology and Groundwater

The types of impacts associated with training an additional IBCT and CAB activities would be the same as for the Proposed Action for the ORTC, BAAF, and the Range and Training Areas.

Surface Water, Stormwater, and Floodplains

The discussion provided in Section 3.6.2.2.1 also applies to the ORTC, BAAF, and the Range and Training Areas.

3.6.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, their impacts have been included as part of this No Action Alternative.

No construction to support an additional IBCT or CAB would occur under the No Action Alternative. Therefore, water resources, surface water, stormwater, or floodplains would not be affected by construction or facility operation activities above those described in the 2007 Fort Carson Transformation EIS.

No construction to support an additional IBCT or CAB would occur under the No Action Alternative. Therefore, there would be no impacts to surface water, stormwater, or floodplains above those described in the 2007 Fort Carson Transformation EIS.

Training an additional IBCT and a CAB would not occur under the No Action Alternative. Therefore, hydrology and groundwater resources would not be affected above those described in the 2007 Fort Carson Transformation EIS under the No Action Alternative.

3.6.2.6. Mitigation Measures

Pursuant to provisions in the CWA, contractors performing work at Fort Carson must submit a NOI to obtain coverage under the EPA's Construction General Permit for each construction project that disturbs one acre or more. In addition, project proponents must develop and implement a SWPPP for each project that outlines mitigation strategies to reduce impacts associated with stormwater runoff during

construction. The greatest impact posed by land disturbance is the erosion/sedimentation process that is not managed effectively at the source.

Phasing of construction, compliance with the Construction General Permit, and successful implementation of the SWPPP would reduce potential negative impacts to surface water. The conversion of open areas to buildings and parking areas may increase stormwater runoff; however, proposed projects should be designed to meet the needs of Fort Carson's watershed, which in part can be determined through Fort Carson's hydrologic modeling efforts. These efforts may result in budget adjustments and/or design revisions in order to minimize the overall impact on Fort Carson's watersheds.

Fort Carson should strive to incorporate low impact development methods into the construction project designs, in order to promote infiltration and evapotranspiration processes. This would alleviate offsite runoff and potential negative impacts to water quality and quantity.

3.7. Biological Resources

This section describes the affected environment and environmental consequences of the Proposed Action, alternatives, and the No Action Alternative for biological resources on Fort Carson. This includes vegetation, wildlife, sensitive species, and wetlands. Information on the occurrence and distribution of natural resources on Fort Carson was obtained from a variety of sources, chiefly the latest INRMP (Reference No. 6) and Fort Carson GIS data.

3.7.1. Affected Environment

3.7.1.1. Vegetation

Fort Carson is located at the western edge of the Central Shortgrass Prairie Ecoregion, which includes all the plains of Colorado east of the Rocky Mountains as well as parts of Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico. The Central Shortgrass Prairie is characterized by rolling-to-undulating plains and tablelands of low relief that are traversed by streams and contain canyons, buttes, badlands, and isolated mountains. Shortgrass prairie, mixed-grass prairie, and sand-sage prairie community types dominate the Central Shortgrass Prairie Ecoregion (Reference No. 67).

Fort Carson is within upper regions of the Prairie Grasslands Plant Zone, an area characterized by generally treeless terrain dominated by plants belonging to the grass family (Reference No. 6). Figure 3.7-1 shows vegetation types on Fort Carson.

A reference plant collection (herbarium) was developed for species found on Fort Carson. This herbarium includes a laminated sample of each plant species with pertinent information on each laminated sheet. The entire collection has been digitized (Reference No. 6). Existing data on plant species present on Fort Carson are available in greater detail in the INRMP (Reference No. 6). A plant species[3] list for Fort Carson, including scientific names, is provided in Appendix F.

Grasslands comprise about 45 percent of Fort Carson and the majority of this cover includes two major types: shortgrass prairie and foothills grassland. Blue grama-dominated shortgrass prairie occupies low relief sites, primarily in the southern half of Fort Carson. Cholla is a frequent component of Fort Carson short grass prairie, providing significant structure to grasslands where this species is abundant. Foothills grasslands are interspersed throughout uplands, primarily in the northern and western portions of Fort Carson. Foothills grasslands are generally composed of blue grama mixed with taller grasses: wheat grass, needle-and-thread, dropseed, ryegrass, bluestems and sleepy grass. In the absence of fire, foothills grasslands support deciduous shrubs, primarily skunkbush and yucca.

[3]Scientific names of plants on Fort Carson are in Appendix F.

Figure 3.7-1 Vegetation Types on Fort Carson

Although occupying less area, saline soil alkaline sacaton grasslands found along the eastern boundary of Fort Carson are a significant ecological resource. Sacaton is a densely tufted perennial bunchgrass and, if unburned, forms dense and nearly pure stands or stands with four-winged saltbush. Numerous sensitive wildlife species are found in the sacaton grasslands of Fort Carson, more than any other habitat type on the installation.

Shrublands, typically with grass understory, comprise about 14 percent of Fort Carson vegetation cover. North slopes and moist sites are dominated by montane shrubs: mountain mahogany, skunkbush, or gambel oak. Semi-desert shrublands occupy lowland flats and creek benches, primarily on saline soils. These sites are typically dominated by shadscale or four-winged saltbush. Frankenia shrublands are found on Niobrara barrens, primarily in central and southern Fort Carson, often on high relief sites. Frankenia shrublands support several Species of Special Concern. Relatively rare willow thickets in perennial and intermittent water courses provide significant cover for wildlife, reduce erosion, and slow the speed of water associated with storm events. Several deciduous shrubland types are found on Fort Carson, and these are often restricted to special edaphic (soil-related) conditions (Reference No. 68).

Forest/Woodlands constitute about 37 percent of Fort Carson. Ponderosa pine, Pinyon pine, and one-seed juniper are dominant species and are found in mountainous and high relief sites on Fort Carson, primarily on coarse or rocky soils. Ponderosa pine occurs in pure stands or mixed with pinyon, gambel oak, and Rocky Mountain juniper, depending upon relative seral stage of the site. Oneseed juniper dominates low relief hills and mesas primarily in the southern half of Fort Carson, occasionally invading adjacent grasslands. Oneseed juniper stands are a valuable training resource on Fort Carson and play a significant role in the training mission. Pinyon pine is frequently a significant component in juniper-dominated communities, where it can comprise 15-30 percent of the tree canopy. Recent drought and bark beetles have been a significant source of pinyon mortality. Oak and pinyon are the significant mast producing species on Fort Carson and are of considerable ecological importance to the sustainability of biodiversity in woodland communities.

Riparian woodlands are rare on the installation and are best developed in major drainages. Riparian woodlands provide significant cover for a variety of wildlife species and are important in the regulation of storm water run-off, erosion, and abatement of downstream flooding.

Fort Carson experienced a wildland fire in mid-April 2008 that burned more than 9,000 acres. The fire scorched the downrange area located about 11 miles southwest of Fort Carson's cantonment area in

southern El Paso County, near SH 115. SH 115 served as a firebreak, which helped the firefighters keep the fire from spreading off-post into the rugged terrain to the west. The fire caused people and animals to evaluate from Turkey Creek Ranch and temporary closure of SH 115 from Fort Carson's Gate 6 south. Fort Carson is actively restoring this area. As well as rehabilitation efforts, Fort Carson is actively removing trees that pose a human safety risk to assist in reopening public areas.

3.7.1.1.1. Noxious Weeds

There are currently 58 state-listed weed species designated for containment, control, or eradication. At least 28 state-listed and 17 other county-listed (El Paso, Pueblo, Fremont, and Las Animas[4] counties) noxious weeds have invaded both natural and urbanized landscapes (Reference No. 6). There are 22 noxious weeds known to occur on Fort Carson. Only one, Myrtle spurge (*Euphorbia myrsinites*) is considered an List A species in Colorado. List A species are those considered so potentially damaging (and not yet widespread throughout the state) that they are designated for eradication. List B weed species are species for which state management plans are developed to stop their continued spread.

There are 14 known List B weed species on Fort Carson. They are Canada thistle (*Cirsium arvense*), Common teasel (*Dipsacus fullonum*), Diffuse knapweed (*Centaurea diffusa*), Hoary cress (*Cardaria draba*), Houndstongue (*Cynoglossum officinale*), Leafy spurge (*Euphorbia esula*), Musk thistle (*Carduus nutans*), Redstem filaree (*Erodium cicutarium*). Russian-olive (*Elaeagnus angustifolia*), Salt cedar (*Tamarix chinensis, T. parviflora,* and *T. ramosissima*), Scotch thistle (*Onopordum acanthium*), Spotted knapweed (*Centaurea maculosa*), Perrenial pepperweed (*Lepidium latifolium),* and Yellow toadflax (*Linaria vulgaris*).

List C weed species are species for which the Commissioner, in consultation with the state noxious weed advisory committee, local governments, and other interested parties, would develop and implement state noxious weed management plans designed to support the efforts of local governing bodies to facilitate more effective integrated weed management on private and public lands. The goal of such plans would not be to stop the continued spread of these species but to provide additional education, research, and biological control resources to jurisdictions that choose to require management of List C species. List C weed species known to occur at Fort Carson include: Common burdock (*Arctium minus*), Common mullein (*Verbascum thapsus*), Common St. Johnswort (*Hypericum perforatum*), Downy brome (*Bromus tectorum*), Field bindweed (*Convolvulus arvensis*), Jointed goatgrass (*Aegilops cylindrica*), Poison hemlock (*Conium maculatum*), and Puncturevine (*Tribulus terrestris*). List C species are those that have

[4] Las Animas County is for PCMS noxious weeds.

become so widespread that eradication is impossible and species-specific control would be extremely difficult if not impossible. Therefore, measures for control of these species apply to all weeds in general and are geared towards education and BMPs to help suppress populations. On Fort Carson, the weed species of most concern are myrtle spurge, dalmation and yellow toadflax, leafy spurge, and scotch thistle. As part of the federal mandate to control noxious weeds as directed in *Section 15 of the Federal Noxious Weed Act of 1974, "Management of Undesirable Plants on Federal Lands,"* Fort Carson has developed an *Invasive Plants Management Plan*. The plan addresses noxious weed management strategies for Fort Carson and PCMS through 2012, and would be reviewed and updated if necessary each year.

In 1997, Fort Carson initiated a biological control program as part of a federal initiative to reduce herbicide use by up to 80 percent. The program, using natural enemies (insects and mites) to reduce weed densities, provides a sustainable and environmentally-sound solution to noxious weed issues, while preserving the vulnerable plant and animal communities on Fort Carson. The biological control program has been successful at significantly reducing weed populations at several sites, and has grown into a partnering initiative with several other federal agencies along the Colorado Front Range. More information on the Fort Carson *Biological Control Program* can be found in *Biological Control of Noxious Weeds on Federal Installations in Colorado and Wyoming, 2007 Consolidated Report.*

3.7.1.1.2. Cantonment Area

The cantonment area on Fort Carson is highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping, including bluegrass turf and landscape trees. Only small areas of native vegetation remain within the cantonment area.

3.7.1.2. Wildlife

Wildlife habitats on Fort Carson are diverse and cover large tracts of relatively undeveloped land. Although land use impacts are different than those typically found in the region (e.g., housing development, livestock grazing, mineral extraction), maintaining wildlife habitats within the regime of military training is not completely incompatible but does require active management by Fort Carson. Habitats that are disappearing in the vicinity of these installations due to development are maintained, sometimes in a relatively natural state, in large tracts on Fort Carson (Reference No. 6). Eberly (2007) provides many military installation examples where such quality habitats are helping maintain populations of prairie birds.

Dominant terrestrial habitat types on Fort Carson are grasslands (45 percent), shrublands (14 percent), and woodlands (37 percent). Aquatic habitats on Fort Carson are very limited and consist of wetlands, riparian corridors, and open water. Data on wildlife species and descriptions of wildlife habitats present on Fort Carson were obtained from the INRMP (Reference No. 6). A wildlife species list for Fort Carson is presented in Appendix F.

3.7.1.2.1. Mammals

Common large mammals include mule and white-tailed deer[5], elk, pronghorn, mountain lion, coyote, and black bear (Reference No. 6). Many of these species are more common in mountainous areas, but all were native to the Great Plains at one time and have been extirpated from large areas. While most are not considered species of concern, maintaining this representation of Great Plains biodiversity may require active management at Fort Carson.

3.7.1.2.2. Birds

Numerous bird species are known to occur on Fort Carson. Twenty-seven species of hawks and owls are known to use Fort Carson, including the Mexican Spotted Owl, Bald Eagle, and Peregrine Falcon (Reference No. 6). Of these, 17 species breed on Fort Carson; 19 species are winter residents; and eight species are classified as federally- or state-listed or as species of special concern. Raptors on Fort Carson have a wide range of ecological tolerance and requirements. Effective BMPs represent a combination of general, species-specific, and in some cases individually crafted prescriptions. Currently, the Golden Eagle is the most vulnerable nesting species on Fort Carson. The 24 active eyries on Fort Carson annually contribute significantly to the sustainability of the regional breeding population. Currently, recreation, construction, maintenance projects, and dismounted training constitute the greatest risk to nesting eagles. The Prairie Falcon, Ferruginous Hawk, and Swainson's Hawk are sensitive species and are relatively rare as nesting species on Fort Carson. They can be impacted by the same threats as for the Golden Eagle.

3.7.1.2.3. Fish

Native and non-native fish can be found in reservoirs on Fort Carson (Reference No. 68), eight of which are normally managed for sport fishing (Reference No. 6). In recent years, only three reservoirs, Haymes, Womack, and Townsend, held enough water to sustain fisheries (Reference No. 6). Historically, other reservoirs have supported populations of native fish, water birds, and amphibians. Streams, especially spring-fed streams, also support native fish species on Fort Carson (Reference Nos. 68 and 69).

[5] Scientific names of animals on Fort Carson are in Appendix F.

3.7.1.2.4. Reptiles and Amphibians

Western rattlesnake, triploid checkered whiptail, and coachwhip are typical reptiles found on Fort Carson. Wetlands support several reptile and amphibian species found on Fort Carson, including plains leopard frog, northern leopard frog (petitioned for federal listing as a threatened species in 2006), and painted turtle.

3.7.1.3. Sensitive Species

Federally-listed threatened and endangered plant and animal species are protected under the *Endangered Species Act*. The *Migratory Bird Treaty Act* implements US commitments to international conventions for the protection of migratory birds. Bald and Golden Eagles are protected by the *Bald and Golden Eagle Protection Act*. Other sensitive wildlife species include those listed by the CDOW, Colorado Natural Heritage Program (CNHP), USFWS Birds of Conservation Concern, Partners in Flight, and the Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (now called the Shortgrass Prairie Partnership). Sensitive plant species include those identified by the CNHP as Colorado Species of Concern.

NatureServe (2004) identified Species at Risk for DoD facilities. This list was comprised of plant and animal species that are not federally-listed as threatened or endangered under the *Endangered Species Act*, but that are either federally-listed as candidates or are ranked by NatureServe as critically imperiled or imperiled throughout their range. This list imparts no compliance implications (AR 200-1 provides guidance and directs action) but is used as a tool to conserve species proactively to avoid the need for listing. The original 2004 list from Fort Carson and PCMS included the round-leaf four o'clock, Arkansas Valley evening primrose, rayless goldenweed, and triploid checkered whiptail. Since then, additional species have been considered Species at Risk based on expertise from the natural resource managers at the facilities and other regional experts. Surveys have been conducted for all of these species.

3.7.1.3.1. Federally-Listed Species

The *Endangered Species Act* defines an endangered species as any species in danger of extinction throughout all or a major portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. Table 3.7-1 presents federally-listed endangered, threatened, and candidate species for counties in which Fort Carson is located (El Paso, Pueblo, and Fremont counties). No critical habitat for these species has been designated or proposed for designation in these counties (Reference Nos. 70 and 71).

Table 3.7-1 Federally-Listed Endangered, Threatened, and Candidate Species of Counties[1]				
Species	**Scientific Name**	**Species Type**	**Status**	**Distribution on Fort Carson**
Arkansas darter[2]	*Etheostoma cragini*	Fish	C	Occurs in Turkey Creek (introduced population)
Greenback cutthroat trout[2]	*Oncorhynchus clarki stomias*	Fish	T	Occurred in Lytle Pond, now dry (introduced population)
Black-footed ferret	*Mustela nigripes*	Mammal	E	Not known to occur
Preble's meadow jumping mouse	*Zapus hudsonius preblei*	Mammal	T	Not known to occur; 1995 and 1996 surveys did not find evidence of this species
Mexican Spotted Owl^	*Strix occidentalis*	Bird	T	Winter resident
Ute ladies'-tresses	*Spiranthes diluvialis*	Plant	T	Not known to occur, surveys (1994-1996) found no evidence

[1]Species for which no reasonably suitable habitat exists on Fort Carson are not included.
[2]Species occurring on Fort Carson are also state-listed.
C – Candidate, E – Endangered, T – Threatened,

The following two federally-listed wildlife species are known to use Fort Carson:

The ***Mexican Spotted Owl*** nests in rugged mountainous-forested canyons west of the Fort Carson boundary. It is a rare winter resident on Fort Carson known only from Rock Creek, Little Fountain, and Red Creek canyons. The species is not suspected to breed on Fort Carson. The *Biological Assessment and Management Plan for the Mexican Spotted Owl on Fort Carson* contains more information on this species (Reference No. 72).

The ***Greenback Cutthroat Trout*** is the only trout endemic to headwaters of the South Platte River and Arkansas River systems. Fort Carson is on the eastern edge of the historical distribution of the species. It was introduced into Lytle Pond in the Turkey Creek Protected Species Area. The Turkey Creek population was one of the first recovery efforts for this species by the USFWS within the Arkansas River drainage (Reference No. 6).

3.7.1.3.2. State-Listed Species and Species of Concern

Table 3.7-2 presents the special status wildlife species that occur (i.e., have been observed) on Fort Carson. These species are tracked by CDOW, CNHP, USFWS, Partners in Flight, and the Shortgrass Prairie Partnership. State threatened and endangered wildlife species are protected by Colorado state law, but Species of Concern are identified for planning purposes only. The distribution of sensitive wildlife species habitats on Fort Carson is depicted in Figure 3.7-2.

1

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Southern redbelly dace	*Phoxinus erythrogaster*	Fish	SE	CDOW, CNHP, CSP
Arkansas darter	*Etheostoma cragini*	Fish	T	CDOW, CNHP, CSP, USFWS
Greenback cutthroat trout	*Oncorhynchus clarki stomias*	Fish	ST	CDOW, USFWS
Flathead Chub	*Platygobio*	Fish	SC	CDOW
Northern leopard frog	*Rana pipiens*	Amphibian	SC	CDOW, CNHP, CSP
Painted turtle	*Chrysemys picta*	Reptile	SC	CNHP
Short-horned lizard	*Phrynosoma douglassi*	Reptile	C	CNHP, CSP
Triploid checkered whiptail	*Aspidoscelis neotessalatus*	Reptile	SC	CDOW, CNHP, CSP, SAR
Black-tailed prairie dog	*Cynomys ludovicianus*	Mammal	SC	CDOW, CNHP, CSP
American White Pelican	*Pelecanus erythrorhynchos*	Bird	SC	CNHP
Snowy Egret	*Egretta thula*	Bird	SC	CNHP
White-faced Ibis	*Plegadis chihi*	Bird	SC	CNHP
Mississippi Kite	*Ictinia misisippiensis*	Bird	SC	PIF
Bald Eagle	*Haliaeetus leucocephalus*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Northern Harrier	*Circus cyaneus*	Bird	SC	PIF, USFWS
Northern Goshawk	*Accipiter gentilis*	Bird	SC	CNHP
Swainson's Hawk	*Buteo swainsoni*	Bird	SC	PIF, USFWS
Ferruginous Hawk	*Buteo regalis*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Rough-legged Hawk	*Buteo lagopus*	Bird	SC	PIF
Golden Eagle	*Aquila chrysaetos*	Bird	SC	USFWS
Peregrine Falcon	*Falco peregrinus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Prairie Falcon	*Falco mexicanus*	Bird	SC	CNHP, PIF, USFWS
Scaled Quail	*Callipepla squamate*	Bird	SC	PIF
Mountain Plover	*Charadrius montanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Solitary Sandpiper	*Tringa solitaria*	Bird	SC	USFWS
Black-necked Stilt	*Himantopus mexicanus*	Bird	SC	CNHP
Long-billed Curlew	*Numenius americanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Willet	*Catoptrophorus semipalmatus*	Bird	SC	CNHP
Wilson's Phalarope	*Phalaropus tricolor*	Bird	SC	CNHP
Forester's Tern	*Sterna forsteri*	Bird	SC	CNHP
Band-tailed Pigeon	*Patagioenas fasciata*	Bird	SC	CNHP
Yellow-billed Cuckoo	*Coccyzus americanus*	Bird	SC	USFWS
Northern Pygmy-Owl	*Glaucidium gnoma*	Bird	SC	CNHP, PIF

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson (continued)				
Burrowing Owl	*Athene cunicularia*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Mexican Spotted Owl	*Strix occidentalis*	Bird	ST	CDOW, PIF, USFWS
Short-eared Owl	*Asio flammeus*	Bird	SC	CNHP
Common Poorwill	*Phalaenoptilus nuttallii*	Bird	SC	PIF
Black Swift	*Cypseloides niger*	Bird	SC	CNHP
White-throated Swift	*Aeronautes saxatalis*	Bird	SC	PIF
Black-chinned Hummingbird	*Archilochus alexandri*	Bird	SC	PIF
Calliope Hummingbird	*Stellula calliope*	Bird	SC	PIF
Rufous Hummingbird	*Selasphorus rufus*	Bird	SC	PIF
Lewis' Woodpecker	*Melanerpes lewis*	Bird	SC	CNHP, PIF, USFWS
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Bird	SC	USFWS
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Bird	SC	PIF
Williamson's Sapsucker	*Sphyrapicus thyroideus*	Bird	SC	USFWS
Olive-sided Flycatcher	*Contopus cooperii*	Bird	SC	PIF
Willow Flycatcher	*Empidonax trailii*	Bird	SC	CHNP
Dusky Flycatcher	*Empidonax oberholseri*	Bird	SC	PIF
Gray Flycatcher	*Empidonax wrightii*	Bird	SC	PIF
Cassin's Kingbird	*Tyrannus vociferans*	Bird	SC	PIF
Western Kingbird	*Tyrannus verticalis*	Bird	SC	PIF
Northern Shrike	*Lanius excubitor*	Bird	SC	PIF
Loggerhead Shrike	*Lanius ludovicianus*	Bird	SC	USFWS
Western-Scrub Jay	*Aphelocoma californica*	Bird	SC	PIF
Pinyon Jay	*Gymnorhinus cyanocephalus*	Bird	SC	USFWS
Clark's Nutcracker	*Nucifraga columbiana*	Bird	SC	PIF
Juniper Titmouse	*Baeolophus ridgwayi*	Bird	SC	PIF
Carolina Wren	*Thyrothorus ludovicianus*	Bird	SC	PIF
Western Bluebird	*Sialia mexicana*	Bird	SC	PIF
Mountain Bluebird	*Sialia currucoides*	Bird	SC	PIF
Veery	*Catharus fuscescens*	Bird	SC	CNHP
Brown Thrasher	*Toxostoma rufum*	Bird	SC	PIF
Curve-billed Thrasher	*Toxostoma curvirostre*	Bird	SC	CNHP
White-eyed Vireo	*Vireo griseus*	Bird	SC	PIF
Blue-headed Vireo	*Vireo solitarius*	Bird	SC	PIF
Blue-winged Warbler	*Vermivora pinus*	Bird	SC	PIF
Golden-winged Warbler	*Vermivora chrysoptera*	Bird	SC	PIF
Virginia's Warbler	*Vermivora virginiae*	Bird	SC	PIF, USFWS
Black-throated Gray Warbler	*Dendroica nigrescens*	Bird	SC	PIF, USFWS

Table 3.7-2 Special Status Wildlife Species Observed on Fort Carson (continued)				
Black-throated Green Warbler	*Dendroica virens*	Bird	SC	PIF
Worm-eating Warbler	*Helmitheros vermivorus*	Bird	SC	PIF
Hooded Warbler	*Wilsonia citrina*	Bird	SC	PIF
Grace's Warbler	*Dendroica graciae*	Bird	SC	CNHP, USFWS
Lazuli Bunting	*Passerina amoena*	Bird	SC	PIF
Indigo Bunting	*Passerina cyanea*	Bird	SC	PIF
Dickcissel		Bird	SC	PIF
Green-tailed Towhee	*Pipilo chlorurus*	Bird	SC	PIF
Canyon Towhee	*Spiza americana*	Bird	SC	PIF
Cassin's Sparrow	*Aimophila cassinii*	Bird	SC	CNHP, CSP, PIF, USFWS
American Tree Sparrow	*Spizella arborea*	Bird	SC	PIF
Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird	SC	CNHP
Brewer's Sparrow	*Spizella breweri*	Bird	SC	PIF, USFWS
Black-throated Sparow	*Amphispiza bilineata*	Bird	SC	PIF
Lark Bunting	*Calamospiza melanocorys*	Bird	SC	PIF, USFWS
Grasshopper Sparrow	*Ammodramus savannarum*	Bird	SC	PIF, USFWS
Fox Sparrow	*Passerella iliaca*	Bird	SC	PIF
Lincoln's Sparrow	*Melospiza lincolnii*	Bird	SC	PIF
White-throated Sparrow	*Zonotrichia albicollis*	Bird	SC	PIF
Harris' Sparrow	*Zonotrichia querula*	Bird	SC	PIF
McCown's Longspur	*Calcarius mccownii*	Bird	SC	CNHP
Lapland Longspur	*Calcarius lapponicus*	Bird	SC	PIF
Chestnut-collared Longspur	*Calcarius ornatus*	Bird	SC	CNHP, USFWS
Bobolink	*Dolichonyx oryzivorus*	Bird	SC	CNHP
Brown-capped Rosy Finch	*Leucocsticte australis*	Bird	SC	CNHP
Cassin's Finch	*Carpodacus cassinii*	Bird	SC	PIF

CDOW = Colorado Division of Wildlife; CNHP – Colorado Natural Heritage Program
CSP = Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (Reference No. 73) (now called the Shortgrass Prairie Partnership)
PIF = Partners in Flight (Reference No. 74), SAR = Species of Concern
USFWS = US Fish and Wildlife Service (Reference No. 75)
SE = Colorado State Endangered, ST = Colorado State Threatened, SC = Species of Special Concern

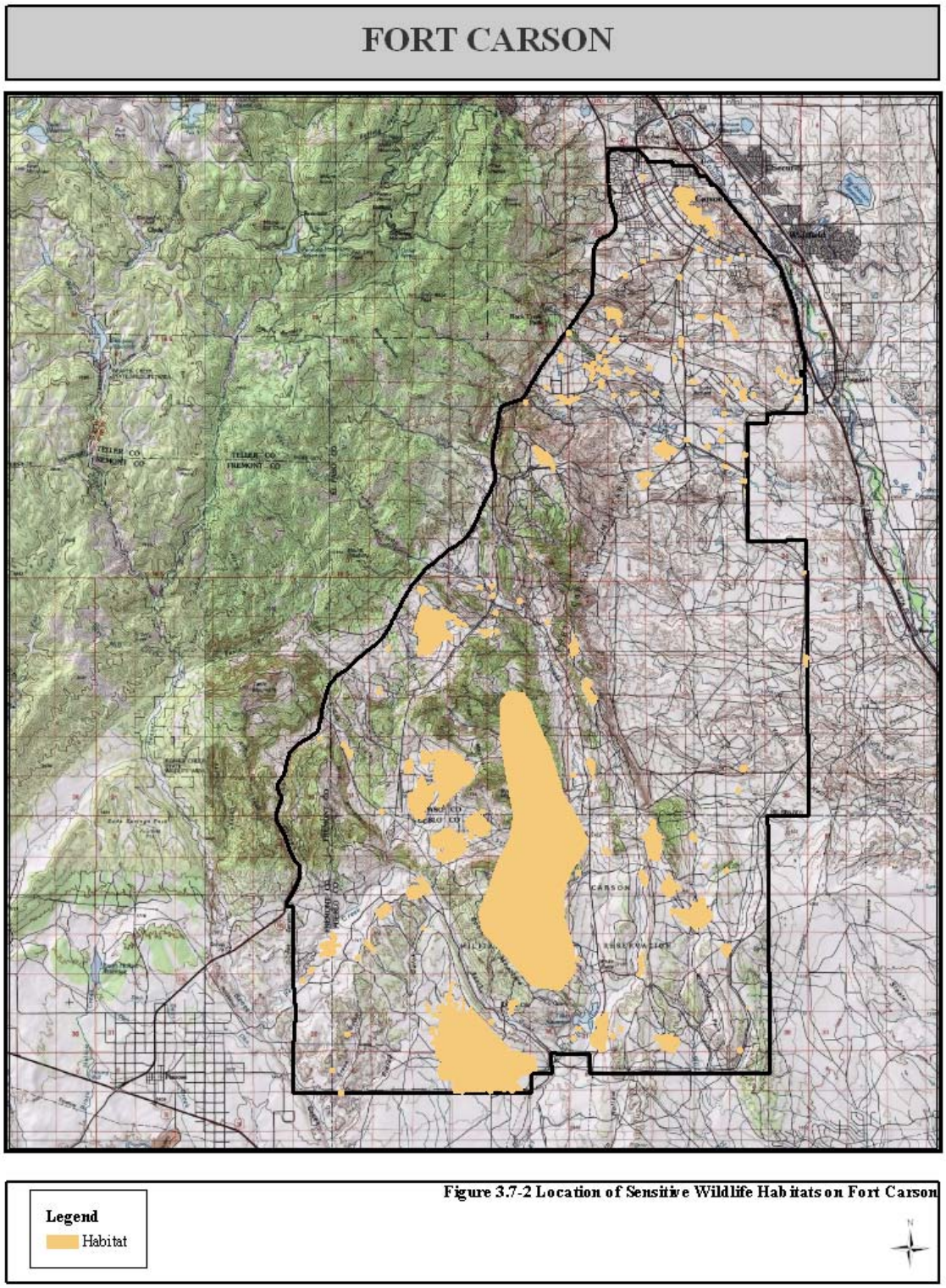

Figure 3.7-2 Location of Sensitive Wildlife Habitats on Fort Carson

Southern redbelly dace, a Colorado Endangered species, was introduced into Stone City Quarry Reservoir from the US Army Pueblo Chemical Depot by Fort Carson and USFWS in the mid-1990s. By 1995 the population was well established. Fort Carson is actively involved with state recovery efforts for this species by providing dace to the CDOW for transplanting elsewhere in the Arkansas River drainage. In 2001 dace captured at Quarry Pond were transferred to the J.D. Mumma Native Aquatic Species Restoration Facility, in Alamosa, Colorado, where they were bred in captivity as part of a state-wide recovery effort (personal communication, Gary Dowler, CDOW Aquatic Biologist, as stated in USACE [2007a]). Progeny of the Quarry Pond dace bred at the facility were recently released in the Arkansas River drainage.

The Arkansas darter (which is also a candidate species for federal listing) was introduced into Lytle Pond in 1980 and has since been stocked in Training Areas 5, 8, 21, 33, 38, and the Small Impact Area. A population established itself in a perennial portion of Turkey Creek, probably as a result of a flood event at Lytle Pond. Fort Carson is actively involved with state recovery efforts for this species by providing darters to the CDOW for transplanting elsewhere in the Arkansas River drainage (Reference No. 6).

Mountain Plovers are rare on Fort Carson, and only a small percent of available habitat is occupied; Mountain Plovers are known to occupy black-tailed prairie dog colonies on Fort Carson only during the breeding season (Reference No. 76).

The Burrowing Owl is a small, burrow-dwelling owl nesting underground in unoccupied prairie dog burrows. The Burrowing Owl has never been common on Fort Carson, and the number of prairie dog colonies annually occupied by this species is low. Much more habitat exists than is used by this species. The Training Area Bravo colony is a long standing site for nesting Burrowing Owls, a state-listed species. In 2007 the prairie dog colony supported eight nests. Surveys have confirmed the presence of Burrowing Owls in 2008. Although sylvatic plague does not directly influence nesting Burrowing Owls, they generally do not nest in colonies where all prairie dogs have been killed by plague, but large colonies partially killed by plague are those often used for nesting by Burrowing Owls on Fort Carson.

The black-tailed prairie dog, a former candidate for federal listing, is common on Fort Carson, occupying approximately 7,700 acres in 78 colonies. It is listed as a Species of Special Concern in Colorado by the CDOW. Frequently referred to as a keystone species of the shortgrass prairie ecosystem, the prairie dog plays a significant role in life cycles of several Species of Special Concern on Fort Carson: the Ferruginous Hawk, Bald and Golden Eagles, Mountain Plover, and the state-listed Burrowing Owl.

Prairie dogs are managed on Fort Carson according to prescriptions detailed in the installation prairie dog management plan (Reference No. 77). The plan balances conservation with human health and property loss and details circumstances for lethal control of the species on Fort Carson.

Surveys conducted in 2007 indicate the black-tailed prairie dog colony in Training Area Bravo is approximately 255 acres and supports more than 2,000 adult prairie dogs. Except for the Mountain Plover, all above listed Species of Special Concern are present in or in the vicinity of the colony annually.

Lethal control of prairie dogs is not permitted on Fort Carson at any site occupied by the Burrowing Owl or the Mountain Plover. The Burrowing Owl is generally present on nesting territories late March through September or early October. The Mountain Plover also arrives in March, but generally migrates in August. Multiple pre-lethal control surveys are generally conducted if either species is suspected to be present.

Fumatoxin, selective shooting (recreational shooting is not allowed), and trapping and moving/euthanasia are currently the only methods that are permitted to be deployed to control prairie dogs on Fort Carson. Baiting is not permitted. Due to the size of the colony, Fumatoxin would be the only cost effective choice for eliminating the Training Area Bravo colony. Fumatoxin is a poisonous gas that can be used only when the underground soil temperature is above 55°F. Weather conditions are generally suitable for using Fumatoxin about April through October, but appropriate conditions are occasionally met other times of the year.

The State of Colorado does not list threatened or endangered plant species. The following Colorado Species of Special Concern plants are either known to occur or have the potential to occur on Fort Carson (updated from Reference No. 6).

- Dwarf milkweed (*Asclepias uncialis*) – Small population in southeastern corner of Fort Carson (Reference No. 78).
- Arkansas River feverfew (*Bolophyta tetraneuris*) – Large populations in southeastern and southwestern portions of Fort Carson (Reference No. 78).
- Bird-bill dayflower (*Commelina dianthifolia*) – Rare and known from only a few sites.
- Brandegee wild buckwheat (*Eriogonum brandegei*) – Searches of Morrison formations in 1995 found none (Reference No. 78).
- Rocky Mountain bladderpod (*Lesquereula calcicola*) – Rare in shale barrens of Fort Carson.

- Golden blazing star (*Mentzelia chrysantha*) – Common in southern and southwestern portions of Fort Carson (Reference Nos. 78 and 79).
- Arkansas Valley evening primrose (*Oenothera harringtonii*) – Uncommon in southern portions of Fort Carson; most records from and adjacent to shale barrens.
- Round-leaf four o'clock (*Oxybaphus rotundifolius*) – Large populations in southern portions of Fort Carson (Reference Nos. 78 and 79).
- Degener penstemon (*Penstemon degeneri*) – 1995 searches found none (Reference No. 78).
- Ute ladies' tresses (*Spiranthes diluvialis*) – Searches of wetlands in 1994 and 1995 found none, and 1995 and 1996 searches of Turkey Creek found none (Reference No. 80). No historic records on Fort Carson.
- Pueblo goldenweed (*Oonopsis puebloensis*) – Common Niobrara shale barren endemic, primarily in southeastern portions of Fort Carson (Reference No. 79).
- Rocky Mountain phacelia (*Phacelia denticulata*) – Single record from central Fort Carson.
- Twinevine (*Scarcostemma crispum* – Found in 2005.
- Fendler's Townsend-daisy (*Townsendia fendleri*) – Uncommon in shale barrens of Fort Carson.

Chalk-shale barrens on Fort Carson host several of these sensitive plants, including Arkansas Valley feverfew, dwarf milkweed, and Colorado endemics golden blazing star, round-leaf four o'clock, and Pueblo goldenweed (Reference No. 81). Fort Carson barrens communities are characterized by exposed bedrock formations and generally low plant cover; they largely are restricted to the southern one-third of the installation. The distribution of these habitats is depicted on Figure 3.7-3. Approximately 45 percent of the known range (acres) of the round-leaf four o'clock, approximately 10 percent of the known range of Pueblo goldenweed, and 27 percent of the known range of golden blazing star occur on Fort Carson (Reference No. 79).

3.7.1.4. Wetlands

In 2002, the USACE issued a Regional Permit Under Section 404 of the CWA (33 U.S.C 1344) for *Fort Carson and the PCMS Erosion Control Activities* (Reference No. 82). This regional permit authorizes Fort Carson to conduct erosion control activities that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

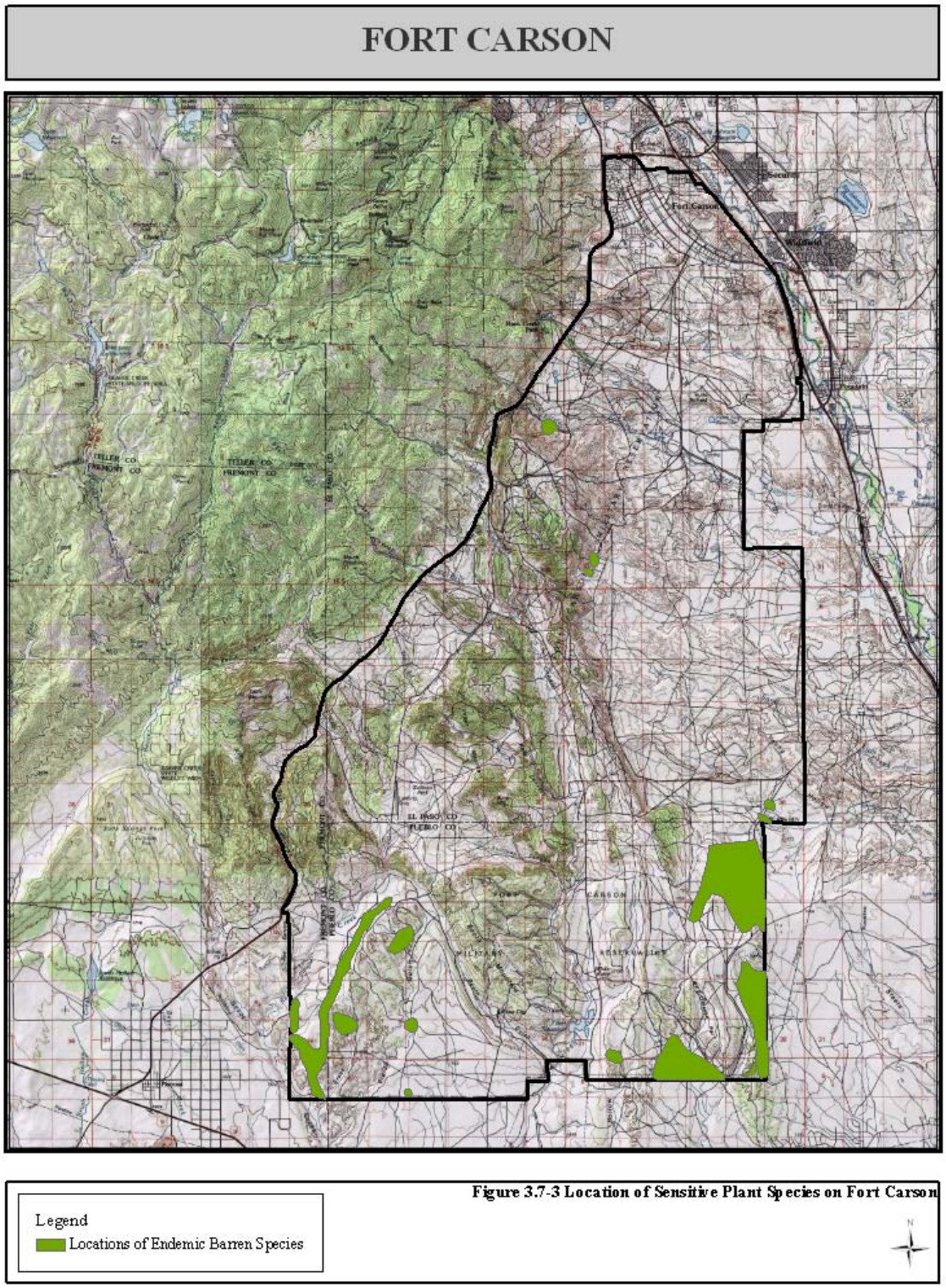

Figure 3.7-3 Location of Sensitive Plant Species on Fort Carson

Fort Carson is included in the National Wetlands Inventory database maintained by the USFWS. Original data showed 487.9 acres of wetlands on Fort Carson. There has been considerable ground-truthing of sites to improve the quality of the original data. The current estimate of wetlands on Fort Carson is approximately 1,028 acres (Reference No. 6).

Wetlands on Fort Carson are generally characterized as linear (e.g., streambeds) or small and isolated. Linear wetlands occur along intermittent and perennial stream channels and tributaries, primarily Rock, Little Fountain, Turkey, Little Turkey, Red, Sand, and Wild Horse creeks. Isolated wetlands usually occur where a dam has been built for erosion control or for water storage; most are only 1-2 acres in size. The largest downrange wetland is on the upper reaches of Teller Reservoir, encompassing approximately 100 acres. In addition to cattails, common wetland species are cottonwood and willow. Some wetlands have been invaded by tamarisk, a noxious weed of primary wetland management concern. About six springs occur on Fort Carson, and they have very small associated wetlands. There are also a number of wetland areas scattered throughout the cantonment area, typically in natural or stormwater runoff drainages and in an area south of BAAF (Reference No. 6).

3.7.2. Environmental Consequences

The following discussions describe the elements of the Proposed Action and the alternatives, including the environmental analyses performed, that are common to all scenarios.

3.7.2.1. Proposed Action and Alternatives

The facility construction for the CS Units would occur as described in Section 2.2.3 within the cantonment area for the Proposed Action and Alternatives 1 and 2. The cantonment area on Fort Carson is highly disturbed and developed, and vegetation consists primarily of non-native ornamental landscaping, including bluegrass turf and landscape trees. Only small areas of native vegetation remain within the cantonment area. Wildlife species that occur within the cantonment area are mostly urban-adapted species such as red fox, pigeons, etc.

Facility construction and renovation of existing facilities to support the CAB would occur as described in Section 2.2.3 for the Proposed Action and Alternatives 1 and 2 at the ORTC site and BAAF. The BAAF is developed area and primarily consists of non-native ornamental landscaping. Due to aircraft operational needs and to reduce the occurrence of Bird Air Strike Hazards (BASH), large trees within flight pattern zones are removed. The vegetation within the ORTC site is described in Section 3.7.2.2.2 and is devoid of any trees.

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited training resources (maneuver area and firing range availability). This does not change with the IBCT and CAB facilities siting alternatives, and remains constant across all alternatives depending on the units training at Fort Carson and PCMS at any given time. Therefore, impacts from training as discussed under the Proposed Action apply to all the alternatives.

Types of impacts from training expected to occur to vegetation, wetlands, and wildlife and their habitats under the Proposed Action would be similar to the No Action Alternative (implementation of Transformation); however, impact intensities would be expected to increase. Environmental conditions would be monitored, evaluated, and considered under the Proposed Action, as they currently are under the No Action Alternative. This process of monitoring and adaptive management feedback would continue to document the level of impact that is occurring and establish the upper acceptable level of impacts that would be allowed to occur without precluding achievement of sustainable land management goals under the Army's ITAM and Sustainability programs.

3.7.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

This site would include construction of facilities for both the CAB (due to its proximity to BAAF) and the IBCT. Virtually all lands within the site footprint would be highly disturbed (i.e., used for buildings, roads, sidewalks, etc. or urban landscaping) (Figure 2-3).

3.7.2.2.1. Cantonment Area

The construction/renovation of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any effects on wildlife or vegetation.

3.7.2.2.2. Downrange Area

Operational Readiness Training Center

Vegetation

Within the 575-acre area of interest, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 130 acres of disturbed land, 254 acres of Western wheatgrass/Blue grama, 140 acres of Small

soapweed/Blue grama, 45 acres of Big bluestem/Little bluestem and 6 acres of Skunkbrush sumac-Small soapweed/Blue grama. Current condition of the existing native vegetation is considered fair (INRMP 2007-2011). This is determined by groundcover where:

- *Excellent* – 0.75 or more seedlings per SF;
- *Good* – 0.5 to 0.74 seedlings per SF;
- *Fair* – 0.25 to 0.49 seedlings per SF; and
- *Poor* – less than 0.25 seedlings per SF.

Noxious weeds that have been noted in the ORTC area include field bindweed, musk thistle, and Canada thistle in the lower depressions.

Wildlife

Landscaping associated with the Proposed Action would have minimal positive effects on native wildlife and its habitat. Affected habitats are common habitat types on Fort Carson; thus, effects to wildlife would not be significant. In addition, operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive species

There are no listed species or Species of Special Concern that use the ORTC site on a regular basis.

Wetlands

No construction activities would occur within wetlands. The ORTC site, however, is adjacent to Rock Creek. Indirect impacts from surface water flow and sedimentation could occur. Section 3.6 provides more information on the potential impacts to Rock Creek from stormwater runoff.

Butts Army Airfield

Vegetation

Any proposed renovation/construction on BAAF would occur within existing structures and/or already disturbed ground. There would be minor impacts associated with the Proposed Action on vegetation.

Wildlife

This alternative would remove wildlife habitat ranging from poor (except for roosting trees for common species) at BAAF to fair in the remainder of the ORTC site. Additional aircraft on the installation would

increase the chances of an aircraft-wildlife strike, which could result in loss of life or significant damage to aircraft. A wildlife hazard assessment and a BASH, if required, would be developed.

Sensitive species

There are no listed species or Species of Special Concern that use this site on a regular basis.

Wetlands

No wetlands are located in proximity to the proposed BAAF construction and/or renovation site; therefore no impacts would occur.

Ranges and Training Areas

The addition of the IBCT as part of the Proposed Action is predicted to increase overall maneuver training impacts by 8.6 percent which accounts for the type of unit and number of Soldiers involved. Live-fire requirements are anticipated to increase by approximately 20 percent. Maneuver training impacts would be projected to increase by an additional 7 percent and live-fire would increase by approximately 6 percent. In 2008, a decision was made to conduct training exercises for battalion- and brigade-size units primarily at PCMS to help alleviate overcrowding at Fort Carson (i.e., mitigation for Fort Carson training impacts at the cost of increased training-related impacts at PCMS) (Reference No. 83).

Vegetation

Training an additional IBCT and CAB at Fort Carson under the Proposed Action could increase potential impacts to vegetation (see Soils Section, 3.5). Impacts to dismounted training areas and maneuver training areas could increase under the Proposed Action, in extent (number of acres), magnitude (severity), or a combination of both, as previously described and depending on land sustainability considerations.

Risks of accidental wildfires caused by training in live-fire and maneuver training areas would increase under higher training loads. The increased risk would be partially offset by the availability of trained military personnel at the site to suppress fires in their initial stages. Prescribed burning would continue to be used to create buffer areas and reduce fuel loads that provide additional protection from wildfires in and around small arms live-fire ranges and live hand grenade ranges.

The greater potential for noxious weed infestations under the Proposed Action would continue to be addressed by the weed prevention strategies and weed control methods that are part of the *Fort Carson Invasive Species Management Plan* (Reference No. 84).

Maneuvers

Restricted areas (e.g., soil protection sites, eagle nesting sites, greenback cutthroat trout protection area), which have been designated to protect resources on particular sites from training impacts, are subject to various constraints to training. To the extent that training is excluded from these areas, there would be minimal impacts to vegetation in restricted areas from training under the No Action Alternative.

Vegetation studies conducted at PCMS to assess effects of training maneuvers on vegetation are applicable to assessing potential impacts of mechanized military training. The studies indicate that grasslands, woodlands, and shrublands have been affected by prior maneuver training on the basis of readily visible imprints of tracks on the soil (tracking) compared with untracked sites. Grassland vegetation ground cover decreased and bare ground increased at tracked compared to untracked sites (Reference Nos. 85 and 86). Surface pitting, caused by tracked vehicle passage, allows for surface water retention, increasing water infiltration into the soil. Reseeding efforts reduce the overall recovery period by allowing succession to shorten the initial weedy stage. Impacts to grasslands, shrublands, and forested areas vary considerably from year to year, and the same is true of mitigation efforts, primarily due to weather and varying training intensities.

Direct impacts associated with maneuver training include tracked vehicles crushing herbaceous and woody vegetation, which might not resprout or otherwise recover, and injury to shallow roots, which might kill the plants or retard development. Pivoting of tracked vehicles can create high shear stress between the tracks and vegetation, resulting in loss of aboveground plant parts and vegetation uprooting, both of which can create bare ground conditions. Disturbance of the soil crust in arid ecosystems can also accelerate erosion, decrease water retention, disrupt plant nutrient cycling at the microbial level, and expose the reservoir of weed seeds in the soil to conditions favorable for germination (Reference No. 87). Indirect impacts from movement of tracked vehicles can result from vegetation loss, soil disturbance, disaggregation, compaction, and consequently erosion, each of which can change the nature and availability of microsites for seed germination (Reference Nos. 85 and 86).

Juniper woodland communities are important for military training because they offer concealment cover for tracked vehicles during maneuvers. PCMS studies (Reference Nos. 85 and 86) indicate that the density of juniper in tracked areas was reduced by 7 percent over a 2-year training period. In these studies understory species in the juniper woodlands were even more seriously impacted than trees due to tracked vehicles maneuvering between larger trees. These actions result in soil compaction with root damage,

mechanical damage to woody vegetation, and soil scarification and erosion, which together can result in an immediate reduction in biomass.

A Fort Carson study showed tree decline in specific watersheds attributable to training, and another study showed 17 percent damage to trees (Reference Nos. 79 and 80). Some damage to trees at Fort Carson and PCMS was the result of porcupine feeding.

Decreases in density and cover of woody plants are especially significant in juniper woodlands because they typically occur on steep slopes, have low initial cover, and highly erodible soils. Such effects on woodland understory vegetation may be less severe at Fort Carson than was indicated by PCMS studies because it has many established trails on which tracked vehicles may travel through the woodland areas (Reference Nos. 81).

Accidental wildfires result from mechanized military training in maneuver training areas. Fires have been caused by hot mufflers and hot exhaust from tracked and wheeled vehicles and by field illumination flares, star clusters, tracer rounds, and grenade simulators.

Hardened or paved road surfaces increase runoff, which can alter plant species composition. Roadside margins are generally permanently disturbed and may provide conduits for invasion by weedy species (Reference No. 88). Ongoing impacts from travel on roads and trails would be expected to increase 8.6 percent under the Proposed Action.

For dismounted training areas, direct impacts to vegetation result mainly from pedestrian traffic. For grasses and herbaceous cover, as well as cryptobiotic soils, these impacts range from negligible to substantial, depending on the numbers of dismounted troops traversing a particular area, how they move across the landscape, and the sensitivity of the resources in those areas to disturbance. Direct damage to shrubs and trees from dismounted training is expected to be minimal.

Live-Fire Training

Direct impacts to vegetation from live-fire training include damage by rounds striking or igniting vegetation. Indirect impacts to vegetation (i.e., those arising from soil disturbance) include those previously described for maneuver training. Fire impacts from live-fire training would remain at similar levels as under the No Action Alternative. Impacts described for live-fire training are less than those

associated with maneuver training because maneuver training (potentially more damaging) does not occur in impact areas during live-fire activities.

Firing of live-fire tracer rounds results in accidental wildfires. Prescribed burning to create buffer areas would continue to be conducted to provide additional protection from wildfires near live-fire activities.

The DPW Fire and Emergency Services has developed a *Fort Carson Fire and Emergency Services Prescribed Fire Plan*, U.S. Army, 2008 (Reference No. 89), which is an example of annual prescribed burning planning for Fort Carson and PCMS. The primary purpose of the Plan is to facilitate military personnel with planned training opportunities, while reducing the possibility of an uncontrolled wildland fire escaping the boundaries of the installation or the PCMS (Reference No. 6).

Objectives of the Plan are as follows.

- Utilize fire efficiently, economically, and safely for fuels treatment activities with the least impact on basic resources and environmental quality.
- In active weapons and munitions firing range project blocks, create a minimum of a 100-foot strip of burn along all perimeters, which would be sufficient to contain any unintentional starts and facilitate military personnel with planned training schedules.
- For project blocks that are other than weapons or munitions use, support rangeland management with a goal of species conservation, invasive species control, or watershed improvement/maintenance.

Fort Carson has Prescribed Fire Permit Areas, which are separated into several Project Blocks, which are further divided into Burn Units. PCMS has one Prescribed Fire Permit Area, which is divided in a similar manner (Reference No. 6). Prescribed burns are conducted during fall, winter, and early spring. Fire is suppressed or controlled where necessary for safety and to protect high-value resources. Wildfires are typically suppressed on PCMS because they generally occur when existing conditions are favorable for large, uncontrollable fires.

Wetlands

Few direct impacts to wetlands occur from ongoing training activities. If future training has the potential to affect wetlands, the Army would coordinate with the USACE to assess impacts and mitigation for disturbance of wetland areas as is the current practice. Training an additional IBCT and CAB could result in indirect impacts to wetlands from erosion and sedimentation processes in drainages upstream of man-

made erosion control dams. Sediments could silt in these small wetlands, changing their nature or converting them to upland habitats if erosion-control dams are not properly maintained.

Most direct impacts to wetlands are avoided, and those that cannot be avoided are mitigated through the Section 404 process (through complying either with the Fort Carson/PCMS regional permit or by applying for coverage under a nationwide or individual permit). Impacts to soils resulting from training are discussed in Section 3.5.

Wetland and riparian area buffers are generally protected from vehicular and mechanized training due to the surrounding topography, which makes these areas unsuitable for this type of training. Because of avoidance and minimization efforts Fort Carson currently implements as part of its INRMP and ITAM procedures, direct effects to wetlands do not occur. Erosion control measures described in Sections 3.5 and 3.6 are protective of surface water, including wetlands and riparian areas.

During 1996-97, a Legacy grant was used to study wetland community constituents and their distribution as well as various physical parameters at ten sites on Fort Carson[6] and five sites on PCMS[7]. No decline was noted in representative wetlands, and no statistically significant increases in measured constituents were identified. These studies would be used to provide baselines for future wetland evaluations (Reference No. 6).

Wildlife

The following impacts to wildlife from military training currently occur and would occur at a higher frequency due to training an additional IBCT and potential CAB as part of the Proposed Action.

Military training can reduce wildlife populations indirectly by damaging soils and vegetation, potentially leading to altered plant communities that are unsuitable as habitat for the wildlife species that once used them. Dismounted military training can flush or startle small mammals, ground nesting birds, and reptiles. This may lead to increased predation on young or the displacement and death of eggs or young. Impacts to reproductive success can cause decreased populations (Reference No. 90).

Mule deer, elk, pronghorn, and many species of raptors are more readily flushed or displaced by pedestrians than by moving vehicles. Wildlife species can be affected by mounted military training

[6] Wetland Program for Fort Carson, Colorado, 1996.
[7] Wetlands Monitoring Program for Piñon Canyon Maneuver Site (PCMS), Model, Colorado, 1998.

through direct disturbance and by indirect alteration of their habitat. Small animals that den, nest, or live exclusively on the ground can suffer death from maneuver training. Eggs and young of ground-nesting birds can be destroyed. Human presence and noise from training exercises can disrupt wildlife species from foraging or reproducing. For example, some raptors abandon nests or territories as a result of human presence in the vicinity (Reference No. 90).

Limited research exists on the indirect, habitat-related impacts of mounted military training on reptiles, amphibians, or aquatic species (Reference No. 90). However, military training results in the creation of two-track roads and wider corridors cleared of vegetation. Effects of these types of vegetation removal and surface disturbance on wildlife have been studied extensively (References Nos. 91, 92, 93, 94, 95, 96, 97, 98, 99, and 100).

Training an additional IBCT and CAB as part of the Proposed Action would increase potential impacts to wildlife. In general, species adapted to reduced vegetation, bare ground, or disturbance would be increasingly favored. Depending on training frequency and intensity, species which prefer these conditions, such as the Mountain Plover, might be attracted into the area in greater numbers.

Training an additional IBCT and CAB might displace maneuvers on the grassland/pinyon-juniper interface farther into current pinyon-juniper habitat, which would exacerbate impacts to species using this habitat. Direct disturbance to wildlife species would increase in areas where vehicular activity, fire, and noise increase, which would occur during both maneuver and live-fire training exercises.

Increased dismounted training activity of the IBCT would increase disturbance of wildlife species sensitive to human presence. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas where military training occurs, while species that are less tolerant of these factors would decline.

Pronghorn

Studies conducted on PCMS indicate that movements or temporary shifts in home ranges caused by military training activities did not have measurable effects on pronghorn productivity or physical condition (Reference No. 101). Pronghorn groups have been alarmed by low jet and helicopter overflights, as shown by studies in other locations. This could contribute to less over-winter survival for individuals, poor condition entering the breeding season, reduced reproductive success and recruitment, and eventual population declines (Reference Nos. 92 and 93). Pronghorn are especially vulnerable during

fawning season (May 1 to June 30) and in severe winters (Reference No. 94). However, Fort Carson and PCMS herds are stable to increasing. Hunting on Fort Carson and PCMS is regulated by CDOW and, with input from Fort Carson wildlife staff, is used as a tool to manage pronghorn populations.

The IBCT and CAB training activities have the potential to impact pronghorn populations. These impacts can be reduced or avoided through management of training during fawning season. BMPs include a combination of land use restrictions and habitat restoration based upon identifying and prioritizing critical areas and resources. General practices include maintaining healthy grassland communities by restoring disturbed areas and areas around water with a mix of native shrubs, grasses, and forbs mitigating impacts from military training (Reference No. 101). Maintaining ecologically healthy grasslands ensure alternative resources are available to pronghorn temporarily displaced by military training. The development of water resources provides similar important mitigation.

Mule Deer

Potential impacts to mule deer from mechanized military training maneuvers could occur. One mule deer study (not on Fort Carson or PCMS) demonstrated that if harassed, mule deer exhibit increased overall activity levels, increased use of cover, increased sensitivity to vehicles, increased flight distance, and decreased reproduction the following spring (Reference Nos. 102 and 90). Mule deer may habituate to maneuvers and off-road vehicles if they are not actively pursued (Reference No. 102). In severe winters and during late gestation and lactation periods, helicopter disturbance could adversely affect deer (Reference No. 103). Training restrictions during severe winters and the fawning season (June 20 to August 20) could minimize impacts to mule deer. Fawns are especially vulnerable at this time to mortality from accidents, abandonment, increased predation, and depletion of energy reserves from excessive movement.

Revegetating disturbed areas reduces impacts from military training on mule deer (Reference No. 103). Hunting on Fort Carson and PCMS is regulated by CDOW with input from Fort Carson wildlife staff; hunting is used to manage mule deer populations on the installations.

Coyote

Coyotes are moderately affected by military training. Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends (Reference Nos. 103, 104, and 105).

The IBCT and CAB training activities have the potential to impact coyote populations. The coyote is demonstrably a resilient and widespread species on Fort Carson, but the species is vulnerable to disturbance during the denning period. Rehabilitating disturbed sites can ameliorate loss of prey and escape cover as the result of military activities (Reference No. 103). Significant population perturbations due to military training are not anticipated; therefore, specific management objectives are not indicated for the projected increase in training. Fort Carson would continue to monitor hunting pressure and harvest levels of this species annually and take appropriate management actions as required.

Birds (General)

Goran et al. (1983) documented declines in avian biomass (numbers of birds in general) in intensively used maneuver sites on Fort Carson. Diersing and Severinghaus (1984) found that bird community composition in prairie habitat on Fort Carson was affected only slightly by training activities. The biomass of seed-eating, open-field species was higher in areas with training while the biomass of omnivorous, open-field species was higher on areas not exposed to training. In woodlands, woodland bird species declined while open-field and edge species increased.

Factors influencing the impacts of military training maneuvers on bird populations include changes in vegetation structure, composition, and development from military maneuvers; responses of birds to changes in vegetation characteristics at many different scales; training-related behavioral changes, which may lead to site abandonment or colonization; seasonal timing of training activities; total displacement of sensitive or secretive species; and attraction of exotic and disturbance-tolerant species to disturbed areas (Reference No. 90).

Studies on changes in the avian community in response to military training for Fort Carson indicate that overall biomass and abundance of prairie habitats were not substantially decreased compared with control sites. The biomass of seed-eating, open-field species was higher on the training site, while the biomass of omnivorous, open-field species was higher on the undisturbed control site. The destruction of trees, shrubs, and ground cover in forests generally results in an increase in open-field, edge, or disturbance-adapted species and a decrease in secretive, woodland, and/or ground-feeding species (Reference No. 90).

Most species in Fort Carson and PCMS grassland habitats, nest on the ground and breed from mid-April to mid-July. Nesting begins in mid-April for several species and is well underway for most species by mid-May. Eggs and nestlings can be destroyed by vehicular traffic, and concentrated training activities can result in abandonment of territories and nests. By mid-fall, most young-of-the-year would be out of nests, although some species continue to nest into fall (Reference No. 103).

Songbirds are particularly susceptible to noise. Male neotropical migrant birds that breed in short-grass prairie, sagebrush, and riparian communities use songs to establish and defend breeding territories and attract females. The volume and frequency of the noise interferes with this ability (Reference Nos. 106, 107, and 108). Waterfowl, especially geese, have been flushed by helicopter overflights; in some cases, normal feeding behavior was substantively disrupted (Reference No. 90).

The area of disturbance varies by species and training activity. Limits on military training during the breeding season reduce impacts on the bird community. Part of the Army's regular practice is to avoid disturbance of nesting birds.

Utility systems that kill raptors and other large birds by electrocution or other means are retrofitted with avian protection devices in accordance with Avian Power Line Interaction Committee guidelines (Reference No. 109). The construction of communications towers follows practices outlined in *Avian Protection Plan Guidelines* (Reference Nos. 110 and 111) to reduce mortalities resulting from bird strikes.

The DOI issued a rule on February 28, 2007, exempting the DoD from the *Migratory Bird Treaty Act* for the incidental take of migratory birds during readiness activities. Although this exemption would apply to Fort Carson, incidental take of migratory birds from military readiness under the Proposed Action Alternative is not anticipated to be substantial. A military activity is defined as "…all training and operations of the Armed Forces that relate to combat, and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use." Fort Carson takes the protection of migratory birds into account during standard operations such as mowing, burning, tree removal, maintenance, and noxious weed management.

Managing for the persistence of breeding avifauna (bird) communities, including sensitive grassland bird species, such as grasshopper sparrow, Cassin's sparrow, and lark bunting, directly conflicts with military training that tends to create large areas of bare soil and reduced grass and shrub cover. These birds nest in grassland sites, a habitat that also supports most maneuver off-road training on the installation, however, surveys indicate that these species are widespread. BMPs for these birds include the use of prescribed fire to maintain open grasslands with scattered shrubs (8- to 10-year rotation); reseeding recovery/rest areas with a mix of short, mid, and tall grass species with shrubs, such as cholla or saltbush; and preventing breeding season fires from encroaching on breeding habitats by burning adjacent areas in late winter or

early spring (Reference No. 76). In contrast, reduced cover and more bare ground support other native species which prefer those conditions, some of which are species of concern, such as the Mountain Plover.

Raptors

Many raptors are intolerant of high levels of human activity, especially during the breeding season (April through June). When disturbed by humans (on foot or in vehicles), by a gas-operated engine, or the sound of a rifle, fewer ferruginous hawks had successful nests, and fewer young fledged from those nests (Reference No. 112).

Some species of raptors can habituate to high levels of human activity. Short-term impacts on raptors from military training include nesting failures, lowered nesting success, displacement, and changes in wintering distribution and behavior (Reference Nos. 113 and 114). These short-term responses can lead to long-term community changes, such as changes in breeding density and species composition.

Resident raptors located where military training occurred shifted the center of their home range and activity areas, made movements outside of areas where they had previously been confined, and increased the size of the area they used. Birds located in areas not exposed to training did not exhibit these changes to the same extent. In general, birds appeared to increase the size of their home range during periods of military activity. An alternative response to disturbance might have been to seek out areas within the home range but isolated from the disturbance (Reference No. 112).

The addition of a CAB to Fort Carson would result in changes in the disturbance regime experienced by nesting raptors, which constitute the most vulnerable group on the installation. Cliff and tree-top nesting species would experience an increase in disturbance associated with noise and the sudden presence of low flying aircraft in the immediate vicinity of nests or eyries. Raptors nesting on the installation possess individual and species differences in response to disturbance. Individuals nesting in populated sections of Fort Carson or raptors nesting in the vicinity of the aircraft bombing range have demonstrated a greater tolerance to specific types of disturbance, a tolerance that may not be present in conspecifics nesting elsewhere on the installation.

Surveys and anecdotal data collected on Fort Carson identify large mature deciduous trees in riparian or small isolated stands, cliffs, and the pinyon-juniper/grassland ecotone as the most important large birds of prey nesting habitats. Most frequently used trees are plains cottonwood and Siberian elm (Reference No.

76). Fort Carson biologists provide G-3 with wildlife information and recommendations for minimizing potential impacts to nesting raptors. Most tree-nesting raptors nest just inside treelines in pinyon-juniper or similar woodland islands, the same locations where troops prefer for visual access to open areas.

Jet overflights have not been shown to influence nesting success of Red-tailed Hawks. Over time, these birds habituate to low-level air traffic and the intensity of avoidance behavior decreases. For example, many raptor species that nest along prominent landscape features, such as cliffs in open country, are easily disturbed during the nesting season, often resulting in nest abandonment (Reference No. 114). Golden Eagles prefer to nest away from human disturbances, including roads, and experience reduced nesting success in nests located closer to roads than in nests farther from roads (Reference No. 115).[8]

Part of Fort Carson's regular practice is to identify Golden Eagle nest sites annually and establish 1,640-foot (500-meter) buffer zones around each nest site. Training activities are restricted in these buffer zones from April through June (Reference No. 103). Usually these buffers can be accommodated during training exercises, but in some cases, training could require encroachment on a buffer area. The G-3 coordinates with Fort Carson wildlife biologists before each exercise to devise a training plan that minimizes potential impacts to nesting birds.

Increases in the duration and intensity of training can impact raptor species. Minimal management of vulnerable species includes individually established buffer zones around nests in which human activities are curtailed or reduced.

Small Mammals

Impacts from military training on small mammals are similar to those on bird communities; species adapted to reduced vegetation, bare ground, or disturbance are favored, while more sensitive woodland species or those requiring intact short-grass prairie ecosystems decline. Studies of small mammal community compositions at Fort Carson indicate that, in prairie habitats, small mammal species that prefer sandy soils and eat seeds of weedy plants replaced other species (Reference No. 90).

Diersing and Severinghaus (1984) found that in Fort Carson prairie, small mammals that preferred sandy soils and eat seeds of weedy plants replaced other species in areas disturbed by training. In woodland, woodland small mammal species were replaced by open-field, disturbance-adapted species. Goran et al. (1983) found four small mammal species declined and three species were unaffected in intensively used maneuver sites on Fort Carson.

[8] Studies have not been conducted on Fort Carson or PCMS.

Elk

Many elk found on Fort Carson and PCMS are part of resident populations, and these elk spend all or most of the year on the installations. Development of water resources and recovering/reseeding grasslands adjacent to known elk wintering areas reduce impacts from military training on elk (Reference No. 76). It is notable that elk moved onto PCMS after acquisition and initiation of military training.

Sensitive Species

The following impacts to sensitive species from military training occur on Fort Carson and would continue to occur and with higher frequency under the Proposed Action. Fort Carson regularly coordinates with the USFWS and CDOW to determine potential impacts and mitigation for sensitive species. Fort Carson implements measures outlined in several biological assessments to minimize impacts to protected species.

Figure 3.7-2 depicts sensitive wildlife species habitat on Fort Carson.

Black-tailed Prairie Dog

Training an additional IBCT and CAB would likely increase prairie dog burrow damage, and direct mortality could increase from increased maneuver training in prairie dog habitat. Impacts to prairie dogs from increased military training would directly and indirectly affect associated species, including the Burrowing Owl, Mountain Plover, and Bald and Golden Eagles. Disturbance and destruction of prairie dog habitat would directly affect Burrowing Owls and Mountain Plovers if these species were present in the colony and would reduce suitable habitat in areas not currently occupied by these species. If prairie dog populations significantly decline on Fort Carson or PCMS, use of the installation for foraging and/or nesting by Ferruginous Hawks could decline or be eliminated. Black-tailed prairie dogs would continue to be managed according to the *Biological Assessment and Management Plan for the Black-tailed Prairie Dog on Fort Carson and the PCMS* (Reference No. 77).

Prairie dogs prefer vegetation with low structure and height. Disturbances that reduce vegetation structure and height (direct training impacts, bivouac areas, fires, etc.) may allow prairie dogs to colonize disturbed areas, potentially resulting in an increase in occupied habitat. This may have the net effect of increasing habitat for associated species.

Destruction of active burrows from large-caliber weapons firing (on Fort Carson only) or mine plows is the greatest threat to the prairie dogs from military training. Prairie dog burrows usually have multiple entrances and are generally deeper than the surface disruption from mine plows; therefore, mine plow deployment within a colony would have little long-term effect on the colony. Off-road vehicles could damage burrow entrances or kill prairie dogs caught in the open during a maneuver; however, it is unlikely these activities would permanently damage burrows or kill occupants of a burrow. Trench obstacles dug within prairie dog colonies could damage burrows and kill prairie dogs.

Equipment and personnel drops may have a short-term direct adverse effect on prairie dogs and a negligible effect on the long-term viability of a colony. Live small-arms-caliber munitions firing poses minimal to no threat to prairie dogs. However, prairie dog burrowing activities on small-arms ranges with electronic targeting mechanisms have caused problems with buried electrical power wires. In these cases, prairie dogs are controlled according to practices outlined in the *Biological Assessment and Management Plan for the Black-tailed Prairie Dog on Fort Carson and the PCMS* (Reference No. 77). In 2004, black-tailed prairie dogs were removed from the USFWS Candidate species list; however, Fort Carson still follows recommendations in this management plan, where feasible. Prairie dogs are frequently killed by vehicles on roads through or near colonies.

The number of colonies and total occupied acreage of black-tailed prairie dogs can vary substantially from year to year because of sylvatic plague outbreaks. Results of Fort Carson surveys suggest that plague exerts greater control over prairie dog populations than do mechanized and off-road vehicular training.

Burrowing Owl

Burrowing Owls (state-listed as Threatened) use active prairie dog colonies and other dens in Fort Carson and PCMS. Military training impacts to Burrowing Owls are similar to those of prairie dogs, but actions like establishing bivouacs in close proximity to nest burrows can result in nest abandonment. The USFWS recommends maintaining a 0.8- to 1.6-kilometer buffer around active nest burrows (Romin and Muck 1999). Generally, these buffers can be accommodated for establishment of bivouac sites, but in some cases, training may require occasional encroachment of nesting areas.

Because colony occupation by Burrowing Owls is low (generally fewer than 10 percent of Fort Carson prairie dog colonies are used by nesting owls), the most effective BMP for Burrowing Owls is controlling fleas with pesticides in colonies supporting owls to prevent extirpation of prairie dogs, especially those

colonies not generally subjected to off-road and mechanized military training. Maintaining plague-free colonies is necessary for maintaining this species at current levels on Fort Carson under heaver training loads (Reference No. 76). BMPs also include scheduling resource management activities outside the owl nesting season. Maintaining the health of prairie dog colonies on PCMS is also essential since nearly all (>98 percent) of observations of the species nesting on PCMS have been in black-tailed prairie dog colonies.

Mountain Plover

Dismounted troops and off-road vehicle traffic are the greatest direct threats to Mountain Plovers on Fort Carson and PCMS. People walking across the prairie or exiting vehicles caused Mountain Plovers to perform their distraction display or flush and fly a short distance. Plovers rarely responded to military convoys and other traffic by flushing unless the Plovers were near the roadway. Prolonged human presence near breeding territory would likely disrupt egg incubation or chick brooding, resulting in death of the eggs or chicks (Reference No. 116). Vehicles traveling cross-country, including travel contiguous to roads, could kill juveniles sheltered in tall vegetation adjacent to the road and destroy nests on the open prairie. Effects of military helicopter overflights on nesting Mountain Plovers are unknown, but jet overflights did not alter or interrupt the normal behavior routine of adult Plovers (Reference No. 116). The Mountain Plover was proposed for listing as a threatened species in 1999, but the USFWS withdrew the proposal in 2003. Because the Mountain Plover is no longer proposed for listing, the *Biological Assessment and Management Plan for the Mountain Plover on Fort Carson* (Reference No. 72), which required a 660-foot radius buffer zone around each Mountain Plover nest site during the breeding season, is no longer in force. Fort Carson, however, does maintain these buffers during training exercises, but in some cases, training may require encroachment on this buffer area. The G-3 coordinates with Fort Carson wildlife biologists to devise training plans that minimize potential impacts to nesting birds. Buffer zones can be cordoned off using engineering tape attached to metal fencing posts, by placing painted automobile tires around the perimeter with off-limits signs attached, or by placing certified weed-free straw bales with appropriate signage around off-limits areas (Reference No. 72).

Military training impacts to Mountain Plovers would be similar to those of prairie dogs. Off-road vehicles and resource management activities can negatively affect nesting Mountain Plovers by killing eggs and young birds. Plovers are sometimes struck by vehicles operating on roads traversing prairie dog colonies. Dismounted training, recreationists, and employees can destroy eggs in cryptic nests or cause increased predation of juvenile birds. Plovers successfully nest in the primary breeding colony while facing these threats. Significant population perturbations due to military training are not anticipated; therefore, specific

management objectives are not indicated for the projected increase in training. Fort Carson would continue to annually monitor the presence of plovers on Fort Carson and take appropriate management actions as required, including monitoring breeding success of the plovers.

Sylvatic plague in prairie dogs is probably the greatest indirect threat to Mountain Plovers on Fort Carson by lowering the occurrence of suitable habitat for nesting. On Fort Carson, Mountain Plovers exclusively nest in prairie dog colonies because habitat conditions for nesting Plovers are maintained by soil disturbing and foraging behaviors of the prairie dog. Plague in prairie dog colonies can be controlled by treating burrows with a flea pesticide. Resource management activities, such as reseeding, control of invasive vegetation, and prescribed fire can have negative affects on Plover reproduction if conducted during the breeding season. However, these activities are planned to occur outside the nesting season. Prairie dog colonies requiring reseeding are seeded only with shortgrass species, such as blue grama or buffalo grass (Reference No. 76).

Bald and Golden Eagles

Impacts to the Bald Eagle from military training are primarily related to the availability of black-tailed prairie dogs as prey. No training restrictions are associated with the management of the Bald Eagle. Available research indicates variable Bald Eagle response to disturbance (Reference No. 90). The loss of prairie dogs from sylvatic plague and prolonged activities, such as bivouacking, in prairie dog colonies are sources of secondary impacts to Eagles.

Golden Eagles nest on Fort Carson and PCMS. During breeding season, the Golden Eagle is sensitive to human disturbance, particularly dismounted troops, recreationists, approaching vehicles, and many land management activities.

Golden Eagle eyrie occupation surveys are conducted to identify areas used by nesting Golden Eagles that should be closed during the nesting season.

Triploid Checkered Whiptail

Surveys conducted on Fort Carson and PCMS in 2006 (Reference No. 117) indicate this species is fairly common in southeastern Colorado juniper woodland and savanna, Pinyon-juniper woodland, western great plains riparian woodland and shrubland, inter-mountain basins wash, and invasive southwestern riparian woodland and shrubland. At PCMS most suitable habitat is within dismounted training areas. Impacts to triploid checkered whiptails (Species at Risk) from military training would be similar to those

described for small mammals and ground-nesting birds. Habitat may be disturbed, and animals may be killed during training maneuvers. Specific impacts of military training on this species are difficult to determine at this time.

Mexican Spotted Owl

Military training effects on Mexican Spotted Owls roosting and foraging are unknown, but disturbance to Mexican Spotted Owls from dismounted troop movement, vehicle maneuvering, cross-country movement, bivouac, and aircraft support has been evaluated to be minimal (Reference No. 72). All wildfires in Mexican Spotted Owl management areas are suppressed, and prescribed burns are used as a fire management tool. The *Biological Assessment and Management Plan for the Mexican Spotted Owl on Fort Carson* (Reference No. 72) describes protection measures for Mexican Spotted Owls. Training would not impact breeding owls since they do not breed on Fort Carson.

Delany et al. (1999) recommended at 334-foot buffer zone for helicopter overflights year-round (Holloman Air Forces Base, New Mexico). Spotted Owls are known to winter on Fort Carson, primarily within impact safety fans for aircraft and large munitions firing. Because the owls use multiple day roost locations within a wintering area, generally changing roost sites daily, avoiding individual sites is not feasible.

Arkansas Darter

Arkansas darters are found in areas that are open to the public but are restricted from military training. There are no known impacts from military training to the Arkansas darter.

Greenback Cutthroat Trout

Restricted training zones exist around greenback cutthroat trout ponds, and there is a no-dig zone near the underground pipeline connecting Lytle and Duck ponds. The total land area designated as buffer zones and removed from training is approximately 20 acres, and the duration of military training restrictions at the ponds is indefinite (Reference No. 6). There are no impacts from military training to the greenback cutthroat trout.

Southern Redbelly Dace

Stone City Quarry, where the southern redbelly dace is found, is restricted from training because of its historical significance, and no military training takes place in this area (Reference No. 6). There are no known impacts from military training to the southern redbelly dace.

Impacts to sensitive plant species from increased military training on Fort Carson under the Proposed Action would generally be similar to those described above for vegetation within the particular type or types of training areas in which they occur.

3.7.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

Vegetation

Virtually all lands within the site footprint would be highly disturbed (i.e., used for buildings, roads, sidewalks, etc. or urban landscaping) (Figure 2-10). Within the 700-acre AOI, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 250 acres of disturbed land, 215 acres of Western wheatgrass/Blue grama, 232 acres of Skunkbrush sumac/Small soapweed/Blue grama and 2 acres of Common cattails/Mesic graminoids. Current condition of the existing native vegetation is considered fair or poor (described in Section 3.7.2.2.2).

Noxious weeds noted in the Training Area Bravo area are tamarisk, Russian olive, hoary cress, spotted knapweed, and Canada thistle (noted in low-lying areas or depressions). Giant pepperweed has been noted near TA Bravo and is suspect for this area.

Wildlife

Landscaping associated with this alternative would have minimal positive effects on native wildlife and its habitat. In addition, operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive Species

Construction activities at the Training Area Bravo site could indirectly impact the burrowing owl by removing nesting habitat (prairie dog burrows). Proactively addressing the Training Area Bravo colony would be required to prevent costly construction delays due to compliance conflicts with the *Migratory Bird Treaty Act* and state laws protecting the owls. Presence of the owls and the toxicant use weather requirements dictate that lethal control at the site be conducted August-September prior to beginning construction. Fort Carson maintains a contract to control prairie dogs when necessary. Control is only used when the prairie dog colony can cause damage to structures or risk of plague spread is possible. In

addition to potential project delays, failure to address the Training Area Bravo colony would create pest management issues at sites in the vicinity of the project site.

Training Area Bravo in its entirety (approximately 700 acres) conservatively supports a prairie dog colony of more than 2,000 individuals. Approximately 200 acres are proposed to support the construction site, and, depending on the final siting, part of the colony would most likely be affected. There is no way to predict where they would go when construction begins, but they would likely immigrate to turf grass and bare soil in the nearby populated areas of the cantonment area, creating human health concerns. Following completion of construction, prairie dog mortality would likely increase due to traffic and decisions to remove prairie dogs as previously described.

Wetlands

No wetlands would be affected by this alternative.

3.7.2.3.1. Cantonment Area

The construction of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any measurable effects on flora or fauna.

3.7.2.3.2. Downrange Area

Operational Readiness Training Center

This alternative would have the same impacts as described in the Proposed Action in Section 3.7.2.2.2

Butts Army Airfield

Impacts from the construction/renovations under this alternative at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

Impacts under this alternative would be the same as for the Proposed Action.

3.7.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Vegetation

Within the 265-acre AOI, the following vegetation species occur and approximately 200 acres within that study area would be needed to build the facility set. This area is comprised of approximately 50 acres of disturbed land, 175 acres of Small soapweed/Blue Grama, 21 acres of Big bluestem/Blue grama, 16 acres

of Ponderosa pine/Gamble's oak/Riparian woodland, 2.5 acres of Big bluestem/Little bluestem and 0.5 acres of Common cattails/Mesic graminoids.

Wildlife

Landscaping associated with the Alternative 2 would have minimal positive effects on native wildlife and its habitat. Affected habitats are common habitat types on Fort Carson; thus, effects to wildlife would not be significant. Operation of facilities would create disturbance around these facilities. Urban wildlife species would adapt reasonably well to this disturbance as has been shown by similar types of disturbance elsewhere on Fort Carson.

Sensitive Species

The only Species of Special Concern that uses this site on a regular basis is the black-tailed prairie dog. This area is a designated prairie dog suppression area, so there would be no new effects on this species. The Burrowing Owl and Mountain Plover have not been known to occur at this site.

Wetlands

There would be no direct impacts to wetlands from this alternative. However, indirect impacts to wetlands or riparian areas are currently being assessed in the *Stormwater Simulations for Grow The Army EIS Fort Carson*, which will be available prior to the public meetings taking place later this year.

3.7.2.4.1. Cantonment Area

The construction of facilities for the CS Units would be on previously disturbed and developed areas within the cantonment area and would not have any measurable effects on vegetation or wildlife.

3.7.2.4.2. Downrange Area

Operational Readiness Training Center

Only the CAB facility set would be placed in the vicinity of the ORTC under this alternative and would require an approximate 50-acre construction footprint. This alternative would have the same impacts as described in the Proposed Action in Section 3.7.2.2.2

Butts Army Airfield

Impacts from the construction/renovations under this alternative at BAAF would be the same as for the Proposed Action.

Ranges and Training Areas

Impacts under this alternative would be the same as for the Proposed Action.

3.7.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson associated with Transformation would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities already analyzed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, they are on schedule and their implementation is assumed as part of the No Action Alternative.

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson. Therefore, no construction to support these units would occur, and impacts from construction and operation of facilities would not occur.

Impacts to vegetation, wildlife, and wetlands from training as described under the Proposed Action currently occur at Fort Carson and would continue to occur under the No Action Alternative. Fort Carson already trains an existing IBCT and has had aviation training ongoing in different formations over the years, based on stationing and National Guard/Reserve training. Impacts from the increased frequency from training the additional IBCT and CAB would not occur, however, under the No Action Alternative.

3.7.2.6. Mitigation Measures

To ensure the continued availability of quality training lands, the Proposed Action would continue to implement Fort Carson's land and environmental management programs on Fort Carson and PCMS. The Proposed Action would continue to implement the INRMP (Reference No. 6) and the ITAM program at Fort Carson and PCMS to provide for sustainable land management and to apply monitoring programs for interpreting the impacts of the training mission. Both programs balance the Army's training needs with the need to sustain the quality and sustainability of environmental resources in training areas.

Noxious Weeds

Noxious weeds are mandated under the *Federal Noxious Weed Act of 1974, P.L. 93-629, Section 15*; *1996 Colorado Noxious Weed Act; EO 13112, AR 200-1*; Cultural, mechanical, biological, and chemical control methods would continue to be used to reduce weed populations and stop the spread of noxious weeds. Military vehicles are washed before and after their use to reduce the potential for spreading weed

seeds on and off the installation. These practices would continue under the Proposed Action. Fort Carson has targeted noxious weeds for priority control by preventing them from populating disturbed areas, controlling infestations to levels compatible with other land management objectives, or eliminating the weed species from the area (Reference No. 6). Maintaining healthy native plant communities and revegetating disturbed areas, as necessary, are the most effective methods of preventing weed establishment and encroachment at Fort Carson (Reference No. 6).

Raptors

Protection of raptors is mandated under the *Bald and Golden Eagle Protection Act; Migratory Bird Treaty Act*. Studies would determine if training of the CAB aircraft downrange on Fort Carson would harm breeding populations and if the harm can be mitigated. The Army would develop BMPs based on results of investigations of behavioral and physiological responses to predicted disturbance. Additional aircraft on the installation would increase the chances of an aircraft-wildlife strike, which could result in loss of life or significant damage to aircraft. A wildlife hazard assessment and subsequent development of a *Bird Air Strike Hazard Plan* would be developed.

In a study of effects of helicopter noise on the Mexican Spotted Owl at Holloman Air Forces Base in New Mexico, Delany et al. (1999) recommended at 105-meter buffer zone for helicopter overflights year-round. Spotted Owls are known to winter on Fort Carson, primarily within impact safety fans for aircraft and large munitions firing. Because the owls use multiple day roost locations within a wintering area, generally changing roost sites daily, avoiding individual sites is not feasible.

BMPs for all species of raptors include ensuring sustainability of riparian forests primarily through water rights management, fire prescriptions to match seral state targets of specific sites, wetland restoration through planting to replace lost habitat, management for quality habitats that retain biological diversity of prey species in the presence of increased military training, and an effective outreach program for recreationists, Soldiers, and other downrange users.

Sensitive Species

Impacts to sensitive wildlife species from increased military training under the Proposed Action would be similar to impacts to other wildlife species, as described in Section 3.7.2.2. The following measures are species-specific.

- Restrictions on military training in protected Arkansas darter habitat would continue.
- Buffer zones around greenback cutthroat trout habitat would be maintained, and training activities would not affect the greenback cutthroat trout.

- The restriction on training in southern redbelly dace habitat would continue, and training activities on Fort Carson would not affect the southern redbelly dace.
- Buffer zones around Mountain Plover nests on Fort Carson would be accommodated where feasible. If buffers were maintained, Mountain Plovers would not be affected by increased military training during the breeding season. Fort Carson biologists annually provide G-3 with wildlife information and recommendations for minimizing potential impacts to nesting birds.
- The *Biological Assessment and Management Plan for the Mexican Spotted Owl on Fort Carson* (Reference No. 118) would be maintained. Fire suppression and prescribed burning would be maintained in Mexican Spotted Owl management areas, as recommended in the management plan. Mexican Spotted Owls would not be affected by increased military training on Fort Carson as long as the management plan is followed.

BMPs employed to protect black-tailed prairie dogs include:

- Exercising control in areas only to protect human health and property;
- Using pesticides to control plague fleas in selected colonies to encourage/retain use by Burrowing Owls and to support wintering Eagles and Ferruginous Hawks; and
- Using pesticides to control plague fleas in the Training Area 54 colony on Fort Carson to ensure that prairie dogs are present to maintain Mountain Plover habitat (Reference No. 76).

Prescribed burning has been effective in maintaining and establishing prairie dog habitat if conducted during the right seasons.

Mule Deer

The IBCT and CAB training activities have the potential to impact mule deer populations. BMPs for reducing military training impacts on mule deer would include the following:

- Revegetating disturbed areas with plant species that are valuable to deer for forage and cover as soon as possible after military training (Reference No. 103);
- retaining juniper and pinyon-juniper forested patches (2-5 acres) with greater than 60 percent crown cover for thermal cover;
- Using prescribed burns to rejuvenate foraging areas;
- Reducing recreational use of northern riparian and shrubby areas during the critical fawning season of June through August;

- Limiting resource management activities (e.g., burning and forest thinning) during the fawning period;
- Using prescribed fire judiciously in fawning areas (i.e., rotating fires through multiple sites with long-burning interval between fires on each site);
- Using prescribed burns in late winter to protect adjacent fawning areas from wildfire during the fawning season;
- Developing habitat improvement areas on margins of areas supporting frequent vehicular training;
- Developing water resources in drier regions adequate for supporting deer forced to move in response to training maneuvers (Reference No. 76); and
- Maintaining conservative harvest regulations to sustain established population management and harvest objectives (Reference No. 103).

Vegetation

As stated previously, wildfires are a threat to vegetation (habitat) on the installations. Fort Carson has, and would continue cooperative agreements with the Colorado Springs Fire Department, El Paso County, and the USFS to provide mutual aid for the suppression of wildland fires on the installation and surrounding area (Reference No. 6).

Eagles

Wintering Bald Eagles on Fort Carson and PCMS are protected in various ways, including restricting aboveground poisoning of black-tailed prairie dogs (Bald Eagle prey) and measures to prevent Bald Eagles from being electrocuted on towers, poles, and power lines (Reference Nos. 119 and 120).

BMPs being implemented to minimize effects to Golden Eagles include:

- Temporarily closing training areas supporting active eyries to all non-training activities;
- Advising military trainers of the presence of active eyries to reduce pedestrian and bivouacking activities in the vicinity of nests;
- Prohibiting prairie dog eradication except to protect health and property; and
- Using flea pesticides to prevent the spread of plague and loss of prairie dogs in select colonies (Reference No. 76).

3.8. Cultural Resources

3.8.1. Affected Environment

Cultural resources management (CRM) on Fort Carson (this also includes management of PCMS) encompasses conservation of resources of significance to the history or prehistory of the United States or of traditional, religious, or cultural importance to Native Americans. These resources consist of the material manifestations of the knowledge, beliefs, art, morals, laws, and customs particular to a people or society. Fort Carson manages cultural resources associated with all major prehistoric and historic cultural periods recognized on the southern Great Plains and Rocky Mountains.

Archeological and historical studies have been conducted on the land encompassed by Fort Carson for the past 60 years. Prehistoric, historic, and multi-component sites eligible for inclusion in the National Register of Historic Places (National Register) are known to occur throughout the installation. Evaluative studies of Fort Carson's built environment (historic structures) have also been conducted or are in progress, to include World War II (WWII) temporary wood structures, Capehart and Wherry Era (1949-1962) family housing, and Cold War Era facilities.

Between April 14, and Aug 12, 2008, Fort Carson experienced four wildland fire events covering 9,461 acres. The TA-25 fire was the largest, encompassing 9,064 acres. Fort Carson's CRM and Senior Archaeologist were on-site as Resource Advisors (RA) and conducted immediate cultural resources site assessments following the DOI *Burned Area Emergency Response/Rehabilitation (BAER) standards.* The assessments identified 44 archaeological sites eligible for inclusion in the National Register, including two Native American burial sites and three historic grave sites. Thirty of these sites require further evaluative sub-surface testing to determine appropriate levels of site stabilization. The CEMML at Colorado State University began evaluative testing in July 2008 under the direction of the CRM and the Deputy Garrison Commander, PCMS. In addition, Fort Carson cultural resources personnel have conducted a 100 percent Phase I/II Archaeological Inventory of both un-surveyed and previously surveyed lands within the fire perimeters. To date, 250 additional archaeological sites have been identified.

3.8.1.1. Prehistoric and Historic Background

Three general stages of prehistory have been documented for southeastern Colorado: the Paleoindian, Archaic, and Late Prehistoric. An earlier stage, the Pre-Clovis, has been proposed, but direct evidence of this stage in the region is lacking. The Paleoindian, Archaic, and Late Prehistoric stages in southeastern Colorado are each subdivided into three periods. These periods represent specific changes or innovations

in the material culture of prehistoric peoples that suggest broader changes in environmental conditions and/or political and socioeconomic structure. These periods span from approximately 11,500 Before Present (B.P.) to 225 B.P.

The historic era of southeastern Colorado spans the first 16th century European incursions into the area to the present. The cultural chronology includes occupations during the Spanish, Mexican, and Euroamerican eras, such as trapping/trading sites, 19th century Hispanic and Euroamerican settlements, early 20th century homesteading and ranching complexes, and WWII and Cold War era military sites.

Appendix G contains a detailed description of the prehistoric and historic cultural sequences, as well as sections specifically covering the settlement of the Fort Carson region and the historic development of Camp/Fort Carson.

3.8.1.2. Section 106 Compliance and the Army Alternate Procedures

Management of cultural resources hinges on the identification and eligibility of resources for inclusion in the National Register. Both historic and prehistoric archaeological sites, as well as buildings and structures are referred to as *historic properties.* A separate class of cultural resources is the *traditional cultural property* (TCP), which may be eligible for inclusion in the National Register because of traditional, religious, and/or cultural importance to Native American tribes or other cultural groups. This designation also incorporates and considers Native American sacred sites. Coordination with Native American tribes regarding TCPs and sacred sites, and those identified to date on Fort Carson are discussed in Section 3.8.1.7.

The foundation of broad legislation for preservation of cultural resources is the *National Historic Preservation Act* (NHPA) of 1966 (36 CFR Part 800). The NHPA calls upon the federal government to be a leader in preservation and outlines roles of the National Register, the *State Historic Preservation Office* (SHPO), and the *Advisory Council on Historic Preservation* (ACHP) in overseeing management of cultural resources.

Of particular importance to military installations are Sections 106 and 110 of the NHPA. Section 110 of the NHPA, part of a 1980 revision, requires federal agencies to institute programs to identify and evaluate cultural resources eligible for inclusion in the National Register under their care. Section 110 inventories identify cultural resources using literature review and physical/pedestrian survey. Documentation on each inventoried resource is submitted to the Colorado SHPO (COSHPO). These inventories, however, may

not provide sufficient information to assess the historic significance, *i.e.,* National Register eligibility, of identified resources.

Evaluative studies constitute the mechanism by which inventoried resources are assessed against criteria of the National Register and upon which all subsequent management actions are based. Section 106 requires federal agencies to consider effects of *undertakings* on resources listed in, or eligible for inclusion in, the National Register through a process of consultation. The process for compliance with Section 106 consists of the following steps:

1) ***Identification of cultural resources*** located within the Area of Potential Effect (APE) of a proposed undertaking is accomplished through review of existing documentation and field surveys.
2) ***Cultural resources evaluation*** is conducted using National Register criteria (36 CFR Part 63). Properties that meet the criteria are considered *eligible* for listing in the National Register and are subject to further review under Section 106. Properties that do not meet the criteria are considered *not eligible* for inclusion in the National Register and are generally not subject to further Section 106 review.
3) ***Determination of effect*** of the proposed undertaking is assessed on properties that are determined to meet the National Register criteria. One of the following effect findings will be made: *No Historic Properties Affected*, *No Adverse Effect*, or *Adverse Effect*.
4) ***Resolution of adverse effects/mitigation*** occurs when adverse effects are found. Consultation continues between the federal agency and consulting parties to attempt resolution. Successful consultation results in an agreement of the efforts to be taken to avoid or mitigate adverse effects.

Fort Carson has maintained a *CRM Program* since the late 1970s. *CRM Program* personnel have developed and implemented various management plans and agreement documents to guide overall cultural resources identification, treatment, and preservation strategies for compliance with the NHPA and all federal, state, DoD, and Army laws, regulations, and policies provisions regarding cultural resources management. To date, the two most significant guidance documents are a Memorandum of Agreement (MOA) between Fort Carson, the COSHPO, and the ACHP (1980), and the *Integrated Cultural Resources Management Plan, 2002-2006* (Reference No. 7).

In July 2007, Fort Carson's Garrison Commander made the decision to comply with Section 106 of the NHPA through implementation of the *Army Alternate Procedures* (AAP) in lieu of 36 CFR Part 800. The AAP will allow Fort Carson to be more efficient, consistent, and comprehensive in its compliance with

Section 106, while providing better management of the Army's historic properties through a planning approach to compliance, closer integration with the military mission, and by encouraging new and innovative means for stakeholder involvement.

The AAP was approved by the ACHP in 2001, and was amended in 2004 to reflect the Army's new management structure. The NHPA allows an agency to develop procedures to implement Section 106 and substitute them for subpart B as long as they are consistent with Section 106 regulations (36 CFR 800.14[a]). The AAP approaches the installation's management of historic properties programmatically, instead of on a project-by-project review as prescribed by the regulations of the ACHP, and is intended to be a proactive planning and management approach to historic preservation.

The AAP involves consultation input from the COSHPO, Native American tribes, other consulting parties, and the public to develop a set of SOPs for the consideration and treatment of historic properties. Identified consulting parties for Fort Carson's AAP efforts are the COSHPO, the Colorado Council of Professional Archaeologists (CCPA), Colorado Preservation, Inc. (CPI), the Colorado National Trust for Historic Preservation, preservation specialists from Las Animas, Huerfano, and Otero counties, and the 12 Native American tribes with a cultural affiliation to Fort Carson administered lands.

As part of the AAP, a *Historic Properties Component* (HPC) is developed in consultation with all appropriate parties. Once completed and certified by the ACHP, the HPC replaces several chapters in the installation ICRMP. As such, implementation of the AAP serves as both a *Programmatic Agreement* for Section 106 compliance and a management document to direct day-to-day operations for CRM. At present, Fort Carson anticipates completion of the HPC and certification by the ACHP in early 2009. Until that time, the case-by-case Section 106 compliance review stipulated in the 1980 MOA with the COSHPO and ACHP, and the basic management principles outlined in the 2002-2006 ICRMP, will remain as the governing guidance.

Appendix G contains a copy of the 1980 MOA, a complete list of cultural resources related laws, regulations, and EOs, and the full text of the AAP (2004, as amended). A copy of the 2002-2006 ICRMP may be reviewed at the Fort Carson Curation Facility, Building 2420.

3.8.1.3. Cultural Resources Investigations

3.8.1.3.1. Archaeological Resources

The history of archaeological research on Fort Carson and in the surrounding area dates from the 1930s. Archaeological research has intensified over the last two decades in association with the development of the *CRM Program* at Fort Carson and the acquisition of the PCMS. The listing of Fort Carson's archaeological investigations, reports, and publications is summarized in Appendix G; however, it is not an inclusive list of all Section 106 compliance actions since only large-scale archaeological investigations generate full reports. Since the Army's objectives have evolved to meet the changing military training strategies that have emerged through the Global War on Terrorism, such large-scale projects have not taken place on Fort Carson since 2001.

As such, the *CRM Program* initiated a programmatic shift in 2004/2005 to the use of in-house archaeological services for the majority of the annual workload requirements. The internal focus has allowed for the accomplishment of a much larger percentage of field work and a greater concentration on resource management. The majority of undertakings at Fort Carson pertain to the cantonment area, with other project-specific activities occurring due to upgrades to ranges, maintenance of training land, or from utilities-type work. These projects are generally forwarded to the COSHPO via letters or letter-reports. Although Fort Carson makes every attempt to be proactive in its pedestrian surveys and historic property re-evaluations, most work is based on a current requirement and is conducted by Fort Carson archaeological personnel on a project-by-project basis in conjunction with the NEPA process.

Approximately 75 percent of Fort Carson has been inventoried for cultural resources, with historic properties identified in the following categories: districts, buildings, structures, and historic, prehistoric, and multi-component archaeological sites. A total of 1,605 archeological sites have been recorded on Fort Carson to date. Of these, 108 are currently determined to be eligible for inclusion in the National Register, with 1,497 sites determined to be not eligible. Prehistoric sites number 1,319; historic sites number 240, of which 46 sites are multi-component (i.e., having both prehistoric and historic components); and approximately 50 sites contain either historic or prehistoric rock art. The cantonment area of Fort Carson has been surveyed 100 percent for cultural resources and is devoid of known prehistoric sites.

Prehistoric encompass 82 percent of the total number of sites recorded to date. Prehistoric site types include defensive fortifications, open architectural sites, open and sheltered camp sites, lithic scatter assemblages and food procurement or processing sites, quarry locations, and game drives. Historic sites

date to the late 1860s and include 19th/20th century ranching, homestead, and town complexes with numerous building types and functions, and small mining and stone/clay quarry operation sites. Both prehistoric and historic rock art is found on Fort Carson, again, with prehistoric elements predominating. Most rock art is located within the designated Turkey Creek Rock Art District, but some isolated panels exist. Of the 108 sites on Fort Carson determined to be eligible for inclusion in the National Register, 88 are prehistoric, 14 are historic, and 6 are multi-component.

Site investigations have resulted in the collection of over 1,000 cubic feet of curated materials from Fort Carson investigations, which include material culture, faunal remains, and associated scientific documentation. The archaeological collection is housed in Fort Carson's Curation Facility. Artifacts and all associated documentation are curated in accordance with 36 CFR Part 79, *Curation of Federally-owned Archaeological Resources* and 48 FR 44716, *Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines*.

3.8.1.3.2. Paleontological Resources

Although not strictly classified as cultural resources, paleontological resources are managed by the *Fort Carson Cultural Resources Program*, as the management issues surrounding paleontological locales and collections are essentially consistent with those of archaeological resources. To date, 53 paleontological localities have been identified on Fort Carson.

3.8.1.4. Architectural Properties

All extant buildings and structures on Fort Carson that are not documented as historic archaeological sites were constructed during military ownership and occupancy, with the exception of the Corley House, the remnants of Stone City, and the Turkey Creek Ranch. The Corley House (ca. 1910s-1920s), was evaluated in 1999 and determined not eligible for inclusion in the National Register (SHPO concurrence 6 DEC 1999). Stone City (ca. 1906-1959) was a small town created around the industry of clay and gypsum mining and stone quarrying. The remains of the town and quarries were evaluated in 1985 and re-evaluated in 1988/89 and 1997, and are currently protected as a historic archaeological site. Details on Turkey Creek Ranch (Spencer Penrose, ca. 1912-1939) are provided in the discussion on historic districts in Section 3.8.1.5. Architectural evaluations on 43 historic building sites over or approaching 50 years of age have been completed. Four historic districts are located on Fort Carson: the Old Hospital Complex, the Incinerator Complex, the Turkey Creek Recreation Area, and the Turkey Creek Rock Art District. A total of 68 buildings on Fort Carson are contributing properties of these historic districts.

Fort Carson has completed the inventory and evaluation of WWII era architectural properties and historic architectural investigations are focused on the built environment from the Cold War Era. In 2000, the US Army Environmental Command (USAEC) produced the *Thematic Study and Guidelines: Identification and Evaluation of U.S. Army Cold War Era Military-Industrial Historic Properties* (Reference No. 122) that established a historic context for the Army's Cold War mission and outlined significance standards for evaluation of these properties for National Register eligibility. Under this guidance, properties on Fort Carson have little potential for qualification to the National Register under *Criteria Consideration "g"* for properties less than 50 years of age. National Register eligibility determinations will be assessed for all properties approaching 50 years of age.

The inventory of Fort Carson's historic Cold War Era properties began in 2002. To assist in evaluating the installation's built environment, *The Cold War and Fort Carson: A Historic Context* was completed in 2003 (Reference No. 123). The inventory will be completed in three phases. The first phase will address the built environment of Fort Carson from the beginning of the Cold War in 1947 to the Berlin Crisis of 1961. The Cold War Phase I (1947-1961) Buildings Inventory of 55 buildings and structures is currently in process with a completion date projected for the end of 2008. The second phase will cover the period from 1962-1979 with an estimated 334 buildings and structures scheduled for inventory beginning in 2012. The third, and final, phase will cover the period from 1980-1989 with an estimated 120 buildings and structures scheduled for inventory in 2030.

On May 21, 2007, the Army published a notice in the FR (Vol. 72, No. 97) to adopt the *ACHP Program Comments (18 August 2006), for Cold War Era (1946-1974) Unaccompanied Personnel Housing, WWII and Cold War Era (1939-1974) Ammunition Storage Facilities, and WWII and Cold War Era (1939-1974) Army Ammunitions Production Facilities and Plants* as a programmatic compliance mechanism under 36 CFR 800.14(e).

These comments include treatment measures for the following undertakings: ongoing operations; maintenance and repair; rehabilitation; renovation; mothballing; cessation of maintenance; new construction; demolition, deconstruction, and salvage; remediation activities and transfer, sale, lease, and closure of the facilities. To ensure that the effect of these undertakings is taken into account, the Army will execute the steps identified as treatment measures in the *Program Comments*, Sections II.A., relating to each property type. Properties on Fort Carson that are affected by the *Program Comments* include 36 Cold War Era (1946-1974) Unaccompanied Personnel Housing (UPH) buildings and 13 WWII and Cold War Era (1939-1974) Ammunition Storage Facilities on Fort Carson. The Army submitted lists of

properties in each state, drawn from the *Integrated Facilities System* (IFS) 4th Quarter fiscal year 2006 data, affected by the *Program Comments* to the COSHPO.

In 1996, the DoD initiated a program to privatize family housing in an effort to facilitate refurbishing current quarters and to build new housing. In November 1999, Fort Carson became one of the first DoD installations to award a 50-year contract to privatize on-post family housing, which was awarded to J.A. Jones Management Services of Colorado Springs, Colorado. The purpose of the contract was to revitalize, maintain and manage the existing 1,826 housing units, and develop, maintain and manage new housing units. Of the existing units, 301 were constructed in 1957 and 1958 as part of the Capehart military housing program established in 1955 to improve living conditions for military personnel and their Families. Under a collaborative effort between the federal government and private industry, the program provided financial incentives to private companies for the construction of family housing units on or near military installations.

Due to the high percentage of family housing units that would be reaching the 50-year age criteria for National Register consideration on military installations, the DoD began consultation with the ACHP to discuss options to streamline compliance of Capehart and Wherry properties in April 2001. Following a request for program comments (January 2002) on the Army's proposed program for management of these properties, the ACHP published a NOI to issue a Program Comment (March 2002), with approval on 31 May 2002. Section 106 compliance was, therefore, completed for Army properties through the *Program Comment for the Capehart and Wherry Era Army Family Housing and Associated Structures and Landscape Features (1949-62)*. This agreement between the DoD, Army, and the ACHP allows installations to proceed with renovation, demolition, or privatization of these housing units without any additional consultation or SHPO notification. Military housing on Fort Carson is currently managed by Balfour Beatty Communities, Limited Liability Company.

3.8.1.5. Historic Districts

Fort Carson manages four historic districts: the Old Hospital Complex, the Incinerator Complex, Turkey Creek Ranch Historic District, and the Turkey Creek Rock Art District. The Old Hospital Complex and Incinerator Complex, both WWII era properties, are located on the cantonment area. The Turkey Creek Ranch Historic District is located in the Turkey Creek Ranch Recreation Area, which is open to the public and is located along the southwest parameter of Fort Carson. The Turkey Creek Rock Art District is located downrange on Fort Carson in Turkey Canyon.

The Fort Carson Military Reservation Old Hospital Complex represents the largest hospital complex, one of only nine built on military installations in the nation during WWII. The Carson Hospital Center opened in August 1942 to provide medical care for Camp Carson's Soldiers. The combined general and convalescent hospitals had a 2,000-bed capacity with 11 square miles of floor space, where more than 30,000 patients were cared for over the course of the war. Many of the former hospital center buildings have either undergone extensive renovations during the past fifty years or have been demolished. Buildings 6236 and 6237 represent the most extant remains of the Old Hospital Complex, and both have been adapted for reuse. Building 6237 was recently restored to represent as closely as possible the building's WWII appearance. A 2002 amended MOA with the COSHPO was developed concerning treatment of the Old Hospital Complex Historic District. Certain stipulations of the MOA have bearing on proposed construction adjacent to the Complex. The specific stipulations are covered in the Environment Assessment for Additional Family Housing Units, Fort Carson, Colorado, 2006 (Reference No. 54).

The Incinerator Complex (ca. 1942) consists of three extant buildings (3850, 3851, and 3852) and is located near Gate 20 along the southwest boundary of the former WWII era Waste Water Treatment Plant (WWTP). The remaining two-story concrete block and brick buildings with brick smokestacks are distinctive in architecture from the other buildings constructed on Camp Carson during WWII. Constructed from standard military plans, the incinerators burned medical waste and military documents. Today the buildings have been converted to serve as engineering offices and administrative facilities.

Turkey Creek Ranch is a historic district eligible for inclusion in the National Register for its association with Spencer Penrose, mining magnate, tourism entrepreneur, and developer of Colorado Springs community projects (ca. 1912-1939). The historic district consists of seven contributing buildings and structures. The architectural centerpiece of the district is a Spanish Revival style residence, the Penrose House (ca. 1912), built by architects MacLaren and Thomas of Colorado Springs. The roughly hewn log cabin (ca. 1912) with large stone fireplace was the first building constructed on the property by Penrose. Other structures include the former milk house that played a role in Penrose's dairy operation, a riding stable, and two barns, each unique in its distinctive architecture that is representative of a Wisconsin Dairy Barn and Traverse Frame Barn. Today, the historic district is part of the Turkey Creek Recreation Area, which provides Fort Carson and the community with camping, trail rides, and special events hosted within the historic district, especially in the Penrose House.

The Turkey Creek Rock Art District was listed on the National Register in 1976 and is also known as the "Turkey Canyon District," and is listed on the Colorado Historical Society Office of Archaeology and Historic Preservation database as "Indian Petroglyphs and Pictographs – Turkey Creek Canyon." Although lacking well-defined boundaries, the district contains 31 archaeological sites, only five of which are known to have rock art.

3.8.1.6. Former Historic Districts

The former WWII era WWTP was determined as a historic district eligible for inclusion in the National Register in 1996, as the facility was facing an extensive upgrade to comply with Colorado mandates for effluent and water quality that required construction of new facilities. Many of the former WWII structures had previously been upgraded and renovated (1960s, 1970s, and 1980s), some extensively altered during the 50-year operation of the facility. Upon completion of the 1990s upgrade, and in accordance with the requirements stipulated in the 1996 MOA between the ACHP, the COSHPO and Fort Carson, the former obsolete WWII buildings and structures were demolished or abandoned. Thus, the WWTP was determined as not eligible as a historic district.

The former WWII era Warehouse and Utility District is situated in the railhead area in the northeast corner of Fort Carson. Many of the WWII temporary buildings and structures, covered by the Programmatic MOA between the DoD, the ACHP, and the National Council of SHPOs (1986, amended May 1991), have been demolished through the years. On August 4, 2000, the COSHPO concurred with Fort Carson's recommendation that the District was no longer eligible for inclusion in the National Register.

3.8.1.7. Native American Consultation Status and Initiatives

Ethnohistoric research to identify Native American tribes having traditional ties to Fort Carson administered lands began in the 1980s as part of the cultural resources surveys in support of Army acquisition of the PCMS. Although no specific Fort Carson or PCMS locations were identified at that time, the study described the southeastern Colorado region as an "inter-tribal and peripheral area rather than a core territory" with the exception of the Apachean groups that utilized the region for a long period of time.

In 1998, a comprehensive ethnohistoric study of Fort Carson and the PCMS was conducted to provide a basis for future consultation with Native American tribes to identify traditional cultural properties. This study identified seven general tribal cultures with 13 points of contact for consultation. It also recorded

sites on both installations that had potential tribal significance that could assist in the identification of traditional cultural properties.

Also in 1998, an extensive Native American oral history project was initiated to create a record of traditional Native American use of Fort Carson and the PCMS and support identification of traditional cultural properties. While this project was to include all tribes expressing interest in Fort Carson or the PCMS, it was only completed for the Cheyenne-Arapaho Tribe of Oklahoma.

Beginning in 2002, Fort Carson initiated a project to complete the required Native American consultation in accordance with Section 106 of the NHPA, the *American Indian Religious Freedom Act* (AIRFA) of 1996, and the *Native American Graves Protection and Repatriation Act* (NAGPRA) of 1990. Nine sessions of field visitation occurred at the PCMS and Fort Carson, with 23 tribal representatives from ten federally-recognized tribes participating. All consultation efforts were conducted in accordance with the Presidential Memorandum, *Government to Government Relations with Native American Tribal Governments* (April 29, 1994); EO 13175, *Consultation and Coordination with Indian Tribal Governments* (November, 2000); and the DoD *Annotated American Indian and Alaska Native Policy* (27 October 1999).

In November 2004, a *Comprehensive Agreement* (CA) Regarding Tribal Access, Privacy and Information Sharing, and Inadvertent Discovery and Intentional Excavation of Native American Human Remains and Cultural Items Culturally Affiliated with the Following Indian Tribes: Apache Tribe of Oklahoma; Cheyenne and Arapaho Tribes of Oklahoma; Comanche Nation of Oklahoma; Kiowa Tribe of Oklahoma; Northern Arapaho Tribe; Northern Cheyenne Tribe; Oglala Sioux Tribe of the Pine Ridge Reservation; Shoshone Tribe (Eastern Band); Southern Ute Indian Tribe; and the Ute Mountain Ute Tribe, Within Federal Lands Owned or Controlled by Fort Carson, Colorado was signed in a ceremony held on Fort Carson. The Jicarilla Apache Nation signed a separate, but identical, CA in May 2005. Appendix G contains a copy of the Agreement.

TCPs and sacred sites were also identified during the consultation process, the results of which are presented in *Our Footprints Are There: Report of Native American Consultation to Identify Traditional Cultural Properties and Sacred Sites on Land Administered by Fort Carson, Colorado* (Reference No. 121). On Fort Carson, one sacred site was identified, located within the Turkey Creek Rock Art District. Although only one site was identified as having direct, religious significance for culturally affiliated tribes, the sacred site associated with this District may be expanded in the future depending on

consultation with other tribes that expressed an interest in the area, but have thus far been unable to complete a site visit.

Native American consultation will not be necessary for the cantonment area unless human remains are discovered during ground disturbing activities, but will continue for downrange area projects with the potential to impact cultural resources significant to Fort Carson affiliated tribes. In the event that human remains are discovered, either through construction activities, training, or natural processes, Fort Carson's Inadvertent Discovery of Archaeological Resources or Burials SOP will take effect, resulting in further consultation with the appropriately identified Native American tribe(s) as outlined in the NAGPRA CA. Fort Carson has inventoried its collection and has completed repatriation of all human remains in accordance with NAGPRA.

Native American tribes are not the only groups that may have an interest in properties located on Army administered lands for cultural or traditional reasons. Other ethnic groups, such as those of Hispanic, Italian, or German descent, etc., also have historic ties to southern Colorado. Fort Carson makes every attempt to include these groups/individuals in background research and decision-making processes when they can be identified. On Fort Carson, such groups have included "Keeping History Alive," an association with a preservation interest in the Harkin's Grave site off SH 115, as well as oral histories and document sharing with former residents of the Turkey Creek Ranch and Stone City. Cultural resources personnel respond to all Family and community inquiries for access to or information about historic properties located on Fort Carson.

3.8.2. Environmental Consequences

The following discussions describe the elements of the Proposed Action and alternatives, including the environmental analysis performed, that are common to all scenarios.

3.8.2.1. Proposed Action and Alternatives

The locations and actions analyzed in this EIS as the Proposed Action and Alternatives are detailed in Section 2.0. Fort Carson's CRM has determined that these actions constitute undertakings in accordance with Section 106 (36 CFR 800.16[y]) of the NHPA. As is allowable under 36 CFR 800.8(c) of the Act, Fort Carson has elected to use the NEPA process for the purpose of compliance with 36 CFR 800.3-6 of Section 106. Notification of this intent was forwarded to the COSHPO and the ACHP on August 25, 2008, and scoping notification and invitation to the May 19, 2008 agency scoping meeting was sent to the COSHPO on May 7, 2008.

Three alternative locations are being considered for this federal undertaking. The proposed IBCT is the only unit to change location between the three siting alternatives; its facilities could be set either:

1) South of Titus Boulevard on Wilderness Road at the ORTC site (identified as the Proposed Action);
2) The eastern part of the main cantonment area at Training Area Bravo (referred to as Alternative 1); or
3) South of Titus Boulevard on Wilderness Road at the Tent City site (referred to as Alternative 2).

For each alternative scenario, the facilities for the CS units would be constructed in the cantonment area and the CAB facilities would be constructed at the ORTC site and BAAF (directly adjacent to the ORTC site).

The cultural resources determinations for the Proposed Action and alternatives pertain primarily to construction related actions. Training activities are currently managed to avoid impacts to cultural resources and management of training activities would continue in accordance with installation management protocols. Should potential impacts to cultural resources be identified in the future due to changes in military training schedules or activities, or should additional construction be proposed outside the established APE, additional Section 106 consultation will be initiated. In the event that subsurface cultural materials are encountered during construction activities, Fort *Carson's Inadvertent Discovery of Archaeological Resources or Burials and/or the NAGPRA SOPs* and appropriate Section 106 consultation will be implemented.

3.8.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

As stated above, proposed construction/renovation sites for the CS Units would be in the cantonment area and construction of potential CAB facilities would be at the ORTC site and BAAF. This would not change with the IBCT siting alternatives. Fort Carson has completed the review process to identify historic properties and assess the effects of this undertaking on those properties for the Proposed Action. The APE for the ORTC site has been analyzed. Phase I archaeological inventories and/or historic building evaluations have been completed. No historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within the APE. In addition, this action would have no impact on the three historic districts eligible for inclusion in the National Register within Fort Carson boundaries, nor would buildings approaching 50 years of age or that

are currently under evaluation be affected. As such, Fort Carson's CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) by the Proposed Action.

3.8.2.2.1. Cantonment Area

The facility construction for the CS Units would occur within the cantonment area in two general locations (Figure 2-4). The proposed construction to support the Engineer Company would require the demolition of the existing buildings that reside within the proposed APE. There are eight buildings within the APE of the Engineer Company potential siting. These buildings were constructed in 1956 as motor pool facilities. Fort Carson has completed the Architectural Inventory evaluation, and the CRM has determined that they are not eligible for the National Register of Historic Places. Consultation was initiated with the COSHPO in a letter dated April 15, 2008. Fort Carson has assumed COSHPO concurrence under 36 CFR 800.3(c)(4), as no official response was received within 30 days of receipt of the letter. As such, the CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) for construction at this location.

The proposed construction to support the Quartermaster Company would require no demolition of existing facilities and would occur on previously disturbed ground. As such, the CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) for construction at this location.

3.8.2.2.2. Downrange Area

Operational Readiness Training Center

As stated in Section 3.8.2.2, Fort Carson's CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) by the Proposed Action.

Butts Army Airfield

Fort Carson has completed the review process to identify historic properties and assess the effects of this undertaking on those properties for BAAF. The APE for the BAAF site has been analyzed. Phase I archaeological inventories and/or historic building evaluations have been completed. No historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within the APE. In addition, there would be no impact on the three historic districts eligible for inclusion in the National Register within Fort Carson boundaries, nor would buildings approaching 50 years of age or that are currently under evaluation be affected. As such, Fort Carson's CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) for construction/renovation at the BAAF.

Ranges and Training Areas

The impacts from training an additional IBCT and potential CAB at Fort Carson could directly and indirectly affect nearly all available training areas within the boundaries of Fort Carson. Military training activities have the potential to result in adverse impacts to cultural resources. The demands of training these additional units combined with Transformation actions of training three HBCTs, one IBCT, 43rd Sustainment BCT, Special Forces and Reservists, make cultural resource protection a very important component of the overall environmental protection and sustainable principles adhered to by Fort Carson. Fort Carson would continue to enforce all cultural resource protection regulations and policies as described previously in this section to prevent adverse impacts to known cultural resources.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents in force prior to training use (unless a project-specific agreement has been developed through the consultation process), the following would apply:

- Use of areas that have been inventoried for cultural resources and that contain no historic properties eligible for inclusion in the National Register would not be restricted because there is no potential for adverse impacts to significant resources.
- Areas that have been inventoried for cultural resources and contain known historic properties eligible for inclusion in the National Register would be used only for dismounted training until the area has been evaluated to determine that cultural resources can be protected against adverse impacts. If impacts cannot be avoided, further consultation with the SHPO and/or Native American Tribes (if applicable) regarding mitigation would occur prior to ground-disturbing activities.
- Areas that have not been inventoried for cultural resources would not be used for activities other than dismounted training until an archaeological investigation has been conducted and resources determined for eligibility in the National Register have been evaluated against potential adverse effects. If impacts could not be avoided, further consultation with the COSHPO and/or Native American Tribes (if applicable) regarding mitigation would occur prior to ground-disturbing activities.

3.8.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Fort Carson has completed the review process to identify historic properties and assess the effects of this undertaking on those properties for Alternative 1. The APE for the Training Area Bravo site has been

analyzed. Phase I archaeological inventories and/or historic building evaluations have been completed. No historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within the APE. In addition, there would be no impact on the three historic districts eligible for inclusion in the National Register within Fort Carson boundaries, nor would buildings approaching 50 years of age or that are currently under evaluation be affected. As such, Fort Carson's CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) by Alternative 1.

3.8.2.3.1. Cantonment Area

Under this alternative, impacts on the cantonment area would be the same as for the Proposed Action.

3.8.2.3.2. Downrange Area

Under this alternative, impacts on the downrange area would be the same as for the Proposed Action.

3.8.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Fort Carson has completed the review process to identify historic properties and assess the effects of this undertaking on those properties for the Alternative 2. The APE for the Tent City site has been analyzed. Phase I archaeological inventories and/or historic building evaluations have been completed. No historic properties eligible for inclusion in the National Register, nor properties with the potential for National Register eligibility, are located within the APE. In addition, there would be no impact on the three historic districts eligible for inclusion in the National Register within Fort Carson boundaries, nor would buildings approaching 50 years of age or that are currently under evaluation be affected. As such, Fort Carson's CRM has made a determination of "no historic properties affected" (36 CFR 800.4[d][1]) by Alternative 2.

3.8.2.4.1. Cantonment Area

Under this alternative, impacts on the cantonment area would be the same as for the Proposed Action.

3.8.2.4.2. Downrange Area

Under this alternative, impacts downrange area would be the same as for the Proposed Action.

3.8.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of this No Action Alternative.

3.8.2.6. Mitigation Measures

It must be noted that under the NHPA, NAGPRA, ARPA, and all other cultural resources laws and regulations, the term *mitigation* generally refers to total data recovery of an archaeological site and, at minimum, HABS/HAER documentation for other historic properties. This term under NEPA is used to discuss the measures employed to avoid or minimize potential effects to historic properties. It is rare that Fort Carson cultural resources personnel recommend extensive sub-surface excavation work.

As detailed in the 2007 Fort Carson Transformation EIS, the cantonment area has been completely surveyed for cultural resources and is devoid of known prehistoric sites. The inventory and evaluation of historic properties through the Cold War Era is ongoing, and it is anticipated that construction activities would have a minimal impact on historic properties within the cantonment area. Training activities are currently managed to avoid impacts to cultural resources, and management of training activities would continue in accordance with installation management protocols.

Implementation of Fort Carson's ICRMP, and development of the AAP, would continue to maintain cultural resources sustainability. This includes evaluation of all historic properties for NRHP eligibility and continued consultations with Native American tribes to identify and evaluate TCPs and Sacred Sites.

Unsurveyed areas would be surveyed, and resources identified during the survey would be evaluated for NRHP eligibility according to the Secretary of the Interior's Standards for Archaeology and Historic Preservation, as well as applicable Colorado standards. The Army would continue to consult with the COSHPO under the 36 CFR Part 800 process until such time as the AAP are approved.

Fort Carson would continue development and implementation of the cultural resources education and awareness programs for Army personnel, families, civilians, and the public to enhance the conservation of historic properties on Fort Carson lands. As discussed in this chapter, if cultural resources are disturbed

or discovered during this or any other undertaking, Fort Carson's Inadvertent Discovery of Archaeological Resources or Burials SOPs would be implemented.

Fort Carson's *CRM Program*'s BMPs are used during project design and planning to avoid or minimize effects to all cultural sites. If an impact cannot be avoided, consultation with the COSHPO, Native American tribes, and other interested parties would be initiated.

3.9. Socioeconomics

This section describes the affected environment and environmental consequences to the following:

- Demographics
- Housing
- Economic development
- Public finance
- Quality of life
- Environmental justice in minority and low-income populations
- Protection of children from environmental health risks and safety risks

Implementing the Proposed Action could have impacts that are concentrated in a geographical area referred to as the ROI. The definition of the ROI considers local residential, shopping, and commuting patterns. The ROI is intended to encompass the geographical area within which linkages are strongest between businesses involved in construction activities and the long-term operation of the new facilities.

The ROI for the Proposed Action at Fort Carson comprises three counties: El Paso, Fremont, and Pueblo. The area of Fort Carson, where all of the construction activity would occur, is located in southern El Paso County. Virtually the entire Colorado Springs urbanized area is located north of the installation and contained within El Paso County. Adjacent portions of surrounding counties are also a part of the Colorado Springs functional economic region, including Fremont County to the southwest, and Pueblo County to the south. Socioeconomics and the ROI for PCMS are discussed in Section 4.9.

3.9.1. Affected Environment

3.9.1.1. Demographics

3.9.1.1.1. Region of Interest

The estimated population of the ROI totaled 77,806 in 2006, an increase of more than 11.6 percent since 2000. Two large communities are located in the ROI: the City of Colorado Springs, located north of Fort Carson, with a population of just over 370,000 in 2006; and the City of Pueblo, located southeast of Fort Carson, with a population in 2006 of approximately 104,000 residents (Reference No. 124).

More than 5,100 civilian workers are employed at Fort Carson (appropriated, non-appropriated, contractor, and others). Assuming each is a head of household, this would represent a population of over 14,600 persons (applying an average household size of 1.87 as estimated by the PPACG, 2008 [Reference

No. 125]). The 25,100 active duty military personnel are accompanied by approximately 46,900 Family members, which results in a total connected population of about 77,000 persons, or nearly 10 percent of the entire 2006 population of the ROI (Table 2-1).

3.9.1.2. Housing

3.9.1.2.1. On-Post

Fort Carson has on-post housing units for both unaccompanied and accompanied personnel. There are currently 2,664 family housing units of various types contained in numerous clusters or "villages."

According to the 2008 Housing Market Analysis, there is a validated on-post housing requirement for 4,012 family housing units by 2013 (Reference No. 126). With a current inventory of 2,664 family housing units, a serious housing deficiency exists on-post that will continue to grow over the next five years. The analysis anticipated that another 952 units would be needed by 2013. The construction of 952 family housing units may not be realized however, due to limited space and land constraints within the cantonment area on Fort Carson.

Balfour-Beatty, the installation's public/private housing provider, plans to construct at least 400 additional family housing units (dependent upon land availability and funds). This project will be the subject of an EA prepared by the Balfour-Beatty, prior to project initiation.

Unaccompanied personnel are accommodated in barracks that collectively provide 5,672 spaces, of which 372 are Wounded Warrior spaces. Of these, 72 spaces are used for personnel newly arrived at the installation. Because of the severe shortfall in barracks spaces, a number of projects are planned or underway to provide more billeting for unaccompanied Soldiers. By 2013, an additional 4,346 barrack spaces should be available (Reference No. 127).

3.9.1.2.2. Off-Post

As of July 2007, an estimated 329,800 housing units were located in the ROI (Reference No. 124). The proportion of owner-occupied housing units was 68 percent, with the lowest concentration in El Paso and Pueblo County (68 percent in 2006) and highest concentration in Fremont (76 percent in 2000; 2006 information unavailable for this County). Overall, the quality of housing in the ROI is considered good. The proportion of units lacking complete plumbing and kitchen facilities (a surrogate measure for quality) is low for all counties of the ROI.

The off-post population in the Fort Carson market area (within a 20-mile commute of the installation's main work areas) currently totals 535,167 persons, having increased at an average annual rate of 1.8 percent since 2000. Population is forecast to grow 2.3 percent per year, for a projected market area population of 598,428 persons in 2013. The area's housing stock is currently estimated to total 225,277 units. Owner-occupants claim 64.9 percent of occupied homes, while renters occupy the remaining 35.9 percent (Reference No. 126).

Vacancy rates and rentals in all areas within the Colorado Springs metropolitan area are highly cyclical. The rental vacancy rate was estimated to be 8.8 percent, up from 4.8 percent in 2000 (Reference No. 124). The influx of military personnel into the Fort Carson area will lead to declining vacancy rates over the next five years. Vacancy rates for 2013 are projected to be 6.5 percent in the rental market (Reference No. 126).

3.9.1.3. Economic Development

Characteristics of economic development include employment and its distribution across industrial sectors, unemployment, earnings and sources of income, and the contribution made to the regional economy by the military installations, their personnel, and retired service members.

3.9.1.3.1. Employment

In 2006, the US Department of Commerce (Reference No. 128) indicated that there were more than 3.1 billion jobs in Colorado, of which about 95 million were military and federal/civilian jobs.

More than 400,000 people were employed in the ROI in 2005, 79 percent of whom worked in El Paso County (Reference No. 129). In El Paso County, the largest share of employment is concentrated in the federal government, with 11 percent accounted for by military and civilian jobs. The retail trade sector employed 11 percent and state and local government accounted for a 9 percent share. In Fremont and Pueblo counties, employment in state and local government contributes substantially to both economies. The largest employers in El Paso County are the major military installations, with the proportion of military employment in the county being much higher than the ROI and the state.

The unemployment rate in all counties of the ROI gradually increased from an average low of three percent in 2000 to an average of six percent in 2005. In 2000, the unemployment rate of the State of Colorado was approximately three percent and in 2005 it was approximately five percent (Reference No. 130).

3.9.1.3.2. Earnings and Income

Total non-farm wage and salary earnings in the ROI totaled nearly $17.6 billion in 2006, approximately 84 percent of which was contributed by El Paso County (Reference No. 128). The contribution to total earnings by the military sector is highly concentrated in El Paso County, where it reaches approximately 18 percent compared to 2 percent for the state and 1 percent for the other ROI counties, collectively.

3.9.1.3.3. Military Activities

Five major military installations are within the ROI, including Fort Carson, USAFA, Schriever Air Force Base (AFB), Peterson AFB, and the Cheyenne Mountain Air Station. These installations are important to the health and stability of the regional economy and support businesses and jobs through 1) payroll expenditures by military and civilian personnel; 2) direct procurement of goods and services by the installations for operations and maintenance functions; and 3) government contract awards to private firms located in the region.

Personnel (Active Duty and Civilian)

According to the US Department of Commerce (Bureau of Economic Analysis), the estimated total economic impact of the military in Colorado for 2007 was $3.39 billion. This represents about one third of the total state economy.

According to an article by John Hazlehurst in 2007 (Reference No. 131), direct military payrolls totaled $2.32 billion in 2006. Construction, services, and procurement of materials, equipment, and supplies injected $1.3 billion into the regional economy and, according to the Chamber, the dollar value of jobs created was $960 million. Fort Carson alone accounts for 10 percent of the region's economy, before the scheduled troop increases. The local economic impact of Fort Carson is nearly $1 billion annually, including $662.1 million in military payroll, $147.4 million in civilian payroll, $60 million in operations, $13 million in utilities, $167.1 million in military procurement, and $40 million for TriCare health insurance. Statewide, the post will account for almost 53,000 jobs, almost all in the Pikes Peak region (including troops). Employee compensation and gross business income will increase to approximately $2 billion. State and local tax revenue attributable to the post will increase from $87.4 million to about $192 million.

The total Fort Carson related population as of 2006 was approximately 36,000 (Reference No. 132).

Payroll

Earnings paid to personnel (active duty and civilian) at Fort Carson totaled over $1 billion in 2007 (Reference No. 10).

Procurements

Expenditures on grants and contracts by the installations vary measurably from year to year. The value of grants and contracts for Fort Carson, as reported by the DoD, ranged between $191 and $334 million annually for the period 2004-2008.

In 2007, operating expenditures at Fort Carson that had the greatest effect on the local economy (after salaries) were local purchases and contracts (approximately $204 million), utilities (approximately $17 million), and rent and lease payments (approximately $3 million) (Reference No. 10).

The large majority (greater than 99 percent) of DoD prime contracts awarded to firms in the ROI have been made to companies located in El Paso County, accounting for over 54 percent of all DoD awards statewide. The value of prime contract awards in El Paso County totaled more than $2.2 billion in 2006 (Reference No. 133).

Multiplier Effects

The injection of funds into a regional economy has what is referred to as a direct effect. This spending creates a demand for goods and services that, in turn, increases output and employment in numerous support industries. This is referred to as the induced effect, and the link between the two is the multiplier effect.

3.9.1.4. Public Finance

The primary sources of revenue for the three counties of the ROI are 1) sales taxes, 2) property taxes, 3) transfers from the state government, and 4) transfers from the federal government (Reference No. 134). In El Paso and Fremont counties, property taxes contribute a relatively small share of total revenues (under 17 percent) in comparison to Pueblo County (30 percent). Sales tax revenues are especially important for El Paso County and are attributable to its role as the major commercial hub of the ROI. Revenues derived from state and federal government transfers are important to all counties in the ROI, and particularly in Fremont County, where the revenue comprises approximately 45 percent.

The major operating expenditure categories for the counties are 1) public safety, 2) general government, 3) social services, and 4) health. The provision of social services consumes approximately 30 percent of operating expenditures in Pueblo and Fremont counties but is much lower in El Paso County at approximately 21 percent. Expenditures on public safety comprises approximately 25 percent of the operating expenditures for each county (Reference No. 134).

3.9.1.5. Quality of Life

3.9.1.5.1. On-Post

Numerous facilities and services located on Fort Carson contribute to the quality of life of on-post residents and military personnel and their Families residing off-post.

Child Care

The childcare programs at Fort Carson are available for children six weeks to eleven years of age. These services are provided at six on-post centers: the Southwest Center, located by Gate 5 offers hourly care and well as full-day care; the East and West Centers are located near Gate 1. The Southeast Center is located near Gate 20, and the North Center is near Gate 3. Before and after school care is offered for infants up to 11 years. Of these six centers, one is for school age (first grade through sixth grade); the other five centers are for infants through kindergarten. Most of the centers are at capacity and together support about 970 children. Four additional childcare facilities are planned for construction over the next several years.

Health Care

Evans Army Community Hospital is located on-post and has about a 400-bed capacity. Most of the rooms at Evans Army Community Hospital are semiprivate (two beds), although there are a limited number of private rooms, and four bed rooms as well. The hospital is comprised of two distinct buildings separated by a glassed Commons Area. The five-story Tower at the front of the hospital houses all Inpatient Units, the Operating Suite, the Delivery Suite, Nursery, Radiology, Occupational Therapy, Physical Therapy, Emergency Room, and the Nutrition Care Division. The two-story Clinic Building contains all Outpatient Clinics, the Command Suite, and other administrative support functions. The Commons Area, which provides the main entries into the building, also houses patient service activities such as Outpatient Records, Outpatient Pharmacy, Admissions and Dispositions, Hospital Treasurer, Post Exchange, Barber Shop and Chapel. The hospital provides service to Soldiers, retirees, and their Families. Care is supplemented by dental clinics and other medical clinics.

Public Schools

Located 7 miles southwest of the City of Colorado Springs, Fountain-Fort Carson School District 8 encompasses the City of Fountain, Fort Carson, Rock Creek, and nearby rural areas. There are 11 schools within District 8, of which three elementary schools and one middle school are located on Fort Carson. Most of the enrollment in the on-post schools comes from on-post and off-post military dependents, with a small percentage of non-military children. High school students residing on-post are bused to the nearby Fountain-Fort Carson High School.

Other Facilities

There are also a number of additional on-post facilities, including a commissary, Post Exchange, recreation facilities, chapel, mini-mall, dental clinics, and many other support facilities.

3.9.1.5.2. Off-Post

The communities that surround Fort Carson provide numerous recreational, medical, retail, food, and other community services and facilities. Of the wide array of off-post services and facilities, public schools are highly important.

Community Public Schools

There are 20 school districts in the ROI with a total combined student membership in 2007 of 138,019 (Reference No. 135).

Personnel assigned to Fort Carson reside throughout the ROI and their children make up sizeable portions of the student membership in some school districts. There can be substantial fiscal implications for school districts that have a high proportion of their student members residing on military installations. The major installations in the region include Fort Carson, Peterson AFB, Air Force Academy, and Schriever AFB.

School districts rely on a number of funding sources, especially local property tax assessments, funds from the state, and federal funds. Military installations are exempt from local taxes and, thus, local school districts are eligible for federal impact aid funds. These payments are designed to offset the potential loss of property tax payments to affected school districts. The impact aid received is highly weighted in proportion to the students who reside on the military installations, not in the communities.

The number of federally connected students, primarily the children of military and appropriated fund civilian personnel in this area, is highly concentrated in Fountain-Fort Carson School District 8, adjacent to Fort Carson, which also operates the four on-post schools. For 2008, this school district's average daily attendance (ADA) was 5,340.84, of which 3,012.99 consisted of federally connected students (Reference No. 136).

Smaller, yet noticeable, concentrations are evident in the Academy School District (21 percent of ADA), Widefield School District 3 (15 percent of ADA), and El Paso County School District 3 (15 percent of ADA).

Although the share of ADA that federally connected students comprise is high, the impact aid contribution to the budget in these three school districts is smaller. This is explained by the fact that the great majority of the students do not reside on the military installation; thus, less impact aid is directed to these school districts. Their contribution to the school district budgets is through property tax payments associated with their places of residence in the community.

3.9.1.6. Environmental Justice

EO 12898, "*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*," requires each federal agency to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations.

Environmental Justice: Guidance Under the National Environmental Policy Act defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, or Hispanic (Reference No. 137). According to the guidance, a minority population should be identified where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.

According to US Census Bureau (Reference No. 138), the percentage of minority populations within the ROI are approximately 20 percent in El Paso County, 18 percent in Pueblo County, and 11 percent in Fremont County. The population of the census tracts including and immediately adjacent to Fort Carson has a higher percentage of minority population than El Paso County and the ROI. The proportion of minority population, however, was less than the 50 percent threshold. Fort Carson's residential population, as with other military populations, contributes to that higher minority percentage in the immediate area of the post. Of the total US Military, 38 percent of active duty members identify themselves as minorities (Reference No. 139).

Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. For example, the poverty threshold for a Family of four with two children was $17,463 in 2000 and rose to $21,027 by 2007. Nationwide, the proportion of people in poverty was 11.3 percent in 2000 and 12.5 percent in 2007. The Census Bureau defines a "poverty area" as a census tract or block numbering area where 20 percent or more of the residents have incomes below the poverty threshold (Reference No. 140).

Both Pueblo and Fremont counties have poverty levels that exceed or are equivalent to 20 percent; Pueblo County at approximately 31 percent and Fremont County at approximately 20 percent. El Paso County's poverty level is approximately 15 percent. While each county does not meet the definition of a poverty area (census tracts or blocks), there are small geographical areas within each county where more than 20 percent of the population lives below the poverty level (Reference No. 140).

3.9.1.7. Protection of Children

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," seeks to protect children from disproportionately incurring environmental health or safety risks that might arise from government policies, programs, activities, and standards.

Children are present on Fort Carson in a number of settings, including family housing neighborhoods, three elementary schools, one middle school, day care centers, and recreational areas. During the 2007-2008 school year, there were 2,322 children enrolled in the schools on Fort Carson. Of the 2,322 children enrolled, 1,817 were in elementary and 505 were in Mmddle school (Reference No. 141).

3.9.2. Environmental Consequences

3.9.2.1. Proposed Action

3.9.2.1.1. Economic Measures of Project Effects

A number of measures are used to assess the economic effects that the project could have on the regional economy. Attention is focused on the project-induced effects on population, employment, income, and sales volume.

The initial step in estimating socioeconomic effects is to characterize aspects of the construction and operational phases of the Proposed Action. With the aid of economic impact modeling techniques (described as follows), the economic effects of each aspect of the Proposed Action are translated into measures such as jobs and income.

The primary catalyst for changes to socioeconomic resources is a change in economic activity, i.e., industrial output (value of goods and services), employment, and income. Changes in employment have the potential to affect population, housing, and associated community services and infrastructure.

A distinction is made between direct effects and secondary effects, the latter comprising both indirect and induced effects:

- Direct effects are defined as changes in expenditures on goods and services directly related to construction and operation. For example, an increase of $25 million in the final demand for construction inputs such as concrete block and brick will cause that manufacturing sector to increase output by $25 million worth of concrete block and brick.
- Indirect effects are defined as backward linkages through expenditures on intermediate goods or services required by the direct industry in order to increase output. These include construction or operation labor and other inputs. For example, $25 million worth of additional concrete block and brick would require increased output by the cement-producing industry (to produce an additional $2.5 million worth of cement) and aggregate industry (to produce $0.5 million worth of sand/gravel).
- Induced effects are defined as forward linkages derived from employees (both direct and indirect) spending wages within a region. For example, if additional employees were hired to work in the industries supporting and providing inputs to the construction sector, their personal consumption expenditures will induce employment.

The differentiation among direct, indirect, and induced effects contributes to the concept of the "economic multiplier." The larger and more highly urbanized the area, the more complex and integrated the economy is likely to be. Thus, more of the additional economic activity will likely occur within the area and increase the size of the multiplier.

The US Army's *Economic Impact Forecast System* (EIFS) model is used to assess the economic effects of GTA recommendations. In this case, the model was used to assess economic effects of all transformational activities, to include 2007 Fort Carson Transformation EIS, BRAC 2005, IGPBS, and AMF, and also includes estimates for projects previously analyzed under NEPA that would be constructed during the Transformation implementation period. Results are compared to rational threshold values (RTVs) to evaluate the significance of these effects in relation to the regional economy. RTVs are positive and negative percent changes in population, employment, sales volume, and income that represent an acceptable range around the maximum historic fluctuations within the ROI over

approximately the last 20 years. RTVs represent the degree of economic change that the ROI has absorbed in the past. The EIFS model, its inputs, outputs, and significance measures are discussed in more detail in Appendix H.

3.9.2.1.2. Economic Impacts of Construction and Operations

Implementation of the Proposed Action at Fort Carson requires completion of a number of construction projects at the ORTC site, cantonment area, BAAF, and training ranges. Although the potential CAB is included in the Proposed Action, it was not included in the EIFS analysis, as too many assumptions would have to be made. If the decision is made to bring the CAB to Fort Carson, a new EIFS will be conducted at that time and disclosed in follow-on NEPA documentation.

In all, 20 construction projects are planned at Fort Carson, including 2 projects in the cantonment area and 6 range projects on training land. The total estimated cost of these projects between fiscal year 2009 and fiscal year 2012 is approximately $525.2 million. Projects that would serve the post population include a physical fitness center, a child development center, a fire station, a central vehicle wash facility, a dining facility, and access control improvements at Gate 6, Gate 19, and the Crow's foot. There are also a number of construction projects already underway at Fort Carson, including large troop complexes that have been previously analyzed under NEPA, i.e., the 2007 Fort Carson and PCMS Transformation EISs. Although the actual schedules of all the proposed construction projects are still subject to change, available information indicates that the year when the greatest construction expenditures at the Fort Carson would occur is 2010. Economic modeling used construction expenditure estimates for all of the projects that are currently anticipated for fiscal year 2009 through fiscal year 2012, as well as the increase in military and civilians. This approach provides the largest annual inputs and resulting economic effects. Actual annual effects may be somewhat less than those shown. It is anticipated that the large majority of economic effects associated with the proposed construction projects would be experienced in the ROI.

Demographics

No population changes are anticipated. The construction projects at Fort Carson are not expected to trigger a temporary movement of workers from outside the ROI to fill the supply of construction job opportunities.

Economic Development

Implementation of the Proposed Action would result in an increase in active duty military employment of approximately 3,800 for the IBCT between 2009 and 2012. In addition to the increase in active duty

personnel, the Proposed Action is expected to result in the addition of approximately 16 civilian jobs on Fort Carson. Moreover, the increase in both the personnel and residential population on Fort Carson would require increased operational expenditures for purchases of goods, contracting of services, utilities, and rent and lease payments. Increases in on-post contractors are accounted for under operational expenditures, rather than as employment.

Table 3.9-1 shows the results of the EIFS model associated with the increase in personnel (active duty military and civilian) and construction and operational expenditures on Fort Carson.

Table 3.9-1 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 under the Proposed Action

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2009	Direct Sales Volume	$57,189,530		
	Total Sales Volume	$158,415,000	0.62	-4.00 to 5.64
	Direct Income	$11,922,920		
	Total Income	$33,026,480	0.22	-3.62 to 5.63
	Direct Employment	380		
	Total Employment	1,052	0.27	-3.95 to 4.04
	Local Population	0		
	Local Off-Post Population	0	0	-1.59 to 3.17
2010	Direct Sales Volume	$145,319,900		
	Total Sales Volume	$402,536,200	1.57	-4.00 to 5.64
	Direct Income	$35,857,550		
	Total Income	$89,482,190	0.59	-3.62 to 5.63
	Direct Employment	1,126		
	Total Employment	2,834	0.72	-3.95 to 4.04
	Local Population	401		
	Local Off-Post Population	200	0.06	-1.59 to 3.17
2011	Direct Sales Volume	$111,863,300		
	Total Sales Volume	$309,861,300	1.21	-4.00 to 5.64
	Direct Income	$149,083,400		
	Total Income	$190,362,200	1.26	-3.62 to 5.63
	Direct Employment	4,380		
	Total Employment	5,695	1.45	-3.95 to 4.04
	Local Population	9,056		
	Local Off-Post Population	4,548	1.36	-1.59 to 3.17

Table 3.9-1 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 under the Proposed Action (continued)

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2012	**Direct Sales Volume**	$12,742,680		
	Total Sales Volume	$35,297,220	0.14	-4.00 to 5.64
	Direct Income	$9,253,979		
	Total Income	$13,956,170	0.09	-3.62 to 5.63
	Direct Employment	276		
	Total Employment	425	0.11	-3.95 to 4.04
	Local Population	476		
	Local Off-Post Population	238	0.07	-1.59 to 3.17

Reference No. 250

The economic benefits resulting from increased employment and operational expenditures are long term. The changes in specific economic parameters would fall well within historical fluctuations, as represented by the RTVs shown in Table 3.9-1, and would be considered minor. One exception is that the projected change in off-post population slightly exceeds historical changes in population within the ROI.

Demographics

Table 3.9-2 shows the total population directly associated with Fort Carson (No Action) and after the Proposed Action minus the CAB (2012).

Table 3.9-2 Fort Carson Projected Population Increase

	After Implementation of Proposed Action (2012)	Total Population Increase	No Action Alternative
Military Personnel	29,000	3,900	25,100
Civilian Employees/Contractors	5,140	16	5,124
Military Family Members	54,230	7,293	46,937
Total	**88,370**	**11,209**	**77,161**

Source: Families: Reference No. 10
All Others: Reference No. 11

The on-post workforce population (all military, civilian, and on-post contractor personnel) would result in population increases of 3,900 persons to approximately 29,000.

Because there would be an increase in on-post and off-post population, an increase in demand for private and public services would result from implementing the Proposed Action, as follows.

Housing, On-Post

Fort Carson has a current authorized military personnel strength of 18,477 active-duty permanent-party members, and is responsible for housing troops as well as supporting the needs of Soldiers and their Families. Of these Soldiers and Family members, 6,105 unaccompanied personnel and 10,403 families require housing. Using the criteria and methods approved by Headquarters, Department of the Army, and current guidance by the Office of the Secretary of Defense (OSD) regarding market analyses for military housing, it is projected that in 2013, there will be 9,396 unaccompanied personnel and 15,933 families requiring housing at Fort Carson. Currently, there is a total unaccompanied housing requirement of 6,258 units, and a projected total unaccompanied housing requirement of 9,529 units in 2013. There is a total military family housing requirement of 4,188 units and a projected total requirement of 4,012 units in 2013. Due to this shortfall in military family housing, the demand for off-post housing in the local housing market would increase.

Property taxes are not applicable to on-post housing at Fort Carson. Property tax revenues, however, could increase in local jurisdictions, with an increase in the construction of housing units to meet the higher demand for off-post housing.

Housing, Off-Post

The majority of the new military personnel are expected to live off-post, creating an increased demand for off-post housing. Based on the *Fort Carson Regional Growth Plan, Economic Impacts Technical Report* under the *Expected Growth Scenario*, housing demand would require approximately 12,500 new homes to be built in the primary housing impact area or ROI. It is projected that the housing market should be able to absorb the Fort Carson growth by 2012. These units would be located primarily in southern Colorado Springs, Fountain, and Security/Widefield (all within El Paso County). Approximately 97 percent of Fort Carson's Soldier population lives in El Paso County. It is likely that between 5,200 and 8,600 new units would be built by fiscal year 2009, which would match the demand for new units (Reference No. 10).

According to the *Fort Carson Regional Growth Plan, Economic Impacts Technical Report*, an estimated 800 residential housing units have been built, or are under construction as of the spring of 2007. Approximately 6,400 lots with infrastructure would likely be completed by the end of 2007, and over 14,000 lots are currently being reviewed under the local government approval process. Thus, the region could potentially include over 21,000 for-sale single family units and townhome units and there would be

adequate off-post housing units to accommodate military personnel and their families as well as population growth from other sources (Reference No. 132).

Quality of Life

The Proposed Action would result in an increase in both the on-post and off-post population, with a resulting proportionate increase in demand for schools and childcare facilities, public safety, medical, and other services as discussed as follows.

Schools

School enrollment would increase as a result of the increase in regional population. Some of the additional school-age children whose families move to Fort Carson can be expected to attend the on-post elementary and middle schools. Those whose families settle outside these attendance areas would attend off-post schools.

Growth projections for student enrollment prepared recently for advanced planning purposes by Fountain-Fort Carson District 8, a net military personnel increase of 12,500 (this included the approximately 8,500 personnel anticipated in the 2007 Fort Carson Transformation EIS was assumed to occur by the 2009-2010 school year.

Based on existing attendance patterns, population increases at Fort Carson are expected to result in additional students at the three on-post elementary schools and the on-post middle school, from families living on-post. Enrollment increases are anticipated at Fountain-Fort Carson District 8 off-post as well.

Enrollment changes would be expected to occur in the other school districts that serve Fort Carson and surrounding areas. These school districts, however, receive federal impact aid as an offset for the costs of providing public education to dependents of military personnel. In addition, not all students would attend public schools; some may attend private school or be home-schooled.

Child Care Services, On-Post

The expected increase in population associated with Fort Carson could result in an increased demand for childcare services. The military personnel that are projected to live on-post, as well as many who live off-post, would increase the demand for childcare services. This increased demand would likely be met by the four child development center projects that are anticipated by fiscal year 2011. Three of these centers

were addressed in the 2007 Fort Carson Transformation EIS. The other will be considered as part of this Proposed Action: Child Development Center (Project Number 71171, fiscal year 2010).

Child Care Services, Off-Post

Demand for off-post child care services is not expected to rise significantly, as many of the military personnel commuting to work at Fort Carson would likely first look on-post (near their place of employment) for preschool child care services, rather than off-post. As with any population increase, the services provided through the private sector would be expected to respond to any increased demand by increasing supply.

Family Support and Retirement Services

Services would continue to be provided to residents and retirees by the Army Community Support Center, the Family Connection, Family Readiness Groups, and the Retirement Services Office.

No immediate increase in the retiree population is anticipated. Although some of the older active duty personnel may possibly choose to retire or settle in this area after discharge or retirement, most of the new troops are typically younger and many will likely serve at other posts before discharge or retirement, or return to their place of origin. It is unlikely that the Proposed Action would have an impact on the retiree population.

Shops and Services, On-Post

The additional on-post and off-post population would increase demand for on-post retail, food, and related services such as Fort Carson's commissary and retail outlets in the Post Exchange. On-post impacts would include the need for a greater level of SRM (Service, Repair, and Maintenance) funding for support facilities that would be required by the Proposed Action (construction of facilities on Wilderness Road). This would include the construction of several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities and road infrastructure that would be required if facilities were sited on Wilderness Road.

The Army Air Force Exchange Service (AAFES) is currently developing plans for a lifestyle village on Fort Carson. Fort Carson has plans to increase the size of its current commissary and Post Office. These projects are being assessed in an EA and are included in Section 5.0 of this EIS.

Shops and Services, Off-Post

Off-post, the services provided through the private sector can be expected to respond to the increased demand by increasing supply. Currently, the City of Fountain is planning a retail village to be constructed just to the east of Fort Carson's Gate 20. Colorado Springs is also developing plans for a retail village just north of Fort Carson's Gate 4.

Recreation

Demand for recreational facilities would increase with the additional population residing on-post and off post.

The Proposed Action would provide additional on-post community and recreational facilities. A Physical Fitness Center is included in the Proposed Action, which will include a gym, swimming pool, exercise and weight rooms, indoor track, and climbing wall/indoor ropes course. The center would also include administrative offices, locker rooms, sauna/steam room, etc.

The increase in off-post population would also increase the demand for off-post recreational facilities. The demand for some facilities, such as gyms and pools, may be moderated by the use of the new on-post facilities. Nevertheless, as with any population increase, the services provided through the private sector can be expected to respond to the increased demand by increasing supply. Thus, recreation centers and other facilities that offer recreational opportunities can be expected to increase in number to meet any additional demands.

Environmental Justice

Construction impacts are temporary in nature, but they can range from annoying to detrimental for those living near a construction site. Because most of the construction activity would be carried out in the core of the installation, few adverse impacts to low-income and minority communities are expected.

Impacts from noise, dust, and traffic generated by construction would be minimized by careful construction planning. Fugitive dust emissions would be minimized throughout the construction period by use of conventional dust suppression, BMPs, and mitigation techniques, such as soil erosion and sedimentation control, restrictions on where vehicles can travel on site, speed controls for construction vehicles and equipment, and watering of exposed soil and demolition debris to control dust. Noise from construction equipment would be controlled by use of appropriate sound mitigation techniques and

BMPs. Construction traffic during peak hours would be reduced by the use of using centralized construction staging areas.

Therefore, no disproportionately high and adverse effects on minority and low-income populations are anticipated.

3.9.2.1.3. Protection of Children

There is a potential for minor short-term adverse impacts to children. Because construction sites can be appealing to children, construction activity could be an increased safety risk. This analysis evaluates the potential impacts to the children in general terms. None of the IBCT or CAB facilities siting alternatives are located near family housing areas. Only the proposed construction for the CS/CSS units would be located within the cantonment area near family housing areas. Gate 3 used by construction vehicles could pose a risk as it is near housing and a school. The majority of the construction vehicles for the IBCT/CAB construction would access the area through Gate 6 or Gate 19 (family housing areas near these two gates are not present).

Barriers and "no trespassing" signs would be placed around construction sites to deter children from playing in these areas, as well as to keep out other trespassers. All construction vehicles, equipment, and materials would be stored in fenced areas and secured when not in use. During construction, safety measures stated in 29 CFR Part 1926, "*Safety and Health Regulations for Construction*," and other applicable regulations and guidance would be followed to protect the health and safety of all residents on Fort Carson, as well as construction workers.

3.9.2.2. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Construction of the IBCT facilities at Training Area Bravo would result in a temporary decrease in socioeconomic impact from construction compared to the Proposed Action and Alternative 2. Several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities that would be required if facilities were sited on Wilderness Road would not be necessary or would be of lesser scope if the IBCT facilities were constructed at Training Area Bravo Site in the cantonment area.

Socioeconomic impacts off-post would be similar to the Proposed Action. On-post impacts would include less SRM funding for support facilities that would not be required by this alternative.

Table 3.9-3 shows the results of the EIFS model associated with the increase in personnel (active duty military and civilian) and construction and operational expenditures on Fort Carson under Alternative 1.

Table 3.9-3 Economic Impact Forecast System Model Output for Fiscal Year 2009-2012 Under Alternative 1

Fiscal Year	Indicator	Projected Change	Change (Percentage)	Rational Threshold Values Range (Percentage)
2009	**Direct Sales Volume**	$44,463,000		
	Total Sales Volume	$123,162,500	0.48	-4.00 to 5.64
	Direct Income	$9,269,681		
	Total Income	$25,677,020	0.17	-3.62 to 5.63
	Direct Employment	295		
	Total Employment	818	0.21	-3.95 to 4.04
	Local Population	0		
	Local Off-Post Population	0	0	-1.59 to 3.17
2010	**Direct Sales Volume**	$108,152,000		
	Total Sales Volume	$299,581,200	1.17	-4.00 to 5.64
	Direct Income	$28,108,760		
	Total Income	$68,018,060	0.45	-3.62 to 5.63
	Direct Employment	879		
	Total Employment	2,150	0.55	-3.95 to 4.04
	Local Population	401		
	Local Off-Post Population	200	0.06	-1.59 to 3.17
2011	**Direct Sales Volume**	$98,018,510		
	Total Sales Volume	$271,511,300	1.06	-4.00 to 5.64
	Direct Income	$146,197,000		
	Total Income	$182,366,900	1.21	-3.62 to 5.63
	Direct Employment	4,288		
	Total Employment	5,440	1.39	-3.95 to 4.04
	Local Population	9,056		
	Local Off-Post Population	4,548	1.36	-1.59 to 3.17
2012	**Direct Sales Volume**	$12,742,680		
	Total Sales Volume	$35,297,220	0.14	-4.00 to 5.64
	Direct Income	$9,253,979		
	Total Income	$13,956,170	0.09	-3.62 to 5.63
	Direct Employment	276		
	Total Employment	425	0.11	-3.95 to 4.04
	Local Population	476		
	Local Off-Post Population	238	0.07	-1.59 to 3.17

Reference No. 250

3.9.2.3. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Temporary socioeconomic impacts from construction revenues would be greater for both the Proposed Action and Alternative 2. This would be due to the construction of several support facilities (chapel, dental clinic, child care facility, Troop Store [mini-mall], etc.) and additional utilities and road infrastructure that would be required if facilities were sited on Wilderness Road. These facilities and infrastructure requirements would be of lesser scope if the IBCT facilities were constructed at Training Area Bravo Site in the cantonment area.

Socioeconomic impacts would be similar to the Proposed Action. Table 3.9-1 represents the impacts for the Proposed Action and Alternative 2. On-post impacts would include the need for a greater level of SRM funding for support facilities that would be required by both this alternative and the Proposed Action.

3.9.2.4. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented; however, their impacts have been included as part of this No Action Alternative.

No new construction activity beyond that described in the 2007 Fort Carson Transformation EIS would be anticipated under the No Action Alternative.

No changes related to ongoing operations at Fort Carson are anticipated under the No Action Alternative. All upgrading and replacements that were decided in the 2007 Fort Carson Transformation EIS would continue. Normal upgrading and replacement of recreational facilities, schools, and other quality-of-life resources will be necessary over time.

3.9.2.5. Mitigation Measures

Mitigation measures are not warranted for socioeconomics.

3.10. Transportation

This section describes the affected environment and the environmental consequences of the Proposed Action and the alternatives on transportation resources on and surrounding Fort Carson.

3.10.1. Affected Environment

This section addresses existing regional transportation involving the roadway network, average daily traffic (ADT) and daily levels of service (LOS); installation transportation involving transportation planning, the roadway network and traffic as well and other transportation modes to include rail, aviation and transit.

3.10.1.1. Regional Transportation

3.10.1.1.1. Roadway Network

Fort Carson is located on the southern edge of the City of Colorado Springs and is bounded by I-25 to the east, SH 115 to the west, and Academy Boulevard to the north (Figure 3.10-1). I-25 is a north-south highway that bisects the Colorado Springs metropolitan area and is a major north-south highway along Colorado's Front Range. Fort Carson provides access from the external roadway network through six entry control facilities:

- Gate 1 (visitor's entry) at western boundary;
- Gate 2 at western boundary;
- Gates 3 (commercial vehicle entry) and 4 at northern boundary;
- Gate 5 (access to housing facilities and golf course) at western boundary; and
- Gate 20 at eastern boundary, just southeast of the cantonment area.

In addition to I-25, the primary north-south routes in Colorado Springs are along Academy Boulevard and Powers Boulevard. The Colorado Springs roadway network offers few continuous east-west routes, with this movement primarily accommodated by Fountain Boulevard, Platte Boulevard, Austin Bluffs Parkway, and Woodmen Road. The only access from Colorado Springs to the west is on US 24, while the primary access to the east of Colorado Springs is provided along US 24 and SH 94.

3.10.1.1.2. Traffic

Existing traffic data for select Colorado Springs area roadways were collected from the PPACG. The existing 2005 ADT volumes and corresponding daily LOS are summarized in Table 3.10-1, along with roadway classification, number of through lanes, posted speed limit on roadways surrounding Fort Carson, and daily volume to capacity (v/c) ratios (Reference No. 132).

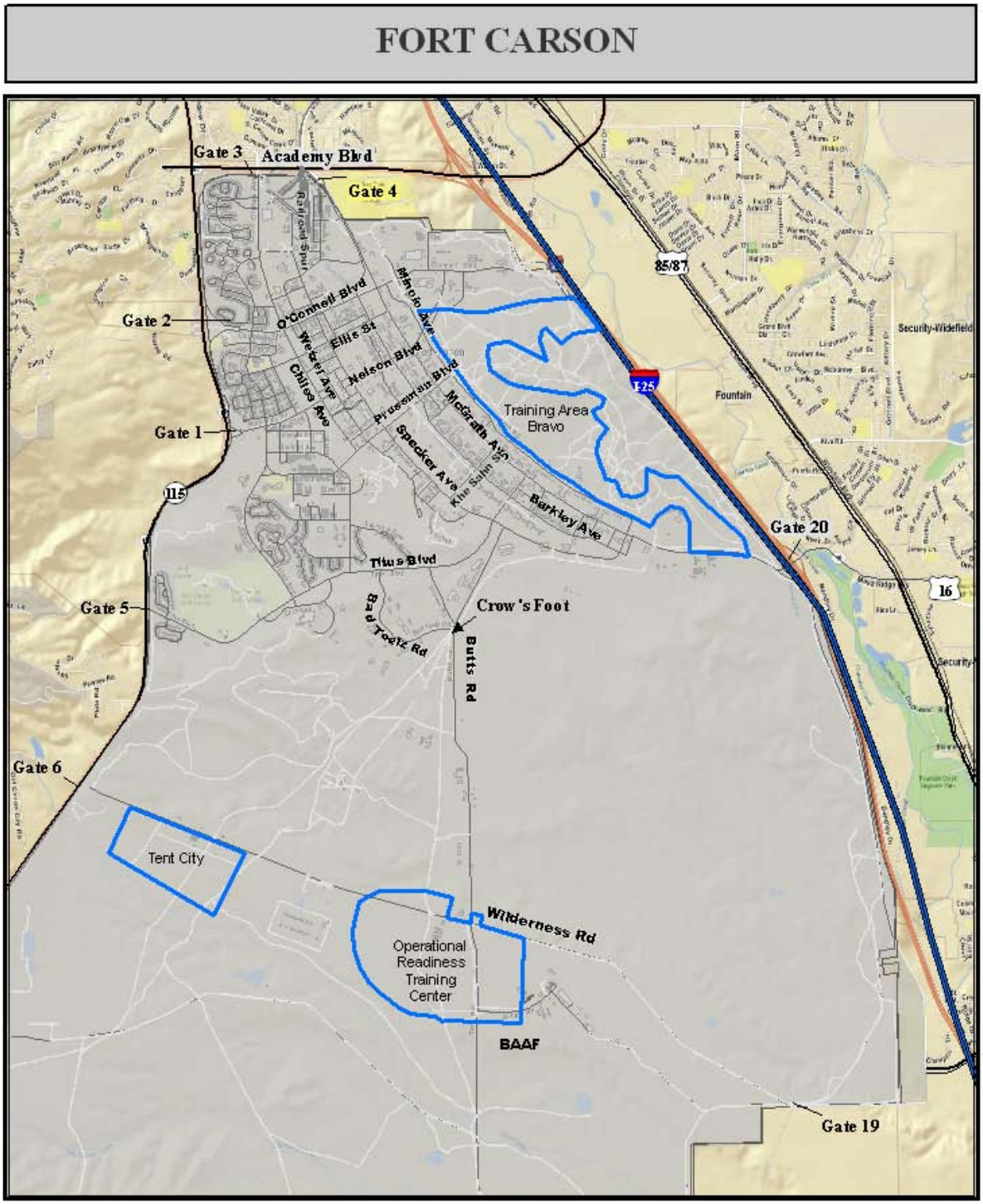

Figure 3.10-1 Fort Carson Roadway and Cantonment Network

Table 3.10-1 2005 Traffic Volumes for Select Colorado Springs Area Roadways

Roadway Classification	Roadway	Number of Through Lanes	Posted Speed (mph)	ADT	v/c	LOS
Interstate	**I-25 (south of SH 16)**	4	75	41,300	0.43	B
	I-25 (north of SH 16)	4	75	73.400	0.77	D
	I-25 (north of Academy Boulevard)	4	65	72,100	0.77	D
	I-25 (north of Nevada Avenue)	5	55	96,700	0.90	E
	I-25 (north of Bijou Street)	6	55	98,500	0.73	D
Expressway	**US 24 (west of I-25)**	4	35	45,500	0.79	D
	US 24 (east of Powers Boulevard)	4	55	44,200	0.71	D
Primary Arterial	**Academy Boulevard (west of I-25)**	5	45	46,000	0.62	C
	Academy Boulevard (east of I-25)	5	50	46,200	0.57	C
	US 24 Bypass/Fountain Boulevard (east of I-25)	4	55	20,900	0.24	A
	SH 115 (south of Gate 1)	2	60	17,600	0.49	B
	SH 115 (north of Gate 1)	4	55	25,300	0.35	B
	SH 115 (north of Star Ranch Road)	4	50	31,000	0.65	C
	SH 16 (east of I-25)	2	45	31,600	1.58	F
	SH 85/87 (south of Academy Boulevard)	4	50	24,500	0.60	C
	Academy Boulevard (north of Constitution Avenue)	6	35	43,500	0.85	D
Minor Arterial	**SH 94 (east of Marksheffel Road)**	2	60	15,600	0.44	B

Source: Reference No. 132
ADT = average daily traffic
LOS = level of service
SH = State Highway
v/c = volume to capacity

LOS is a measure by which transportation planners determine the quality of service on transportation devices, or transportation infrastructure. LOS is a holistic approach, which measures traffic density (or a measure of congestion) and time.

The transportation LOS system uses the letters A through F, with A being best and F being worst.

- LOS A is the best, described as conditions where traffic flows at or above the posted speed limit and all motorists have complete mobility between lanes.
- LOS B is slightly more congested, with some impingement of maneuverability; two motorists might be forced to drive side by side, limiting lane changes.
- LOS C has more congestion than B, where ability to pass or change lanes is not always assured. LOS C is the target for urban highways in many places. At LOS C most experienced drivers are

comfortable, roads remain safely below but efficiently close to capacity, and posted speed is maintained.

- LOS D is perhaps the level of service of a busy shopping corridor in the middle of a weekday, or a functional urban highway during commuting hours: speeds are somewhat reduced, motorists are hemmed in by other cars and trucks.
- LOS E is a marginal service state. Flow becomes irregular and speed varies rapidly, but rarely reaches the posted limit.
- LOS F is the lowest measurement of efficiency for a road's performance. Flow is forced; every vehicle moves in lockstep with the vehicle in front of it, with frequent drops in speed to nearly zero miles per hour (mph).

The Colorado Department of Transportation (CDOT) completed an EA in July 2007 and issued a Finding of No Significant Impact (FNSI) in September 2007 for transportation improvements for the SH 16 and I-25 interchange. The study evaluated solutions, including capacity improvements on SH 16 and the reconstruction of the SH 16 and I-25 interchange, to alleviate the substantial congestion that occurs along SH 16 near Gate 20 during the morning peak period. The selected alternative includes the widening of SH 16 to four lanes from Fort Carson Gate 20 to Syracuse Street, replacing the interchange with I-25, and reconstructing the interchange with US 85. The selected alternative, which is currently under construction, will reduce congestion and improve traffic operations by providing additional lanes and improving interchange configurations. Based on the PPACG traffic demand model forecasting, daily traffic volumes are expected to increase to 36,000 vehicles per day along SH 16. The existing ADT on SH 16 listed in Table 3.10-1 results in an unacceptable daily LOS, contributing to this is the high morning peak hour traffic demand that occurs at Fort Carson's Gate 20. The CDOT project will help to alleviate the significant congestion that occurs along SH 16 near Gate 20 during the morning peak and improve the LOS along SH 16 (Reference No. 142). In addition, improvements are also going to be made to I-25 and US 85 as required due to the construction of the new interchanges. The limits of the SH 16 project extend from Fort Carson Gate 20 on the west to Syracuse Street on the east.

PPACG uses the Regional Travel Demand Model to forecast traffic volumes on roadways in the Colorado Springs area for the current planning horizon, the year 2030, to assist with future infrastructure analysis and planning. The *PPACG Regional Growth Plan* base-year model (year 2005) indicates that Fort Carson contributes approximately 56,100 trips to the regional roadway network on a daily basis and predicted an increase of approximately 43,600 trips per day by the year 2015 (Reference No. 132). According to a 2005 travel survey (Reference No. 144), 46 percent of Soldiers reside in the four ZIP codes near the post.

Three of the ZIP codes border Fort Carson immediately to the west, north, and east (80906, 80817, and 80911) and the fourth (80916) is slightly to the northeast off-post. Much of the traffic generated by Fort Carson is concentrated on roadways to and from these areas, including SH 115, SH 16, and Academy Boulevard. The Fountain ZIP code (80817), meanwhile, accounts for the second largest population of Soldiers residing off-post.

3.10.1.2. Installation Transportation

3.10.1.2.1. Transportation Planning

Fort Carson has undertaken several transportation studies over the past few years associated with the growth and development occurring at Fort Carson. In 2005, Fort Carson funded the *Fort Carson Comprehensive Transportation Study* (Reference No. 31). The study assessed existing conditions and identifies short- and long-term transportation needs to meet future demand. The study focused on intersections, roadway corridors, and entry control facilities within the cantonment area and the recommendations are intended to improve traffic flow and safety on the Installation. The study's recommendations included roadway expansion (two to four lanes), new construction, realignment of existing roadways, and upgrades to other traffic-related infrastructure. Sustainable initiatives were also identified to reduce automobile dependency on the installation and included pedestrian connectors, bus and bicycle facility improvements, and parking lot minimization.

The *4th Infantry Headquarters Complex Supplemental Traffic Study* (Reference No. 145) provided further recommendations to address traffic impacts resulting from the relocation of the 4th ID Headquarters Complex.

The *Fort Carson Comprehensive Transportation Study* was recently updated in May 2008 (Reference No. 32) and looked at the future potential increase in population at Fort Carson as well as analyzed the following:

- *4/4 ID (Light BCT) Site Plan*, Infrastructure
- *Infrastructure Capacity Analysis* for Fort Carson, CO
- 4th ID Headquarters Complex
- *Fort Carson Traffic Study for Automated Installation Entry Information*
- *Fort Carson Lifestyle Village Traffic Impact Study*
- IBCT unit to be stationed at Fort Carson
- Proposed CAB unit to be stationed at Fort Carson

3.10.1.2.2. Roadway Network

The roadway network at Fort Carson consists of approximately 696 miles of roads, of which approximately 266 miles are paved and approximately 433 miles are unpaved. Access to Fort Carson is provided through the following six active entry control points: Gates 1, 2, and 5 on SH 115; Gates 3 and 4 on Academy Boulevard; and Gate 20 on I-25.

Cantonment area roadways generally form a grid pattern that is laid out in a crescent shape from northwest to southeast. Primary east-west access within the cantonment area is provided by O'Connell Boulevard, Prussman Boulevard and Titus Boulevard, while primary north-south access within the cantonment area is provided by Specker Avenue and two one-way roads (Magrath Avenue and Barkeley Avenue). Butts Road provides access from the cantonment area to the downrange area. A map of the cantonment area roadways is shown on Figure 3.10-1.

The cantonment area roadway system can be classified into the following three categories.

- *Arterial highways* – serve the region and have minimal levels of access to adjacent properties;
- *Collector roadways* – feed arterial highways and have moderate levels of access to adjacent properties; and
- *Local roadways* – provide direct access to adjacent properties and service both collector and arterial roadways.

Butts Road, Magrath Avenue, and Barkeley Avenue are classified as arterials. Collector roadways within Fort Carson include O'Connell Boulevard, Ellis Street, Nelson Boulevard, Prussman Boulevard, Titus Boulevard, Specker Avenue, Chiles Avenue, and Wilderness Road. Local roadways throughout Fort Carson serve as the direct connections to parking lots and adjacent properties.

The road network in the cantonment area is generally well maintained and adequate for supporting assigned mission activities. Nearly all major roads within the cantonment area have bituminous surfaces and are capable of accommodating all types of wheeled vehicles. The main roads in the downrange area, with the exception of Route 1 which is paved, are unpaved and reasonably well maintained, while secondary roads in the downrange area are maintained to varying degrees (Reference No. 6).

3.10.1.2.3. Traffic

A majority of installation roadways have one lane for each direction of travel with the exception of Magrath Avenue and Barkeley Avenue which have two one-way lanes and Specker Avenue (between

Titus Boulevard and Magrath Avenue) as well as Magrath Avenue (between Specker and Gate 20) which are both four lane roadways. The posted speed limit throughout the cantonment area is generally 30 mph, although some cantonment area and downrange area roadways have posted speed limits of 40 mph. Existing traffic data indicate that congestion exists on select installation roadways during peak periods, and that all signalized intersections operate at acceptable levels of service according to 2008 traffic volumes. Traffic volumes on select cantonment area roadway segments are summarized in Table 3.10-2.

Traffic-volume data were collected when approximately 55 to 60 percent of the active duty military personnel stationed at Fort Carson were deployed. As such, existing traffic-volume counts on the installation were found to be noticeably less when compared to a normal pre-deployment condition. The existing volumes in Table 3.10-2 reflect an adjusted ADT count to represent normal pre-deployment rates.

Table 3.10-2 2008 Average Daily Traffic on Select Cantonment Area Roadways Fort Carson Comprehensive Transportation Study

Roadway Classification	Roadway	Average Daily Traffic
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	2,451
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	2,965
	Butts Road (near Mates Facility Access)	2,036
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	2,266
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	2,110
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	5,608
	Titus Boulevard (at Sheridan Avenue)	6,802
	Specker Avenue (between Ellis Street and Evans Street)	7,566
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	8,520
	Wilderness Road (west of Butts Road)	615

The amount of use of downrange area roadways fluctuates due to the nature of the maneuver training, deployments, and variations of training mission requirements.

Traffic volumes at the six active entry control points were collected in 2008 and are representative of the morning peak hour. Figure 3.10-2 shows the 2008 distribution of traffic to each active entry control point. The distribution indicates that the morning peak-traffic demand on Gate 4 is the highest, followed by Gate 20. Peak commuting periods on Army installations differ from traditional morning, afternoon, and evening peaks on off-post roadway systems. At Fort Carson, inbound peaks occur prior to morning physical training (usually before 6:00 a.m.), during morning off-post commuter times for the on-post civilian workforce, mid-morning as the Soldiers return to the installation for the day, and prior to the lunch hour. Outbound peaks generally occur in the morning after physical training, around the lunch hour, and again at the end of the day prior to evening off-post commuter peak periods.

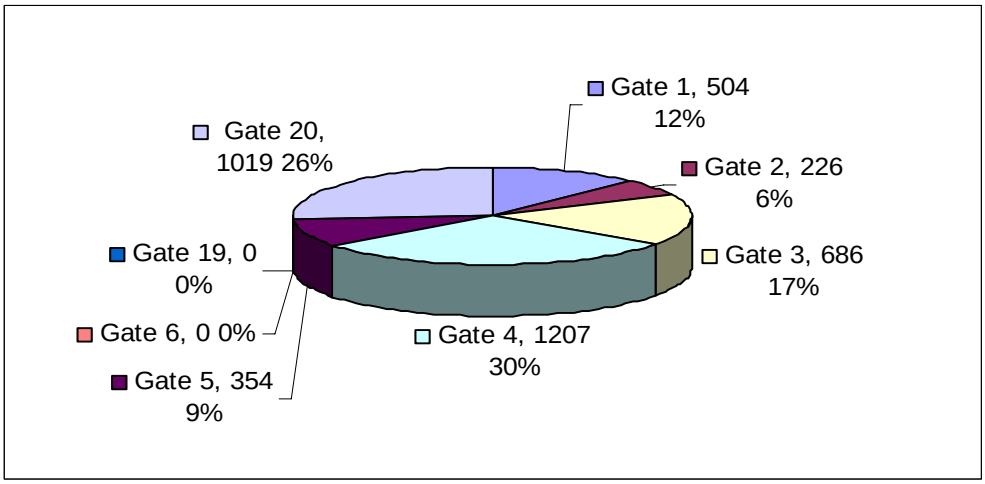

Figure 3.10-2 Traffic Distribution at Fort Carson's Active Entry Points, 2008

3.10.1.2.4. Other Transportation

Alternative modes of transportation at Fort Carson include transit service, pedestrian and bike routes, and freight rail access. Bus transit is provided by the Mountain Metropolitan Transit (Routes 30 and 33) which provides hourly weekday and Saturday service between Fort Carson and Pikes Peak Community College at 50-minute intervals. There are numerous pedestrian and bike routes on Fort Carson that are often utilized for physical fitness, but to a lesser degree as an alternative mode of transportation. Freight rail service is provided to and from the north between Gates 3 and 4.

Descriptions of the rail, aviation, and transit systems that serve Fort Carson are presented as follows.

Rail

Fort Carson is served by a freight rail line, located between Gates 3 and 4, in the northern portion of the cantonment area. The access railroad is 2.1 miles in length and connects Fort Carson to the main line of the Denver and Rio Grande Western Railroad at Kelker Junction in Colorado Springs, with cross connection facilities to the Burlington Northern Santa Fe Railroad at the same location. Fort Carson is responsible for approximately 7.1 miles of rail track and has a total loading footage availability of approximately 2.8 miles of track. The railhead area has sufficient capacity to move 270 rail cars per day.

Aviation

Aviation facilities at Fort Carson are located at BAAF, approximately 4 miles south of the cantonment area and immediately south of the Small-Arms Impact Area along Butts Road. First established in 1949, BAAF houses operations and administrative functions for several units, contractor maintenance and

support personnel, and rotary-wing aircraft. The existing permanent aircraft population is four, none of which is fixed-wing aircraft. Nearly all fixed-wing aircraft that land at Fort Carson are C-130s, C-12s, or USAFA training aircraft, and the landing strip is not sufficient in length to accommodate larger types of aircraft. In addition to BAAF, there is a tactical airstrip at Camp Red Devil, located at the south-west corner of Fort Carson.

Transit

Public transit on Fort Carson is provided by Mountain Metropolitan Transit, which also serves the Colorado Springs metropolitan area. Routes 30 and 33 provide service within the cantonment area and connect to the regional bus system at the Pikes Peak Community College Transfer Station, immediately north of Fort Carson. Bus service is offered Monday through Friday from 8:15 a.m. to 6:15 p.m., and Saturday from 7:05 a.m. to 6:15 p.m. Transit service operates on 50-minute intervals (Reference No. 146).

3.10.2. Environmental Consequences

This section outlines the potential transportation impacts for the Proposed Action and alternatives set forth in this EIS. Although transportation impacts associated with each alternative differ, training activities/concepts do not change across the alternatives. The following discussions describe elements of the Proposed Action and alternatives, including the environmental analyses performed, that are common to all scenarios.

3.10.2.1. Proposed Action and Alternatives

3.10.2.1.1. Regional Traffic

Under the Proposed Action, traffic volumes on the regional roadways network would increase because of the relocation of troops and their Families. Results from the *PPACG Regional Travel Demand Model* (year 2035) estimate traffic growth using a Soldier population of 30,000 which was the upper bound projections for Fort Carson's Soldier population (Reference No. 147). The implementation of the Proposed Action would result in the stationing of approximately 32,000 Soldiers at Fort Carson. PPACG's traffic study was used to extrapolate an estimate of traffic impacts within this section.

The area in which traffic attributable to Fort Carson results in a noticeable increase over the No Action Alternative is defined as the traffic AOI. The traffic AOI for the Proposed Action at Fort Carson extends to Constitution Avenue (east of I-25) to the north, the southern boundary of Fort Carson to the south, Marksheffel Road (south of Airport Road) to the east, and approximately 1 mile west of SH 115 (between

Academy Boulevard and I-25). Table 3.10-3 summarizes the PPACG troop increase scenario LOS and v/c ratios and ADT for 2030.

Table 3.10-3 Projected 2035 Traffic Conditions for Selected Colorado Springs Area Roadways

		PPACG 2035 Scenario with 10,000 Troop Increase		
Roadway Classification	**Roadway**	**ADT**	**v/c**	**LOS**
Interstate	I-25 (south of SH 16)	82,400	.86	E
	I-25 (north of SH 16)	142,900	1.49	F
	I-25 (north of Academy Boulevard)	140,000	1.0	E
	I-25 (north of Nevada Avenue)	167,500	.85	D
	I-25 (north of Bijou Street)	163,400	.69	C
Expressway	**US 24 (west of I-25)**	73200	.84	D
	US 24 (east of Powers Boulevard)	76,400	1.23	F
Primary Arterial	**Academy Boulevard (west of I-25)**	66,200	.89	E
	Academy Boulevard (east of I-25)	76,500	.93	E
	US 24 Bypass/Fountain Boulevard (east of I-25)	34600	.39	B
	SH 115 (south of Gate 1)	31,700	.44	B
	SH 115 (north of Gate 1)	41,100	.57	C
	SH 115 (north of Star Ranch Road)	37,000	.77	D
	SH 16 (east of I-25)	59,300	1.48	F
	SH 85/87 (south of Academy Boulevard)	44,500	.93	E
	Academy Boulevard (north of Constitution Avenue)	43,500	.85	D
Minor Arterial	**SH 94 (east of Marksheffel Road)**	27,600	.39	B

Source: Reference No. 148
ADT = average daily traffic SH = State Highway
LOS = level of service v/c = volume to capacity

In general, the patterns of traffic increase on the major roadways show larger increases closer to Fort Carson and smaller increases further away from the installation as people filter to minor arterials and collectors to enter their neighborhoods. Because access to Fort Carson is provided off I-25, Academy Boulevard, SH 16, or SH 115, these roadways experience the largest daily traffic-volume increases on

their segments adjacent to the installation. These roadway segments, however, do not necessarily have the largest percent daily traffic-volume increases. The daily traffic-volume increases on the higher-volume roadways can often result in smaller percentage increases. Likewise, lower-volume roads often experience a higher percent increase in daily volume due to the additional troops even though the actual volume increase is not as great as on the major roadways. The greatest change in v/c ratio occurs on I-25 north of SH 16 and on US 24 east of Powers Boulevard.

The v/c trend is further explained by comparing the daily LOS between the current 2005 conditions and the 2030 PPACG scenario. The eight roadway segments that experience a drop in daily LOS due to higher v/c ratios are I-25 south of SH 16, SH 115 north of Gate 1, SH 115 north of Star Ranch Road, SH 85/87, US 24 Bypass/Fountain Boulevard, US 24 east of Powers Boulevard, Academy Boulevard west of I-25 and Academy Boulevard east of I-25. The drops in LOS result in unacceptable daily LOS along four of the eight segments. Those segments that drop to unacceptable LOS are SH 85/87; Academy Boulevard east of I-25; Academy Boulevard west of I-25 (currently being widened); and US 24 east of Powers Boulevard.

The roadway network in the southeast area in and around Fountain experiences the highest percent traffic-volume increase. This is to be expected because the 2005 travel survey indicates that the Fountain area houses the second highest number of troops, and it contains areas that are currently undeveloped and can accommodate growth. Several of the areas north and west of Fort Carson (highest percentage of current Soldiers) cannot accommodate additional development or additional troops.

Traffic impacts resulting from the Proposed Action and alternatives could be lessened by encouraging ridesharing and transit use. Improvements to the regional roadway network programmed in the 2008-2013 TIP or currently underway would also help in accommodating the traffic growth resulting from the Proposed Action. Fort Carson should continue to coordinate with state and local agencies to plan for future transportation improvements to ensure that these projects take into account growth anticipated at Fort Carson.

3.10.2.1.2. Other Transportation

Rail

Under the Proposed Action and alternatives, use of the rail system would increase to accommodate increased troop deployments and training at the PCMS. A typical BCT would require four train shipments to the PCMS (one per day for four days) consisting of 225 cars total. All vehicles shipped by

train are shipped back to Fort Carson at the conclusion of the training rotation. Rail shipments to and from the PCMS and Fort Carson would not be projected to exceed one shipment per day for a total of 40 days per year for BCT training rotations. Shipments of vehicles for battalion units occur over the course of one to two days. These shipments would not be projected to exceed one shipment per day for a total of 60 days per year for battalion training rotations. It is assumed that all company operations would take place in conjunction with BCT or battalion training deployments.

The stationing of the CAB at Fort Carson would not increase the use of the rail system for training as all of the CAB support vehicles are wheeled and would travel to PCMS on the local roadway system and not by rail. Therefore, no additional training related increase on the rail system would occur as a result of the CAB being stationed at Fort Carson with the exception of wheeled vehicles using rail transportation during operational deployment overseas.

All rail shipments to the PCMS would be scheduled through the Installation Transportation Officer at least 60 days in advance of the training rotation in order to file a movement request. This allows the Installation Transportation Officer to complete adequate coordination with the rail lines prior to any rail movement. With proper coordination, the increased use of rail would not burden the rail system.

Air

When deploying overseas, units would utilize military and commercial aircraft departing from an existing area adjacent to the Colorado Springs Municipal Airport. The airport is located adjacent to Peterson AFB approximately 10 miles to the northeast of Forth Carson.

Transit

The Proposed Action would not affect transit services at Fort Carson, although the realignment of troops to Fort Carson may minimally increase transit ridership on-post and region-wide. The current transit system is not compatible with some aspects of Soldiers' schedules, such as morning physical training. Therefore, it is unlikely that future transit demand would exceed available system capacity.

Ongoing coordination with Mountain Metropolitan Transit to assess Fort Carson's transit needs as additional troops arrive would minimize impacts that increased bus ridership may create. Additional bus routes and more frequent bus service may be implemented if demand is sufficient.

3.10.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.10.2.2.1. Cantonment Area

The majority of the construction traffic associated with the Proposed Action would likely enter the post through Gates 6 and/or 19 to mitigate the impact of that traffic on the main cantonment area. This special provision is currently in use at Gate 6 and 20 in support of other major construction projects on post. The remaining construction traffic will enter the regular commercial gate (Gate 3) and be routed from Chiles onto Hare to Specker. Specker is the primary north/south truck route through post and the primary route for commercial and construction traffic. This route was established in large part to mitigate the impacts to the elementary school located on Chiles.

On-post roadways may need to be temporarily closed during construction activities. Use of traffic control procedures, including flaggers and posted detours, would minimize impacts to traffic flow. In addition, current activities at ORTC would need to be moved during some phase of the construction process which may result in a small shift in traffic patterns on Fort Carson. Other BMPs to address potential traffic impacts include minimizing construction vehicle movement during peak rush hours on the installation and placing construction staging areas in locations that would minimize construction vehicle traffic within administrative, housing, and school areas.

Traffic volumes at signalized intersections on-post would increase under the Proposed Action. All signalized intersections, however, would have sufficient capacity to accommodate the increased demand. Table 3.10-4 summarizes the additional a.m. and p.m. peak traffic trips generated on Fort Carson as a result of the Proposed Action in relation to the total additional a.m. and p.m. peak trips generated due to currently proposed and projected development at Fort Carson as indicated in the *Fort Carson Comprehensive Transportation Study*.

Table 3.10-4 Additional A.M. and P.M. Peak Trips

Peak Hour Trips	Future Total peak trips [1]	IBCT Trips	IBCT Percent of total future trips	CAB Trips	CAB Percent of total future trips	Total IBCT and CAB Trips	Total Percent of IBCT and CAB Trips
A.M. Trips	8,954	1,134	13	904	10	2,038	23
P.M. Trips	9,422	1,015	11	809	9	1,824	19
A.M. and P.M. Trips Total	18,376	2,149	12	1,713	9	3,862	21

[1]Future total peak trips were based on the information provided in Exhibit 8.1 which identified projected and planned development for Fort Carson and trip generations for those developments.
CAB = Combat Aviation Brigade; IBCT = Infantry Brigade Combat Team

Table 3.10-5 shows the percentage of ADT growth on select cantonment area roadways as a result of the Proposed Action and other Fort Carson growth predictions from 2005 to 2013. The large percentage increase on these selected cantonment area roads is not solely a result of the Proposed Action but rather is cumulative as the result of the Proposed Action in conjunction with other proposed and projected development projects on Fort Carson.

Table 3.10-5 Future Traffic Volumes for Select Cantonment Area Roadways

Roadway Classification	Roadway	Average Daily Traffic Growth (percent)
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	283
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	146
	Butts Road (near Mates Facility Access)	212
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	117
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	240
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	112
	Titus Boulevard (at Sheridan Avenue)	192
	Specker Avenue (between Ellis Street and Evans Street)	103
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	155
	Wilderness Road (west of Butts Road)	1,074

3.10.2.2.2. Downrange Area

Regional Traffic

Under the Proposed Action traffic on roads on Fort Carson and surrounding the post would increase temporarily due to construction activities associated with the stationing of the IBCT and potential stationing of the CAB at the ORTC site. Construction traffic would consist of construction vehicles and equipment, including bulldozers, graders, backhoes, excavators, dump trucks, cement trucks, and hoe-ram excavators. Transport vehicles would move the construction equipment to and from work sites.

Installation Traffic

Under the Proposed Action, traffic volumes on Fort Carson's roadway system would increase because of the realignment of troops and their families. Additionally, the facilities that would be constructed to accommodate the new troops would change travel patterns on the installation.

Traffic growth is expected to be the greatest on roadways that run through the less densely developed areas of Fort Carson. A sharp increase is expected on Wilderness Road, which currently has low existing traffic volumes. The increase in traffic on Wilderness Road would require additional entry control point access onto Fort Carson. Gates 6 and 19 would be opened and enhanced to accommodate the additional

traffic demand. Traffic at the active entry control points is expected to increase as a result of the stationing actions under the Proposed Action but also due to ongoing and future actions not related to the Proposed Action. Figure 3.10-3 shows the 2008 adjusted future morning peak hour distribution at each active control point and includes the activation of Gate 6 and Gate 19. The change in travel patterns to and on Fort Carson would make traffic volumes at Gate 20 the highest, followed by Gate 4.

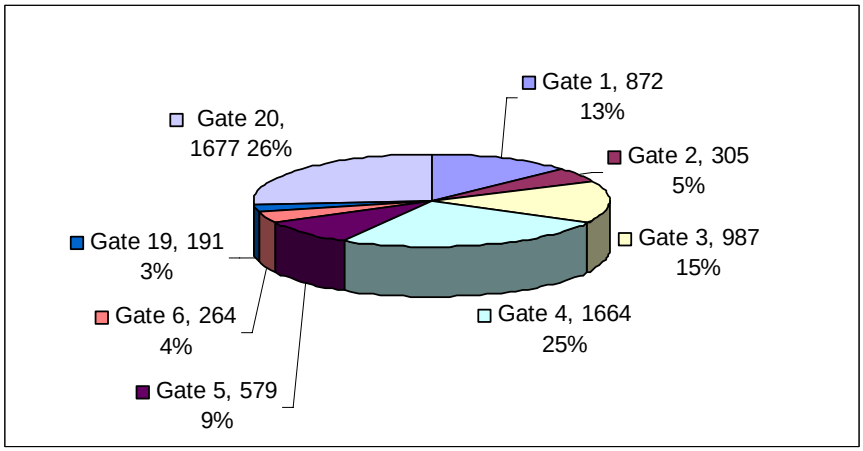

Figure 3.10-3 Future Traffic Distribution at Fort Carson's Active Entry Points

The stationing actions of the IBCT and CAB would contribute an additional 6,205 trips per day by active military personnel on Fort Carson. A majority of these trips would be along Wilderness Road. The current ADT volume along Wilderness Road is 619 trips. The stationing actions as well as other proposed and planned development is expected to increase total daily trips to approximately 7,220, an increase of 6,601 trips along Wilderness Road. Assuming all of the approximate 6,205 trips made by the IBCT and potential CAB are along Wilderness Road this would account for nearly 94 percent of the future trips forecasted for Wilderness Road.

Impacts caused by an increase in traffic volumes on Fort Carson could be mitigated by implementing the suggested roadway improvements as presented in the *Fort Carson Comprehensive Transportation Study*. The activation of some currently closed entry control points at Fort Carson would help to reduce the impact at the currently active entry control points due to the increased traffic.

Expansion projects for Gates 6 and 19 are currently planned in order to adequately accommodate the increased traffic volumes associated with the Proposed Action and reduce the impact to other entry control points. Currently, both Gate 6 and 19 are closed and do not meet the needed requirements for operational active entry points. The expansion project for Gate 6, located approximately 2 miles from

Gate 1 would support approximately 3,500 vehicle trips per day and provide a direct expressway connection between Wilderness Road, Fort Carson's main cantonment area, and the Colorado Springs Metro Area. In addition, this expansion would require improvements to the intersection of Wilderness Road and SH 115. Those needed intersection improvements are currently under design by CDOT as part of the planned SH 115 capacity and safety improvement project.

Gate 19 is located directly east of BAAF at the intersection of Wilderness Road and Charter Oak Ranch Road. The expansion project for Gate 19 would provide direct access between the Wilderness Road/BAAF area, Interstate 25 and the City of Fountain and would support approximately 2,500 vehicles trips per day. The expansion would require reconstruction of approximately 1 mile of Charter Oak Ranch Road which is owned by El Paso County. Currently, funding for the reconstruction of Charter Oak Road is being requested through the *Defense Access Road (DAR) Program*.

The activation and expansion projects for both gates and potential roadway improvements would coincide with the proposed construction of the IBCT facilities and potential CAB facilities in the Wilderness Road area with an expected completion date of mid-2011.

3.10.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Regional Traffic

Under Alternative 1, traffic volumes on the regional roadways networks would increase because of the realignment of troops and their Families. That increase and associated impact would be the same under this alternative as previously described under the Proposed Action. During construction, traffic on roads on Fort Carson and surrounding the post would increase temporarily as previously stated under the Proposed Action.

Installation Traffic

Installation traffic under this alternative would essentially be the same as previously mentioned in the Proposed Action. Under this alternative the IBCT would be stationed at Training Area Bravo along Minick Avenue and not along Wilderness Road as identified under the Proposed Action. Therefore, the trips associated with the IBCT under the Proposed Action and Alternative 1 would be relocated to Minick Avenue. Currently, no information exists for the current average daily traffic volumes along Minick Avenue. The stationing of the IBCT along Minick Avenue would increase daily trips of active military

personnel along this road by 3,452 assuming that 100 percent of all the forecasted IBCT trips were made along Minick Avenue.

Other Transportation

Under this alternative conditions and impacts to rail, aircraft and transit would be the same as described under the Proposed Action.

3.10.2.3.1. Cantonment Area

Cantonment area traffic would be the same as described in Section 3.10.2.3, Installation Traffic.

3.10.2.3.2. Downrange Area

As a result of stationing the IBCT at Training Area Bravo only the CAB would be stationed along Wilderness Road. Therefore, the forecasted traffic volumes on Wilderness Road would only increase by 3,149 trips instead of the 6,601 trips previously stated. Trips generated from the CAB stationed along Wilderness Road would then account for 87 percent of the total 3,149 additional trips along Wilderness Road under this alternative.

3.10.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.10.2.4.1. Regional Traffic

Under Alternative 2, traffic volumes on the regional roadways networks would increase because of the realignment of troops and their dependants. That increase and associated impact would be the same under this alternative as previously described under the Proposed Action.

3.10.2.4.2. Other Transportation

Under this alternative, conditions and impacts to rail, aircraft and transit would be the same as for the Proposed Action.

3.10.2.4.3. Cantonment Area

During construction, traffic on roads on Fort Carson and surrounding the post would increase temporarily as previously stated under the Proposed Action.

3.10.2.4.4. Downrange Area

Installation traffic under this alternative would be the same as previously mention in the Proposed Action, although the stationing of the IBCT and CAB would be at two different sites on Fort Carson. The sites would still be located along Wilderness Road less than 2 miles apart. Therefore, the installation traffic conditions and impacts stated in the Proposed Action would remain the same under this alternative.

3.10.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. Many of the actions, to include unit stationing proposed in 2007, have not yet occurred; however, their impacts to transportation been included as part of this No Action Alternative.

The Army utilized the 2008 PPACG report to extrapolate potential impacts of the No Action Alternative. Approximately 55 percent of the transportation impacts cited in that report were a result of BRAC 2005 and other Army Transformation actions (Table 3.10-6).

Table 3.10-6 Future Traffic Volumes for Select Cantonment Area Roadways Under the Proposed Action

Roadway Classification	Roadway	Average Daily Traffic Growth (percent)
Arterials	Magrath Avenue (between Prussman Boulevard and Yano)	240
	Barkeley Avenue (between Hogan Street and Khe Sanh Street)	124
	Butts Road (near Mates Facility Access)	180
Collector Roadway	Ellis Street (between Wallace Street and Pershing Drive)	100
	Nelson Boulevard (between Barkeley Avenue and Pershing Drive)	205
	Prussman Boulevard (between Iron Fighter Drive and Specker Avenue)	96
	Titus Boulevard (at Sheridan Avenue)	164
	Specker Avenue (between Ellis Street and Evans Street)	88
	Chiles Avenue (between Ellis Street and O'Connell Boulevard)	132
	Wilderness Road (west of Butts Road)	240

3.10.2.5.1. Regional Traffic

Under the No Action Alternative, traffic volumes for the 2030 regional planning horizon on the regional roadway systems would increase by at least one-third in the vicinity of Fort Carson. According to the PPACG regional travel demand model (year 2030), I-25 volumes north of Academy Boulevard would grow by 53 percent. SH 115 traffic would grow by 50 percent north of Gate 1 and 67 percent south of the gate, while US 24 traffic would grow by 26 percent west of I-25. Academy Boulevard traffic in the

vicinity of Fort Carson would grow by 26 percent and 36 percent further north near its intersection with Airport Boulevard/west Peterson AFB entrance. Powers Boulevard traffic would grow by 64 percent near Drennan Road/Colorado Springs Airport, and by 47 percent further north near Airport Boulevard (Reference No. 147).

The roadways in the southeast Colorado Springs area would experience greater daily volume growth between existing conditions and year 2030 under the No Action Alternative. The east side of Colorado Springs is currently the least densely developed portion and is the primary growth area for the Colorado Springs metropolitan area. I-25 traffic would grow by 80 percent south of Academy Boulevard and then by 86 percent south of SH 16/Gate 20. South of the SH 85/87 Fountain interchange, the percent-volume traffic increase is nearly 200 percent. Likewise, Powers Boulevard and Marksheffel Road south of Bradley Road experience a 350 percent traffic growth. On the eastern edge of Colorado Springs, US 24 traffic would grow by 460 percent and SH 94 traffic would increase by 285 percent. SH 16 traffic would grow by 94 percent east of its interchange with I-25 and then by 680 percent closer to its junction with Powers Boulevard. South of SH 16, the daily traffic-volume would increase by 225 percent on SH 85/87 and by 420 percent on Link Road. Furthermore, most of the roadways in the Fountain area experience significant daily traffic-volume growth (Reference No. 147).

The general area in which traffic attributable to Fort Carson results in a noticeable increase (1 percent or more) over the No Action Alternative is defined as the traffic "area of influence." The traffic area of influence for the Proposed Action at Fort Carson extends north to Constitution Avenue/Fontanero Street and south to the southern boundary of Fort Carson. It extends east to Marksheffel Road/Link Road and west to a line extended north and south of 7th Street. Table 3.10-3 summarizes the PPACG projected 2035 traffic conditions for select Colorado Springs Roadways which includes the PPACG scenario.

Under the No Action Alternative, Army Transformation projects would continue to be implemented and associated construction impacts would occur to transportation both on- and off-post.

3.10.2.5.2. Other Transportation

Under the No Action Alternative, there would be increased use of rail and other transportation systems resulting from additional unit stationing.

3.10.2.6. Mitigation Measures

Fort Carson staff would coordinate with external state and federal agencies to improve off-post roads connecting to Gates 6 and 19 which would experience an increase in traffic as a result of implementing the Proposed Action. Currently Gates 6 and 19 are closed; however Fort Carson is undertaking expansion

projects for both gates. Additionally, Fort Carson is coordinating with CDOT on intersection improvements as part of the SH 115 capacity and safety improvement project. Alterative transportation modes would also be developed such as traffic demand management and low impact vehicle studies.

Fort Carson would establish additional access control points for authorized personnel, such as opening Gates 6 and 19, to would allow for increased traffic flow on- and off-post and to decrease congestion at current entry points. Currently, expansion projects for Gates 6 and 19 are planned in order to adequately accommodate the increased traffic volumes associated with the Proposed Action and reduce the impact to other entry control points. In addition, this expansion would require improvements to the intersection of Wilderness Road and SH 115. Those needed intersection improvements are currently under design by CDOT as part of the planned SH 115 capacity and safety improvement project. Fort Carson is also currently exploring two potential roadway improvements set forth in the *Fort Carson Comprehensive Transportation Study 2008 Update*. These are the construction of a two-lane paved roadway from Route 1 near Gate 19 westward to the Butts Road intersection. Secondly, improvements to the Butts Road and Wilderness Road intersection and the potential construction of a roundabout at that location to increase traffic flow and reduce congestion are being considered.

3.11. Utilities

This section describes the existing utilities at Fort Carson associated with potable water, wastewater, energy sources, communications, and solid waste, and describes the environmental consequences for these utilities from additional personnel and the construction and operation of new facilities. The environmental consequences for utilities include assessing the need for upgrades and any secondary impacts associated with those upgrades.

3.11.1. Affected Environment

Utilities at Fort Carson are operated in accordance with the base operations performance work statement and guided by the DPW. Potable water resources are controlled by the *Fort Carson Water Resources Management Plan (200-4)*. Energy reduction efforts are guided by energy conservation programs detailed in the *Energy Management Plan* (Reference No. 149) and installation policy letters. *The Energy Management Plan* supports the Energy Policy Act (EPACT) of 2005 which requires federal installations to meet multiple goals in the areas of energy conservation, reducing greenhouse gas emissions, renewable energy implementation and water conservation. Key resources for Army utility management include:

- *Safe Drinking Water Act*
- CWA, NPDES;
- EO 13423, *Strengthening Federal Environmental, Energy and Transportation Management*;
- EPACT 2005; and
- AR 420-1, *Army Facilities Management*.

Solid waste management at Fort Carson is conducted in compliance with all applicable regulations. Key resources for Army solid waste management include:

- *Resource Conservation and Recovery Act (RCRA)*;
- EPA's non-hazardous solid waste regulations codified in 40 CFR Parts 240-258;
- EO 13423, *Strengthening Federal Environmental, Energy and Transportation Management*;
- AR 200-1, *Environmental Protection and Enhancement*;
- 10 U.S.C 2577, *Disposal of Recyclable Materials*;
- Department of Defense Instructions (DoDI) 4715.4, *Pollution Prevention*; and
- 6 CCR 1007-2, Part 1, *Regulations Pertaining to Solid Waste Sites and Facilities*.

3.11.1.1. Potable Water Supply

Colorado Springs Utilities (CSU) supplies water to residents and businesses in Colorado Springs and also to some entities outside the city limits, including Fort Carson and other area military facilities. Potable water is purchased by Fort Carson from CSU for domestic, industrial, and irrigation use in the cantonment area. A portion of the water purchased by Fort Carson is also supplied to the Cheyenne Mountain Air Force Station. The current capacities of CSU are shown in Table 3.11-1.

Table 3.11-1 Colorado Springs Utilities Capacities

Function	Capacity
Firm yield of raw (untreated) water	119,000 acre-feet per year (106 mgd)
Storage capacity of raw water	188,000 acre-feet
Delivery capacity	196,000 acre-feet per year (175 mgd)
Treatment capacity of raw water	230,000 acre-feet per year (205 mgd)
Storage capacity of treated water	322 acre-feet (105 million gallons)

Source: Reference No. 150
mgd = million gallons per day

As presented in Table 3.11-1, the constraining factor for CSU is the firm yield of raw water. CSU has developed a population-based "planning forecast," which "represents a water demand forecast for which actual water demands will be at or below the forecast at least 95 percent of the time." (Reference No. 150) The CSU planning forecast will be nearing the capacity constraints of firm yield of raw water by 2012 (Reference No. 150). To mitigate the effects of population growth and increased water demand, CSU is working to reduce demand through conservation, as described in its *2008 – 2012 Water Conservation Plan* (Reference No. 151). CSU is also looking to increase supply of raw water by accessing existing rights in the Arkansas River basin. These activities are described in the *Southern Delivery System Draft Environmental Impact Statement* (Reference No. 150).

In 2006, CSU delivered approximately 26 billion gallons (79,800 acre-feet) of potable water to 417,000 persons. Deliveries to the 116,100 single-family residences totaled 11.44 billion gallons (35,108 acre-feet) (Reference No. 151). At 2.83 persons per household (Reference No. 150), approximately 328,600 persons living in single-family residences received an average of 95 gallons of potable water per person per day. Assuming a 3 percent annual growth rate from 2006 to 2008, which is the expected population growth rate during these years (Reference No. 152), it is estimated that in 2008 CSU will deliver approximately 27.6 billion gallons (84,650 acre-feet) of potable water to 443,000 persons.

Fort Carson-related potable water use is distributed among military and industrial use on-post, and domestic water use both on- and off-post. Fort Carson on-post use of water (including residential) from CSU for 2008 is approximately 2.1 mgd (6.4 acre-feet per day or 2,350 acre-feet per year), which is approximately 2 percent of Colorado Springs' firm yield of 119,000 acre-feet per year (Reference No. 150). This is used by approximately 25,100 military and 5,100 civilians performing their jobs at Fort Carson, and also approximately 18,500 persons residing on-post. Of those residing on-post, approximately 5000 live in barracks or Bachelor Officers Quarters and 3,000 military live in family housing (10,500). The remainder of the military (17,100) and their Families (31,977) live off-post.

Estimates of residential use of potable water, at 95 gallons per person per day, by Fort Carson affiliated personnel living off-post are shown in Table 3.11-2.

Table 3.11-2 Off-Post Residential Use of Potable Water

Category	Number[1]	Water Usage (gpd)[2]
Civilian employees	5,124	486,780
Civilian employee Family	8,220	780,900
Military	17,100	1,624,500
Military Dependents	31,977	3,037,815
Total	62,421	5929,995

[1] Number of individuals as presented in Section 3.9.
[2] Calculated at 95 gpd per person.

For purposes of the analysis, all off-post personnel are assumed to reside in the CSU service area, which is a conservative assumption that would result in relatively higher impacts. Total off-post water usage by Fort Carson-affiliated personnel is approximately 5.9 mgd (6,629 acre-feet per year) and would represent approximately 5.6 percent of firm yield. Total 2008 water usage for all Fort Carson affiliated personnel, both on- and off-post, is estimated at 8,979 acre-feet per year, which is approximately 7.5 percent of the firm yield for raw water. This amount would be approximately 10 percent of the total Colorado Springs usage.

In 1975, CSU set the maximum water supply of 14 mgd for Fort Carson, but the maximum historical daily water demand on the installation is only 5.5 mgd (Reference No. 153). Fort Carson has actually reduced overall water use on the installation by approximately 45.9 percent since 2002 (Reference No. 154). Water reduction has been achieved through installation of low-flow fixtures in some facilities, waterless urinals in new facilities, single-bay washes inside motor pools, and other conservation efforts. Reduced troop levels as a result of deployments are also a factor.

Potable water is delivered to Fort Carson through two 20-inch-diameter lines that enter the installation from the north and feed the eastern and western sides of the cantonment area. The 50-year-old water lines within the cantonment area are deteriorated and are being replaced. Two 6-inch water lines run down Butts Road from the cantonment area to BAAF, and a 20-mile, 6-inch water line extension from BAAF near Route 1 to the multi-purpose range complex at the southern end of Fort Carson. The potable water supply system at BAAF is an outdated system which requires chemical treatment. An 8-inch line from BAAF extends east to the Range Control Complex and the ORTC barracks facilities along Wilderness Road. The potable water storage system at Fort Carson consists of seven water storage tanks that provide capacity during emergency conditions.

Tributaries for which Fort Carson retains water rights are Little Fountain Creek, Little Turkey Creek, Red Creek, Rock Creek, Sand Canyon Creek, Turkey Creek, and Wild Horse Creek (Figure 3.6-1). Fort Carson has 16 subsurface water rights for nine installed wells. Decreed use categories include irrigation, recreation, fish maintenance, fire fighting, military, livestock, domestic, and industrial. Potable water for consumption during training activities in the downrange area is trucked from the cantonment area, while at the multi-purpose range complex, potable water is piped from the cantonment area.

3.11.1.2. Wastewater System

Fort Carson operates and maintains a wastewater collection and treatment system for both sanitary and industrial wastewater components. Forty-seven miles of lines service the cantonment area, the family housing area, BAAF, and Cheyenne Mountain Air Station. Effluent discharges from the sewage treatment plant are regulated under EPA NPDES Permit Number Permit No. CO-0021181, which is effective until September 30, 2010. CDPHE allows Fort Carson to discharge only 3.02 mgd into Clover Ditch (Reference No. 153). The Fort Carson golf course is irrigated, in part, by the effluent (Reference No. 155).

The sanitary sewage treatment plant, which was re-constructed in 1998, has a 4.0-mgd design capacity with a peak historical flow of 2.6 mgd. The current wastewater load for the entire system is 1.3 mgd (Reference No. 153).

The Colorado Water Quality Control Commission (WQCC) adopted new EPA ammonia discharge standards (EPA-823-F-99-024); the new standards were put into effect in October 2007. Fort Carson, which discharges into Clover Ditch, a tributary of Fountain Creek, is in the process of determining how to achieve compliance with these standards. Based on a review of the current permit limits for Fort Carson,

it has been concluded that the facility is in compliance with the current ammonia effluent limits. The annual average total ammonia concentration in the effluent is approximately 0.50 mg/L. Under the proposed regulations, if future ammonia standards require facility upgrade, Fort Carson will have until calendar year 2012 to accomplish implementation.

The original sanitary system, constructed in 1942, comprises numerous areas of old, deteriorated lines that have been identified and replaced or programmed for replacement. Deteriorated sewer lines along Titus Road were recently replaced to facilitate sewage flow for construction projects on the southern end of the cantonment area. These upgrades also facilitated flow to the sewer lines running along Butts Road.

Portable toilets, dry vault, and self-composting latrines are used in the downrange area when septic tanks/leach fields are not available (e.g., during training activities on the downrange area).

An industrial wastewater treatment plant (IWTP) is located directly north of the sanitary sewage plant, near Gate 20. The IWTP was designed and constructed to treat petroleum-contaminated water from the motor pools in the cantonment area. The IWTP collection sewer extends down Minick Avenue behind the motor pools and delivers industrial wastewater to the IWTP. Wastewater is conveyed using both lift stations and gravity flow. IWTP effluent is combined with the sanitary sewage water entering the sewage plant. Treated IWTP effluent is discharged directly into “B” Ditch, “I” Ditch (Clover Ditch), or “U” Ditch (Unnamed Ditch), Fort Carson’s three main ditches.

BAAF, the Colorado Army National Guard Centennial Training Site, and the Special Forces Complex along Wilderness Road are not connected to the IWTP. These facilities all use an oil-water separation system (OWS) to pre-treat industrial wastewater before it is drained into the main wastewater system.

3.11.1.3. Energy Sources

Fort Carson purchases natural gas and electricity from CSU. The installation obtains 2.3 percent of its energy needs from solar panels and is currently researching other sources of renewable energy for future use. Further details on renewable energy sources can be found in Section 3.13.

Electrical services are provided through two aerial 34.5-kilovolt, three-phase supply lines, which terminate at three power substations in the cantonment area. The peak historical electrical demand at Fort Carson is 27.9 mega volt ampere (MVA) while the total capacity of transmission lines available to the installation is 57.4 MVA and the total capacity of transformers is 37.9 MVA. Two of the transformers are

close to capacity and the Titus Road substation is planned for an upgrade so that it would have 10 circuits. This substation upgrade would support electricity demand on the cantonment area and two to four feeders would also extend from Titus Road down to Butts and Wilderness Roads.

Electrical supply lines to BAAF were upgraded in 1986 and are now operating at peak capacity. Upgrades to the electrical system at BAAF would be necessary to continue to meet electrical demands for this area. Power for maneuvers and target training within the downrange area is supplied locally by battery or generator.

Fort Carson receives natural gas from CSU via two feeds at the north end of the installation, near Gate 4. CSU is installing an additional 10-inch steel gas line along SH 115 to be completed by the end of 2008. The natural gas is metered and piped through a series of gas mains and distribution lines to Fort Carson's four central heating plants, BAAF, and the family housing area. The peak historical daily consumption of natural gas at Fort Carson is 9,329 million cubic feet (mcf)/day (Reference No. 153). CSU's maximum delivery capacity to the installation is 24,000 mcf/day (Reference No. 153). Recent upgrades to lines within the cantonment area and the additional 10-inch steel line would adequately support gas demands within the cantonment area, but upgrades would be required in the downrange area.

The existing gas line servicing BAAF does not have the capacity to accommodate additional gas service to the downrange area or facilities located on Wilderness Road. There is a planned 4-inch gas line extension upgrade from Titus Road down Butts Road to the BAAF. Additional gas line upgrades and extensions would be required to provide facilities along Wilderness Road with sufficient gas supplies.

3.11.1.4. Communications

The primary communication infrastructure at Fort Carson consists of cable lines that run throughout the cantonment area, seven ranges, and BAAF. The communication system around the cantonment area is sufficient to meet the current needs for personnel and operations. However, as the number of Soldiers and support personnel at Fort Carson increases, significant upgrades to the existing communications infrastructure will be required several years in the future. Cable extensions are currently being built for various new construction projects underway within the cantonment area. Basic administrative analog telephone and low-speed data are available along Wilderness Road and the downrange area locations using copper and leased fiber lines.

3.11.1.5. Solid Waste

The *Integrated Solid Waste Management Plan* (ISWMP) (Reference No. 156) contains details of the *Solid Waste Management Program* at Fort Carson. The ISWMP complies with AR 200-1 and is consistent with AR 420-49 and other applicable guidance on solid waste management. Fort Carson intends to achieve a 50 percent annual reduction/diversion rate of solid waste by 2010 through recycling, reuse, and reduction (based on a 1992 baseline generation rate), while ensuring that integrated non-hazardous solid waste management programs provide an economic benefit when compared with disposal using landfills and incineration alone. Refuse, construction-related solid waste, and recyclable materials are all managed by DPW.

Until 1998, Fort Carson operated a 50-acre sanitary landfill, located south of the cantonment area, for the disposal of municipal solid waste. Construction and demolition waste was placed in an adjacent 20-acre landfill that was closed in 2002. Since that time, waste has been shipped off site for disposal in local landfills by a waste disposal contractor (Reference No. 156).

Currently, all solid waste from Fort Carson, including waste from the housing units, is shipped 15 miles to offsite landfills, including the Midway Landfill in Fountain, Colorado by a licensed contractor. Midway Landfill and other landfills are permitted Subtitle D landfills.

Fort Carson operates a recycling center located near Gate 3. In addition to the recycling center, there are three additional large drop-off facilities located in the cantonment area. Smaller recycling bins are located near all facilities. As expansion continues on the installation, additional recycling containers would be placed at all new facilities. Recyclable materials collected at these sites include paper, plastic, glass, cardboard, wood pallets, aluminum and scrap metal.

3.11.2. Environmental Consequences

The following discussions describe the environmental consequences of the Proposed Action and the alternatives as they relate to utilities.

3.11.2.1. Proposed Action and Alternatives

3.11.2.1.1. Potable Water

The Proposed Action and alternatives would result in an increase in Fort Carson employment of approximately 6,700 Soldiers which is an increase of approximately 27 percent by 2012. In addition,

there would be an increase of approximately 12,500 military dependents (Section 3.9). The military would experience an on-post increase of approximately 2,200 unaccompanied personnel and approximately 560 personnel living in family quarters. There will be an estimated increase of approximately 1,050 military dependents living in family quarters. Personnel and Families living on-post would increase by approximately 21 percent. Based on the increase in post employment, water usage would increase by approximately 22 percent over the period ending in 2012, an amount equal to approximately 462,000 gallons per day (gpd) (520 acre-feet per year), which would be approximately 0.4 percent of firm yield. Total usage at Fort Carson in 2012 would be approximately 2,562,000 gpd (2,870 acre-feet per year). The total on-post use would be approximately 2.4 percent of the CSU firm yield.

The increase in estimated residential use of potable water caused by the increase in Fort Carson affiliated personnel living off-post are shown in Table 3.11-3.

Table 3.11-3 Change In Off-Post Residential Water Usage, 2012

Category	Number[1]	Water Usage (gpd)[2]
Civilian employees	27	2,565
Civilian employee Family	51	4,845
Military	3,940	374,300
Military Dependents	11,450	1,087,750
Total	15,468	1,469,460

[1] Number of individuals as presented in Section 3.9.
[2] Calculated at 95 gallons per day (gpd) per person.

The increase in off-post water usage by Fort Carson affiliated personnel would be approximately 1.5 million gallons per day (mgd) (1,679 acre-feet per year), or approximately 1.4 percent of firm yield. Total water usage for off-post personnel in 2012 would be approximately 2.7 billion gallons (8,308 acre-feet), which would be approximately 6.9 percent of firm yield.

Total annual water usage for all Fort Carson affiliated personnel in 2012 is estimated at 9.6 mgd (10,742 acre-feet per year). The total amount of water used by all Fort Carson affiliated persons would be approximately 9 percent of the firm yield for raw water, an increase of 1.8 percent of firm use as a result of the Proposed Action and alternatives. Therefore, water usage would be closer to the firm yield for raw water by 2012.

Fort Carson should continue to aggressively pursue water conservation and work with CSU to implement the CSU *Water Conservation Plan*, which projects annual water savings of 6.7 percent by 2012 of the

planning forecast discussed in Section 3.11.1.1. These actions would help minimize impacts until new water sources are accessed, such as through the proposed Southern Delivery System projects (Reference No. 150).

The existing water lines on-post, which are deteriorated and require replacement, cannot support the additional personnel and operations at ORTC and operations at BAAF. According to Fort Carson utility planning, the estimated annual flow for 2009 is 2.3 mgd, which is less than a 10 percent increase over the estimated annual flow for 2008. Without upgrades, the current potable water infrastructure at Fort Carson cannot handle the increased water demands from the additional IBCT, CS personnel, and potential CAB.

3.11.2.1.2. Wastewater System

The addition of Soldiers to Fort Carson would increase the load on the sanitary wastewater system requiring extensions and upgrades to the wastewater treatment system to handle the increased load of IBCT and CAB personnel and operations.

3.11.2.1.3. Energy Sources

Electrical upgrades would be needed to facilitate the overall growth at Fort Carson as described in the Proposed Action and alternatives and would increase energy demand from new facilities as well.

3.11.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center

Under the Proposed Action, extension of utilities would be required for personnel and the specific operational facilities for the IBCT and potential CAB at the ORTC. Personnel facilities (barracks, dining facility, etc.) would be required for the CAB at the ORTC. Additional administrative and operational facilities for the CAB would be constructed adjacent to BAAF.

Large (linear) areas of temporary disturbance around the proposed sites would be attributed to the installation of new utilities. These disturbed areas would be re-graded and seeded with ground vegetation in order to restore these sites in accordance with BMPs for new construction.

3.11.2.2.1. Cantonment Area

Potable Water

Increased CS personnel under the Proposed Action would cause infill construction (demolition and new construction) in the Fort Carson cantonment area. This would result in increased demand to utilities, but only minor utility upgrades in the form of line tie-ins would be required to support this growth in the cantonment area.

Wastewater System

The addition of approximately 400 CS Soldiers to Fort Carson would increase the load on the sanitary wastewater system. However, the extension of sanitary sewer lines and industrial wastewater lines from the existing infrastructure would handle the additional flow in the cantonment area.

Energy Sources

The addition of approximately 400 CS Soldiers to Fort Carson would increase energy demand from new facilities within the Fort Carson cantonment area. The installation of additional electrical feeders and the extension of natural gas piping to the new CS facilities would be adequate to meet the additional energy demand for these units. Under the Proposed Action, there would be no adverse impact on the electric and natural gas system at Fort Carson.

3.11.2.2.2. Downrange Area

Operational Readiness Training Center

Potable Water

As part of the Proposed Action, a 500,000-gallon elevated water storage tank would be installed on the west end of Wilderness Road near Gate 6. A water pump station (1,500 gpm) with additional pump capacity would also be installed for this area of Wilderness Road. Construction of 15,000 LF of 8-inch water main, and two to ten pressure-reducing valves and vaults, would be necessary between Gate 1 and Gate 6. The two existing waterlines which run down Butts Road to the BAAF do not require upgrades to meet the demands of these new facilities. Another 8-inch water main would be extended from BAAF to the Wilderness Road sites. Water line extensions would connect these mains to each of the facilities to be constructed under the Proposed Action.

The potable water system would be installed underground, and disturbed areas would be restored after the construction of the new service lines. Under the Proposed Action, no adverse effect to the potable water system at Fort Carson would occur.

Wastewater System

The Proposed Action would require extensions and upgrades to the wastewater treatment system to handle the increased load of IBCT and CAB personnel and operations An extension of a 12-inch sewer line from BAAF along Wilderness Road to Gate 6 would be constructed to support the new facilities at the ORTC. In addition, each of the proposed buildings would have a wastewater line and a cleanout. Aeration pumps would be added along Wilderness Road. The sanitary wastewater would be conveyed to

centralized holding, then to the treatment facility. The wastewater system would be installed underground, and disturbed areas would be restored after completion of the projects.

Construction and operation of new motor pools (including seven vehicle maintenance shops) for the IBCT at the ORTC would require a dedicated industrial collection system and lift stations to support the increased industrial wastewater. New industrial wastewater lines would be installed along Butts Road and along the southern portion of the new facilities at the ORTC.

No IWTP would be added at Wilderness Road because a pre-treatment OWS would be used and the treated water would then be added into the regular sewer line. The construction of this facility would minimize the impacts of the construction and operation of new motor pools and aircraft maintenance facilities on the wastewater system at Fort Carson.

It is anticipated, based on the low levels of ammonia in the effluent, that the wastewater treatment plant can reasonably be expected to meet new ammonia effluent limitations, even with the increase in wastewater that would be generated under the Proposed Action. As noted in the Fort Carson Transformation plans, any required facility upgrades required to meet the new standard, must be completed by 2012.

Under the Proposed Action, no adverse effect to the wastewater system at Fort Carson would occur.

Energy Sources

In addition to the planned electricity upgrades needed to facilitate overall growth at Fort Carson, several electric utilities upgrades would be completed under the Proposed Action. According to Fort Carson utility planning, estimated peak electricity demand for the entire installation in 2009 is approximately 45 MVA, which is a 45 percent increase over current demand. The increase in personnel and operations at the ORTC/BAAF would require the installation of a new substation along Wilderness Road to supply electricity to the IBCT/CAB facilities. This substation would have between eight and ten circuits with feeder lines connecting to all of the new facilities at the ORTC. As mentioned in Section 3.11.1.3, the Titus Road substation must be upgraded to support increased electricity demand in the cantonment area. Along with the upgrade of the Titus Road substation, two to four feeders would also extend to the ORTC. A portion of these feeders would connect to an existing circuit east of BAAF to assure power reliability, which would require manholes every 500 feet. Electric lines would be connected to each new facility at the ORTC and BAAF.

With the construction of a new electricity system along Wilderness Road, the existing above-ground power lines would be removed. The new lines would be installed underground, and disturbed areas would be restored after completion of the projects.

Upgrades and coordination with CSU would provide the power and capacity to support additional personnel and operations at the ORTC and BAAF under the Proposed Action.

Increased personnel and operations would result in increased natural gas demand at ORTC and BAAF. According to Fort Carson utility planning, estimated peak demand for the installation in 2009 is 18,661 thousand cubic feet (Referenc No. 157). The current natural gas system is inadequate to meet the current and future personnel needs in the downrange area. The Proposed Action would require the extension of an 8-inch line along SH 115 to the dirt road and then to Gate 6 and connecting to Wilderness Road. An extension upgrade would be required for a 4-inch line along Titus Road, which extends to Butts Road. A gas line would be constructed to connect the line from Butts Road to the new line from Gate 6. Gas lines would be connected to the new facilities at the ORTC and BAAF. The natural gas system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects.

3.11.2.2.3. Communications

Under the Proposed Action, the basic communications infrastructure along Wilderness Road would require considerable upgrades to support IBCT and CAB facilities at the ORTC and BAAF. New cables would be installed along Wilderness Road and connect to the existing lines along Butts Road. A two by four duct bank system, which currently connects the Range Control facility to the south side of Wilderness Road, would be upgraded. In addition, five new duct banks and 27 new manholes would be installed at the ORTC. Copper and strand fibers would connect to each new facility. The communication lines would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, there would be no adverse impact on the communications system at Fort Carson under the Proposed Action.

3.11.2.2.4. Solid Waste

Solid waste generation at the ORTC and BAAF would increase under the Proposed Action; construction of required facilities would also increase the amount of solid waste generated. Solid waste generated from implementation of the Proposed Action would be managed in accordance with the existing ISWMP. Solid wastes would be collected and transported to appropriately permitted disposal facilities off-post. Large and small recycling containers would be placed at the new facilities and existing recycling

procedures would be implemented. Therefore, no adverse effect to solid waste would occur due to implementation of the Proposed Action.

Butts Army Airfield

Potable Water Supply

Installation of a looped potable water supply would improve the water quality and reliability of water delivery at BAAF.

Wastewater System

The Proposed Action would include upgrades to the industrial wastewater system that would adequately handle the additional wastewater generated by the new activities at BAAF.

The oil water separator requirement and ammonia levels would be the same as under the Proposed Action. Therefore, under the Proposed Action, no adverse effect to the wastewater system at Fort Carson would occur.

Energy Sources

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Communications

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Solid Waste

Impacts would be the same as for the Proposed Action in Section 3.11.2.2.2.

Range and Training Areas

No utilities upgrades would be required for the improvement of ranges.

3.11.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

Under this alternative, extension of utilities would be required for the facilities set for the IBCT at Training Area Bravo. Linear areas of temporary disturbance around the proposed sites would be attributed to installation of new utilities.

The CAB infrastructure would remain at the ORTC and BAAF; and the CS units would remain at the Fort Carson cantonment area. The utilities upgrades and extensions for just the CAB at the ORTC would remain the same as discussed in Section 3.11.2.2. The utilities upgrades and extensions for the CS units would also remain the same as discussed in Section 3.11.2.2 for the BAAF.

3.11.2.3.1. Cantonment Area

Potable Water Supply

The existing water lines within the cantonment area could support the additional personnel and operations at Training Area Bravo. A new 500,000-gallon elevated tank would be built along Minick Avenue to provide sufficient water flows for fire. IBCT facilities would be tied into the potable water system from the main cantonment area. Extension of service lines would be sufficient to support the development of IBCT facilities at Training Area Bravo. The potable water system would be installed underground, and disturbed areas would be restored after the construction of the new service lines. Under Alternative 1, no adverse effect to the potable water system at Fort Carson would occur.

Wastewater System

A further detailed analysis of the impacts of increased wastewater flow in Training Area Bravo must be completed prior to the development of IBCT facilities at this location. Sanitary sewer lines would extend from the Training Area Bravo to the cantonment area infrastructure. The wastewater system would be installed underground, and disturbed areas would be restored after completion of the projects.

Construction and operation of new motor pools (including seven vehicle maintenance shops) for the IBCT at Training Area Bravo would increase industrial wastewater. New industrial wastewater lines would be installed along Minick Avenue. These new lines would connect to the existing IWTP located along Minick Avenue in the cantonment area. Under Alternative 1, no adverse effect to the potable water system at Fort Carson would occur.

As discussed in the Proposed Action, the wastewater treatment plant can reasonably be expected to meet new ammonia effluent limitations even with the increase in wastewater that would be generated under Alternative 1. Any required facility upgrades required to meet the new standard, must be completed by 2012.

Energy Sources

Increased personnel and operations would result in increased electricity demand at Training Area Bravo. According to Fort Carson utility planning, estimated peak electricity demand for the entire installation in 2009 is approximately 45 MVA, which is a 45-percent increase over current demand. Upgrade of the substation, transformer, and coordination with CSU to provide additional capacity would provide the power and capacity to support additional personnel and operations at Training Area Bravo under Alternative 1.

A new substation was just added off of Magrath Avenue. This substation would provide sufficient electric supply to IBCT facilities at Training Area Bravo. The installation of new electrical feeders connecting Training Area Bravo to this substation would meet electrical demand generated by additional personnel and operations at Training Area Bravo. Electrical lines would be installed along Minick Avenue and throughout the new Training Area Bravo infrastructure. The electrical system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, no adverse effect to electricity would result from implementation of the Alternative 1.

Increased personnel and operations would result in increased natural gas demand at Training Area Bravo. The current natural gas system off of Minick Avenue is adequate to meet the current and future personnel needs in the area east of the cantonment area. A new gas line extension would be constructed along Minick Avenue to supply natural gas to IBCT facilities at Training Area Bravo. The natural gas system upgrades would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, no adverse effect to gas system would result from implementation of the Alternative 1.

Communications

Under Alternative 1, the IBCT facility at Training Area Bravo would require cable line extensions from the existing communications system within the cantonment area. New cables would be installed along Minick Road. In addition, new duct banks and new manholes would be installed at Training Area Bravo. Copper and strand fibers would connect to each new facility. The communication lines would be installed underground, and disturbed areas would be restored after completion of the projects. Therefore, there would be no negative impact on the communications system at Fort Carson under Alternative 1.

Solid Waste

Solid waste generation at Training Area Bravo would increase under the Proposed Action; construction of required facilities would also increase the amount of solid waste generated. Solid waste is managed in

accordance with the ISWMP. Solid wastes are collected and transported to appropriately permitted disposal facilities off-post. Solid waste generated from implementation of the Proposed Action would be managed in accordance with the existing ISWMP. Large and small recycling containers would be placed at the new facilities and existing recycling procedures would be implemented. Therefore, no adverse effect to solid waste would occur due to implementation of the Alternative 1.

3.11.2.3.2. Downrange Area

Operational Readiness Training Area

Utility requirements would be similar to the Proposed Action to support CAB facilities; however support facilities and IBCT facilities would not be constructed at the ORTC area, thus requiring less.

Butts Army Airfield

Impacts would be the same as for the Proposed Action in Section 3.11.2.1 for the BAAF.

Range and Training Areas

No utility upgrades would be required for the improvement of ranges.

3.11.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Construct Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.11.2.4.1. Cantonment Area

The CAB infrastructure would remain at the ORTC and BAAF; and the CS units would remain at the Fort Carson cantonment area. The utilities upgrades and extensions for just the CAB at the ORTC would remain the same as discussed in Section 3.11.2.2. The utilities upgrades and extensions for the CS units would also remain the same as discussed in Section 3.11.2.2.

3.11.2.4.2. Downrange Area

Operational Readiness Training Area

Utility requirements would be similar to the Proposed Action to support CAB facilities; however support facilities and IBCT facilities would be constructed at Tent City. Due to the close proximity of both ORTC and Tent City sites, utility upgrades would be the same as the Proposed Action. Regardless of the construction site location, utilities would be tied into existing lines along Butts Road and new lines constructed between Gate 6 and Gate 1, thus creating a closed loop.

Butts Army Airfield

Impacts would be the same as under the Proposed Action in Section 3.11.2.1 for the BAAF.

Range and Training Areas

No utility upgrades would be required for the improvement of ranges.

3.11.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of this No Action Alternative. As a result of the implementation of the No Action Alternative there would be no change to land use. This increase under the No Action Alternative would impact utilities at Fort Carson. Details on the impacts to potable water system, wastewater system, energy sources, communications and solid waste from the No Action Alternative can be found in the 2007 Fort Carson Transformation EIS.

3.11.2.6. Mitigation Measures

Capacity shortages could be mitigated through infrastructure upgrades as indicated above. Reduction in usage could be mitigated through aggressive pursuit of conservation and sustainability measures.

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3.12. Hazardous and Toxic Substances

This section describes the affected environment and environmental consequences to hazardous and toxic substances including uses of hazardous materials, storage and handling areas, hazardous waste disposal, site contamination and cleanup, and special hazards within the cantonment area, BAAF, and the downrange area.

3.12.1. Affected Environment

In accordance with the RCRA, 6 CCCR 1007-2 and 1007-3, DoDI, *Department of the Army Regulations*, and Part B Permit No. CO-06-09-29-01, Fort Carson has a comprehensive program to address the management of hazardous waste, hazardous materials and toxic substances. This includes the proper handling, and disposal of hazardous waste and procurement, use, storage, and abatement (if necessary) of toxic substances. Additionally, a systematic approach is employed to investigate and remediate known or suspected contaminated sites across the installation until closure or receipt of a No Further Action (NFA), if necessary.

Hazardous and toxic materials used at Fort Carson include gasoline, batteries, paint, diesel fuel, oil and lubricants, explosives, JP-8 jet fuel, pyrotechnic devices used in military training operations, radiological materials at medical facilities, radioactive materials, pesticides, and toxic or hazardous chemicals used in industrial operations (Reference No. 155). Some of these materials end up as wastes, either through certain processes, or as a result of process changes whereby the material no longer meets required specifications, or becomes contaminated and unusable. The Part B Permit (Attachment 3, *Waste Analysis Plan*, 29 September 2006) (February 2006) displays the estimated quantity of hazardous waste (pounds per year) that are either typically or may potentially be generated annually at Fort Carson.

To reduce the amount of hazardous waste generated on Fort Carson, a Hazardous Material Control Center (HMCC) was established in an effort to centralize and control purchases of hazardous materials and employ affirmative procurement practices. To minimize hazardous waste disposal, Fort Carson maximizes recovery of waste for reuse and recycles applicable materials according to the *Installation Recycling Plan* (Reference No. 158), *Pollution Prevention (P2) Plan* (also known as *the Waste Minimization Plan*) (Reference No. 159), and the ISWMP, (Reference No.156). The *Hazardous Waste Management Plan (HWMP)*, updated in September 2007, also supports waste reduction efforts and is currently being revised to incorporate additional sustainable principles. A description of the applicable management programs and plans implemented at Fort Carson is included in Appendix A.

3.12.1.1. Uses of Hazardous Materials

3.12.1.1.1. Cantonment Area

The principle industrial operations and activities involving the use of hazardous materials and petroleum-based products at Fort Carson are painting, repair and maintenance of vehicle and aircraft at the consolidated maintenance facility (Building 8000) and various other motorpools. Additionally, Fort Carson operates an IWTP, an Army Oil Analysis Program Laboratory (AOAPL), medical and dental facilities and engages in solvent recycling. All of the above activities represent the majority of the following hazardous waste generated at Fort Carson: paint thinner, paint booth filters, paint related rags and solvents, Chemical Oxygen Demand (COD) and laboratory reagents, heptanes, kerosene, methanol, ethanol and solvent distillation sludges.

As required by DoD policies, Fort Carson emphasizes integrated pest management. Pesticides and herbicides are required for insect and rodent control in select structures and in the control of undesired vegetation including noxious weeds (Reference No. 160).

Asbestos-containing materials were prevalent in building construction until the 1970s; although the use of asbestos has declined dramatically, asbestos is occasionally found in new building materials (Reference No. 161). Specifically, asbestos can potentially be found in floor tiles, pipe wrappings, ceilings, and insulation.

Lead-based paint is no longer used but may be found in older structures (Reference No. 162). Lead can potentially be found in chipped or cracking painted walls or in surrounding soils. Paint in liquid form can also contain hazardous lead concentrations.

Transformers manufactured prior to 1976 and light ballasts manufactured before 1979 are assumed to contain polychlorinated biphenyl (PCB) waste (Reference No. 163). There are 16 transformers and possible existing ballast light fixtures within the cantonment area that potentially contain PCB dielectric fluid (Reference No. 54). These transformers are scheduled for removal and proper disposal during a project to upgrade the electrical substation. Expected timeframe for removal is by the end of calendar year 2008. Ballast in light fixtures removed during renovations/demolitions are turned in to the Hazardous Waste Storage Facility (HWSF) for proper disposal.

3.12.1.1.2. Downrange Area

Butts Army Airfield

The principal industrial operations at BAAF involving the use of hazardous materials and petroleum-based products include the painting, repair, and maintenance of aircraft and their supporting wheeled ground vehicles. Aircraft maintenance hangars, one hot-refuel point, and one outdoor wash rack are utilized to perform standard vehicle maintenance. Additionally, painting operations are conducted at a paint booth within one of the old hangars.

Pesticides and herbicides are required for insect and rodent control in select structures at BAAF and in the control of undesired vegetation including noxious weeds (Reference No. 160). Lead-based paint and asbestos-containing materials may be found in older facilities at BAAF (Reference No. 54). Possible transformers and existing ballast light fixtures that potentially contain PCB dielectric fluid may also exist (Reference No. 164).

The only use of hazardous materials outside of BAAF in the downrange area is the use of petroleum-based products required during the repair and maintenance of vehicles and replacement of obsolete or malfunctioning targetry systems such as lifters that contain hydraulic fluids (Reference No. 155).

3.12.1.2. Storage and Handling Areas

3.12.1.2.1. Cantonment Area

Hazardous materials are stored securely in maintenance areas, flammable storage lockers/areas, and mobile transfer units (tank trucks) (Reference No. 159). Petroleum products are stored in numerous aboveground storage tanks (ASTs) within the cantonment area and include newly constructed contractor-owned, contractor-operated bulk and retail fuel facilities that provide fuel to all military units on Fort Carson. Three commercial gas stations are operated on Fort Carson and each station contains three USTs (Reference No. 159). Lists B-1 through List B-7 within the *Spill Prevention Control and Countermeasures Plan* (SPCCP*)* (Reference No. 165) provide a detailed chemical inventory and contain chemical storage locations areas within Fort Carson.

Lead-acid batteries are managed under the installation battery procurement and exchange program, whereby the vendor delivers new batteries in exchange for used batteries for recycle. Used batteries are stored at individual units and maintenance facilities until the vendor provides the exchange services, which usually occurs within 30 days.

Building 3708 is used to store and mix pesticides (Reference No. 165). Minor amounts of consumer pesticides are also stored and distributed at the commissary, Post Exchange, and the veterinary clinic (Reference No. 160).

3.12.1.2.2. Downrange Area

Butts Army Airfield

Petroleum-based products are stored in several ASTs and at the hazardous cargo loading area at BAAF located at the south end of the runway.

Ranges and Training Areas

Petroleum-based products used in the repair of malfunctioning targetry systems and service vehicles are stored at established locations throughout the downrange area including Buildings 9300, 9550, Range 123 and the MPRC.

Petroleum-based products used in the repair of malfunctioning military vehicles during maneuvers are stored at various locations throughout the downrange area. Each of these areas are inspected and cleared of materials and debris at the conclusion of each tactical exercise.

3.12.1.3. Waste Disposal

All hazardous waste generated at Fort Carson (including the cantonment and downrange areas, and BAAF) is transported to the (HWSF, Building 9248, for storage and eventual shipment offsite for proper disposal. Currently, there are seven satellite accumulation points (SAPs) on Fort Carson for the collection and temporary controlled onsite storage of hazardous waste (Reference No. 54).

The installation has no active landfills, and all sanitary waste is disposed of off-post at commercial landfills (Reference No. 156).

3.12.1.4. Site Contamination and Cleanup

Fort Carson is not listed on the EPA's *National Priority List* (NPL), which designates high-priority cleanup sites under the *Comprehensive Environmental Response Compensation and Liability Act* (CERCLA), more commonly known as the *Superfund Program*. Investigation and cleanup of Fort Carson is conducted under the Corrective Action portion of their RCRA Part B Permit (#CO-06-09-29-01).

Investigation and cleanup of Fort Carson's contaminated sites is conducted in accordance with the RCRA Part B permit requirements. Typical contaminants of concern include organics (solvents, petroleum hydrocarbons, etc.), explosives residues (trinitrotoluene [TNT], cyclotrimethylenetrinitramine [RDX], etc).

For the 170 Solid Waste Management Units (SWMUs) within *Fort Carson's Corrective Action Program*, site investigation and cleanup are being performed in accordance with applicable Army, state, and federal requirements to achieve established cleanup goals and schedules.

Figure 3.12-1 shows the location of SWMUs at Fort Carson, regardless of cleanup status, at the cantonment area, BAAF, and downrange area.

To the extent practical, all SWMUs are avoided during construction projects. Fort Carson manages the SWMUs according to all federal, state, and local regulations, and Fort Carson's RCRA Part B permit (Appendix A).

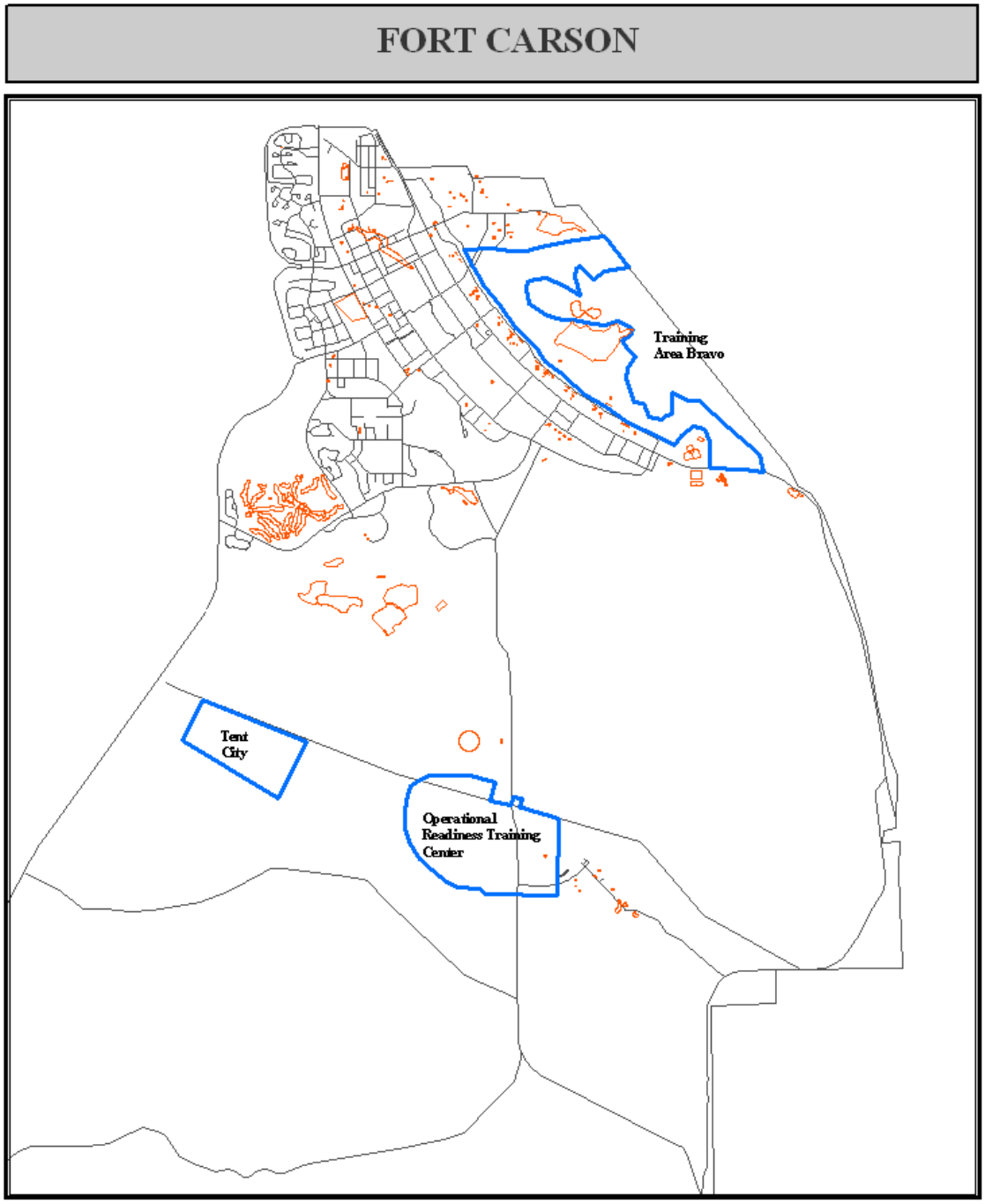
3.12.1.5. Special Hazards

3.12.1.5.1. Cantonment Area

The cantonment area is an area of high concern for radon potential (Reference No. 54) and requires monitoring and engineering precautions to limit radon exposure. Unserviceable components are sent off-post for repair or disposal Building 8000 is over 1 mile from existing and proposed family housing sites (Reference No. 54). The *Radioactive Materials Management Plan* (Reference No. 166) for Fort Carson provides the requirements for handling these materials.

3.12.1.5.2. Downrange Area

Ammunition is stored at the ASP located just north and east of Townsend Reservoir and is classified as Class V material according to the Army's supply categories. The ASP contains 20 standard ammunition storage igloos, two aboveground magazines, the ASP office, and a utility building (Reference No. 167). Lead is found at gun and artillery practice ranges where lead munitions are used (Reference No. 168). UXO is found in the large impact area, which is the only authorized area on Fort Carson where dud-producing ammunition can be fired. UXO deemed unsafe to detonate in place are transported to Range 121 for treatment via open detonation (OD). The OD unit is currently operating in interim status while a Subpart X permit is being prepared by CDPHE.



Legend
SWMU's

Figure 3.12-1 Solid Waste Management Units at Cantonment, Butts Army Airfield, and Downrange Area

3.12.2. Environmental Consequences

The following discussions describe elements of the Proposed Action and alternatives including the environmental analysis performed, that are common to all the scenarios.

3.12.2.1. Proposed Action and Alternatives

Adding personnel as projected under the Proposed Action would result in an increase in the use of hazardous materials and subsequent generation, handling, storage, and disposal of hazardous waste. An increase in minor spills would be anticipated, but due to extensive outreach and training efforts on spill prevention, major site contamination and cleanup or other special hazards resulting from increases in personnel would not be anticipated at the cantonment or downrange areas. All parties would continue to implement the *P2 Plan*, HWMP, SPCCP, and the *Installation Pest Management Plan* (Reference No. 160) for waste minimization, spill prevention, and proper hazardous waste management. No additional mitigation actions with regard to use of the hazardous materials and subsequent generation of hazardous wastes would be necessary if the Proposed Action were implemented.

The training of an additional IBCT and potential CAB would result in an increase in special hazards as described as follows. No changes would occur to the use of hazardous materials, storage and handling areas, waste disposal or site contamination, and cleanup resulting from additional training. Under the Proposed Action, existing management plans would continue to be followed and would be updated as necessary, as described further in Section 3.12.2.2.

Construction and operation of facilities as projected under the Proposed Action would result in an increase in the use of hazardous materials and petroleum-based products at the cantonment area, BAAF, and downrange area.

Construction and operation of facilities projected under the Proposed Action would result in a potential increased risk in the cantonment and downrange areas to the exposure of naturally occurring radon. All parties would continue to implement the *Radon Management Plan* (Reference No. 169) in all new facilities and would comply with indoor air monitoring and radon remediation technology, and no additional mitigation actions would be necessary if the Proposed Action were implemented.

3.12.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center

3.12.2.2.1. Cantonment Area

The increase in construction and operations would result in an increase in the use of hazardous materials and subsequent generation and disposal of hazardous waste, site contamination and cleanup, and special hazards. No changes would occur to the storage and handling areas or waste disposal resulting from increases in construction and operation. Under the Proposed Action, existing management plans would continue to be followed and would be updated as necessary. Increases in waste volume associated with the Proposed Action would be managed by corresponding increases in the number of personnel at the hazardous waste storage facility who would be assigned to handle and manage the additional waste.

Special Hazards

Construction and operation of facilities projected under the Proposed Action would not result in an increase in the production of radiological materials within the cantonment area from the construction of combat service support unit facilities. Operational management of radiological materials are conducted in accordance with the existing *Radioactive Materials Management Plan for Fort Carson* (Reference No. 166).

Use of Hazardous Materials

Construction, demolition and operation of facilities as projected under the Proposed Action would result in an increase in the generation of lead, asbestos, PCBs, and chlorofluorocarbon wastes within the cantonment area. Demolishing unused buildings to construct facilities and upgrading utilities would be potential sources for generating these wastes Fort Carson would continue to implement the *Asbestos Management Plan* (Reference No. 161), *Lead Management Plan* (Reference No. 161), and *PCB Management Plan* (Reference No. 163) for handling, transporting, and disposing of these wastes.

Site Contamination and Cleanup

Construction of facilities as part of the Proposed Action may result in the disturbance of SWMUs within the cantonment area. If construction within the boundary of a SWMU were proposed, coordination with the *Installation Restoration Program* including consultation with CDPHE, would be required to address design features, avoidance measures, or other aspects of construction project siting to avoid or minimize disturbance of existing contaminated sites and prevent new spills.

3.12.2.2.2. Downrange Area

Operational Readiness Training Center

Use of Hazardous Materials

Construction and operation of facilities as projected under the Proposed Action would result in an increase in the use of hazardous materials and petroleum-based products Vehicle maintenance and storage facilities would be constructed and used for vehicle storage to perform routine oil changes and lubes, wash-downs, and refueling. Hazardous wastes typically generated from construction activities and vehicle maintenance operations are described in the Part B Permit (Attachment 3 *Waste Analysis Plan*, September 2006). Petroleum products and used oil would be stored in ASTs. Fort Carson would continue to implement the *P2 Plan* (Reference No. 159), *Hazardous Waste Management Plan* (Reference No. 170), SPCCP (Reference No. 165), and FC Regulation 200-1, Chapter 13 (USTs and ASTs) for waste minimization efforts, hazardous waste management procedures, and spill prevention measures.

Fort Carson would continue to implement the *Asbestos Management Plan* (Reference No. 161), *Lead Management Plan* (Reference No. 166), and *PCB Management Plan* (Reference No. 160) for handling, transporting, and disposing of these wastes.

Butts Army Airfield

Use of Hazardous Materials

Construction, demolition and operation of facilities as projected under the Proposed Action would result in an increase in the generation of lead, asbestos, PCBs, and chlorofluorocarbon wastes at the BAAF. Demolishing unused buildings to construct facilities and upgrading utilities would be potential sources for generating these wastes.

Fort Carson would continue to implement the *Asbestos Management Plan* (Reference No. 161), *Lead Management Plan* (Reference No. 166), and *PCB Management Plan* (Reference No. 160) for handling, transporting, and disposing of these wastes.

Site Contamination and Cleanup

Construction of facilities as part of the Proposed Action may result in the disturbance of SWMUs at the BAAF. If construction within the boundary of a SWMU were proposed, coordination with the *Installation Restoration Program* including consultation with CDPHE, would be required to address design features, avoidance measures, or other aspects of construction project siting to avoid or minimize disturbance of existing contaminated sites and prevent new spills.

Ranges and Training Areas

Use of Hazardous Materials

Increased use of hazardous materials and subsequent generation of hazardous waste at the downrange area would occur at the qualification training ranges and urban assault course. Fort Carson would continue to implement the *P2 Plan* (Reference No. 159), *Hazardous Waste Management Plan* (Reference No. 170), *SPCCP* (Reference No. 165), and FC Regulation 200-1, Chapter 13 (USTs and ASTs) for waste minimization efforts, hazardous waste management procedures, and spill prevention measures.

Special Hazards

The training of an additional IBCT and potential CAB as projected under the Proposed Action would result in an increase in special hazards, specifically munitions and UXO. Fort Carson's munitions storage areas would accommodate the increased storage requirement of the additional throughput on existing ranges, range construction, upgrades, and improvements.

Fort Carson would continue to implement the *ASP SOP* (Reference No. 171) for storage and transportation of additional munitions. The designated Installation Explosives Ordnance Detachment (EOD) would continue to respond to discoveries of UXO for safe open detonation either in place or at Range 121.

3.12.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Facilities at Training Area Bravo Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

A change in location of proposed facilities and operations would not impact hazardous and toxic substances differently. Impacts would be the same as for the Proposed Action.

3.12.2.4. Alternative 2 – Construction of Infantry Brigade Combat Team Facilities at Tent City Site and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

A change in location of proposed facilities and operations would not impact hazardous and toxic substances differently. Impacts would be the same as for the Proposed Action

3.12.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers at Fort Carson would continue in accordance with BRAC 2005, GDPR, and AMF, as discussed in the 2007 Fort Carson Transformation EIS. Projects and activities proposed in the 2007 Fort Carson Transformation EIS are included as part of the No Action Alternative. Many of the actions proposed in 2007 have not yet been implemented, however, their impacts have been included as part of this No Action Alternative.

The No Action Alternative would result in no additional personnel, training, or construction and operation at Fort Carson beyond those actions covered in the 2007 Fort Carson Transformation EIS. Fort Carson would continue to comply with applicable laws and regulations and implement the BMPs described in the management plans and programs listed in Appendix A. Therefore, no impacts due to the use and storage of hazardous materials and subsequent generation and disposal of hazardous waste or creation of special hazards are anticipated under the No Action Alternative.

3.12.2.6. Mitigation Measures

Fort Carson would continue to implement all hazardous and toxic substance related management plans.

If construction of facilities result in disturbance of SWMUs, coordination with Installation Restoration and CDPHE, would be conducted to address design features, avoidance measures, and other aspects of construction project siting.

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3.13. Sustainability at Fort Carson

This section describes the existing Fort Carson sustainability initiatives that derive from Fort Carson's adoption of *25-Year Sustainability Goals* in 2002 and the Army's 2004 Strategy for the Environment, which emphasizes a triple bottom line of *Mission*, *Environment* and *Community*. According to the Army's Strategy, "a sustainable Army simultaneously meets current as well as future mission requirements worldwide, safeguards human health, improves quality of life, and enhances the natural environment," (Reference No. 172).

Fort Carson's 25-Year Sustainability Goals represent a sustainable development approach for both current operations and future planning. The goals specifically call for achieving the following performance levels by 2027:

- Training Lands: Training ranges are capable of supporting current and future military training to standard.
- Energy: Sustain all facility and mobility systems from renewable sources with the capacity to generate all facility energy on post.
- Water: Total water purchased from outside sources will be reduced by 75 percent from the 2001 baseline.
- Procurement: All DoD and Fort Carson procurement actions support sustainability by 2027.
- Transportation: Reduce automobile dependence and provide balanced land use and transportation systems.
- Land Use: Further integrate sustainability principles into the Fort Carson land use planning, Real Property Master Planning, and MILCON, Military Construction Army (MCA) programming processes.
- Buildings: All applicable facilities at Fort Carson will be high performance buildings that meet or surpass the Platinum Standard of SPiRiT or Leadership in Energy and Environmental Design (LEED) by 2027.
- Solid and Hazardous Wastes: The total weight of solid and hazardous waste disposed of is reduced to zero.
- HAPs: The total weight of HAP emissions is reduced to zero.

Fort Carson also adopted a *Sustainability and Environmental Management System* (SEMS) to manage compliance and performance. To support the goals and the SEMS, Fort Carson's sustainability experts created a *Sustainable Development Checklist* as a "Smart growth" evaluation tool for area and site planning and development.

The following section describes the existing conditions at Fort Carson for each of these initiatives. It also includes an evaluation of the environmental consequences for these initiatives from additional personnel, construction, increased training, and operation of new facilities under the Proposed Action and the alternatives.

3.13.1. Affected Environment

This section addresses the mission and sustainability goals for Fort Carson training lands, energy, water, procurement, transportation, land use, buildings, solid and hazardous waste, hazardous air emissions, community of one and partnership, and SEMS Training.

3.13.1.1. Training Lands

As part of the Army's training mission requirements, Fort Carson must maintain and maximize training land use in order to achieve and maintain mission readiness now and in the future.

The Army uses the *Sustainable Range Program* to improve the way it designs, manages, and uses ranges and to ensure that current and future doctrinal requirements are met. The goal of the *Sustainable Range Program* is to maximize the capability, availability, and accessibility of ranges and training land to support training and testing requirements. It consists of two core programs: the *Range and Training Land Program*, which consists of range modernization and range operations, and the ITAM program, which consists of land management, rehabilitation, and maintenance activities. The ITAM program essentially acts as an ongoing mitigation program for Army training and testing activities by repairing and preventing damage to soils and maintaining vegetative cover. It is the Army's formal strategy for focusing on sustained use of training and testing lands, and it provides the Army with the sound planning and execution mandatory to protect Army land as an essential asset for training. The intent of the ITAM program is to provide a uniform training land management capability across the total Army in order to manage its lands in a manner to ensure no net loss of training capabilities and to support current and future training and mission requirements. The integration of stewardship principles into training land and conservation management practices ensures that the Army's lands remain viable to support future training and mission requirements. ITAM establishes a systematic framework for decision-making and management of Army training lands. It integrates elements of operational, environmental, master planning, and other programs that identify and assess land use alternatives. The ITAM program also supports sound natural and cultural resources management practices and stewardship of land assets while sustaining those assets to support training, testing, and other installation missions. ITAM is governed by AR 350-19 and FC Regulation 350-9 (Reference No., 173 and 174, respectively).

In addition to proper management and rehabilitation protocols for training lands at Fort Carson, the installation is actively involved in the ACUB program. ACUB establishes buffer areas around Army installations to limit effects of encroachment by incompatible private development and maximize available post land in support of the installation's mission. At Fort Carson, the ACUB Program has leased approximately 65,000 acres along 15 miles of the perimeter of the installation under annual conservation easement leases through the spring of 2009. In addition, approximately 16,000 acres of permanent conservation easements are held under this program. The Nature Conservancy serves as a main Fort Carson ACUB partner holding leases and easements and negotiating requirements of these land transactions. El Paso County is also a valued ACUB partner, negotiating, purchasing, and managing fee interests in numerous properties near the eastern border of Fort Carson that would otherwise be developed as residential sites.

3.13.1.2. Energy

The *Army's Strategy for the Environment* guides all Army installations to improve energy efficiency and pursue renewable energy sources from new and on-installation sources. In addition, EO 13423 (Reference No. 175) requires the federal government to reduce its energy intensity annually.

Fort Carson's sustainable energy goal is to use 100 percent renewable energy. The installation began on-post generation of solar energy with the development of a 2-megawatt solar photovoltaic system that annually produces enough energy to power 540 Fort Carson homes. The solar array, the sixth largest solar project in the US at the time, was completed in early 2008.

In fiscal year 2007, total energy consumption for Fort Carson was reduced by 8.36 percent from the fiscal year 2003 baseline. This energy reduction was partly the result of improved energy efficiency in all new buildings on the installation (the Army's current design standard is for new facilities to achieve 30 percent less energy use than current building codes). These energy efficient buildings comply with LEED Standard Silver guidelines, which are provided in more detail as follows.

As part of the sustainable energy goal, a 50-meter meteorological tower and a sonic detection and ranging system have been installed in the southeastern portion of Fort Carson in order to analyze wind energy potential on the installation.

Another future sustainable energy action is to implement a detailed energy survey under an Energy Savings Performance Contract (ESPC) and initiate several projects that are cost effective such as lighting retrofits and utility control system expansions.

3.13.1.3. Water

As part of Fort Carson's sustainability goals, the installation aims to reduce water use by 75 percent from outside sources within 25 years. Fort Carson reduced its annual water use by 45.9 percent between fiscal year 2002 and fiscal year 2007.

Fort Carson's water conservation success is attributed to the reuse of non-potable water to irrigate various sites, such as the golf course. Over 90 rain sensors were installed in a two-year period, reducing water consumption by approximately 80,000 million gallons per year.

Facility improvements, such as the installation of waterless urinals and energy efficient clothes washers in barracks also contribute to purchased water reduction.

The Stormwater Program for Fort Carson and PCMS is being managed on a watershed scale rather than on a site-by-site basis. This enables a more comprehensive understanding of how the processes in the hydrologic cycle are connected, which facilitates more effective, sustainable watershed management versus compartmentalized assessment. Low-impact design development therefore is encouraged for all construction projects.

3.13.1.4. Procurement

The goal is to achieve 100 percent sustainable procurement by 2027, which will minimize long-term cost/budget impacts and negative impacts on global natural capital. Under this initiative, Fort Carson is currently using 95 percent environmentally-friendly cleaning products at Evans Army Community Hospital. A *Medical Department Activity (MEDDAC) Plan* requires Soldiers to follow *LEED Standard Silver Guidelines* for products used in new MEDDAC barracks.

Fort Carson has also increased the use of higher-post-consumer-recycle-content and chlorine-free office paper. Fort Carson is implementing a *Sustainable Procurement System* that will focus on 15 products or services to fiscal year 2012 and development of tools/systems that will help procurement actions achieve sustainability performance. These initiatives support the DoD *Green Procurement Policy* (Reference No. 176) and the sustainable procurement requirements of EO 13423.

3.13.1.5. Transportation

EO 13423 set the goal of reducing petroleum use and an increasing the use of alternative fuels. Fort Carson's 2027 *Sustainable Transportation Plan* aims to reduce automobile use by 40 percent and to provide an innovative alternative transportation system to support all of the sustainability goals (renewable energy, reducing HAPs, etc.). A short-term objective is to reduce single-occupancy vehicles 25 percent per capita by 2012.

At Fort Carson, large-scale roadway improvements and realignments have recently occurred to reduce traffic bottlenecks. In addition to reducing traffic congestion on the installation, Fort Carson has committed to helping state and regional transportation agencies in the development of transportation projects in the surrounding community that directly effect Fort Carson traffic flow.

Fort Carson's Transportation Motor Pool administrative fleet currently maintains 48 percent alternatively fueled vehicles (AFVs), though it should be noted that only gasoline hybrids actually reduce fuel consumption per mile. The Transportation Motor Pool administrative fleet has seen a 50 percent reduction in the number of vehicles using unleaded fuel; while the number of AFVs in the fleet using E-85 fuel has jumped from 23 to 143 in 5 years.

A public transit system is being planned (to be completed early fiscal year 2009) for personnel traveling around the cantonment area. Smart-growth land development reduces dependency on automobile, increases access to the community, reduces congestion, and improves physical activity and health through walkability (Section 3.2).

As part of its *Sustainable Transportation Plan*, Fort Carson is analyzing a Personal Rapid Transit (PRT) system that might be constructed for future use within the cantonment area and connected to appropriate destinations in the community. This type of rapid transit system is estimated to use ten times less energy per passenger mile than present automobiles.

3.13.1.6. Land Use

Sustainability goals adopted by Fort Carson aim to avoid 'sprawl' development that increases life-cycle infrastructure costs and degrades overall quality of life on the installation. Proper land use planning is critical for smart growth and helps protect the training lands, open space, and unique ecological habitats of Fort Carson. Master Planning and SEMS personnel evaluate sites for development including the

following smart growth principles in the *Fort Carson Sustainable Development Checklist* for area planning and development:

- Proximity to infrastructure and services
- Protection of land
- Development density/mixed land use
- Transportation options

As part of a sustainable land use plan, Fort Carson aims to make the most of limited public resources and builds on public investments already made. A site is more sustainable if it is developed in close proximity to existing utility and road infrastructure. As distance from the existing infrastructure increases, the less sustainable a site becomes and the more economic and material resources are required for construction and operations of the site. The co-location of various buildings also facilitates co-use of existing utilities (water lines, gas lines, electricity, etc.).

Another critical aspect of the sustainable land use initiative at Fort Carson is the preservation of open space and ecologically valuable lands. Land protection conserves environmentally sensitive areas, watersheds, important habitat, urban forest, and other green infrastructure. By creating high-density development in the cantonment area, this allows more open space to remain undisturbed. This type of sustainable land use is also correlated with the sustainability initiative for training lands due to the lower risk of development encroachment onto training lands.

Smart growth land use creates high-density, mixed use areas to reduce square footage per acre of development. The cantonment area is designed for high density co-mingled living facilities that are in close proximity to ancillary facilities (e.g., banks, commissaries). This smart growth design also promotes mass transit, improves walkability and provides critical density to support current and future transit needs.

3.13.1.7. Buildings

Fort Carson has established a goal for all applicable facilities for high performance buildings that meet or surpass the *LEED Standard Platinum Guidelines* by 2027. Currently, all new buildings at Fort Carson are designed to achieve LEED Silver ratings while achieving a 30 percent energy savings from current building codes. Achieving energy savings includes integrating applications such as more efficient heating, ventilating, and air conditioning (HVAC) systems, increased amounts of insulation, proper facility orientation, and installing advanced lighting systems. New Brigade and Battalion Headquarters

being constructed are designed to maximize the use of natural daylight and solar efficiency. As previously mentioned, water-conserving fixtures will be installed in these new facilities. Such water-conservation LEED design standards include drip irrigation systems, water-less urinals, water efficient appliances, and xeriscaping on the grounds surrounding these buildings.

LEED ratings also support the storage and collection of recyclable materials. Fort Carson is using recycled-content construction materials on a new headquarters building along Specker Avenue. This building is also designed to maximize open space and energy efficiency.

Fort Carson's Sustainable Development Checklist further evaluates the sustainability of new facilities in terms of the durability of construction materials and interior furnishings (wall systems, roofing materials, etc). Many of the materials used in construction also have established requirements for a minimum content of recycled materials. Fort Carson is using recycled-content construction materials in construction of several facilities including the new headquarters building. Facilities are also being designed with locations in each facility to collect recyclables.

Department of Army policy requires a minimum of 50 percent of construction debris waste be recycled. Construction of new facilities must meet this requirement. Most construction projects on Fort Carson divert, at minimum, concrete, metals, and asphalt.

Water conservation is another area of focus when designing new facilities. Water-conserving fixtures will be installed in new facilities.

Installation of renewable energy systems for facilities is not pursued in most cases due to high initial costs. When designing and constructing new facilities, however, potential renewable energy systems are being considered. Where feasible, orientation of the long axis of a facility to face south is an important requirement that helps for future solar and daylighting applications. New Brigade and Battalion Headquarters being constructed are designed to maximize the use of natural daylighting and solar efficiency.

3.13.1.8. Solid and Hazardous Waste

Fort Carson's sustainability goal aims to reduce the total weight of solid and hazardous waste disposed to zero by 2027.

Solid and hazardous waste reduction achievements at Fort Carson include a fiscal year 2007 addition of a recycle/refuse Post Exchange collection point. In fiscal year 2007, the installation saved $582,000 in landfill fees by recycling. The current estimated solid waste recycling rate at Fort Carson is 42 percent.

All new site designs are evaluated to provide accessibility to recycling, composting, or other waste removal options.

3.13.1.9. Hazardous Air Pollutants

As part of *Fort Carson's 25-Year Sustainability Goals*, the total weight of HAPs is to be reduced to zero. Approximately 80 percent of the HAPs emissions generated by Fort Carson are from transportation activities.

In order to achieve this goal, an installation-wide mobile emissions tracking system was created to evaluate fleet vehicle emissions on an annual basis. Each mile of travel in an auto represents 450 grams of HAPs emissions (benzene, acrolein, acetaldehyde, 1,3 butadiene, formaldehyde, carbon dioxide). These emissions could be dramatically reduced through proper implementation of transportation and sustainability planning.

Fort Carson has also started a transition, wherever possible, of all products containing HAPs to those without HAPs. Further analysis is being done to replace products containing VOCs with those containing less reactive or non-reactive organic compounds. Use of low/no VOC- and HAP-containing paint products for paint stripings are encouraged through *Fort Carson's Sustainable Development Checklist*. Also, the checklist encourages low NO_x and low SO_x emitting HVAC systems.

3.13.1.10. Community of One and Partnerships

The SEMS is not just an environmental program (sustainability can be defined as maximizing both social and environmental performance of an organization), and its benefits will reach outside Fort Carson boundaries. The system will drive sustainability performance by making sustainable actions and thinking a part of everyone's daily job responsibilities. For this reason, one of Fort Carson's sustainability goals is to improve communication and encourage external stakeholder input from the Pikes Peak regional community.

Fort Carson is working with various community leaders, organizations and resource users in the region to promote sustainable development. These "Community of One" partnerships are designed to assist Fort

Carson's achievement of its sustainability goals and to help the region capture the quality of life and economic advantages offered by sustainability.

The PPACG is another critical partner in helping local governments to understand the likely economic, social, and other impacts resulting from the additional Soldiers to be stationed Fort Carson over the next 5 years, through its *Military Impact Planning Program* (www.ppacg.org).

Fort Carson initiated the *Pikes Peak Sustainability Indicators Project* (PPSIP) in 2003 to educate the regional stakeholders on the installation's sustainability goals and about the importance of using sustainability indicators on a regional basis to promote sustainable development of southeastern Colorado (report available at www.ppacg.org).

Organizations collaborating with Fort Carson to promote regional sustainability include many local governments, state government, federal government agencies, plus the following regionally based non-profits or educational institutions.

- Educational Institutions:
  - 1-1 The University of Colorado in Colorado Springs
  - 1-2 Colorado State University, Pueblo
  - 1-3 Colorado College
- Organizations:
  - 1-4 Colorado Association for Recycling
  - 1-5 Colorado Alliance of Sustainable Business Associations
  - 1-6 Clean Cities Coalition
  - 1-7 Climate Change Coalition
  - 1-8 The Nature Conservancy
  - 1-9 Southern Colorado Chapter, US Green Building Council
  - 1-10 Southern Colorado American Institute of Architects
  - 1-11 Sierra Club
  - 1-12 Catamount Institute
  - 1-13 Peak to Plains Alliance
  - 1-14 SouthEast Colorado Renewable Energy Society
  - 1-15 Green Cities project of the Pikes Peak Peace and Justice Coalition

3.13.1.11. Sustainability and Environmental Management System Training

Under this goal, Fort Carson aims to provide sustainability training to both internal and external stakeholder groups in order to promote compliance and motivation in sustainability practices.

SEMS training is currently provided to all military and civilian staff at Fort Carson via monthly installation newspaper columns and email. In addition, SEMS Awareness Training is available online to all personnel at Fort Carson and is required annually. SEMS Competence Training is provided every 2-3 years to management personnel. Army units of approximately battalion size will be developing their own SEMS systems and training for system performance throughout fiscal year 2009.

SEMS training for Fort Carson personnel and community stakeholders is intended to produce a culture throughout Fort Carson and the surrounding community that values sustainability. The SEMS training program is designed to create an awareness of:

- The importance of conforming to the *Sustainability and Environmental Policy*.
- The significant sustainability (environmental and social) aspects of work activities and the benefit of improved personal performance.
- Roles and responsibilities in the SEMS and for emergency preparedness and response to environmental spills and accidents.
- The operational controls that are in place to ensure the proper management of environmental and social aspects associated with duties and the potential consequences of not following specified controls.
- The importance of global sustainability and individual actions that promote it.
- The sustainability strategies, policies, and procedures of the US government (especially the DoD and Army) and local governments relevant to the installation.

3.13.2. Environmental Consequences

This section describes the environmental consequences of each siting alternative in relation to *Fort Carson's Sustainability Goals* as described in Section 3.13.1.

3.13.2.1. Proposed Action and Alternatives

Several *Fort Carson Sustainability Goals* would be equally affected by the Proposed Action and alternatives due to either being installation-wide policy or procedural based. Example goals meeting these criteria include Energy, Water, Procurement, Buildings, Solid and Hazardous Waste, Community of

One Partnerships, and SEMS Training. *Sustainability Goals* that would be affected by the different siting alternatives include Training Lands, Transportation, Land Use, and HAPS. A discussion of the *Sustainability Goals* that are equally affected by the Proposed Action and alternatives is presented in this section. *Sustainability Goals* that are impacted differently by each of the siting alternatives is addressed separately in Sections 3.13.2.2 through 3.13.2.4. Table 3.13-1 provides a general comparison of each *Sustainability Goals* relative to each siting alternative as determined by Fort Carson sustainability staff. The results of this comparison are described in more detail in subsequent sections.

Table 3.13-1 Proposed Action Versus Alternatives Sustainability Performance Comparison

Sustainability Goal	Proposed Action Operational Readiness Training Center	Alternative 1 (Training Area Bravo)	Alternative 2 (Tent City)
Training Lands	◔	◑	◔
Energy	◔	◔	◔
Water	◔	◔	◔
Procurement	●	●	●
Transportation	◔	◕	◔
Land Use	○	◑	○
Buildings	◑	◑	◑
Solid and Hazardous Waste	◔	◔	◔
Hazardous Air Pollutants	◔	◑	◔
Community of One and Partnerships	●	●	●
Sustainability and Environmental Management Systems Training	●	●	●

● Full Conformance ◕ Substantial Conformance ◑ Partial Conformance ◔ Nominal Conformance ○ Non-Conformance

Energy

All facility sets would have the same energy requirements and design standards regardless of specific development location. Therefore, no distinct advantage exists among the Proposed Action and the alternatives.

In accordance with the Army's sustainability standards, the new IBCT and CAB facility designs would meet fundamental energy efficiency requirements for the *LEED Silver Ratings* (Reference No. 176).

Each siting alternative has potential renewable energy opportunities (passive/active solar, geothermal). Renewable energy, however, is not currently proposed as part of the design to power these new facilities.

Despite the *LEED Silver Energy Design*, this action would not meet Fort Carson's 100 percent renewable energy goal because of the lack of renewable energy use. Therefore, all three alternatives would be nominal with the installation's energy goal.

Water

Facilities would have the same water requirements and design standards regardless of specific development location. The Soldier and civilian population is the same regardless of which site is chosen. Therefore, no distinct advantage exists among the Proposed Action and the alternatives.

Water efficiency design standards would be used in the development of the IBCT and potential CAB facilities to satisfy *LEED Silver Ratings*. Water efficient appliances, water-less urinals, and single-bay motor pools would all help to reduce water use for these facilities. Although Fort Carson has reduced water consumption rates by 45.9 percent since 2002 (Reference No. 154), these rates would still increase due to an increase in population as described in Section 3.11. Therefore, the Proposed Action and the alternatives would immediately have an adverse affect Fort Carson's 75 percent water use reduction goal. Through pursuit of additional water conservation technologies and implementing water use BMPs, however, the installation could still feasibly achieve the 2027 water use reduction goal. Therefore, all three alternatives would nominally conform.

Procurement

Green procurement would not be influenced by the specific development location as the 100 percent sustainable procurement goal is an installation-wide process. Therefore, no distinct advantage exists between the Proposed Action and the alternatives. All three alternatives are anticipated to conform.

Buildings

Sustainable building performance is not expected to differ among the Proposed Action and the alternatives. Materials and resources used to develop construct facility sets would meet *LEED Silver Ratings*. As previously mentioned, these facilities could potentially be designed for renewable energy use.

Although the LEED Silver ratings would comply with the Army's sustainability goals, they would not meet Fort Carson's sustainability goal of *LEED Platinum Ratings*. Therefore, the Proposed Action and alternatives would partially conform.

Solid and Hazardous Wastes

Increase in solid and hazardous waste generation would be commensurate with the increase in Soldier and civilian populations under the Proposed Action and alternatives.

There is no reason to anticipate a per capita increase in solid waste and recycling generation as a result of the increases in personnel. However, there would be overall increases in both.

While the Proposed Action and the alternatives are anticipated to increase solid and hazardous waste generation, Fort Carson's goal of zero solid and hazardous waste generation would still be achievable by 2027. Fort Carson's existing management practices would still be in place. Therefore, the Proposed Action and the alternatives would nominally conform.

Community of One Partnerships

There is no substantial difference in the three siting alternatives. All would result in continued conformance with this goal.

Sustainability Training

There is no difference between the Proposed Action and alternatives for Fort Carson's 100 percent sustainability training goal. Sustainability training would continue in order to reduce community and regional negative social impacts that may be associated with population growth on the installation. The Proposed Action and the alternatives would not likely change the present sustainability training commitments. Providing training and monitoring compliance with the training requirement would require additional resources. Therefore, the Proposed Action and the alternatives would continue to result in conformance.

3.13.2.2. Proposed Action – Construction of Infantry Brigade Combat Team and Combat Aviation Brigade Facilities at Operational Readiness Training Center Site

3.13.2.2.1. Training Lands

The ORTC footprint is currently used as training area for TUAVs and a night-vision course for rotary-winged aircraft. Construction of IBCT facilities and potential CAB barracks within the ORTC footprint would require the removal of the TUAV training facility and movement of the TUAV training function to a separate range. This construction would also adversely affect night-vision training for BAAF aircraft due to increased lighting associated with a brigade-sized building complex.

Implementation of the Proposed Action would replace existing training area with administrative and operational uses. This would result in a net loss of training lands and additional pressure on existing training ranges, which could cause scheduling challenges and/or training area overuse. These potential impacts could compromise some unit METL training, and limit range rehabilitation programs.

The IBCT facilities and CAB barracks would be co-located, which would reduce support facility needs. The co-use of facilities between the IBCT and CAB personnel would reduce overall developed acreage, leaving more open space for training land at other locations. Co-use of support facilities, such as dining facilities, physical fitness facilities, and child development centers, supports the sustainable development strategy.

The Proposed Action supports the sustainability goal of training lands because it would require less of an overall footprint for personnel and operational facilities than if the IBCT and potential CAB were placed in separate locations. In contrast, though, use of this site encroaches on other training lands in the downrange area, which does not support the sustainability goal because it causes a net loss of training land. Thus, the Proposed Action only nominally supports the sustainability goal for training lands.

Land Use

The Proposed Action would not receive any LEED site placement points because the new IBCT/CAB facilities would be built on previously undeveloped land. Selection of the ORTC site would not promote sustainable development standards of high density development because it is more than 6 miles away from the cantonment area.

This site would require significant extension of existing utility lines (Section 3.11.2.2.2) and, thus, would not promote sustainable land use.

Mass transit system opportunities would not be encouraged under the Proposed Action due to significant population dispersions between the cantonment area and the ORTC site. Any mass transit system used in the cantonment area would not benefit from the demands of the additional IBCT and CAB personnel.

Transportation

Fort Carson's sustainability goal of 40 percent reduced automobile dependency would not be supported under the Proposed Action. According to the *2008 Traffic Plan*, an additional 6,250 trips would be made daily to Fort Carson and an additional 6,600 trips specifically to Wilderness Road. Many of these POVs are anticipated to drive the approximate 11-mile roundtrip from the ORTC to the cantonment area for ancillary facilities (e.g., restaurants, banks, commissary, etc.). Not only does the locating of the IBCT and potential CAB facilities at the ORTC increase dependence on vehicle transport, it would also cause an adverse impact in regard to HAPs.

A mass transit system for the Wilderness Road area is unlikely to occur due to the lack of population density. Additionally, the stationing of 6,700 Soldiers downrange does not support mass transit expansion within the existing cantonment area. Additionally, other stationing of Soldiers along Wilderness Road or the airfield area in the future would provide greater density of residents and workers that may cost-effectively support mass transit service.

Gate improvements for Gates 6 (SH 115) and 19 (I-25 exit 128) would potentially be required to handle the increased traffic volumes associated with the additional Soldiers and other personnel. Also in consideration under the Proposed Action is a road expansion at the intersection of Wilderness Road and SH 115 and along Charter Oak Ranch Road. Such improvements would not support Fort Carson's sustainable development principles for the transportation infrastructure, as it does not reduce automobile dependency or the average daily commute miles and does not provide for alternative means for travel.

One benefit to the locating of facilities at the ORTC is the proximity to training lands in the downrange area. As part of the federal government's sustainability goals of EO 13423, there must be a reduction in fleet petroleum use by 2 percent per year and an increase in fleet biofuels use 10 percent per year. The IBCT unit's tactical vehicle fleet would be approximately 6.5 miles closer to downrange training areas than from Alternative 1 (Training Area Bravo), which would reduce tactical fleet fuel consumption since

there are approximately 960 vehicles in an IBCT unit and most vehicles have significantly lower fuel economies than most POVs.

The CAB is already in existence and is stationed at another installation. Therefore, no net change in petroleum use on the Army-wide level would occur for the CAB fleet. On the other hand, the ORTC's proximity to BAAF would enable CAB personnel to walk to and from work; which would assist in reducing vehicle dependency at Fort Carson.

Other than the potential decrease in petroleum consumption, the other above factors do not support *Fort Carson's Transportation Sustainability Goal*. Therefore, the Proposed Action only nominally supports this goal.

Hazardous Air Pollutants

Emissions from construction, operations and maintenance activities should not differ among the Proposed Action and the alternatives. The HAPs emitted from automobile use, however, differ significantly between the Proposed Action and Alternative 1.

As was discussed under Transportation, placement of the IBCT and CAB facilities at the ORTC would require an extended commute from support facilities in the cantonment area to the downrange area of Fort Carson.

Each mile of travel in an auto represents 450.91 grams of HAP emissions. While determination of miles traveled per POV to the ORTC is difficult, there would be a significant increase in HAPs given the 6,605 estimated trips per day to Wilderness Road. This overall increase in HAP emissions would not support Fort Carson's zero hazardous air emissions goal.

Despite the increase in POVs under the Proposed Action, 5.9 fewer kilograms per trip of HAPs would result from approximately 13 fewer miles travelled to and from training areas (see transportation goal) as compared to driving the tactical fleet from Training Area Bravo. Reduction in HAPs emissions from the tactical vehicle fleet would be a benefit of developing the IBCT and CAB facilities at the ORTC. However, the reduced fleet emissions would not facilitate achievement of compliance with Fort Carson's HAPs emissions goal because they would not offset the significant increase in emissions from POVs as tactical vehicle use is infrequent and sporadic. Therefore, the Proposed Action would only nominally support the installation's HAPs goal.

3.13.2.3. Alternative 1 – Construction of Infantry Brigade Combat Team Support Facilities at Training Area Bravo and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Site

3.13.2.3.1. Training Lands

Training Area Bravo is located within the cantonment area and is used infrequently for individual and squad level training. It is currently one of the least used training sites on Fort Carson, and its scheduling is not managed by Range Control due to infrequent training conflicts. As such, Soldiers and small units may use the site on a first-come first-served basis.

Under Alternative 1, construction of IBCT facilities at Training Area Bravo is predicted to have less impact on Fort Carson's training land resources as compared to other training areas. In addition, construction of CAB barracks at the ORTC under this alternative would require a small construction footprint (<50 acres). Facilities and operations conducted within this footprint would have a minimal impact on training activities routinely conducted in vicinity of this site. Alternative 1 would be in partial conformance with the Training Land goal as it maximizes training area land use in comparison to other alternatives, but would still cause an overall net loss in total installation training area acreage.

Transportation

Siting an IBCT facilities set at Training Area Bravo would increase the amount traffic in the cantonment area by 3,452 trips per day. Additionally, 2,753 trips per day would be made to the Wilderness Road area for the CAB personnel. Although the overall POV fuel use would not be discernible, Training Area Bravo is located in closer proximity to support facilities in the cantonment area than the ORTC site. This would reduce the amount of POVs traveling the additional miles south to Wilderness Road to just CAB personnel. This alternative would cause increased congestion in the cantonment area, primarily at Gates 2, 4, and 20, the splitting of the IBCT and CAB facilities would reduce the POV congestion along Wilderness Road.

Cantonment area siting would reduce POV use under this alternative because of the close proximity to ancillary facilities and the public transportation system. With the increased density in the cantonment area, it would be more likely that there would be a greater demand for public transportation, expediting the development of a highly fuel efficient personal rapid transit system. In addition to public transit, the location would promote walkability to community areas and operational facilities.

The approximate 6.5 additional miles between the IBCT facility at Training Area Bravo and the downrange area would increase the petroleum use by tactical vehicles as compared to the sites along Wilderness Road. The increase in petroleum use, however, would be offset by the significant reduction in dependence on POVs in the cantonment area.

Due to the reduced POV use and potential increase in mass transit use, this alternative would support Fort Carson's sustainability goal of reducing automobile use by 49 percent.

Land Use

As with the two potential sites on Wilderness Road, Training Area Bravo is an undeveloped location; thus, no LEED points would be received for site placement. The former landfill which had an approximate 80-acre footprint within the Training Area Bravo site is not technically classified as Brownfield site, but its use would meet Fort Carson's sustainable development principles through land reuse. If the approximate 80-acre landfill area were included in the developed area on Training Area Bravo, this would reduce the overall impacts on undisturbed land.

Training Area Bravo would promote additional sustainable development standards of high-density development on the installation because its location is directly within the main cantonment area. As previously mentioned, the development of IBCT facilities within the cantonment area allows for use of existing ancillary facilities, utilities, and a mass transit system. These existing facilities would not be as readily accessible to the CAB, which would still be placed along Wilderness Road.

Infrastructure upgrades would require less than 1 mile of linear extension, promoting sustainable land use.

This location, while not of particular ecological sensitivity, would spread development into previously undeveloped wildlife habitat. Development within the cantonment area, however, could protect the amount of contiguous undeveloped wildlife habitat in the downrange area.

In regard to stormwater runoff, the B Ditch is located adjacent to Training Area Bravo, which has a general slope of greater than 15 percent slope in some areas. Under this Alternative, B Ditch could realize increased runoff from the IBCT facilities into the surrounding riparian area.

Alternative 1 would involve more new development that the Proposed Action because the IBCT and CAB facilities would be at different sites. Yet this alternative would involve less outward sprawl from the cantonment area and encroachment onto previously undeveloped lands. Therefore, Alternative 1 partially conforms to Fort Carson's land use goal.

Hazardous Air Pollutants

The key difference between Alternative 1 and the other alternatives in terms of meeting Fort Carson's sustainability goal for hazardous air emissions is in the amount from automobiles. An additional 5.9 kg of HAP emissions per tactical vehicle would result from additional miles travelled to and from the downrange training areas as compared to the Wilderness Road locations. These emissions would cause a cumulative impact on air quality, but do not increase the air emissions as much as the thousands of POVs driving on a daily basis.

While the determination of miles traveled per POV to Training Area Bravo is difficult, there would be a reduced use of POVs and reduced travel distance from the residential areas north of the cantonment area. This would be a reduction in HAPs given the 3,452 estimated trips per day to Training Area Bravo instead of to Wilderness Road. An estimated 2,753 trips per day would still be made to the CAB facilities along Wilderness Road. This number, however, is an approximate 60 percent reduction from the number of trips made under the Proposed Action or Alternative 2.

This overall decrease in HAP emissions would better facilitate conformance with Fort Carson's zero HAP emissions goal than the Proposed Action and Alternative 2 because of the overall reduction in miles driven by POVs. Therefore, Alternative 1 partially supports the *HAPs Goal*.

3.13.2.4. Alternative 2 – Infantry Brigade Combat Team Support Facilities at Tent City and Combat Aviation Brigade Support Facilities at Operational Readiness Training Center Sites

3.13.2.4.1. Training Lands

Under this alternative, sustainability impacts would be about the same as the Proposed Action, but would include additional impacts to training areas and the additional loss of a parachute drop zone. The Tent City site is currently used as a bivouac area for units to stage prior to moving downrange for maneuvers or other training operations. The land use for this site would change to administrative and operational use to support the IBCT; this would create an indirect impact by requiring its current function to be moved elsewhere on the installation.

There is potential for co-use of facilities between IBCT and CAB personnel at Tent City. It would reduce overall developed acreage on Fort Carson, leaving more open space for training land at other locations.

Alternative 2 would nominally support *Fort Carson's Training Land Goal* due to the potential co-use of support facilities. However, the encroachment of cantonment area facilities on Wilderness Road, and the net loss of training area minimize Alternative 2's favorable characteristics.

Transportation

As the location of Tent City is in close proximity to the ORTC along Wilderness Road, there is no discernable difference between the Proposed Action and Alternative 2. Thus, Alternative 2 only nominally supports the HAPs goal.

Hazardous Air Pollutants

As the location of Tent City is in close proximity to the ORTC along Wilderness Road, there is no discernable difference between the Proposed Action and Alternative 2, and this alternative therefore only nominally supports the HAPs goal.

3.13.2.5. No Action Alternative

Under the No Action Alternative, the addition of Soldiers and the completion of projects and activities would continue in accordance with BRAC 2005, GDPR, and AMF as discussed in the 2007 Fort Carson Transformation EIS. Many of the actions, to include unit stationing, proposed in 2007 have not yet occurred; however, their impacts to sustainability have been included as part of the No Action Alternative.

Under the No Action Alternative, Fort Carson would continue to comply with the Army's triple bottom line sustainability regulations. The installation would also continue to implement SEMS guidelines in order to achieve the *Fort Carson 25-Year Sustainability Goals*.

3.13.2.6. Mitigation Measures

Fort Carson would continue to implement sustainable development strategies for all construction and training activities for both current and future actions.

The Army will continue to look for opportunities to increase vertical construction to reduce the development on training acreage and other undeveloped land across the installation.

Additionally, mitigation could involve:

- Achieving LEED Platinum standards for new construction, pursuing passive and active solar energy at siting alternatives;
- Using permeable pavements for parking areas and other hardstand areas;
- Developing mass transit service to facilitate alternate means of installation travel; and
- Developing walk/bike paths to main facilities on the cantonment area.

3.14. Unavoidable Adverse Impacts

Most potential adverse impacts identified in this EIS would either be negligible or could be avoided through adherence to BMPs and existing Army regulations during construction and the conducting of training exercises. Some unavoidable adverse impacts, however, could result from implementation of the Proposed Action or alternatives. These are described in this section and detailed in Table E-1 in the Executive Summary.

Some open space on Fort Carson would be lost to support the construction and use of new facilities to support increased numbers of troops and their Families. Similarly, currently undeveloped land in the surrounding communities would be developed for residential housing to accommodate troops and their families, although there is sufficient and adequately zoned land to do so. Furthermore, additional training activities on Fort Carson would likely reduce the availability of the downrange area for recreational uses.

Implementation of the Proposed Action or alternatives would create an additional net loss in training lands on the installation. Military training functions and activities performed on each of the proposed siting alternatives would be required to move to another location. This action would effectively reduce training land capacity and increase overall training demand for existing ranges. With an increase in personnel and training demands, some unit METL training could be compromised due to range scheduling conflicts.

Air quality would be adversely affected by increased emissions of criteria pollutants associated with operation of new facilities (additional external combustion sources such as boilers and water heaters, increased use of paint booths, and increased personnel travel). Air quality and visibility would be adversely affected during training exercises due to increased vehicle exhaust emissions, use of materials that cause smoke, and additional troop movements that cause more fugitive dust emissions. Construction of facilities would increase fugitive dust and equipment emissions during the construction period. The concentration levels of these pollutants, however, when added to background air concentrations, would be below the applicable air quality standards and, therefore, would not significantly affect regional air quality. Visibility could be unavoidably reduced during conduct of training exercises but impacts would remain local and short term.

Noise associated with additional training activities would increase noise levels in communities surrounding Fort Carson, including El Rancho, Midway Ranch, Turkey Canyon Ranch, and Fountain. There may also be minor noise increases associated with increases with roadway traffic surrounding Fort Carson. Although Fort Carson would implement BMPs to limit noise disturbance to the community, some increase in noise levels may be unavoidable.

The increase of maneuver training on Fort Carson would unavoidably increase the potential for direct adverse impacts to soils, such as compaction and rutting, and indirectly increase potential for soil erosion due to loss of vegetative cover. Fort Carson would continue to implement existing plans to reduce adverse effects to soils from training.

Increased training activities could result in unavoidable increases in soil erosion, sedimentation of surface water and potential for hazardous material spills. Groundwater use would increase although this increase can be accommodated under existing water rights.

Vegetated areas within building and other paved construction footprints would be unavoidably and permanently converted to impervious surface, which typically increases stormwater runoff. If LID practices, however, are utilized in order to match pre and post developmental hydrographs, these impacts would be greatly minimized.

Vegetative areas and terrestrial habitats throughout Fort Carson could be disturbed during training exercises, particularly in maneuver areas. Most disturbed areas would be repaired. Continued management of biological resources under existing plans and regulations would minimize adverse impacts.

Wildlife would be affected by loss of habitat, increased human and vehicular activity in the training area, increased traffic throughout maneuver areas, and noise. Less mobile and burrowing species (such as amphibians, some reptiles, and small mammals) could be affected during training exercises or from vegetation clearing and other site preparation activities for construction. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas of military training, while those species that are less tolerant would decline. Training activities would likely and unavoidably increase prairie dog burrow damage, and directly increase mortality. Species associated with prairie dog colonies would also be directly and indirectly affected, including the burrowing owl, mountain plover, and bald and golden eagles. Although Fort Carson would implement BMPs and enforce policies and procedures to protect wildlife, some wildlife may be unavoidably impacted under the Proposed Action or alternatives.

The risk of accidental wildfires caused by military training would likely increase under the Proposed Action or alternatives, despite Fort Carson's continued implementation of wildfire prevention efforts.

Additional training activities have the potential to unavoidably affect previously unidentified archaeological and paleontological resources. Most current training areas on Fort Carson have been

heavily disturbed and the likelihood of discovering intact resources is small. Fort Carson would also minimize impacts to cultural resources by not conducting training, other than dismounted, in areas that have not been inventoried for cultural resources, until an archaeological investigation has been conducted. Monitoring during training exercises would further reduce the potential to adversely affect cultural materials, and Fort Carson would continue to implement its "*Inadvertent Discovery of Archaeological Resources or Burials*" SOP to minimize damage to archaeological resources. The potential for adverse impacts to paleontological resources is low because most training exercises will occur in locations where these resources are not known to exist.

Traffic volumes on Fort Carson would unavoidably increase on most roadways within the cantonment area. Increased traffic volume would result in congestion and delay on some roadways, although congestion is not expected to be significant.

Traffic volumes in the region are projected to increase with and without the increased population at Fort Carson. Independent of the Proposed Action or alternatives, roadways in the vicinity of Fort Carson are expected to experience more than 30 percent increase in traffic volume by 2030, and many area roads are projected to become more congested. Under the Proposed Action or alternatives, local and regional roadways would experience an additional increase in traffic volume.

The utility infrastructure at Fort Carson is not adequate to accommodate additional personnel. Potable water, wastewater, natural gas, electric, and stormwater infrastructure lack adequate conveyance capacity and would require upgrades and new construction. There would be unavoidable increases in energy and water demand under the Proposed Action or alternatives, as well as the generation of wastewater and stormwater runoff. Utility service could be temporarily interrupted with implementation of the improvements included in the Proposed Action or alternatives.

Waste generation, including wastes associated with vehicle maintenance, construction and demolition, and medical and dental procedures, would unavoidably increase as a result of increased use of hazardous materials under the Proposed Action or alternatives, although Fort Carson would continue and expand its recycling and hazardous material minimization practices. Materials and wastes would be managed to avoid exposure to the environment, there would be an increased risk for accidental spills because of increased handling of materials and generation of wastes.

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3.15. Irreversible or Irretrievable Commitment of Resources

Irreversible or irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources would have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy from hydrocarbons and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored after implementing a Proposed Action (e.g., extinction of threatened or endangered species).

Construction of facilities would consume construction materials, such as concrete and steel, which would become irretrievable resources in the short-term but could be recycled after their effective life. Although the materials could be recycled, some permanent loss of energy would be expected in the manufacture and recycling processes, and would be considered an irreversible effect.

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3.16. Short-Term Uses of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

The implementation of design features, BMPs, standard construction practices, and other measures described in this EIS and adherence to existing management plans and programs and federal, state, and local regulations that would be incorporated into the Army's Proposed Action is aimed at the sustainability of Fort Carson's military mission. With increased training activity, short-term uses of the environment would become more frequent and intensive. Nevertheless, the Army's need to maintain the long-term productivity of its training lands for continued military use also provides protection to land-based resources such as soils, water, vegetation, and wildlife. Additionally, Army regulations protect sensitive environmental resources, such as cultural resources, wetlands, and floodplains, from avoidable damage.

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4. Piñon Canyon Maneuver Site Affected Environment and Environmental Consequences

4.1. Introduction

This chapter describes the affected environment and environmental consequences of implementing the Proposed Action and No Action Alternative. This chapter qualitatively and quantitatively evaluates the potential environmental impacts of the additional training of new units at PCMS as described under the Proposed Action. The affected environment and associated environmental impacts have been determined using the criteria in the Army NEPA Guidance Manual 2007 (Reference No. 14).

4.1.1. Resources Analyzed

This chapter analyzes and discloses the direct and indirect impacts for the following resource areas (Cumulative Impacts are addressed in Chapter 5):

- Land Use (Section 4.2)
- Air Quality (Section 4.3)
- Noise (Section 4.4)
- Geology and Soils (Section 4.5)
- Water Resources (Section 4.6)
- Biological Resources (Section 4.7)
- Cultural Resources (Section 4.8)
- Socioeconomics, including Environmental Justice (Section 4.9)
- Transportation (Section 4.10)
- Utilities (Section 4.11)
- Hazardous and Toxic Substances (Section 4.12)
- Sustainability (Section 4.13)

Under the Proposed Action and No Action Alternative, construction of new facilities would not occur at PCMS. The majority of impacts would occur as a result of training activities associated with the implementation of the Proposed Action and alternatives. A discussion of the No Action Alternative is also presented in this Chapter.

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4.2. Land Use, Plans, and Policy

This section describes the affected environment and environmental consequences to land use at PCMS.

4.2.1. Affected Environment

4.2.1.1. Geographic Setting and Location

PCMS is an approximately 235,000-acre Army site dedicated to training units stationed at, or otherwise under the responsibility of, Fort Carson. PCMS is located in southeastern Colorado in Las Animas County, approximately 150 miles southeast of Fort Carson. PCMS is bounded by US 350 to the west, Purgatoire River Canyon to the east, Las Animas County Road 54 to the south, and Otero County to the north. Nearby cities include Trinidad to the southwest and La Junta to the northeast.

4.2.1.2. Climate

PCMS has a moderate, dry climate. Average monthly maximum temperatures range from 46.9°F in January to 88.9°F in July. Average monthly minimum temperatures range from 16.7°F in January to 58.6°F in July. Average annual precipitation is about 13 inches, with the majority falling as rain in the summer months (May through August). Snowfall has occurred in every month except June, July, and August and is heaviest in November, December, and March.

From 2001 to 2005 (with the exception of 2004), PCMS experienced severe to extreme drought conditions (Reference No. 177).

4.2.1.3. Existing Land Use

4.2.1.3.1. Military Use

Las Animas County recognizes PCMS land use as a military training facility. Land use on PCMS has been divided into the cantonment area and training areas. The cantonment area consists of developed land; the training areas consist of open land.

Cantonment Area

The cantonment area comprises approximately 1,660 acres of PCMS. The cantonment area provides limited, administrative and Soldier support facilities. Military training is restricted in this area.

Training Areas

The training areas consist of unimproved or open lands used for military training maneuvers and small arms live-fire activities. PCMS terrain varies widely from open, rolling prairies to semi-arid, basaltic hills. To a large degree, the terrain defines the suitability of training activities that occur in the training areas. The four main training land use types within the training areas include maneuver training, dismounted training, small-arms live-fire ranges, and restricted areas (Figure 4.2-1).

- **Maneuver Training.** Maneuver training lands comprise the majority of training land at PCMS. Maneuver training areas are appropriate (based on topography and other environmental conditions) for equipment and personnel tactically maneuvering against an opposing force throughout the area. Land rest and rehabilitation are required in maneuver training areas to recover them from maneuver training activities. Training areas can also be limited in the vicinity of small arms live-fire ranges if the ranges are being used for training activities.
- **Dismounted Training.** Dismounted training includes non-vehicular training activities such as offensive and defensive training certification of Soldiers on infantry tasks to include urban operations.
- **Small-arms Live-fire Ranges.** Small arms live-fire ranges include SDZs identified to protect personnel during weapons training. The SDZs are available for maneuver training when live-fire activities are not occurring.
- **Restricted Areas.** Restricted areas protect lands that support wildlife, ecosystems, soils, facilities, and cultural resources. Varying degrees of training use are allowed in restricted areas. For example, in lands with known occurrences of buried cultural resources, digging is not permitted.

4.2.1.3.2. Recreational Use

Some areas within PCMS are accessible to the public for recreational use when training activities do not occur. The recreational use on PCMS includes hunting and camping (hunters only). Recreational use is allowed in the training areas at a campground near the intersection of Military Supply Routes (MSRs) 1 and 3 (Reference No. 178).

PCMS offers the largest contiguous parcel of public lands available for hunting in the region. The abundance of game, the timing of hunting seasons (close to the rut), and the hunt success rate make PCMS a highly desirable hunting area. Licenses are granted to hunt on PCMS annually. On average, 300 to 500 licenses are issued each year.

PINON CANYON MANEUVER SITE

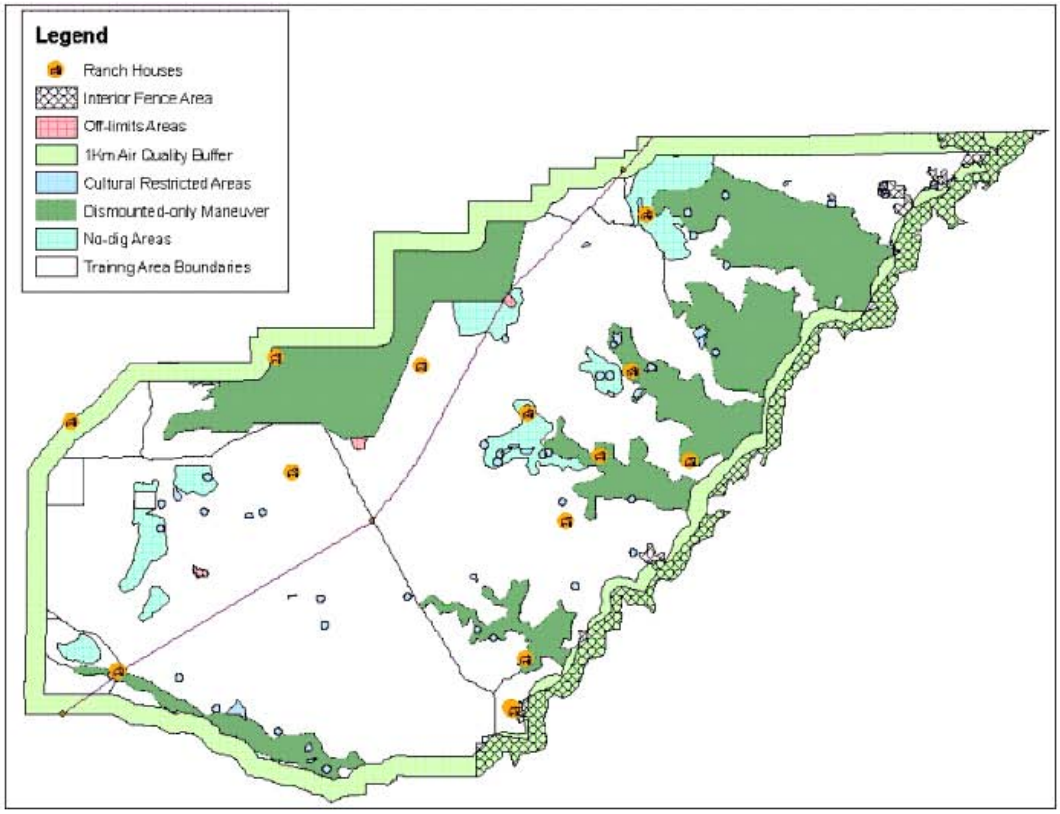

Figure 4.2-1 Training Use
Map Provided by Fort Carson Range Control

4.2.1.3.3. Land Use Planning

Land use planning at PCMS is the responsibility of Fort Carson's DPW Master Planning Division. Master planning at PCMS is tied to Fort Carson because facility and training requirements at PCMS are dependent upon the troops stationed at Fort Carson. The Master Planning Division assesses the need for new facilities and how new facilities can be incorporated to complement existing land uses at PCMS through its master planning process.

4.2.1.3.4. Surrounding Off-Site Land Use

PCMS is surrounded on three sides by land that is zoned for agricultural uses and dryland cattle grazing. The Comanche National Grassland, which is managed by the USFS, lies immediately north of PCMS and consists of undeveloped open land and recreation sites. Small communities are located near PCMS along US 350, including Model, Timpas, Thatcher, Houghton, and Delhi, all of which have populations of less than 50. Trinidad, which has a population of less than 10,000, is located approximately 40 miles southwest of PCMS, and La Junta, with a population of approximately 7,000, is located approximately 42 miles to the northeast.

Comprehensive planning and land uses in Las Animas County are governed by the *Las Animas County Development Guide* (Reference No. 179). The *Draft Cimarron and Comanche National Grasslands Land Management Plan* (Reference No. 180) is being updated. This plan describes existing conditions, identifies desired conditions, and articulates the management goals for the Comanche National Grasslands. Both plans recognize PCMS as a military training installation.

4.2.1.3.5. Prime Farmland

The *Farmland Protection Policy Act of 1981* requires federal agencies to consider the impact of any activity that would convert prime or unique farmlands to non-agricultural uses. PCMS is entirely a military installation; therefore, this action does not involve the conversion of any prime farmland.

4.2.2. Environmental Consequences

4.2.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

There would be no changes to PCMS land use due to the maneuver training of the additional IBCT. Fort Carson has an IBCT that conducts training at PCMS. Training elements of the potential CAB at PCMS would not change land use. Aviation units have trained at PCMS since its inception.

4.2.2.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No changes to land use would result from the No Action Alternative.

4.2.2.3. Mitigation Measures

Mitigation measures are not warranted for land use.

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4.3. Air Quality

This section describes the affected environment and environmental consequences to air quality at PCMS. Appendix C details the approach to the air quality analysis in this EIS.

4.3.1. Regulatory Background

Most air regulations described in Section 3.3.1 for Fort Carson apply to PCMS. PCMS, however, is located in Las Animas County, which is in an attainment area for all criteria pollutants. Therefore, the *General Conformity Rule* does not apply. Also, the Proposed Action does not require any new construction, renovation, or demolition of stationary sources at PCMS. Since none of these activities would be performed at PCMS, the PSD regulations do not apply.

In general, the CAA (as adopted in 1970, and amended in 1977 and 1990) established programs and permitting processes to protect and improve air quality. Air quality regulations are published in 40 CFR Parts 50 through 97 and 1048 through 1068. As mandated by the CAA, EPA has established NAAQS for the criteria pollutants in Table 4.3-1.

The CDPHE has obtained delegated authority from EPA and is the lead agency to implement and manage most CAA provisions. The State of Colorado Air Quality Control Regulations can be found at: http://www.cdphe.state.co.us/ap/regoverview.html.

During the draft comment period for the 2007 PCMS Transformation EIS, the Air Pollution Control Division (APCD) requested analysis of far-field impacts to the AQRVs for the surrounding Class I/II areas. Air quality-related values are generally expressed in broad terms. The impacts of increased pollutant levels on some AQRVs are assessed by measuring parameters that reflect the AQRVs status. For instance, the projected impact on the presence and vitality of species of animals or plants may indicate the impact of pollutants on AQRVs associated with species diversity, or with the preservation of certain endangered species. Similarly, an AQRV associated with water quality may be measured by the pH of a water body or by the level of certain nutrients in the water. The AQRVs of Class I areas differ, depending on an area's purpose and characteristics and on assessments by the area's Federal Land Manager (FLM).

Table 4.3-1 National Ambient Air Quality Standards

Pollutant	Primary Standards Level	Primary Standards Averaging Time	Secondary Standards Level	Secondary Standards Averaging Time
CO	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	8-hour[1] 1-hour[1]	None	
Pb	1.5 µg/m^3	Quarterly Average	Same as Primary	
NO_2	0.053 ppm (100 µg/m^3)	Annual (Arithmetic Mean)	Same as Primary	
PM_{10}	150 µg/m^3	24-hour[2]	Same as Primary	
$PM_{2.5}$	15.0 µg/m^3	Annual[3] (Arithmetic Mean)	Same as Primary	
	35 µg/m^3	24-hour[4]	Same as Primary	
O_3	0.075 ppm (2008 std)	8-hour[5]	Same as Primary	
	0.08 ppm (1997 std)	8-hour[6]	Same as Primary	
	0.12 ppm	1-hour[7] (Applies only in limited areas)	Same as Primary	
SO_2	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 µg/m^3)	3-hour[1]
	0.14 ppm	24-hour[1]		

CO = carbon monoxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter (≤ 10 µm)
$PM_{2.5}$ = particulate matter (≤ 2.5 µm)
ppm = parts per million
SO_2 = sulfur dioxide
µg/m^3 = micrograms per cubic meter
Pb = lead

(1) Not to be exceeded more than once per year.
(2) Not to be exceeded more than once per year on average over 3 years.
(3) To attain this standard, the 3-year average of the weighted annual mean PM2.5 concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m3.
(4) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m3 (effective December 17, 2006).
(5) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).
(6) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(7) (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.

AQRVs have been established by FLMs for the USFS, the National Park Service, and the USFWS, who are responsible for protecting the nation's parks and monuments. National parks and monuments are designated as Class I and Class II areas, depending on the significance of the area to the country. Class I areas are national parks and national wildlife areas that have been designated as special to the public.

Well-managed growth is allowed in Class II areas, which leads to moderate deterioration of air quality in these areas. The concentration at which a pollutant adversely impacts an AQRV can vary between Class I areas and Class II areas because the sensitivity of the same AQRV often varies between similarly designated areas.

4.3.2. Affected Environment

This section describes the air quality in the region potentially affected by the Proposed Action and No Action Alternative. In addition, this section presents emission sources from PCMS in relation to the regional air quality setting.

PCMS is situated in Las Animas County, Colorado, which was established as the near-field (less than 31 miles) radius of impact. As requested by the APCD during the draft comment period for the 2007 PCMS Transformation EIS, far-field impacts to AQRVs were evaluated for Class I/II areas including the Great Sand Dunes National Park and Preserve, the Florissant Fossil Beds National Monument in Colorado, and the Wheeler Peak Wilderness in New Mexico, all of which are located within 125 miles of PCMS.

4.3.2.1. Regional Air Emissions

For a general description of sources and criteria pollutants, refer to Sections 3.3.2 and 3.3.3.1. Based on the most recent data available from the EPA regional 2001 Air Emission Inventory, Las Animas County and other counties in the region reported emissions of criteria air pollutants from both point and non-point sources, including emissions from industrial-source fuel combustion, petroleum-related industries, other industrial processes, use of solvents, storage and transport services, waste disposal, recycling, highway vehicles, off-highway vehicles, agricultural activities, and miscellaneous fugitive dust sources (Reference No. 25), (Table 4.3-2).

4.3.2.2. Regional Ambient Air Quality

Air quality monitoring stations are not located on PCMS. Section 3.3.2.2 lists all statewide monitors in operation for 2006. In the past, APCD has conducted only particulate and meteorology monitoring in the Eastern Plains Counties (those east of the I-25 corridor). The majority of monitoring for particulates in this region (including the nearby city of Trinidad), as well in Walsenburg in the Southern Front Range, has been discontinued after a review of the data showed that levels were well below the standard and declining. Exceptional events associated with regional natural phenomenon (e.g., large wind/dust storm) are not included in NAAQS violation determinations as they are natural and uncontrollable events. Both Lamar and Alamosa monitors have recorded exceptional events (Reference No. 23).

Table 4.3-2 2001 Air Emissions in Tons Per Year Data from Point and Non-Point Sources in Counties Near to and Far[1] from Piñon Canyon Maneuver Site

	CO	NO_x	SO_2	VOC	PM_{10}	$PM_{2.5}$
La Plata	21,295	5,921	164	3,004	5,833	1,458
Las Animas	20,966	2,861	164	1,684	2,823	1,328
Saguache	8,417	639	67	827	2,924	906
Huerfano	11,635	1,777	109	889	1,045	399
Taos[2]	21,121	2,265	195	2,333	37,408	6,439
San Miguel[2]	30,470	3,103	385	2,832	22,176	4,198
Santa Fe[2]	64,234	8,101	688	7,445	55,516	9,258
Cimarron[3]	4,134	1,434	69	956	5,155	1,095

[1]Near is defined as less than 50 km and far as less than 125 miles. Class I and II areas identified in the modeling report are located in these counties.
[2]These counties are in New Mexico.
[3]This county is in Oklahoma.
CO = carbon monoxide NOx = nitrogen oxide $PM_{2.5}$ = particulate matter (≤ 2.5 µm)
PM_{10} = particulate matter (≤ 10 µm) SO_2 = sulfur dioxide VOC = volatile organic compound

Local Sources of Air Pollutants

Pollutants affecting air quality in any region can be characterized as being emitted from either stationary sources (e.g., fuel burning equipment and chemical processing operations), mobile sources (e.g., cars), or are fugitive (i.e., emissions that could not reasonably pass through a stack or tailpipe). Annually, Fort Carson prepares an emissions inventory for the stationary and fugitive emission sources at PCMS, which can be generalized as follows: boilers, furnaces/space heaters, fuel storage and use, military smoke/obscurants, prescribed burning, and fugitive dust from training activities (vehicle maneuvers and convoys).

Current Air Permits and Plans

Due to PCMS's location in an attainment area and its PTE of less than 250 tpy, the facility only has two construction permits: No. 96LA1082, limits the generation of DoD-approved obscurants for training exercises, and No. 04LA0772, for a 20,000-gallon gasoline underground storage tank and its associated dispensing operation. All other stationary sources are APEN-exempt per Colorado *AQCC Regulation No. 3*, and PCMS remains an area source of HAPs (Table 4.3-3).

Table 4.3-3 Piñon Canyon Maneuver Site Stationary Sources Potential to Emit Calendar Year 2007

Emission Unit	Pollutant in Tons Per Year				
	PM_{10}	NO_x	CO	SO_2	VOC
No. 2 Oil Boilers, Furnaces, & Heaters	0.24	4.47	1.12	1.59	0.08
Propane Furnaces & Heaters	0.03	1.04	0.14	1.04	0.04
Storage Tanks	--	--	--	--	0.00
20,000 Gal MOGAS UST	--	--	--	--	2.00
Other MOGAS Storage Tanks and Refueling	--	--	--	--	1.38
Smoke and Obscurants[1]	55.7	--	--	--	54.3
Prescribed Burning	44.8	9.0	334.4	0.00	0.00
Training Exercises (Includes Convoys and Maneuvers)[1]	138.0	--	--	--	--
Installation-Wide Total Stationary Source PTE	**55.96**	**5.51**	**1.26**	**2.63**	**57.8**
Installation-Wide Total Stationary Source PTE	**238.7**	**14.5**	**335.6**	**2.63**	**57.8**

Source: Reference No. 181

[1]Emissions were calculated assuming one IBCT training event per year.

CO = carbon monoxide NOx = nitrogen oxide PM_{10} = particulate matter (≤ 10 µm)
SO_2 = sulfur dioxide VOC = volatile organic compound PTE = potential to emit
UST = underground storage tank

The major sources of PM emissions on PCMS are from burning and military training exercises (i.e., vehicle maneuvers and convoys on unpaved roads/areas). These emissions contribute to inhalable PM emissions that have the potential to limit visibility and impact health. The combustion of fossil fuels in equipment such as boilers and generators does not substantially contribute to the emissions generated at PCMS.

PCMS personnel must adhere to both AR and FC Regulation 200-1 to protect the environment. Though it is not required for PCMS to have a state-enforceable plan, the *Fort Carson Fugitive Dust Control Plan* (Reference No. 182) is followed as a BMP to minimize dust impacts to air quality. Subject to available funds and how much PCMS is anticipated to be used in a particular year, chemical dust suppression is applied to unpaved areas in the cantonment area and the most highly used tank trails. Recently, limited available funds have been used to apply dust palliative on Fort Carson instead of PCMS; however, approximately 32 miles of road near the boundaries of PCMS were treated in 2007. Additionally, state land disturbance permits are applicable and implemented for any disturbed areas larger than 25 acres, or areas that have been disturbed six months or longer.

New Source Review. PCMS is not subject to the non-attainment NSR permitting program and is a minor stationary source under the PSD program. The facility-wide PTE for the installation is less than 250 tpy (Table 4.3-3) and its boilers and hot water heaters are not PSD listed source categories, as they do not have a maximum heat input of more than 250 MMBtu/hour. Prior to installing stationary sources at PCMS, a PSD Applicability Analysis would be performed.

Prescribed Burn Permits. In addition to PCMS acreage being managed by Fort Carson, the *Prescribed Fire Planning Document* addresses PCMS as well. Fort Carson is divided into three quadrants, and its fourth quadrant is PCMS. In addition to the required notifications to APCD prior to and after a burn, Fort Carson Fire Department personnel notify the appropriate personnel in Las Animas County. Controlled burns are used to minimize the risk of large fires by reducing fuel loads and breaking up the continuity of fuels. Prescribed burning targets areas with heavy fuel buildups that are the most likely to ignite from range operations. A Prescribed Burn Planning Document is submitted to meet the requirements of AQCC Regulation No. 9, *Open Burning, Prescribed Fire and Permitting*, and procedures within the INRMP (Reference No. 6) are followed for each prescribed burn event. This activity is responsible for the majority of PCMS's carbon monoxide emissions.

Air Compliance Status

ECHO records the compliance status for each permitted facility. APCD conducts a field and records inspection of PCMS every five years. PCMS was last inspected in 2005. Since then, PCMS has been in compliance and not subject to formal enforcement actions.

4.3.3. Environmental Consequences

This section describes the air quality analysis that was performed for criteria pollutants emitted during military training exercises and convoy traffic at PCMS associated with the Proposed Action.

Due to the anticipated additional military training maneuvers and convoy traffic, there would be impacts to the regional and local air quality. Air dispersion modeling (ADM) was not required under the PSD program as said permitting was not required. ADM, however, was performed to assess the cumulative impacts from the existing stationary sources on PCMS and the anticipated increase in military training exercises. Cumulative impacts were also analyzed from other activities on or near PCMS sponsored by either federal, state, or local agencies that have occurred, are occurring, or would occur in the foreseeable future (Chapter 5). The No Action Alternative is the baseline for comparison of air quality impacts to the Proposed Action.

Similar to ADM performed for Fort Carson, the models of choice were the EPA's preferred near-field (i.e., less than 50 kilometers) regulatory model AERMOD and the long-range transport CALPUFF in the full mode. Based on results from the screening CALPUFF mode for Fort Carson, it was assumed the results would be similar or worse for PCMS and that a full CALPUFF analysis would be necessary. Additionally, the Dust Transport Model (DUSTRAN) (developed by the Desert Research Institute for US Army applications) was used to assess fugitive dust impacts. Analysis by the models included criteria pollutant concentrations at critical receptor distances and visibility changes at federal Class I and sensitive Class II designated airsheds. Details on the ADM results and analyses are addressed in Chapter 5 and Appendix C.

4.3.3.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

New stationary sources would not be constructed under the Proposed Action at PCMS. Additional changes are not expected to be needed for the few permitted sources at PCMS as they are operated well under their permitted capacity. The slight increase over the next few years for prescribed burn activities are not related to the Proposed Action, as they are dependent on uncontrollable climate factors such as drought and meteorological conditions. However, due to the potential 6,700 authorized military personnel to be located or relocated to Fort Carson, it would be expected that training activities associated with an additional IBCT and potential CAB would cause an increase in the following sources at PCMS:

- Use of training ranges and maneuver areas (an increase in duration and frequency);
- Convoy travel along unpaved roads along boundary and in downrange areas; and
- Vehicle exhaust from convoy travel on paved roads between PCMS and Fort Carson.

Convoy travel between Fort Carson and PCMS was estimated in the 2007 PCMS Transformation EIS. The increase in convoy traffic between Fort Carson and PCMS would be on approximately 150 miles of paved public roads. The emissions resulting from the increase in convoys would be low, temporary, and dispersed over a great distance. The increases represent no more than 1 percent of total traffic and 10 percent of heavy vehicle traffic on the portions of road near the PM_{10} air monitors. PM_{10} is monitored in the Colorado Springs area and is representative of the ambient air conditions along the public road where convoy traffic is expected to occur. Currently, emissions from the ADT do not cause exceedences of the 24-hour standard. Therefore, any temporary incremental emission activity from the increased convoy transits is not expected to affect the current monitored compliance levels and would not result in adverse impacts to air quality.

Due to PCMS's topography, semi-arid climate conditions, soil types, and training requirements, long-term impacts may be expected from the increase in training activities downrange in terms of duration/frequency, additional vehicles, and type of training. Similar to the description for Fort Carson in Section 3.3.3.2, the type of military training (mostly maneuvers and convoy travel over large areas) that occurs at PCMS causes a military-unique problem of generating PM from non-traditional sources. Such sources include PM from training (e.g., extensive mounted and dismounted maneuver training and military convoy travel on unpaved roads, airborne training, and smoke and obscurant training) and prescribed burning (although the latter is an ecosystem management tool that assists training). Any impacts as a result of implementation of the Proposed Action would be mitigatable to a level that would be less than significant.

4.3.3.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson and therefore would not train at PCMS. Training activities, unit rotations, and land-based training restrictions would not change. Additionally, maneuver damage prevention would continue to be implemented; that is, the same training lands would need to be rested to recover between significant military training exercises, topography limitations would remain, and range safety fan (the area set aside as a personnel exclusion zone during training) positions would remain unchanged.

Prescribed burn activities are anticipated to increase slightly over the next few years, dependent on uncontrollable climate factors such as drought and meteorological conditions. As required by APCD regulations, Fort Carson would continue to adhere to the regulatory requirements, ensuring conditions are acceptable for prescribed fires, and air quality is not compromised (Reference No. 39).

The use of hand-held smoke grenades and mechanical generators for large area obscure training would continue to be limited by the construction permit emission rates and administrative operational controls would remain in place as per *Colorado AQCC Regulation No. 1*, Part II.D, to ensure no off-property transport of visible emissions from any smoke or obscurants.

Consequently, the No Action Alternative would not result in air quality impacts from these activities.

4.3.3.3. Mitigation Measures

Mitigation measures are not warranted for air quality.

4.4. Noise

This section describes the affected environment and the environmental consequences to noise, including potential impacts to noise-sensitive areas, such as those occupied by residences, schools, hospitals, or nursing homes, and traffic noise from increased convoy movements.

4.4.1. Affected Environment

Noise-sensitive locations adjacent to PCMS consist of a limited number of residences around the periphery of the installation. No other noise-sensitive areas are located adjacent to PCMS.

The primary sources of noise at PCMS originate from short-term military training exercises at the small-caliber weapons ranges and from military aircraft operations at the combat assault landing strip by C-130 aircraft. Large-caliber weapons are not used at PCMS. The vast majority of live-fire weapons qualification will be at Fort Carson, not PCMS.

Airfield noise contours were developed in the noise analysis conducted for the 2007 PCMS Transformation EIS using the NOISEMAP computer model; and *Small Arms Range Noise Assessment Model* (SARNAM) was used to model noise from small-caliber weapons for the noise contours for the small arms ranges. Existing records on flight and range operations, along with reasonable assumptions of use, were used to create inputs for the noise models (Appendix D).

4.4.1.1. Small-Caliber Weapons Ranges

The ranges along the western boundary of PCMS were used to model existing noise contours resulting from small-caliber weapons. These ranges are the only ranges in proximity to noise receptors that would be affected at PCMS. As shown in Appendix D, Figure D-1, existing noise contours for the small-caliber weapons ranges indicate that the NZ II (PK15[met] 87-dB) contour extends beyond the western installation boundary by approximately 2,130 feet. The NZ III (PK15[met] 104-dB) contour does not extend beyond the installation boundary. PK15 describes the peak noise level expected to be exceeded by only 15 percent of the events and is an indication of the maximum noise that can be heard during a single event

4.4.1.2. Combat Assault Landing Strip

Compatible-use-zone noise contours generated for PCMS are shown in Appendix D, Figure D-2. The NZ II (65 ADNL) and NZ III (greater than 75 ADNL) contours for C-130 aircraft operations at the Combat Assault Landing Strip do not extend beyond the installation boundary. The LUPZ (60 to 65 ADNL)

contour extends beyond the western installation boundary by approximately 525 feet. Though the NZ II and NZ III contours are contained within the installation boundary, there is the potential for aircraft to cause annoyance while entering or exiting the airspace.

In addition, a supplemental annoyance buffer was also generated for the NOE flight corridor. A 0.25-mile-wide buffer on either side of the NOE flight corridor was determined to be sufficient to account for possible annoyance outside the actual NOE flight corridor. As a result, the supplemental annoyance buffer extends past the installation boundary for a maximum of 0.25 mile. It should be noted that the 0.25-mile buffer does not surround the entire installation because the NOE flight corridor does not follow the full length of the installation boundary, but rather it is located at varying distances from the boundary.

The 2007 PCMS Transformation EIS concluded that increased convoy movements would result in increased traffic noise levels. Based on the expected traffic increases, hourly average traffic noise levels at locations along area roadways where convoy movements would occur are estimated to increase between 0 and 2 A-weighted decibel (dBA), which would not be a perceptible change to area residents.

4.4.2. Environmental Consequences

To evaluate noise impacts associated with additional IBCT and CAB training activities at PCMS, CHPPM conducted a revaluation of the noise study done for the 2007 PCMS Transformation EIS.

4.4.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

Though small arms range use would most likely increase, there would be no change to the small-caliber weapons noise contours under the Proposed Action because of the distance between the proposed range facilities and the installation boundary. As a result, an updated discussion of noise resulting from small-caliber weapons was not conducted. Appendix D provides anticipated noise contours.

The additional training of a potential CAB would increase the frequency in use of the combat assault landing strip. There would be no change, however, to the noise contours under the Proposed Action. The frequency of noise would increase, but peak levels and intensity would remain the same. An updated discussion of noise resulting from Combat Assault Landing Strip activities was not conducted. In addition, the NOE flight corridor would not change under the Proposed Action; therefore, discussion of noise resulting from the NOE flight corridor is not included in the analysis.

4.4.2.2. No Action Alternative

Under the No Action Alternative, the additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No increased impacts in noise would occur.

4.4.2.3. Mitigation Measures

Noise mitigation is not required due to no change in noise contours or significant levels of noise. PCMS would continue to follow AR 200-1 (Reference No. 42) and the *Installation Environmental Noise Management Plan* (Reference No. 40) to monitor noise.

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4.5. Geology and Soils

This section describes the geology and soil resources of the affected environment and identifies the environmental consequences to soils and geology predicted as a result of implementing the Proposed Action and alternatives at PCMS. There is no new proposed cantonment area, but new construction will expand the existing cantonment area. Therefore, the environmental consequences section focuses on the impacts of increased maneuver training at PCMS by the IBCT and CAB. Because of the maneuver training requirements of units stationed at Fort Carson and existing maneuver land shortfalls to meet doctrinal maneuver requirements, there are no viable alternatives for reduction of maneuver training evaluated in this section which meet the purpose and need for this stationing action. Army environmental and training staff will manage PCMS land resources to meet training, sustainability, and environmental goals to best meet the Army's training needs and sustainability of the land resource. This best use of the training resource to support unit maneuver requirements would occur under all action alternatives.

Sources of information used in this analysis of geology and soils impacts included collaboration with the regional branch of the NRCS, soil surveys from the NRCS web mapper, studies from the CEMML, Army environmental and GIS professionals employed by Fort Carson, and peer reviewed studies. These sources of information were used to project likely impacts to PCMS soils and geology which may result from GTA stationing actions and the potential stationing of a CAB.

Projected impacts from the Army's Proposed Action result from four general categories of action that the Army would need to undertake to support new unit stationing. These four categories of action include:

1) Cantonment area construction and expansion;
2) Training range and infrastructure construction;
3) Live-fire training activities; and
4) Maneuver training activities.

At PCMS, the Army's Proposed Action and alternatives connected with this action involve changes primarily only to maneuver training.

In conducting the analysis of soils and geology impacts, installation range managers provided an overview of the type and geographic extent of maneuver training activities that would take place at PCMS to support the stationing of an IBCT and the CAB. This information was used to generate approximately 9,000- to 10,000-acre area plots to analyze existing conditions and the projected impacts of military maneuvers. The NRCS web mapper tool was used to provide an assessment of compatibility and

suitability of soil conditions in relation to military vehicle use associated with the Proposed Action, projected intensity of use, and location.

Assessment of soil-vehicle interaction considers several soil variables in capturing impacts of maneuver training in a given area. These variables include soil texture, wind and water erosion potential, soil strength, slipperiness in connection with surface shear, stickiness, stone content, aggregation, and slope. The NRCS web mapper tool was used to evaluate compatibility of PCMS maneuver areas with maneuver use by lightweight truck, heavy four-wheel truck, aviation, foot-traffic, and light digging impacts at plots selected on the basis of likely areas for military training. Analysis assumed repeated (50 passes of a vehicle) use and did not assume one-time use of land for vehicle movement. Geographic areas that this analysis focused on assumed use of canyon areas and more heavily contoured areas by units of the IBCT. IBCT training would also utilize PCMS urban operations areas. Analysis of impacts of CAB at PCMS assumed the use of all PCMS maneuver areas in support of CAB training. There is no anticipated differential use of PCMS training areas to support aviation training.

Significant impacts were assessed if Army training activities were projected to result in the loss of more soils than a training area could sustain. To derive these assessments, NRCS T value ratings (maximum tons per acre per year) of soil erosion an area can sustainably lose were used with NRCS hydrologic soils ratings, wind erodibility index values, and soils properties to ascertain whether Army activities are likely to exceed maximum sustainable rates of soil loss. A rating of significant but mitigable was used if mitigating actions would reduce soil loss to sustainable soil loss parameters. If Army activities are not predicted to cause significant erosion they were rated as either less than significant, minor, or no impact. Figure 4.5-1 shows that PCMS exhibits high geographic variability in sustainable soil loss thresholds across the affected environment. The T factor is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting vegetative productivity over a sustained period. The rate is in tons per acre per year. In general, the loamy plains exhibit higher T factor ratings (sustainable soil loss) than the limestone ridges to the Northwest and canyons feeding into the Arkansas River Basin to the East.

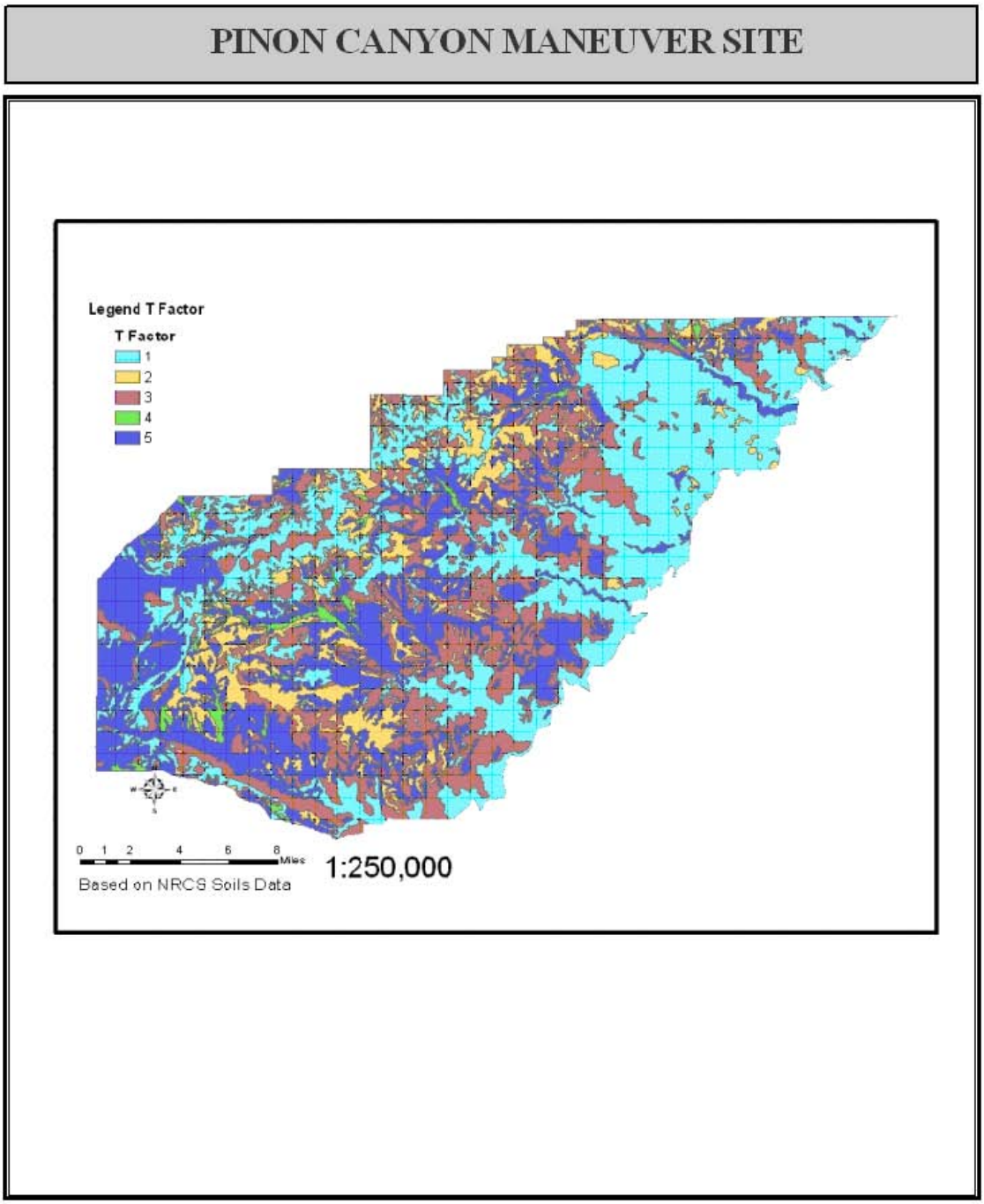

Figure 4.5-1 Sustainable Soil Loss Per Year (T Factor - Tons/Acre/Year)
Source NRCS

4.5.1. Affected Environment

4.5.1.1. Physiography

PCMS is located within the Raton Basin, along the western margin of the Great Plains Physiographic Province. Topographic features, such as mesas, cuestas, dissected plateaus, deep canyons, and volcanic formations, are the typical landscape within this section. The basin gradually slopes downward to the east, with elevations ranging from 5,500 feet above mean sea level (amsl) in the west to 2,500 feet amsl in the east (Reference No. 183). The topography of PCMS is divided into four general regions, as shown in the 2007 PCMS Transformation EIS (Reference No. 184). Woodlands made up of primarily pinyon pine and juniper cover limestone highlands in the north and northwest of PCMS. The Hogback, which consists of a basalt dike of volcanic origin, runs east-to-west along the southern boundary of PCMS. Grassy plains cover the area between the Purgatoire River and the woodlands. The fourth region along the eastern boundary of PCMS consists of canyons that drain to the Purgatoire River.

Elevations on PCMS range from 4,262 to more than 5,576 feet amsl (Reference No. 6). The Raton section of the Great Plains Province, which includes PCMS, falls into the shortgrass prairie zone, which is characterized by blue grama, galleta, and western wheatgrass (Shaw et al. 1989a – from INRMP). Variations in topography and soils affect vegetation patterns that are and will be found at PCMS. Climate, to include major droughts in the 1920s and 1930s also play a major role in determining vegetative associations (Reference No. 85). The NRCS has identified 15 distinct range types at PCMS. These sites are: Alkaline Plains, Basalt Breaks, Gypsum Breaks, Limestone Breaks, Loamy Plains, River Bottom, Sandstone Breaks, Salt Flats, Saline Overflows, Sandy Plains, Shaly Plains, Sandy Bottomlands, 80 percent Loamy Plains/20 percent Gravel, Shaly Plains/Loamy Plains, 75 percent Shaly Plains/25 percent Limestone Breaks, and unknown. Loamy plains (40 percent) is the most common range type at PCMS (Reference No. 6).

4.5.1.2. Geology

The Raton Basin is one of a series of intermontane basins that developed during the late Cretaceous and early Tertiary (approximately 66 million years ago) eras. It developed along the eastern margin of the Rocky Mountain foreland because of compression associated with the Laramide Orogeny. Numerous volcanoes intruded the Raton basin, forming lone mountain peaks. Volcanic vents, cinder cones, and lava fields typify the geology of the area. Geologic structures at PCMS are generally associated with the Apishapa Uplift, which is oriented southeast to northeast across the southern portion of PCMS. Sedimentary rocks associated with the uplift typically dip northeast ranging 1 up to 36 degrees (Reference No. 6). The Black Hills (5,365 feet amsl), Sheep Canyon, and Muddy Creek Monoclines (strata inclined

in the same direction) are major smaller structures within PCMS. Several smaller synclines and anticlines are also associated with these monoclines, including the Model Anticline in the western portion of PCMS (Reference No. 185).

4.5.1.3. Soils

Soil types commonly occurring in the Raton section are aridisol and entisol soils. These soil types are characterized by moderate to severe soil erodibility, landslides, and unstable clay formation movement attributable to variations in moisture content and temperature (Reference No. 51). NRCS recognizes 29 soil series and associations and four major landscape types on PCMS (Figure 4.5-2).

Soils range from shallow to deep and are well drained. The soils are formed primarily from shale, sandstone, and limestone as parent material is a major determinant of soil type and texture at PCMS. In many areas of PCMS the undulating landscape is mantled by loess, or windblown sediments which have resulted from mineral weathering by wind, which has historically been a dominant force in shaping the geology and structure of soils at PCMS. Wide bands of steep slopes border the Arkansas River and its tributaries. In general, soil surface textures at PCMS are loamy, consisting of sandy loams of decreasing depth around canyon drainages. Silty loams are also prevalent at PCMS (Figure 4.5-3) which are more susceptible to forces of wind erosion than clay or sandy soils.

Each of the four landscape types on PCMS has a characteristic pattern and coverage of soils, which are described in Section 4.5.1.3.1. Additional information on PCMS soil types can be found in the INRMP, and specific information can be obtained from the NRCS soil surveys for Las Animas County.

4.5.1.3.1. Western Piñon Canyon Maneuver Site

Flat to sloping plains in the western portion of PCMS contain soils formed in wind-deposited lips with intermittent small ridges of limestone that outcrop in some areas (Reference No. 6). These soils are generally silty, weakly developed, and calcareous throughout. The dominant soils in this landscape are loamy plains on upland flats, saline overflow in the depressions and along intermittent drainages, and sandy plains in sand dunes. This landscape is characterized by medium stability, with moderate soil losses from water erosion and high soil losses from wind in areas where soil is disturbed (Reference No. 6). The native vegetation consists mainly of grassland with some vegetative cover in the form of Piñon and Juniper trees interspersed in areas with steeper slopes. Elevation is between 4,900 and 5,900 feet. Average annual precipitation is 10 to 12 inches per year with a mean annual ambient air temperature of 52 °F. This region experiences approximately 155 frost-free days. Soils in this group are shallow and well drained formed in eolian sands loess, alluvium residuum and colluvium derived dominantly from shale, sandstone, and limestone.

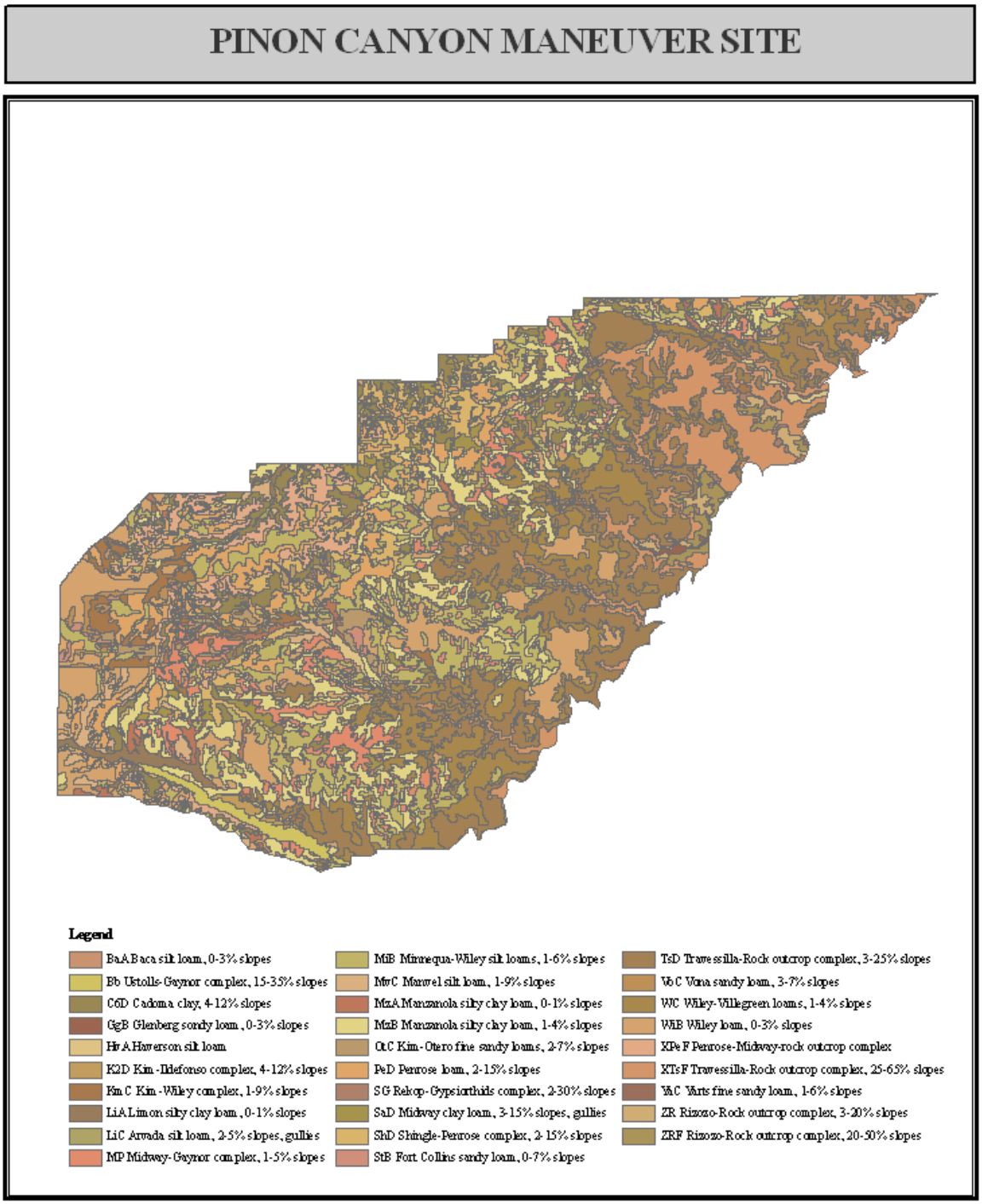

Figure 4.5-2 Soil Associations

PINON CANYON MANEUVER SITE

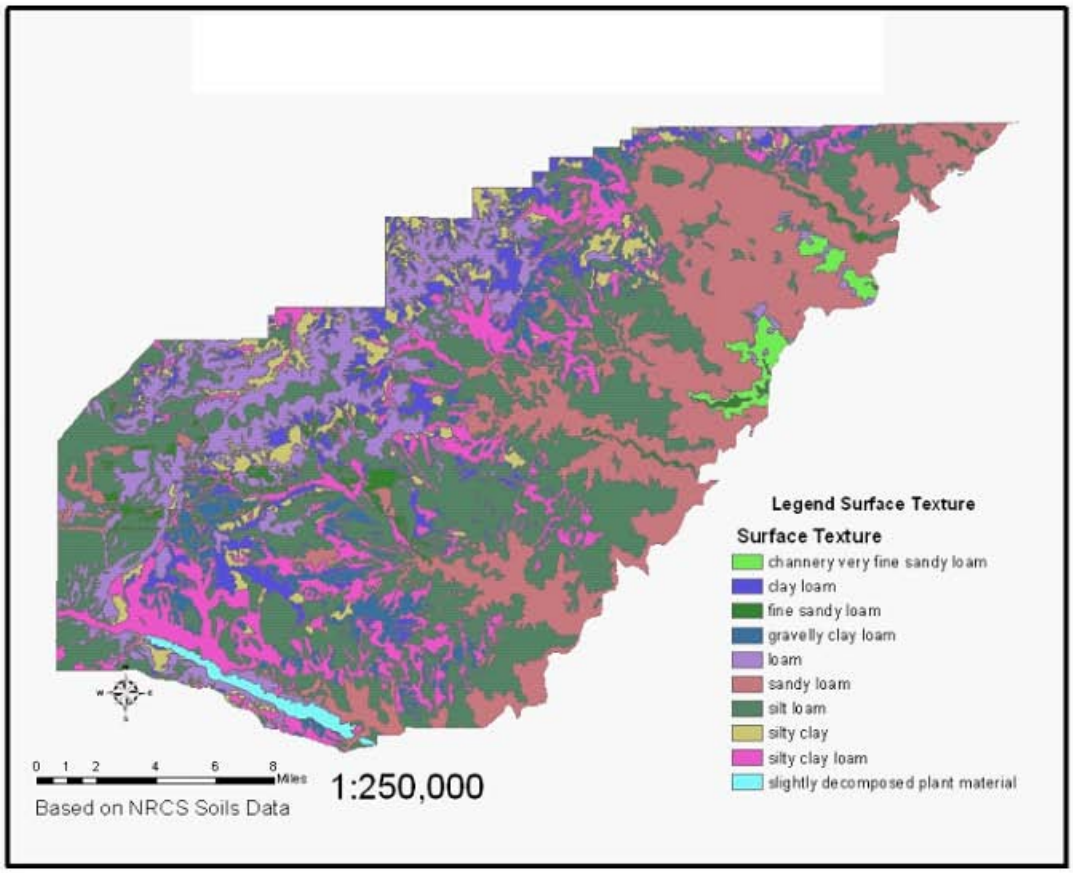

Figure 4.5-3 Soil Surface Textures
Source NRCS

Dominant soil associations in the western plains portion of PCMS consist of Penrose-Manzanola-Midway and associated soils in approximate percentages of 20 percent Penrose, 20 percent Manzola, and 13 percent Midway soil associations in the western plains area (Reference No. 186).

Penrose soils. Typically found on ridges and steep hills, these soils are shallow and well drained. They formed in residuum derived dominantly from limestone. The soils are loamy and are typically underlain by limestone at a depth of 10 to 15 inches. Water capacity is low and potential for water erosion in these soils is high and permeability of these soils is moderate. Potential plant communities on these soils consist mainly of sideoats grama, needlefrass, and blue grama. Shingle Penrose can be found on footslopes and ridges. Shingle Penrose soil is shallow and well drained formed from shale.

Manzola soils. Found in western PCMS in swales and on stream terraces and plains, the soils are well drained and formed in loess, alluvium, and residuum derived dominantly from shale. The surface layer is silty with clay and the subsoil is fine textured. Soils, silty to fine, are moderately salt and alkali affected. Permeability of manzola is slow and available water capacity is high and runoff and water erosion potential is low. Potential vegetation on these soils includes blue grama and western wheatgrass. Only salt tolerant species should be planted, as the soil is calcareous with an effective rooting depth of 60 inches or more.

Midway soils. Found on side slopes, foot slopes, and plains, the soils are typically shallow and well drained. Formed in residuum derived dominantly from shale, the soils are underlain by shale at a depth of 5 to 15 inches, and are slightly salt and alkali affected. Typically, their surface layer is a few inches of clay loam. Permeability of Midway soil is slow, with an effective rooting depth of 5 to 20 inches. Soil is moderately alkaline and saline throughout, with high erosion potential from water erosion and typically rapid runoff.

4.5.1.3.2. Northern Piñon Canyon Maneuver Site and Limestone Ridges

Limestone ridges cross the northwestern highlands of PCMS. The landscape is composed of limestone breaks on steep side slopes and saline overflow along intermittent drainages. Soils are somewhat unstable, experiencing moderate to high water erosion and moderate wind erosion in disturbed areas (Reference No. 6).

The upland valley that crosses the installation from southwest to northeast, between limestone ridges and the Purgatoire River, contains soils that range from wind-deposited silty soils in flat areas to clayey soils

formed from weathered shale in broad depressions. Major soils in this landscape consist of loamy plains, alkaline plains, and saline overflow. Soils in this landscape are characterized by medium to low stability, moderate water erosion, and high wind erosion rates in disturbed areas. The dominant soil associations in the Northwestern Limestone Ridges include Manzola silty clay loams (approximately 30 percent), Travessilla soils complexes (approximately 15 percent), and Midway-Razor soils complexes and rock outcrops (approximately 13 percent).

Travessilla soils. Found on steep canyons, ridges, and steep-sided drainage ways, the soils are shallow and well drained, formed in residuum derived dominantly from sandstone, are sandy and loamy, and are underlain by sandstone at a depth of 5 to 15 inches. Run-off of water is medium to rapid and water erosion potential is medium to high. Potential plant communities include mainly grama and blue grama. Seeding is typically difficult because of bedrock exposure and permeability is moderate and available water capacity is low.

A discussion of Manzola and Midway soil associations is provided in the description of western plains soil types.

4.5.1.3.3. Eastern Piñon Canyon Maneuver Site, Plains Bordering the Canyon

Soils occurring in the landscape where the Purgatoire River and the associated side canyons form a series of rock-strewn cliffs and rolling mesa tops are predominantly loamy plains and sandstone breaks, interspersed with rock outcrops with some areas of loamy plains, saline overflow, and salt meadow soil types. These soils are moderately stable and water erosive in gently sloping areas, but are unstable and severely erosive in steep areas. Soil loss from wind erosion is low on most soils in this landscape.

This portion of PCMS consists of sloping plains bordering steep canyons. Vegetation consists mainly of grassland with juniper trees on steeper slopes where bare rock is not exposed. The eastern portion of PCMS consists of an estimated 55 percent Travessilla soils, 15 percent Wiley soils, and 15 percent Villagreen soil associations and complexes.

Wiley soils. Found on gently sloping plains that border canyons and drainage ways. Soils are deep and well drained and formed in loess (silty wind-eroded material) and derived mainly from sediment deposits and wind erosion. Soils are silty throughout, native vegetative cover is mainly grass, and the surface layer or Wiley Loam is typically about 5 inches thick with a substratum to a depth of 60 inches or more. Soil is moderately alkaline and calcareous throughout. Runoff is slow and water erosion potential is moderate.

Potential vegetative communities on these soils include blue grama and western wheatgrass. These soils are susceptible to wind erosion and their permeability of Wiley soils is moderate and water capacity is high.

Villagreen soils. Found on plains adjacent to drainage ways and canyons. Soils are moderately deep and well drained and formed in loess and residuum derived dominantly from sedimentary deposits. Soils are silty and underlain by sandstone at a depth of 32 inches. Formed in Aeolian silt and sand residuum derived dominantly from sandstone. The surface layer is typically 6 inches thick with a subsoil that is silty clay loam and 18 inches thick. It is noncalcareous and mildly alkaline in surface layer and moderately alkaline and calcareous below that depth.

A discussion of Travesilla soil associations are provided above in the description of Northern PCMS soil types.

4.5.1.3.4. Southern Plains

Southern plains of PCMS consists of sloping plains with vegetation consisting mainly of grassland. Dominant soils associations include Wiley and Kim soils and generally have a loamy surface texture. Wiley soil associations make up approximately more than 50 percent of the soils in the southern plains of PCMS with Kim soil associations representing approximately 10 percent of the soils surveyed (Reference No. 56). These soils are typically deep, and well-drained. Slopes in the area typically range from 0 to 9 percent. See discussion of Wiley soils in Section 4.5.1.3.3.

Kim soils. Found on steeper sloping plains, these soils are deep and well drained formed in eolian material (wind blown material usually bound with calcium carbonate [$CaCO_3$]). Kim soils are derived dominantly from sedimentary deposits and these soils typically consist of a loamy surface texture and are classified as soils that are moderately susceptible to water erosion.

4.5.1.4. Erosion Management

PCMS has several land management programs that implement management plans designed to sustain training resources and offset adverse effects associated with military training (Reference No. 6). The BMPs and engineering controls implemented to reduce effects on soils are included in these programs. Approximately 70 erosion-control reservoirs on PCMS are monitored by the USGS as funding is available (Reference No. 60). The major plans, permits, and regulations implemented to reduce the effects of erosion and sedimentation on PCMS include:

- *MDC Program, Deferment Program, Reclamation Planning* (Reference No. 187);
- INRMP (Reference No. 6);
- *Fugitive Dust Control Plan* (Reference No. 53); and
- Section 404 Regional Permit No. 2002-00707 (Reference No. 61).

In addition, the EIS for Training Land Acquisition (Reference No. 188) identified mitigation that would minimize erosion on the installation. Under the direction of these plans and regulations, PCMS implements various erosion-control BMPs and mitigation measures on the installation intended to reduce the adverse effects of erosion and associated sediment.

In addition to the programs previously listed, soils management at PCMS includes erosion control projects that are carried out by Fort Carson's Watershed Team when erosion control needs are identified. Prior to implementing erosion control projects, the work is subject to environmental review, which may include a categorical exclusion, Record of Environmental Consideration (REC), EA, or EIS, and permitting.

The types of erosion control projects implemented by DECAM and ITAM include:

- Grading of existing roads to ensure proper drainage;
- Installation and maintenance of erosion control structures such as erosion control dams, rock check dams, waterbars, and hardened (bed of rock) crossings in existing drainages at intersections with established dirt roads;
- Bank-sloping to reduce gully erosion and to increase military training opportunities;
- Revegetation of disturbed lands; and
- Installation and maintenance of water diversions.

The main dirt roads in the training areas are maintained by the DPW by contractors.

4.5.1.4.1. Modeling Studies

Adding Modern Soil Erosion Prediction and Rangeland Health Assessment to the Land Condition Trend Analysis Program at Fort Carson and PCMS (Reference No. 189) evaluates soil erosion on training areas and the influences of land use and management practices on training areas at PCMS. The USDA assessment applied a hillslope erosion model to 19 study sites, one control site, and two bank slope sites on PCMS to assess soil erosion rates and sediment yield along hillslopes. In the assessment, the USDA recommended using the model in soil protection planning and the design evaluation on PCMS to evaluate

revegetation design on sloped sites, training areas, and rest rotations (Reference No. 189). The model has not been used on PCMS since the initial studies were conducted by the USDA in 1999 because of the intensive field effort that would be required to collect data.

4.5.1.5. Chemical Constituents in Soil

As described in the INRMP, Fort Carson and PCMS have some of the highest naturally occurring documented levels of selenium in the United States. Naturally occurring selenium can acutely and chronically impact both aquatic and terrestrial wildlife when land disturbances, such as military mechanized maneuvers, and excessive erosion occur. Selenium that has leached into lower soil profiles over millions of years is exposed by land disturbance and taken up by selenium receiving plants that are uniquely adapted to these sites. The two most common plants found as indicators are two native species, desert princess plume (*Stanleya pinnata*), and two-grooved milkvetch (*Astragalus bisulcatus)*. When selenium-loaded soils are exposed to water, selenium can directly enter surface water systems and biologically accumulate in the systems of aquatic and terrestrial animals. Deep-rooted, selenium receptor plants can also redistribute selenium onto the ground surface and into the soil. Other heavy metals naturally occurring at high levels on Fort Carson, such as mercury, follow the same geological and biological pathways as selenium.

There are no government standards or regulations for terrestrial and non-point source selenium, because the understanding of selenium distribution in soil and plant communities is complex and studies are limited. The DECAM completed and implemented a selenium reception study in 1998 in conjunction with the University of Wyoming. The study defined the distribution of selenium in soils and vegetation, and subsequent academic work defined the relationship of selenium concentrations to geologic distribution (Reference No. 57). Additional academic study is ongoing, including a study conducted by the University of California, Riverside, in 1999, for which known selenium plant receptor tissues collected from all over the United States led to the observation that princess plume plant tissues from Fort Carson had the highest levels of selenium accumulation. The university then collected genetic material from Fort Carson princess plume populations in 2000 and 2001 to establish a strain of superior selenium receptors for use in biological soil amendments. Additional academic work has quantified selenium in aquatic systems at Fort Carson. Selenium study results provide DECAM managers with site-specific selenium knowledge. Resulting management decisions ensure that land user activities do not create a selenium environmental reception hazard.

In 1998, the DECAM initiated its first major selenium remediation project that dramatically reduced aquatic selenium reception in Training Area 11. About 136,000 cubic yards of selenium-contaminated soil were buried and stabilized (Reference No. 6). Selenium management is a byproduct of watershed management. Thus, selenium exposure is controlled through the implementation of projects within watershed management plans.

4.5.1.6. Geologic Hazards and Seismicity

The Great Plains Physiographic Province may be seismically active. According to the CGS, some of the 90 potentially active faults in Colorado may be near the Raton Basin (Reference No. 48). USGS and CGS databases indicate that faults in the area could have a low to moderate potential to cause damaging earthquakes (Reference No. 47 and 48). It is estimated that several thousand faults within the state that have not been extensively mapped or studied; therefore, predicting the timing or location of potentially dangerous earthquakes is not possible (Reference No. 48).

PCMS is located within the low-risk Seismic Zone 1 (Reference No. 6). Several seismic faults are located within the vicinity of PCMS, although none cross through the installation (Reference No. 57 and 49). Small faults potentially associated with the Apishapa Uplift are found in the northern edge of PCMS (Reference No. 6). As described for Fort Carson, small earthquakes are known to occur in the southeastern portion of Colorado, with generally undetectable effects (Reference No. 6). Since 1973, most earthquakes within 60 miles of PCMS registered a magnitude of less than 4.0 on the Richter scale. The largest earthquake in the area recorded a magnitude of 5.0 approximately 50 miles from the center of PCMS (Reference No. 50). There is low potential for significant seismic activity near PCMS.

A major landslide occurs every 20 to 40 years at PCMS, affecting soils with slopes that are greater than 30 percent. Landslides tend to occur at PCMS from approximately the middle of the western boundary, southwest to Dillingham Ridge (Reference No. 190).

4.5.1.7. Historical Use of Piñon Canyon Maneuver Site

PCMS has a history of grazing use prior to becoming an Army maneuver training site. No grazing has occurred on PCMS since its acquisition in 1983. Since this time the land at PCMS has been used to support the training activities and maneuvers of mechanized tracked vehicles, wheeled vehicles, dismounted Soldiers, and logistics transport trucks. Environmental management staff have implemented sound land management and stewardship policies to support training land use of Piñon Canyon, to include management of fuel loading to decrease potential and severity of wildfires. Land use, management

programs, environmental fluctuations, and changes in climate patterns have all shaped soils and geologic conditions of the affected environment.

4.5.1.8. Climatic Factors Effecting Erosion Potential at Piñon Canyon Maneuver Site

PCMS drains into tributaries which for the most part drain to the Purgatoire River. Tributaries that drain PCMS are intermittent or ephemeral (Reference No. 191).

Contributing factors leading to soil erosion at PCMS are much different than those at Fort Carson. The semi-arid climate of the region has received an average of less than 12 inches of rain per year in the period from 1983 to 2007 (Reference No. 192). A vast majority of rainfall comes in the form of large rainfall events of greater than 0.5 inches. These storm events occur on an average of less than six days per year in any given year, though there is considerable variability in total amount of precipitation received and number of large rainfall events across years from 1983-2007 (Reference No. 193). These larger storms (more than 0.5 inches) generate much of the water erosion potential for PCMS. Approximately 80 percent of the precipitation received by PCMS is received between March and October. Non-hydrologic soils on PCMS have higher run-off potential and are susceptible to water erosion from these large storm events when disturbed. The limited number of days of precipitation, however, serve as a natural mitigation to water-based erosion of soils at PCMS. The fine and silty nature of some of the predominant soil types and the dry conditions mean that PCMS is more susceptible to wind based erosion rather than water erosion for most of the year, with the exception of a limited number of days of heavy rainstorms.

Figure 4.5-4 shows the hydrologic soils groupings of existing soils on PCMS and provides insight into the ability of soils to absorb surface water run-off from rainfall events and susceptibility to surface water erosion. Factors influencing surface water absorption capability include soil surface texture (high clay means less absorption), depth to bedrock, percent organic matter, and slope (Reference No. 55). A vast majority of PCMS soils are rated as C or D, and as Figure 4.5.4 shows do not readily absorb surface water in large rain events.

Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. These soils have high surface water absorption potential. Group B soils have moderately low runoff potential. Water transmission through the soil is unimpeded. Group B soils typically have between 10 and 20 percent clay and 50 to 90 percent sand and have loamy sand or sandy loam textures. Group C soils have moderately high runoff potential.

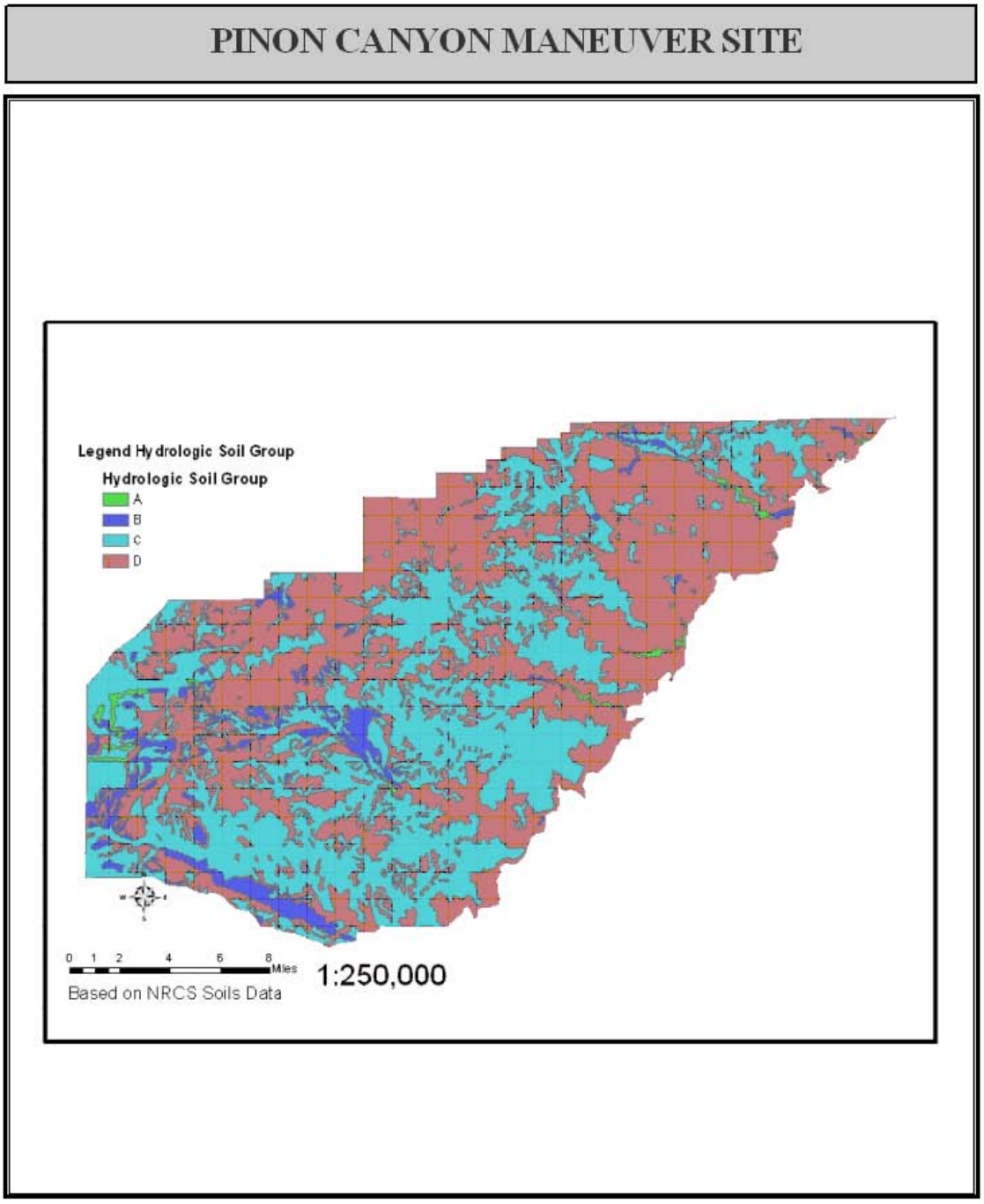

Figure 4.5-4 Hydrologic Soils Groupings
Source NRCS

Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Group D soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is slow or very slow. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas they also have a high shrink-swell potential. Some soils are in this group because the depth to a restrictive layer is less than 20 inches. These soils are capable of absorbing less than 0.14 inches of water per hour.

Historically, PCMS has contributed highly variable levels of sediment/surface soil to the Purgatoire River Basin, ranging from 20,000 tons to several hundred thousand tons of sediment and soils (Reference No. 194). This level of contribution to the system is highly dependent on the variable rainfall and patterns (both total frequency of storms, their size, and amount of precipitation) the region receives; amount of maneuver training and maneuver damage; and the Army's internal land management, environmental, and training management programs.

Soil erosion potential from both water and wind erosion is partially dependent on types of vegetation in addition to slope of the landscape, amount of vegetative cover, and whether soils have been disturbed due to training activities at PCMS. Figure 4.7-1 shows the existing vegetative associations of PCMS.

4.5.2. Environmental Consequences

In order to understand the potential impacts to soils that would result from the Proposed Action it is necessary to understand PCMS' training areas, how they are managed now and in the future to support various alternatives.

In the past, PCMS has been broken down into different management areas to support training (i.e., mounted, dismounted, live-fire, surface excavation). Use of training areas has been scheduled and rotated to promote maximum sustainability of the training landscape while minimizing environmental impacts. This rest/recovery scheduling rotation has been implemented to achieve land sustainability while meeting the training requirements of Fort Carson's units. At the same time, the Army has implemented land rehabilitation, monitoring, and environmental stewardship programs to preserve the landscape and its natural and cultural resources. Since 2001, the maneuver area has seen limited large unit use (one to two Brigade sized deployment rotations per year) because of high deployment tempo to support the Global War on Terrorism. Figure 4.2-1 presents a visual depiction of the current use designations (mounted, dismounted, no-dig, off-limits, and restricted areas) of PCMS and how it is used to support maneuver training.

With the implementation of BRAC 2005, GDPR, and AMF, and substantial increase in training requirements that accompanied these actions, installation managers are projected to have limited options in managing maneuver and live fire training activities at PCMS. The limited cantonment area activities that take place at PCMS would remain concentrated on the central-western portion of the installation. New cantonment area or range construction activities are not being proposed as part of this action at PCMS.

4.5.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

Maneuver activities are the main driver of environmental consequences to soils and geology at PCMS. Maneuvers would result in additional soil surface disturbance and additional exposure to soil loss from wind and water erosion.

The IBCT would be projected to conduct its maneuver training in the more ruggedly contoured areas of PCMS to the northern and western portions of the maneuver training site and in the eastern canyon areas. The IBCT would conduct additional dismounted maneuvers in the dismounted maneuver areas depicted in Figure 4.2-1. The flat plains areas are not ideally suited for executing mounted or dismounted infantry tasks and are more suitable for conventional force on force training exercises of heavy armored vehicles. The IBCT is capable of conducting mounted and dismounted operations in areas with more contour and steeper slopes and would utilize more rugged terrain not accessible or capable of supported mounted operations of armored vehicles. The central and southern plains areas would be more heavily utilized by HBCT units to support mechanized armored engagements.

4.5.2.1.1. Maneuver Impacts of Infantry Brigade Combat Team and Combat Support Units

The IBCT is projected to increase total maneuver training impacts at PCMS by approximately 8.6 percent, though the actual overall increase in maneuver training may be less after implementation of garrison training and land management controls. The IBCT does not engage in major surface disturbing activities, and conducts mounted maneuvers primarily with lightweight and medium tactical trucks. The IBCT's lightweight tactical trucks and HMMWVs have limited potential to shear vegetation and cause significant disturbance to the soil surface, particularly when operating at PCMS under dry conditions, which would be the vast majority of the time. Most of the land area of PCMS is considered compatible with HMMWV vehicles, the dominant type of vehicle used for off-road training by IBCTs. The NRCS rates PCMS as compatible with HMMWV use during both dry and wet conditions. (Figure 4.2-1). Many

of the IBCT's heavier trucks would be associated with logistics functions that would conduct most of their activities at PCMS on existing road and trail networks and would not cause significant increases in soil disturbance or loss of existing vegetation in off-road areas. Surface excavation activities of the IBCT would be restricted around canyon drainages to minimize water erosion potential, as is a management control that is currently in place at PCMS (Figure 4.5-5). Because of the low-impact nature of IBCT maneuver training and existing management controls that would remain in place, the predicted maneuver impacts of the IBCT to soils are less than significant.

Though soil impacts from the Proposed Action are not projected to be significant, the training of these units would result in a moderate increase to soil erosion. Soil erosion resulting from increased training at PCMS would result from both water and wind erosion, and a marginal reduction in vegetative cover from off-road maneuver activities.

Water Erosion

Water erosion is caused both by rain drops striking the earth's surface and sheet and rill (channeled) flow of surface water, particularly over disturbed soils and vegetation. The water erosion rate of soils depends primarily on the slope of the area in question, properties of the soil, climate/precipitation patterns, and vegetative cover (Reference No. 55). The greater the slope of the maneuver area, the more force surface water can generate to move soil particles and top soils from naturally occurring locations, and the greater potential for channeling which cuts into the soil.

Much of the central and southern portions of PCMS consist of gently rolling plains. The gentle slopes serve to naturally limit the potential for water erosion in these areas. Drainages and canyons leading to the Purgatoire River on the eastern boundary of PCMS and areas along the northwestern boundaries of the training area consist of steeper slopes that are more prone to water erosion. These areas would be used by IBCT units, particularly for dismounted training, and would generate some additional disturbance to vegetation and soils increasing the susceptibility of soils in these areas to water erosion. Figure 4.5-6 shows the susceptibility of PCMS to water erosion.

Wind Erosion

Wind movement of soils is often of greater concern than water erosion in the semi-arid southwest (Brashears et al 2003). Wind erosion of soils occurs when the force of the wind overcomes the stabilizing factors that hold soil in place. Factors influencing wind erosion of soils include natural properties of the soil (stickiness, aggregate content, and organic matter content), climate of an area, and amount of surface disturbance (Reference No. 55).

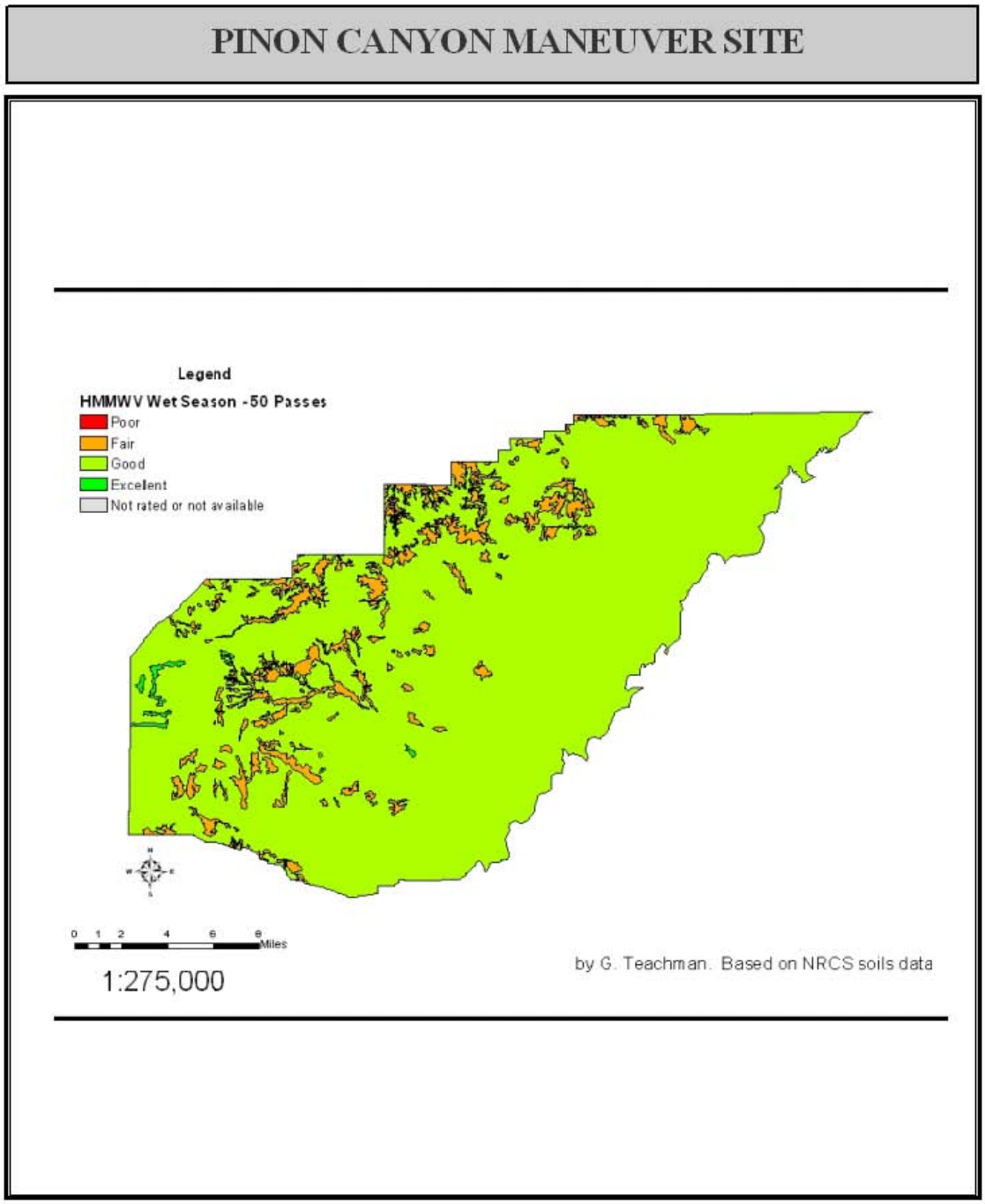

Figure 4.5-5 Military Training Compatibility of PCMS with HMMWV Training (Wet Conditions)
Source NRCS

PINON CANYON MANEUVER SITE

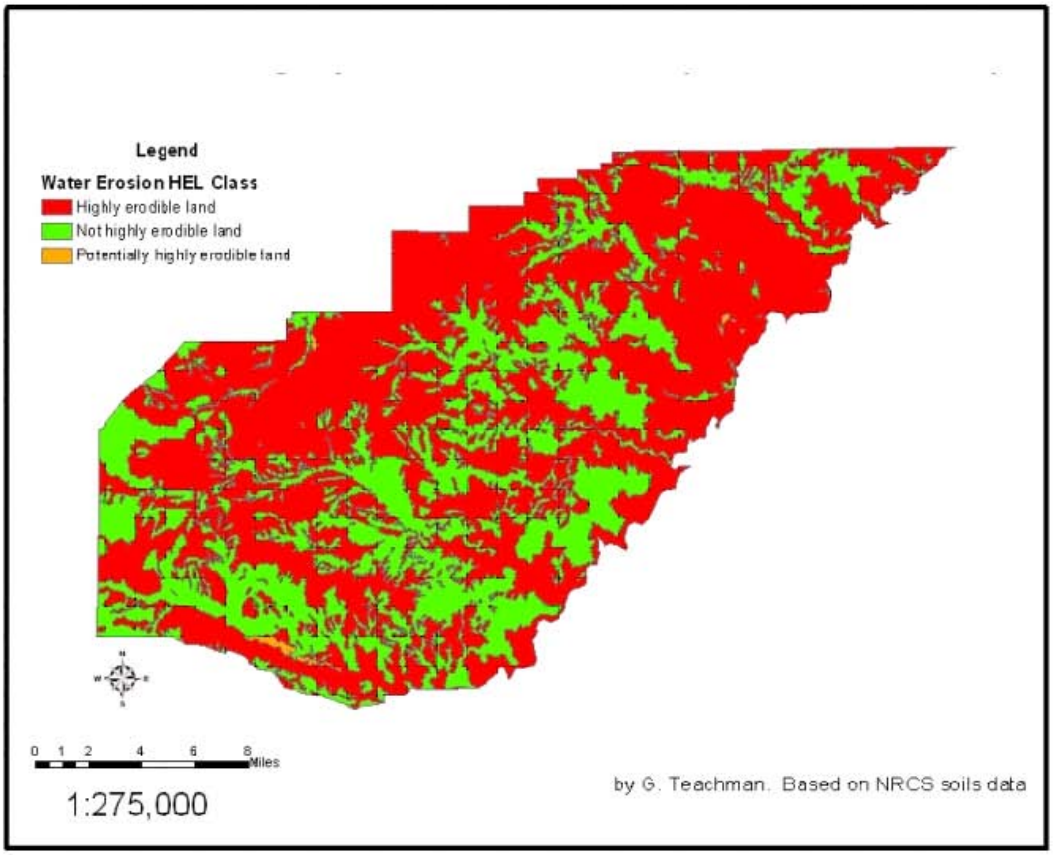

Figure 4.5-6 NRCS Classifications of Highly Erodible Soils (Water Erosion)
Source NRCS

In drier environments, there tends to be less organic matter in the soils and less soils aggregation to prevent loss of soil. Finer soil particles, particularly silt, which lacks cohesion of clays, are prone to wind erosion. Soil associations with their high silt and low clay content are considerably more vulnerable to wind erosion than clay or sand soils (Reference No. 195). PCMS, which consists of approximately 25 percent fine silty surface texture soils (Figure 4.5-3 and Table 4.5-1), is susceptible to wind based erosion in many areas containing silt based soils.

The maneuver training of the IBCT and CS units is predicted to result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency of use of PCMS by the IBCT for maneuvers would result in greater ground surface disturbance and in an increase in the loss of vegetative cover. MIMs calculations estimate an 8.6 percent increase in soil surface and vegetative disturbance impacts. A majority of IBCT off-road maneuvers would occur in topographic areas which permit maneuver of wheeled vehicles, but which have some contour and vegetation to offer cover and concealment to support military maneuvers of mounted and dismounted infantry units. Isolated surface disturbance would occur from the surface excavation of individual fighting positions and establishment of observation points on areas of observation with good fields of view. Loss of vegetative cover and surface disturbance would make soils more prone to water and wind erosion given the steeper sloped topography of areas where the IBCT is projected to operate (western, northern, and eastern PCMS canyon areas). Loss of soils from water erosion would be highly dependent on the number and intensity of large storm events, which are highly variable from year to year. The limited increase in mounted maneuver attributable to the lighter vehicles of the IBCT and minimal surface disturbing activities are predicted to result in less than significant impacts.

Soil Compaction and Rutting. Soils in training areas would be subject to marginally increased levels of compaction. Dryer soils of semi-arid climates such as PCMS are less susceptible to soil compaction and displacement of water in soil pores and are less prone to losses of soil structure and function associated with compaction (Reference No. 196). In addition, vehicles used by the IBCT do not have the compaction potential of armored vehicles of the HBCTs training at PCMS. The logistics vehicles of the IBCT would, in most cases, follow existing trails and pathways and not result in additional soil compaction or rutting from off-road maneuvers. Maneuver training by an additional BCT at PCMS would, however, reduce vegetative recovery, increasing rutting in some areas and reducing the ability of roots to break up existing compaction. Overall impacts to soils of PCMS are predicted to be less than significant.

Reduced Infiltration. The ability of water to infiltrate soils would be marginally reduced because of the additional training, compaction, and reduction in vegetative cover the training areas would experience. Reduced infiltration would lead to less absorption of precipitation and increased volume of surface water flow following storm events which would lead to slight increases in water erosion of soils (Reference No. 197). With less recovery time and increase loss of vegetation, less root matter and organic matter would be available to absorb water and reestablish soil pores. Reduced infiltration would lead to increased surface water erosion of soils, though impacts would be projected to be minor.

Table 4.5-1 Piñon Canyon Maneuver Site Soil Association Category Symbols and Descriptions

Symbol	Description and Slope	Percent Slope	Percent Cover
2-BaA	Baca silt loam	0-3	0.02
3-Bb	Ustolls-Gaynor complex	15-35	0.85
4-C6D	Cadoma clay	4-12	4.76
5-GgB	Glenberg sandy loam	0-3	0.13
6-HvA	Haverson silt loam	N/A	0.59
7-K2D	Kim-Ildefonso complex	4-12	0.32
8-KmC	Kim-Wiley complex	1-9	1.91
9-LiA	Limon silty clay loam	0-1	0.77
10-LiC	Arvada silt loam	2.5	0.03
11-MiB	Minnequa-Wiley silt loams	1-6	10.09
12-MP	Midway-Gaynor complex	1.5	5.22
13-MvC	Manvel silt loam	1-9	1.30
14-MzA	Manzanola silty clay loam	0-1	1.39
15-MzB	Manzanola silty clay loam	1-4	10.17
16-OtC	Kim-Otero fine sandy loams	2-7	1.67
18-PeD	Penrose loam	2-15	6.91
19-Rv	Riverwash	N/A	0.00
20-Sa	Shingle-Penrose complex	2-15	0.76
21-SaD	Midway clay loam, gullied	3-15	1.54
22-SG	Rekop-Gypsiorthids complex	2-30	0.27
23-ShD	Shingle-Penrose complex	2-15	3.84
24-StB	Fort Collins sandy loam	0-7	0.35
25-TsD	Travessilla-Rock outcrop complex	3-35	15.61
27-VoC	Vona sandy loam	3-7	0.45
28-WC	Wiley-villegreen loams	1-4	10.11
29-WiB	Wiley loam	0-3	8.15
30-XPeF	Penrose-Midway-rock outcrop complex	25-65	3.11
31-XTsF	Travessilla-Rock outcrop complex	25-65	8.23
32-YaC	Yarts find sandy loam	1-6	0.04
33-ZR	Rizozo-Rock outcrop complex	3-20	0.62
34-ZRF	Rizozo-Rock outcrop complex	20-50	0.78
Total			**100.00**

Source: Reference No. 52

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. Use of artillery simulators, smoke obscurants, and catalytic converters from use of vehicles have some potential to start fires. The increased frequency of maneuver training elevates the risk of anthropogenic fire and the potential for loss of vegetative cover. This indirectly increases the potential for wind and water erosion of soils. Management would mitigate the indirect impacts from increased fire risk to less than significant.

Geology

The execution of maneuver training at PCMS to support the IBCT and other CS units as part of the Proposed Action is anticipated to have only minor impacts on PCMS geology or topography. These minor impacts are not predicted to result in perceptible changes to geologic resources.

4.5.2.1.2. Maneuver Impacts of the Combat Aviation Brigade at Piñon Canyon Maneuver Site (All Alternatives)

Aviation maneuver training at PCMS would be conducted in support of heavy armored force on force maneuver rotations, and in support of infantry and special operations exercises. The CAB would engage in troop transport and insertion, equipment transport, and maneuver in support of ground units. Aviation units have operated at PCMS in the recent past, and aviation operations were conducted routinely through 2005 by the 3rd Armored Calvary Regiment (ACR). In addition to aviation maneuvers, the CAB ground vehicles would operate from designated areas, primarily traveling along roads and trails.

Aviation units would typically fly at altitudes of several hundred feet during support of armored maneuver rotations, but would conduct low-level flights during landing, and dismounted troop and equipment insertions. During maneuvers, attack and scout aviation elements would use terrain and flight altitude to conceal approaches. Low level flights would expose soils, particularly finer soils to high velocity winds generated by helicopter rotors. This rotor wash would differentially lift silts from the soils and expose areas of previously undisturbed soil surface to both water and wind erosion. Water erosion potential is highly dependent on the number and type of large storm events that PCMS would experience, and this varies considerably from year to year (Reference No. 194).

The maneuver training of the CAB would result in the following impacts:

Increased Surface Disturbance of Soils and Removal of Vegetation. Increased frequency and intensity of use of PCMS by the CAB and its logistics elements would result in increased surface

disturbance from rotor wash in areas used as helicopter landing areas and troop insertion points. Increased training of the CAB would result in an increase in the loss of vegetative cover. Potential for soil loss would be amplified in areas of PCMS with silt based soil associations (central and southern PCMS) that are more prone to impacts from wind erosion. Approximately 25 percent of PCMS soils are loamy with high silt concentrations. Aviation training would further exacerbate soil loss from wind erosion because of high velocity winds generated by helicopter rotor wash. Loss of vegetative cover and surface disturbance would make soils more prone to wind and water erosion. Areas designated for dismounted training, with more rugged contours and steeper slopes, would be differentially impacted by soil surface disturbance from aviation troop insertion activities. Water erosion from large storm events in these contoured areas would carry off disturbed soils and could lead to additional sheet and rill erosion and gullying. The stationing of the CAB and IBCT at PCMS is projected to result in a 15 percent increase in maneuver impacts at PCMS. Impacts are anticipated to be significant but mitigable to less than significant through training and environmental management procedures.

Increased Erosion and Wear from use of PCMS Trail Network. The additional use of PCMS trail network by the logistics element of the CAB would result in additional loosening of soils and sediment run-off from the trail network. Trails would be more susceptible to sheet, rill, and gully erosion during storm events. The limited increased use of PCMS trail network is predicted to result in minor additional direct adverse impacts.

Indirect Effects of Increased Potential for Fire and Lost Vegetative Cover. Maneuver training would result in an increased potential for anthropogenic fire. The use of training simulators, smoke obscurants, and catalytic converters from use of the CABs' ground vehicles have some potential to start fires. The increased frequency of maneuver training elevates the risk of anthropogenic fire and the potential for loss of vegetative cover. This indirectly increases the potential for wind and water erosion of soils. Indirect impacts to soils from fires are predicted to be less than significant.

Geology

The execution of maneuver training at PCMS to support the CAB as part of the Proposed Action is anticipated to have only minor impacts on PCMS geology or topography. The minor impacts to these resources are not predicted to result in significant changes.

4.5.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. Training activities needed to support

these actions at PCMS would not occur either. Levels of maneuver training at PCMS would not increase in comparison to training levels following implementation of stationing actions in support of BRAC 2005, GDPR and AMF decisions. Therefore, under the No Action Alternative, there would be no impacts to geology or soils above those assessed in the 2007 PCMS Transformation EIS.

4.5.2.3. Mitigation Measures

The Army continually funds and implements land management practices and procedures described in the ITAM annual work plan to reduce soil erosion and maintain sustainable use of its training areas (*Sustainable Range Program* AR 350-19). ITAM will implement additional land and vegetation rehabilitation projects to support increased training as funding is made available. ITAM will implement erosion management measures, site restoration, and continue to monitor training areas to mitigate damage from unit training.

Fort Carson staff limit soil erosion by designating no-dig areas around drainages feeding the Purgatoire River and restricting mounted maneuver in areas susceptible to water erosion in the canyon drainage and northern training areas.

Fort Carson staff take measures to reduce fuel loads in PCMS. Prescribed burning and other measures are used to prevent fires and limit their severity when they do occur. In addition, Soldiers are educated on fire prevention procedures prior to conducting maneuver training at PCMS and are required to have a minimum amount of fire fighting equipment on hand to extinguish small fires during maneuver training.

The Army would continue to manage PCMS, aviation training to limit soil erosion and problems with downstream sedimentation where feasible. In addition the Army would harden some designated landing areas to limit soil erosion and sedimentation impacts.

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4.6. Water Resources

This section describes the affected environment and environmental consequences to water resources at PCMS, including surface water, groundwater, and floodplains.

4.6.1. Affected Environment

As described in the INRMP, water resources at PCMS are managed in coordination with the USGS, NRCS, USFWS, US Department of Justice (DOJ), USACE, CDOW, and Colorado State Division of Water Resources. The water resources management program includes watershed and sedimentation monitoring, watershed and sedimentation management and enhancement, project reviews for erosion and sediment control, and compliance with federal and state laws and regulations (Reference No. 6). A cross-functional Watershed Team at Fort Carson provides an integrated approach to watershed compliance, management, and sustainability at PCMS. The Watershed Team is responsible for implementing strategic watershed goals that would maintain the critical land resources that provide a realistic military training environment. Performance goals for the Watershed Team include maintaining or improving rangeland conditions by developing and implementing erosion control and vegetation management initiatives in accordance with accepted scientific methods and engineering standards. This is validated through the Range Training Land Assessment component of the ITAM programs. Management plans and programs applicable to water resources under which PCMS operates are listed in Appendix A.

4.6.1.1. Surface Water

4.6.1.1.1. Regional Setting

PCMS is located in the Arkansas River basin. The Purgatoire River is the primary drainage near PCMS. As shown on Figure 4.6-1, there are several smaller creeks and drainages on or adjacent to PCMS. Water from PCMS drains into the Arkansas River via the Purgatoire River or the Big Arroyo drainage. The Purgatoire River and its tributaries within PCMS have periodic high flows, including the potential for flash floods, while smaller creeks and drainages might be dry much of the year.

4.6.1.1.2. Local Setting

The majority of the drainages at PCMS flow from the northwest to the southeast and drain into the Purgatoire River, which flows to the northeast along the southern and eastern boundaries of PCMS. The Big Arroyo drainage is located in the northwest corner of PCMS and flows northeast (Reference No. 6). No creeks or major drainages are present in the cantonment area. The drainages at PCMS are intermittent; flow originates from precipitation events. Flow from PCMS contributes approximately 4 percent of the total flow in the Purgatoire River at the Rock Crossing USGS Station 07126485 (Reference No. 198).

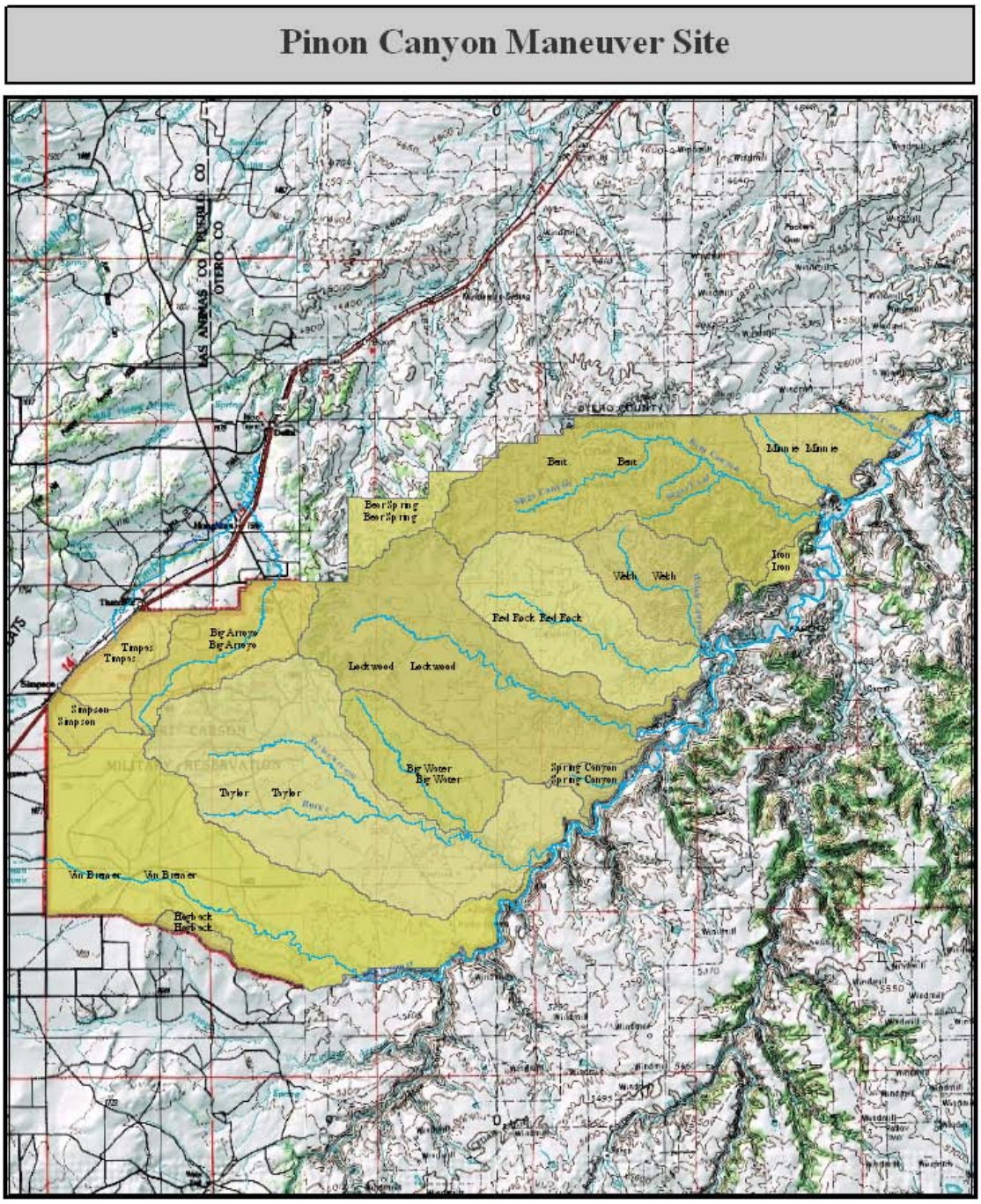

Figure 4.6-1 Surface Water and Topography at Pinon Canyon Maneuver Site

The quality of surface water at PCMS has not changed considerably in the recent past. The surface water at PCMS is not a source of domestic water supply. The potential for sediment loading in surface water is a concern (Reference No. 188). Fort Carson and PCMS have been issued a Section 404 regional permit (Permit No. 2002-00707) by the USACE, Albuquerque District, which authorizes implementation of erosion control activities at PCMS (Reference No. 61).

There is a water resources management program for PCMS. Erosion control activities that are or could be implemented to control sediment loading in surface water are identified and described in detail in the Section 404 regional permit (Reference No. 61), the storm sewer system capacity report (Reference No. 199), and the Programmatic EA for the Erosion and Sediment Control Program (Reference No. 200). The permit includes a range of erosion control methods, including:

- Erosion control impoundments;
- Banksloping of erosion courses;
- Check dams;
- Rock armor;
- Hardened crossings;
- Culverts and bridges;
- Erosion control terraces and water diversions; and
- Water turnouts.

To control and monitor sediment transport and loading, the USGS operates approximately 70 erosion-control reservoirs, a stream flow gauge on the Purgatoire River, and five stream flow-sediment gauges on Purgatoire River tributaries that drain more than 60 percent of PCMS. The erosion-control reservoirs are used to assess sediment yields from small watersheds in the training areas, while the stream flow-sediment gauges quantify water and sediment quantities leaving PCMS. The USGS uses information from the erosion-control reservoirs and stream flow-sediment gauges to support an erosion-production and sediment-production assessment of PCMS (Reference No. 6).

The USGS has monitored water quality, including sediment yield, at PCMS since 1983 in cooperation with the Army and Fort Carson (Reference No. 198). Water quality data from 1984 (before military training activities started at PCMS) through 1987 (after training was initiated) were evaluated by statistical analysis. The finding of this report demonstrated that the military maneuvers conducted during this period did not have a statistically significant effect on water quality in the Purgatoire River (Reference No. 198). Another study sought to evaluate erosion and sedimentation for potential Total

Maximum Daily Load (TMDL) compliance (Reference No. 201). The TMDL study did not result in a TMDL for sedimentation, but it outlined further steps for study.

4.6.1.2. Surface Water Quality

4.6.1.2.1. Water Quality Standards

The CDPHE WQCC is responsible for establishing acceptable water quality levels on all streams in Colorado. As such, WQCC has divided all water bodies in the state into various segments, each of which has been assigned water quality levels, known as "water quality standards," that have been established to protect and preserve the beneficial uses of the water or to improve the water quality.

Classification and use designations have been established for the Purgatoire River, according to the water quality standards adopted by WQCC on February 12, 2007. The mainstem of the Purgatoire River and all tributaries within PCMS are contained in stream Segment 7 of the Lower Arkansas River Basin, and have been designated for the following uses: Aquatic Life Warm 1, Recreation 1a, and Agriculture. As detailed in Regulation 31, *The Basic Standards and Methodologies for Surface Water*, these uses are defined herein:

Warm Water Aquatic Life, Class 1

These are waters that 1) currently are capable of sustaining a wide variety of warm water aquatic life, including sensitive species, or 2) could sustain such aquatic life but for correctable water quality conditions. Waters are considered capable of sustaining aquatic life where physical habitat, water flows or levels, and water quality conditions result in no substantial impairment of the abundance and diversity of specifies. "Aquatic life" includes both fish and invertebrates species.

Recreation Class 1a

These are surface waters in which primary contact uses have been documented or are presumed to be present. These uses include recreational activities in or on the water when the ingestion of small quantities of water is likely to occur such as swimming, rafting, kayaking, tubing, windsurfing, and water skiing.

Agricultural

These surface waters are suitable or intended to become suitable for irrigation of crops usually grown in Colorado, and are not hazardous as drinking water for livestock.

The established water quality standards for the mainstem of the Purgatoire River and all tributaries in PCMS are listed in Table 4.6-1.

Table 4.6-1 Stream Classifications and Water Quality Standards for Segment 7 (Mainstem of the Purgatoire River from Interstate 25 to the Confluence with the Arkansas River)

Designation	Classification	Physical and Biological Standards	Inorganic (mg/L)	Metals (µg/L)
UP	Aq Life Cold 1	DO = 6.0 mg/l	NH_3(ac/ch)=TVS	As(ac)=340
	Recreation E	DO (sp)=7.0 mg/l	Cl_2(ac)=0.019	As(ch)=0.02(Trec)
	Water Supply	pH = 6.5-9.0	Cl_2(ch)=0.011	Cd(ac)=TVS(tr)
	Agriculture	E.Coli=126/100ml	CN=0.005	Cd(ch)=TVS
			S=0.002	CrIII(ac)=50(Trec)
			B=0.75	CrVI(ac/ch)=TVS
			NO2=0.05	Cu(ac/ch)=TVS
			NO3=10	Fe(ch)=WS(dis)
			Cl=250	Fe(ch)=1000(Trec)
			SO_4=WS	Pb(ac/ch)=TVS
				Mn(ac/ch)=TVS
				Mn(ch)=WS(dis)
				Hg(ch)=0.01(tot)
				Ni(ac/ch)=TVS
				Se(ac/ch)=TVS
				Ag(ac)=TVS
				Ag(ch)=TVS(tr)
				Zn(ac/ch)=TVS

µg/L = micrograms per liter
ac = acute
Ag = silver
As = arsenic
B = boron
Cd = cadmium
ch = chronic
Cl = chlorine
Cl_2 = chlorine gas
CN = cyanide
CrIII = trivalent chromium
CrVI = hexavalent chromium
Cu = copper
DO = dissolved oxygen
Fe = iron
Hg = mercury
mg/L = milligrams per liter
ml = milliliters
Mn = manganese
NH_3 = ammonia
Ni = nickel
NO_2 = nitrogen dioxide
NO_3 = nitrate
Pb = lead
S = sulfur
Se = selenium
SO_4 = sulfate
Tot = total
Trec = total recoverable
TVS = table value standard
UP = use protected
Zn = zinc

4.6.1.2.2. 303(d) Listed Waters

Section 303(d) of the CWA requires CDPHE's Water Quality Control Division (Division) to develop a list of water bodies within the state that are not meeting the water quality standards. The Division is then required to further evaluate the stream and develop a TMDL, which will generally specify the amount of pollutants that each source, point and nonpoint, can discharge into the stream. Segment 7 is presently on the Colorado 2008 303(d) list of impaired waters, which identifies water bodies and parameters in instances where the Division has determined that one or more assigned uses or standards are not currently attained. Segment 7 has been listed because the existing quality exceeds the underlying standard for dissolved selenium. In addition, Segment 7 is included on WQCC's 2008 Monitoring and Evaluation List for sediment because there is reason to suspect water quality problems in the stream segment, but uncertainty exists in one or more factors to make a determination.

It should be noted that high selenium levels have been observed in numerous locations throughout the state. The selenium sources are typically tied to fossil fuels, such as coal or oil, or are the result of the natural weathering or irrigation of cretaceous marine shales and shale-derived soils. The latter is especially true of areas where the soils contain high alkalinity and receive low amounts of precipitation. The USGS has determined that PCMS drainage area contains slightly to moderately saline soils (Reference No. 198).

4.6.1.2.3. In-Stream Water Quality

Table 4.6-2 lists the surface water monitoring stations on streams that drain PCMS. The USGS has nine stream monitoring gauge stations along the Purgatoire River and its tributaries within PCMS, all of which have been evaluated to determine the extent of available water quality data. All but two USGS stream monitoring gauge stations stopped collecting data between 1987 and 1989. Two of the stations (07123600 and 07126485) continued to collect very limited data until 1990 and even less data after 1994. Several USGS stream monitoring gauge stations are present both upstream and downstream of the project area, but these stations are too remote from the project area to be representative of PCMS stream flow data. However, limited water quality data were found on the EPA *STOrage and RETrieval* (STORET) water quality database for two stream monitoring gauge stations (WCOP01-0812 and EPA01-0238) on the Purgatoire River adjacent to PCMS. Table 4.6-2 shows all of the water quality monitoring stations relevant to PCMS.

Table 4.6-2 Water Quality Monitoring Stations Within or Near the Piñon Canyon Maneuver Site

Organization Name	Station ID	Stream	Location
USGS	07126130	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Thatcher, Colorado
USGS	07126140	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Tyrone, Colorado
USGS	07126200	Van Bremer Arroyo, Purgatoire River	Van Bremer Arroyo near Model, Colorado
USGS	07126300	Purgatoire River	Purgatoire River near Thatcher, Colorado
USGS	07126320	Burke Arroyo, Purgatoire River	Burke Arroyo Tributary near Thatcher, Colorado
USGS	07126325	Taylor Arroyo, Purgatoire River	Taylor Arroyo below Rock Crossing near Thatcher, Colorado
EPA National Aquatic Resource Survey Data	WCOP01-0812	Purgatoire River	Purgatoire River midway between Taylor and Spring Canyon
USGS	07126390	Lockwood Arroyo, Purgatoire River	Lockwood Canyon Creek near Thatcher, Colorado

Table 4.6-2 Water Quality Monitoring Stations Within or Near the Piñon Canyon Maneuver Site (continued)			
Organization Name	**Station ID**	**Stream**	**Location**
USGS	07126415	Red Rock Arroyo, Purgatoire River	Red Rock Canyon Creek at mouth near Thatcher, Colorado
EPA National Aquatic Resource Survey Data	EPA01-0238	Purgatoire River	Purgatoire River approximately 2 miles upstream of Bent Canyon
USGS	07126485	Purgatoire River	Purgatoire River at Rock Crossing near Timpas, Colorado

Available water quality data from 1999 to present are summarized in Table 4.6-3. Summary statistics of available stream flow data indicate large fluctuations in stream flow conditions. Near the southeast boundary of PCMS (07126300), stream flow in the Purgatoire River ranged from 0.10 to 1,560 cubic feet per second (cfs), while at the northwest boundary of the installation (07126485), stream flow in the river varied between 0.39 and 2,300 cfs. Stream flow fluctuations in the Purgatoire River can be attributed to precipitation, diversions, and irrigation–return flows. Suspended sediment concentrations at 07126485 ranged from 7 to 5,120 mg/L, with the fluctuations due in part to the additional flow from Chacuaco Creek, which is the main tributary to the Purgatoire River. Conductance has been shown to be correlated to dissolved-solids concentrations. Available specific conductance data also indicated large fluctuations in the available data at 07126300 and 07126485. The volume of available data from 1999 to the present was insufficient to establish baseline water quality for the Purgatoire River near PCMS.

Table 4.6-4 shows the available data from the 1993 USGS study at stations 07126300 and 07126485. Though the USGS evaluated 11 stations, including the USGS stations listed in Table 4.6-2, only stations 07126300 and 07126485 were evaluated for various water quality parameters in addition to stream flow, suspended solids, and sediment loads.

In 1993, the USGS completed a study entitled *Assessment of Effects of Military Maneuvers on the Stream Flow, Water Quality, and Sediment Yields at PCMS, Las Animas County, Colorado* (Reference No. 198). This report analyzed instream water quality data during the pre- and post- military maneuver periods at PCMS from 1982 to 1985 and 1985 to 1987, respectively. Effects of military maneuvers on stream flow quantity and quality were determined by statistical analysis. The USGS reported no statistically significant change in stream flow quantity or quality between the pre- and post-maneuver periods for the Purgatoire River and its tributaries within PCMS. The USGS report indicated that the reliability of statistical data, however, could have been improved with additional years of stream flow quantity and quality data. Because existing water quality data after 1999 are extremely limited, the 1993 report summarized the most recent extensive water quality data set for the Purgatoire Rivernear PCMS.

Table 4.6-3 Water Quality Summary for Monitoring Stations Near the Piñon Canyon Maneuver Site

Station ID	Date Period	Statistics	pH (SU)	DO (mg/L)	Temp (°C)	Spec. Cond. (µs/cm)	Instantaneous Discharge (cfs)	Turbidity (NTU)	TSS (mg/L)	Sus. Sediment (mg/L)	Sulfur (mg/L)	Dissolved Ammonia as N (mg/L)	Dissolved Chloride (mg/L)	Dissolved Calcium (mg/L)	Dissolved Magnesium (mg/L)	*Hardness as $CaCO_3$ (mg/L)	Dissolved Selenium (µg/L)	Dissolved Zinc (µg/L)
07126300 (Purgatoire River near Thatcher, CO)	4/29/1999 to 10/6/2004	# samples	--	--	44	24	44	--	--	--	--	--	--	--	--	--	--	--
		Min	--	--	0.3	901	0.10	--	--	--	--	--	--	--	--	--	--	--
		Mean	--	--	15	2812	69	--	--	--	--	--	--	--	--	--	--	--
		Max	--	--	30	4730	1560	--	--	--	--	--	--	--	--	--	--	--
WCOP01-0812 (Purgatoire River midway between Taylor and Spring Canyon)	9/17/2002 to 8/13/2003	# samples	2	0	2	2	--	2	2	--	2	2	1	2	2	--	1	1
		Min	7.95	--	20.9	584	--	175	136	--	24	0.01	--	0.16	16.3	--	--	2.0
		Mean	7.98	--	24.6	618	--	212	156	--	25	0.02	7.24	0.18	17.5	72.3	7.9	17.9
		Max	8.01	--	28.3	651	--	248	177	--	27	0.03	--	0.20	18.6	--	--	33.7
EPA01-0238 (Purgatoire River approximately 2 miles upstream of Bent Canyon)	8/25/2004	# samples	1	1	1	1	--	1	1	--	1	1	1	1	1	1	1	1
		Min	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
		Mean	8.5	7.3	23.5	1357	--	84.1	173	--	63	0	58.8	0.03	63.6	263	1.1	0
		Max	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	3/2/1999 to 9/16/2005	# samples	--	--	67	32	72	--	--	35	--	--	--	--	--	--	--	--
		Min	--	--	0	1240	0.39	--	--	7	--	--	--	--	--	--	--	--
		Mean	--	--	17	2656	148	--	--	819	--	--	--	--	--	--	--	--
		Max	--		28	4190	2300	--	--	5120	--	--	--	--	--	--	--	--

*Calculated from calcium and magnesium concentrations.
°C = degrees Celsius
$CaCO_3$ = calcium carbonate
cfs = cubic feet per second
mg/L = milligrams per liter
NTU = nephelometric turbidity unit
SU = standard unit
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter

1

Table 4.6-4 1993 U.S. Geological Survey Water Quality Data at Stations 07126300 and 07126485

Station ID	Date	Statistics	Spec. Cond. (µS/cm)	Instantaneous Stream Flow (cfs)	Dissolved Oxygen (mg/L)	Dissolved Nitrite Plus Nitrate as Nitrogen (mg/L)	Total Recoverable Cadmium (µg/L)	Dissolved Chromium (mg/L)	Total Recoverable Copper (µg/L)	Total Recoverable Iron (µg/L)	Total Recoverable Lead (µg/L)	Total Recoverable Manganese (µg/L)	Total Recoverable Zinc (µg/L)	Total Cyanide (µg/L)
07126300 (Purgatoire River near Thatcher, CO)	Pre-maneuver (1982 – 1985)	# samples	15	22	16	20	15	15	15	15	15	15	15	12
		Min	1,320	14	7.0	<0.10	<0.1	<10	4.0	160	<1.0	20	10	<0.01
		Mean	2,440	52	8.5	0.18	<0.1	<10	12	1,200	4.0	60	40	<0.01
		Max	3,440	1,090	13.7	0.76	4.0	20	290	180,000	190	4,200	810	<0.01
07126300 (Purgatoire River near Thatcher, CO)	Post-maneuver (1985 – 1987)	# samples	25	22	11	22	10	10	10	9	10	10	9	10
		Min	1,030	17	7.2	<0.10	<0.1	<10	2.0	40	<1.0	30	30	<0.01
		Mean	2,900	275	10	0.38	<1.0	<10	20.5	1,700	9.0	275	110	<0.01
		Max	3,610	1,470	12.2	0.60	8.0	<10	930	290,000	600	11,000	1,500	<0.05
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Pre-maneuver (1982 – 1985)	# samples	15	18	16	20	12	13	12	12	12	12	12	11
		Min	1,320	12	5.9	<0.01	<1.0	<10	2.0	160	<1.0	30	20	<0.01
		Mean	2,950	48	8.0	0.10	<1.0	<10	11	1,035	4.0	70	45	<0.01
		Max	3,430	861	13	0.70	3.0	20	430	240,000	270	6,400	1,100	<0.01
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Post-maneuver (1985 – 1987)	# samples	25	25	9	26	15	15	15	15	15	15	15	15
		Min	1,020	9.3	5.6	<0.10	<1.0	<10	2.0	160	<1.0	40	20	<0.01
		Mean	2,780	211	8.6	0.33	<1.0	<10	130	100,000	6.0	2,800	580	<0.01
		Max	3,480	2,950	11.4	0.75	1.0	20	510	410,000	400	9,800	2,000	<0.05

cfs = cubic feet per second
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter

Summary statistics of available stream flow data from the USGS (Reference No. 198) study indicate fluctuations in stream flow conditions at both USGS stations. However, the minimum stream flow recorded between 1982 and 1987 is 1,020 cfs, which is significantly higher than the limited data after 1999. The USGS (Reference No. 198) study also evaluated dissolved-solids and sediment loads in relation to specific conductance according to water years from 1984 to 1987. Table 4.6-5 summarizes the dissolved solids and suspended sediment loads for the water years evaluated by the USGS (Reference No. 198) study. In general, suspended sediment concentrations from 1982 to 1987 varied from 20 to 70,000 mg/L at stations 07126300 and 07126485.

Table 4.6-5 1993 U.S. Geological Survey Summary of Dissolved Solids and Suspended Sediment Loads

Station ID	Parameters	Water Years			
		1984	1985	1986	1987
07126300 (Purgatoire River near Thatcher, CO)	Dissolved Solids Load (tons)	119,000	110,000	118,000	155,000
	Suspended Sediment Load (tons)	134,000	280,000	701,000	753,000
07126485 (Purgatoire River at Rock Crossing near Timpas, CO)	Dissolved Solids Load (tons)	113,000	106,000	116,000	150,000
	Suspended Sediment Load (tons)	158,000	244,000	820,000	669,000

Source: Reference No. 9

The most recent physical, biological, inorganic, and metal parameters available were evaluated for each station near PCMS to determine existing ambient water quality. The water quality pollutants of concern are those that WQCC has established numeric water quality criteria. Table 4.6-6 lists numeric water quality criteria for which standards are in place and for which data were available from either the USGS or EPA after 1999. Those parameters where the ambient water quality data exceeded the water quality standards for each stream segment are noted in Table 4.6-6. Additionally, the 1993 USGS study compares the water quality data collected during the study to instream water quality standards using time-series plots. Table 4.6-7 indicates the amount of times the water quality standards for stations 07126300 and 07126485 was exceeded during 1982 and 1987.

Table 4.6-6 Comparison of Instream Monitoring Water Quality Data After 1999 to Water Quality Standards

Parameter	Units	Stations ID	Existing Water Quality (Percentile)	Existing Water Quality (Concentration)	Water Quality Standard***	Exceeds Water Quality Standard?
pH	SU	WCOP01-0812	Range of 15th to 85th	7.9 to 8.0	6.5 to 9.0	No
		EPA01-0238	Range of 15th to 85th	8.5**	6.5 to 9.0	No
Dissolved Oxygen	mg/L	EPA01-0238	Minimum 15th	7.3**	5.0	No
Dissolved Selenium	µg/L	WCOP01-0812	85th	7.9**	Se (acute) = 18.4 Se (chronic) = 7.0*	Yes, exceeds temporary modification
		EPA01-0238	85th	1.1**	Se (acute) = 18.4 Se (chronic) = 7.0*	No

Table 4.6-6 Comparison of Instream Monitoring Water Quality Data After 1999 to Water Quality Standards (continued)

Parameter	Units	Stations ID	Existing Water Quality (Percentile)	Existing Water Quality (Concentration)	Water Quality Standard***	Exceeds Water Quality Standard?
Dissolved Zinc	µg/L	WCOP01-0812	85th	29	Zn (acute) = 88 Zn (chronic) = 89	No
		EPA01-0238	85th	0**	Zn (acute) = 261 Zn (chronic) = 263	No

Source: Reference No. 9.
*Temporary modification of Se chronic water quality standard by CDPHE based on uncertainty. The Se temporary modification of 7.0 µg/L expires 12/31/2007.
**Only one water quality data point was available.
***Water quality standards for dissolved selenium and dissolved zinc were calculated from instream hardness concentrations.
µg/L = micrograms per liter
mg/L = milligrams per liter
Se = selenium
SU = standard unit
Zn = zinc

Table 4.6-7 Comparison of Instream Monitoring Water Quality Data from 1993 U.S. Geological Survey Study to Water Quality Standards

	Station ID 07126300		Station ID 07126485	
	# Samples	# Samples Exceeded	# Samples	# Samples Exceeded
Dissolved Oxygen (mg/L)	27	0	24	0
Dissolved Nitrite Plus Nitrate as Nitrogen (mg/L)	42	10	46	11
Total Recoverable Cadmium (µg/L)	25	1	27	0
Dissolved Chromium (mg/L)	25	0	28	0
Total Recoverable Copper (µg/L)	25	14	27	19
Total Recoverable Iron (µg/L)	24	12	27	16
Total Recoverable Lead (µg/L)	25	8	27	6
Total Recoverable Manganese (µg/L)	25	8	27	10
Total Recoverable Zinc (µg/L)	24	7	26	11

Source: Reference No. 9
µg/L = micrograms per liter; mg/L = milligrams per liter

4.6.1.3. Hydrogeology and Groundwater

4.6.1.3.1. Regional Setting

The majority of regional groundwater at or near PCMS occurs in the Dakota Sandstone and the Purgatoire Formation (Reference No. 6), which are part of the Arkansas River basin. Much of the Arkansas River basin has a hydraulic head difference in the deep bedrock aquifers that is lower than that in the shallow formations. This indicates that the deep bedrock aquifers are not in communication with the shallow formations.

4.6.1.3.2. Local Setting

Groundwater movement in the northeastern corner of PCMS is toward the northeast, while groundwater movement throughout the remainder of the installation is toward the east and southeast. Groundwater is recharged primarily from precipitation and subsurface inflow from neighboring aquifers (Reference No. 200).

Previous groundwater quality testing determined that the groundwater beneath PCMS contains concentrations of dissolved solids, sulfate, iron, manganese, nitrate, chloride, fluoride, selenium, and radionuclide constituents that exceed domestic or public-use water quality standards. The water quality in the aquifer is adequate for wildlife and livestock, and for fire suppression (Reference No. 6 and 200). There are approximately 95 wells on PCMS, about 30 of which are functional. Some of the major wells are connected to distribution lines that fill stock tanks for wildlife management and fire suppression (Reference No. 6).

4.6.1.4. Floodplains

Floodplains have not been mapped on PCMS (Reference No. 202). However, flash floods occur intermittently during high rainfall events, typically from May through October (Reference No. 6). Flood-prone areas occur along the drainages in the training areas, but the cantonment area is not subject to flooding. Floodplains within the Van Bremer, Taylor, and Big Arroyo watersheds will be delineated during the modeling efforts outlined below.

4.6.1.5. Stormwater

4.6.1.5.1. Modeling/Program Background

Baseline hydrologic models are currently being built for the Van Bremer, Taylor, and Big Arroyo watersheds. This information will provide realistic representation of floodplains and peak flows for pre-development, existing, and future proposed conditions in these areas. The analysis should be completed and provided as a standalone report prior to the public meetings being held for this effort.

4.6.1.5.2. Regulations

Two permit types are utilized at PCMS under the EPA NPDES stormwater program: the Construction General Permit and the Multi-Sector General Permit.

Construction General Permit

Construction projects on PCMS are authorized to discharge stormwater runoff from construction sites under the NPDES Construction General Permit. To obtain coverage under the general permit, contractors performing work at PCMS must submit a NOI for each construction project that disturbs one acre or more of land. In addition, project proponents must develop and implement a Stormwater Pollution Prevention Plan for each project.

Multi-Sector General Permit

The Multi-Sector General Permit provides facility-specific requirements for many types of industrial facilities within one overall permit. The permit outlines steps that facility operators must take prior to being eligible for permit coverage, including development and implementation of a Stormwater Pollution Prevention Plan. Some types of industrial facilities at PCMS covered under this permit are motor pool, the sewage lagoons, and the POL point. The EPA's Multi-Sector General Permit expired in 2005 and has been administratively continued until a new permit is issued.

4.6.2. Environmental Consequences

The threshold of significance for impacts to water resources would be if the Proposed Action or the Alternatives would cause a violation of state water quality criteria, a violation of NPDES discharge permits or potential degradation of an aquifer.

There would be no significant impacts associated with the ranges and training areas due to the Proposed Action.

4.6.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

There would be no significant impacts associated with the ranges and training areas, due to the Proposed Action.

4.6.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson; and therefore, would not train at PCMS resulting in no additional impacts to water resources.

4.6.2.3. Mitigation Measures

Mitigation measures are not warranted for water resources.

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4.7. Biological Resources

This section introduces the resource areas and the impact analysis approach for PCMS. It also describes the affected environment and environmental consequences of implementing the Proposed Action and the No Action Alternative. There are no impacts to the affected environment for PCMS due to construction of facilities, as all facilities to support the additional IBCT and potential CAB are planned at Fort Carson (Section 2.0). The affected environment and environmental consequences of the Proposed Action would be directly related to training an additional IBCT and potential CAB. Information on the occurrence and distribution of natural resources on PCMS was obtained from a variety of sources, chiefly the latest INRMP (Reference No. 6) and Fort Carson GIS data.

4.7.1. Affected Environment

4.7.1.1. Vegetation

PCMS is within the Central Shortgrass Prairie Ecoregion, which includes all Colorado plains east of the Rocky Mountains as well as parts of Wyoming, Nebraska, Kansas, Oklahoma, Texas, and New Mexico. The Central Shortgrass Prairie is characterized by rolling-to-undulating plains and tablelands of low relief that are traversed by streams and contain canyons, buttes, badlands, and isolated mountains. Shortgrass prairie, mixed-grass prairie, and sand-sage prairie community types dominate the Central Shortgrass Prairie Ecoregion (Reference No. 67). PCMS is within upper regions of the Prairie Grasslands Plant Zone, an area characterized by generally treeless terrain dominated by plants belonging to the grass family (Reference No. 6). Figure 4.7-1 shows vegetation types on PCMS.

A reference plant collection (herbarium) was developed for species found on PCMS. This herbarium includes a laminated sample of each plant species with pertinent information. The entire collection has been digitized (Reference No. 6). Current data on plant species and plant communities at PCMS are available in detail in the *Plant Communities, Ecological Checklist, and Species List for the U.S. Army Piñon Canyon Maneuver Site, Colorado* (Reference No. 85) and the INRMP (Reference No. 6). A plant species list for PCMS, including scientific names, is provided in Appendix F.

Vegetated areas comprise approximately one-fourth of the approximately 1,600-acre cantonment area. This vegetation is primarily native grasses and much of it is mowed. Landscaping plants (Pinyon pines and Blue spruce) are located around the headquarters building. A row of trees was planted as a windbreak around the inside boundary of the cantonment area shortly after PCMS was acquired in the early 1980s.

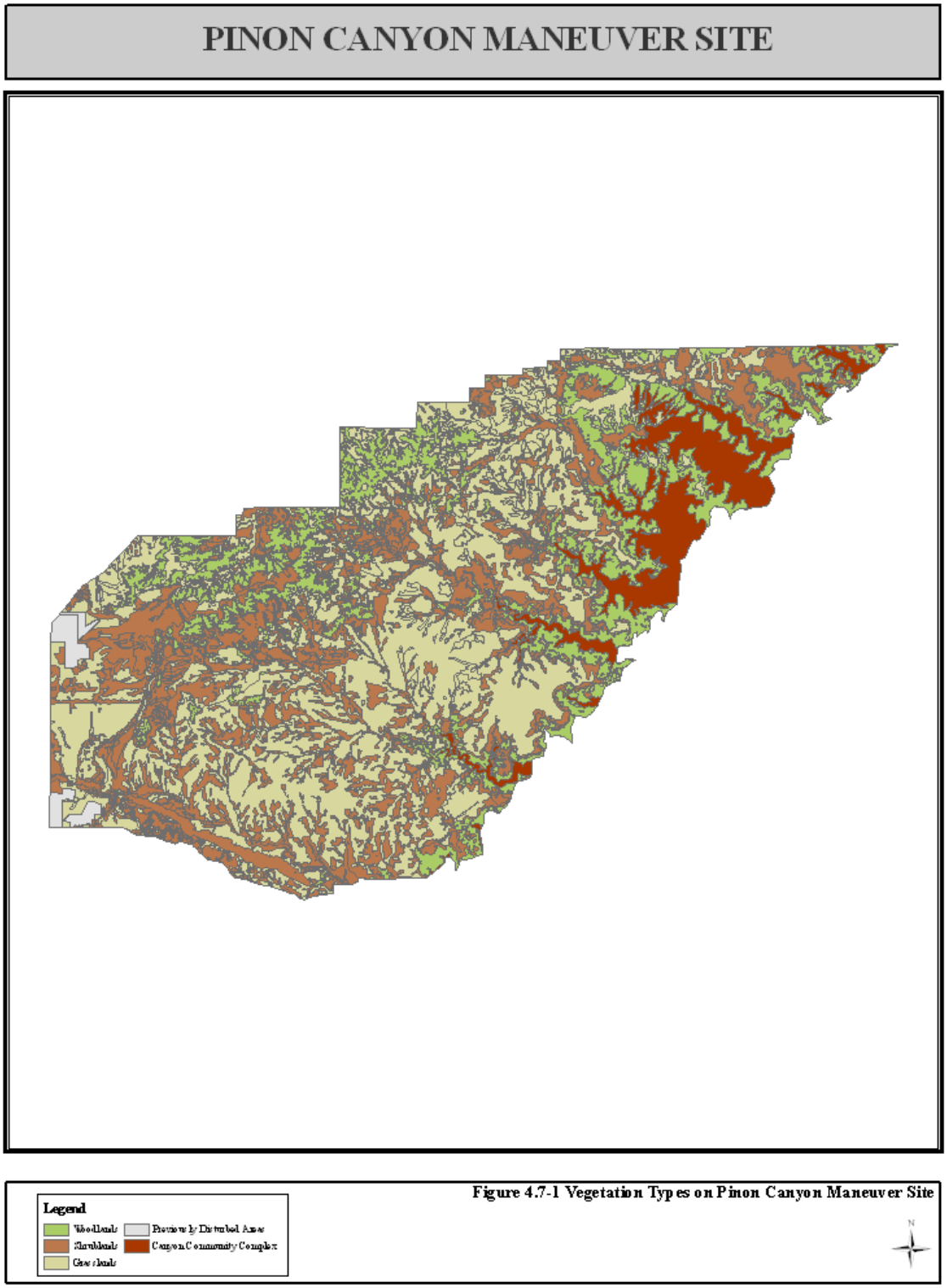

Figure 4.7-1 Vegetation Types on Pinon Canyon Maneuver Site

Grasslands. Comprising about 41 percent of PCMS, grasslands are usually classified as shortgrass prairie. Grasslands dominate much of PCMS. Major grasses include blue grama, western wheatgrass, galleta, sideoats grama, dropseeds, buffalo grass, little bluestem, and needle and thread grass. Various shrubs scattered throughout the grasslands are prickly pear cactus, cholla cactus, yucca, four-winged saltbush, rabbitbrush, and skunkbush sumac (Reference No. 6).

Shrublands. Shrublands typically with grass understory and sometimes intermixed with coniferous and/or deciduous trees, shrublands comprise about 33 percent of PCMS vegetation. Shaw et al. (Reference No. 85) identified 16 shrubland communities on PCMS with dominate species, including black greasewood, fourwing saltbrush, bigelow sagebrush, sand sage, mountain mahogany, trumpet gooseberry, greasebush, rabbitbrush, cholla, yucca and many other shrubs are found throughout PCMS. Deciduous shrubland, whose species include gambel oak, locust, and willow, is found along major drainage ways (Reference No. 6).

Forest/Woodlands. Constituting approximately 17 percent of PCMS.[9] Ponderosa pine, Pinyon pine, and one-seed juniper are the dominant species of higher elevation woodlands on rocky and steeper slopes, and cottonwood, willows, and cherries dominate woodlands of drainage ways (Reference No. 6).

Natural fires. During the 2008 fire season, PCMS experienced severe fire conditions due to drought conditions that persisted throughout the summer, as did most of the Front Range and eastern plains of Colorado. Seven wildland fires occurred this summer burning approximately 50,000 acres on PCMS. Most notably the Bridger wildland fire, which started from a lightning strike on the June 8 and grew to approximately 46,000 acres. A fire of this magnitude has impacts to the mission, natural and cultural resources, and changes the existing conditions of portions of the maneuver site.

The impacts from the fires to natural resources are both positive and negative. Approximately 13,600 acres of woodland, 7,800 acres of shrublands, 7,700 acres of grasslands, and 13,700 acres of canyon complex (a mix of woodlands, shrublands, and grasslands) were within PCMS fire footprint of the Bridger fire and were affected to varying degrees. The remaining acreage reflects burned areas outside of PCMS boundary.

[9] The remaining 9 percent of PCMS vegetation can be explained as categories of anthropologically disturbed (1.3 percent) and canyon complex (8.4 percent), which are a mixture of grassland, shrublands, and woodland.

Some wildlife species will increase their population due to the increased edge created around islands of vegetation that did not burn, while other species will avoid many areas due to the change in habitat composition. The composition of plant species will also change in areas that were heavily impacted with pioneer species taking hold, while many plant species will regenerate in places that were not so intensely burned. Until some of the rehabilitation efforts start to take hold, there will be the potential for wind and rain to cause soil erosion.

Impacts will be evaluated with management decisions made and implemented through a BAER plan. Every effort possible will be made to return the land to a condition that allows the continuation of the military mission and restores the land and associated resources over time.

Noxious Weeds

See Section 3.7.1.1.1 for general noxious weed information that applies to Fort Carson and PCMS. PCMS specific noxious weed information is presented here.

Of the several noxious weeds known to occur on PCMS, only one, African rue (*Peganum harmala*), Family: Zygophyllaceae (Caltrop) is an A List species in Colorado (designated by the State for eradication). First recorded in the United States near Deming, New Mexico, in 1928, African rue is toxic to livestock and can replace valuable forage subsequently reducing the productivity of pasture and rangeland. This plant is extremely drought tolerant, and it has expanded into desert rangelands replacing desirable native plants like saltbrush and grasses. It has a competitive advantage over native plants as it germinates earlier in the spring. Most parts of this plant contain substances that retard or prevent the growth of other vegetation. African rue is present throughout New Mexico and is reported in Arizona, California, Idaho, Montana, Nevada, Texas, Oregon, and Washington.

One small population (8 to 10 plants) was found on PCMS during regular weed monitoring activities in 2006. That population was eradicated and monitoring for additional plants continues. An African rue eradication plan was coordinated with the State. Two additional populations of African rue were recently identified on private lands just south of PCMS. One large population was discovered during non-Army natural resources surveys and inventories for areas adjacent to PCMS. That population (over 100 acres) is located about 9 miles south of the small population found on PCMS. Another population of about 2 acres was discovered through incidental observation approximately 12 miles southwest of the population found on PCMS. This species is not yet well established in Colorado, and should be a priority for immediate eradication if found. There is little or no information available on the control of African rue. Control

efforts should focus on detecting infestations as early as possible and eliminating them by removing plants before seed set and disposing of them properly.

Besides African rue, Russian knapweed and Canada thistle are the weed species of most concern at PCMS. No effective biological controls exist for Russian knapweed, and control efforts concentrate on mechanical and chemical.

While most of the species for which biological control is approved and available are found on Fort Carson, some species occur on PCMS. Tamarisk has recently been approved for biological control efforts (other than experimental populations) in Colorado by USDA Animal and Plant Health Inspection Service (APHIS), USFWS, and the Colorado DA. Fort Carson has initiated release of the biological control agent *Diorhabda elongata* against tamarisk at both Fort Carson and PCMS. Because of the availability of an effective biological control agent, the bindweed mite (*Aceria malherbae),* a List C species, Field bindweed, has been targeted for biological control. Releases of the mite have been made at both Fort Carson and PCMS to help suppress populations of this noxious weed. The 2008 Fort Carson and PCMS *Invasive Plants Management Plan* (Reference No. 203) has detailed information on weed distribution and control strategies.

4.7.1.2. Wildlife

Wildlife habitats on PCMS are diverse and cover large tracts of relatively undeveloped land. Though land use impacts are different than those typically found in the region (e.g., livestock grazing, mineral extraction, farming), maintaining wildlife habitats within the regime of military training is not completely compatible, but does require active management by Fort Carson.

Typical wildlife habitat types on PCMS include shortgrass prairie, pinyon-juniper woodland, and aquatic and riparian communities. Dominant terrestrial habitat types on PCMS are grasslands, shrublands, and woodlands. Aquatic habitats (springs, playa lakes, and man-made structures) on PCMS are very limited and consist of wetlands, riparian corridors, and open water (Reference No. 103).

Data on wildlife species and descriptions of wildlife habitats on PCMS are documented in the *Fish and Wildlife Management Recommendations: Piñon Canyon Maneuver Site Las Animas County, Colorado* (Reference No. 103) and the INRMP (Reference No. 6). A wildlife species list for PCMS, including scientific names, is provided in Appendix F. This list includes mammals, birds, fish, reptiles, amphibians, and invertebrates.

4.7.1.2.1. Mammals

Larger mammals on PCMS include mule and white-tailed deer, elk, pronghorn, mountain lion, bobcat, porcupine, badger, coyote, swift fox, desert cottontail, and black-tailed jackrabbit (Reference No. 6). The lower reaches of the Purgatoire River watershed, in which PCMS occurs, is one of few places on the Great Plains that still supports a relatively intact large mammal community (e.g., elk, mountain lion, pronghorn, bighorn sheep, black bear, mule, and white-tailed deer). Many of these species are more common in mountainous areas, but all were native to the Great Plains at one time and have been extirpated from large areas. While most are not considered species of concern, maintaining this representation of Great Plains biodiversity at times requires active management at PCMS.

Population estimates from Army and CDOW surveys over the past 10 years have fluctuated in the number of pronghorn on PCMS, but overall pronghorn populations have been steady to increasing. Habitat management and hunting have been effective in achieving a healthy pronghorn herd of about 1,000 animals (2007 data).

The mule deer population at PCMS is monitored by the Army and CDOW, and the Army coordinates with the CDOW on population numbers and trends. Overall, CDOW data show that the population associated with PCMS has been stable to slightly increasing. Fort Carson monitors both the habitat and health of the herd.

4.7.1.2.2. Birds

Numerous bird species are known to occur on PCMS. Representative species include the Bald Eagle, Bewick's Wren, Burrowing Owl, Canyon Wren, Ferruginous Hawk, Golden Eagle, Horned Lark, Lewis' Woodpecker, Mountain Bluebird, Mountain Plover, Prairie Falcon, Scaled Quail, Wild Turkey, Swainson's Hawk, Western Meadowlark, and Yellow-billed Cuckoo (Reference No. 6).

4.7.1.2.3. Fish

Surveys during 1983-89 of the Piñon Canyon stretch of the Purgatoire River and its intermittent canyon tributaries on PCMS (Reference No. 204) found 11 native species; no nonnative fish were found. A 1993-94 survey (Reference No. 205) in the same areas found the exotic common carp for the first time.

4.7.1.2.4. Reptiles and Amphibians

The Texas horned lizard and western rattlesnake are typical grassland reptiles found on PCMS. The bullsnake is found in canyons with pinyon-juniper slopes and grasslands on the canyon floor. Wetlands support several reptile and amphibian species found at PCMS, including the plains leopard frog and snapping turtle.

Eight amphibian species have been identified on PCMS (Appendix F). Two of these species are spadefoot toads, which are well adapted to arid climates and spend eight to ten months a year subsurface (Reference No. 206). Other amphibian species found on PCMS are associated with wetlands.

4.7.1.2.5. Invertebrate Species

There are limited data on the types and distribution of invertebrate species on PCMS or in the surrounding area. No federal, state, or local agency has ever raised concerns that invertebrate species are being affected by military activities at PCMS. The few studies conducted at PCMS concentrating on invertebrates were focused on the aquatic habitats of the Purgatoire River and its tributaries (Reference No. 207, 208, and 209).

During summer 2007 systematic sampling for terrestrial invertebrate was initiated using various methods: malaise traps, net sweeps, pit fall traps, and mercury vapor lights within all major vegetation types. This work continued during summer 2008. Results from 2007 field surveys show about 250 species documented from about 50 Families (Appendix F). These data show that PCMS has intact and diverse terrestrial invertebrate species. None of the documented species have any associated regulatory status, but one species, the Colorado blue butterfly, is included on two conservation groups' lists of species of concern. Data will be used as a baseline from which to judge impacts to invertebrates as use of PCMS increases, and to establish baseline data for indicator species (Carabidae) to help monitor rangeland health. Preliminary data from the 2008 sampling show a decline in numbers and diversity. This has been attributed to the severe drought and associated decline in host plant species and flowers required by many of these species (Reference No. 210).

4.7.1.3. Sensitive Species

The first two paragraphs of Section 3.7.1.3, describe general regulatory requirements and agencies/organizations involved in identifying and managing sensitive species; these paragraphs are also pertinent to PCMS.

4.7.1.3.1. Federally- Listed Species

Table 4.7-1 presents federally-listed endangered, threatened, and candidate species that occur in Las Animas and Otero counties. No plant or wildlife species, with documented occurrences on PCMS, appear on USFWS lists of federally listed endangered, threatened, and candidate species, and no critical habitat for these species has been designated or proposed for designation in Las Animas County or any adjoining county (Reference No. 70 and 71).

The triploid checkered whiptail is designated as a Species of Risk by the Army. In 2006, CNHP surveyed for the species'distribution at PCMS. CNHP also developed a habitat model for triploid checkered whiptails based on habitat characteristics at 12 species observation locations (Reference No, 117)

Table 4.7-1 Federally-Listed Endangered, Threatened, and Candidate Species of Las Animas and Otero Counties[1]

Species	Scientific Name	Species Type	Status	Distribution on PCMS
Black-footed ferret	*Mustela nigripes*	Mammal	E	Not known to occur
New Mexico meadow jumping mouse	*Zapus husdonius luteus*	Mammal	C	Not known to occur; documented occurrences in Las Animas County
Mexican Spotted Owl	*Strix occidentalis*	Bird	T	Not known to occur; potential to occur

[1]Species for which no reasonably suitable habitat exists on PCMS are not included.
E = Endangered, T = Threatened, C = Candidate

The New Mexico meadow jumping mouse recently listed (Reference No. 211) as a candidate species has no known occurrences on PCMS from extensive small mammal studies done by Kuenzi (Reference No. 212 and 213). There are known occurrences of the species in Las Animas County from studies done on the James M. John and Lake Dorothey State Wildlife Areas (Reference No. 214). Because there are known occurrences in the same county and within the same watershed as PCMS and even though there is a limited amount of suitable habitat for the species, live-trapping efforts have been be undertaken in the 2008 field season to confirm/document the presence or absence of the species. Current drought conditions, which affect the species life cycle, and wildland fires at PCMS have interrupted the originally planned trapping efforts, although some trapping has been conducted and no jumping mice have been captured. If the 2008 data is inconclusive, the effort will be continued during the 2009 season.

4.7.1.3.2. State-Listed Species and Species of Concern

Figures 4.7-2 and 4.7-3 depict the distribution of sensitive wildlife and plant species at PCMS. Table 4.7-2 lists Colorado state-listed and other special status wildlife species that occur at PCMS.

The Army has conducted surveys annually for black-tailed prairie dogs on PCMS. Approximately 700 to 1,200 acres on PCMS are populated by black-tailed prairie dog colonies. Population numbers fluctuate, primarily in relation to occurrence of sylvatic plague in the region.

Mountain Plovers are rare on PCMS, with two to ten Plover nests generally found annually. Only a small percentage of available habitat (black-tailed prairie dog colonies and other heavily disturbed areas such as from fire and training activities) is occupied. The population has been generally stable at these low numbers.

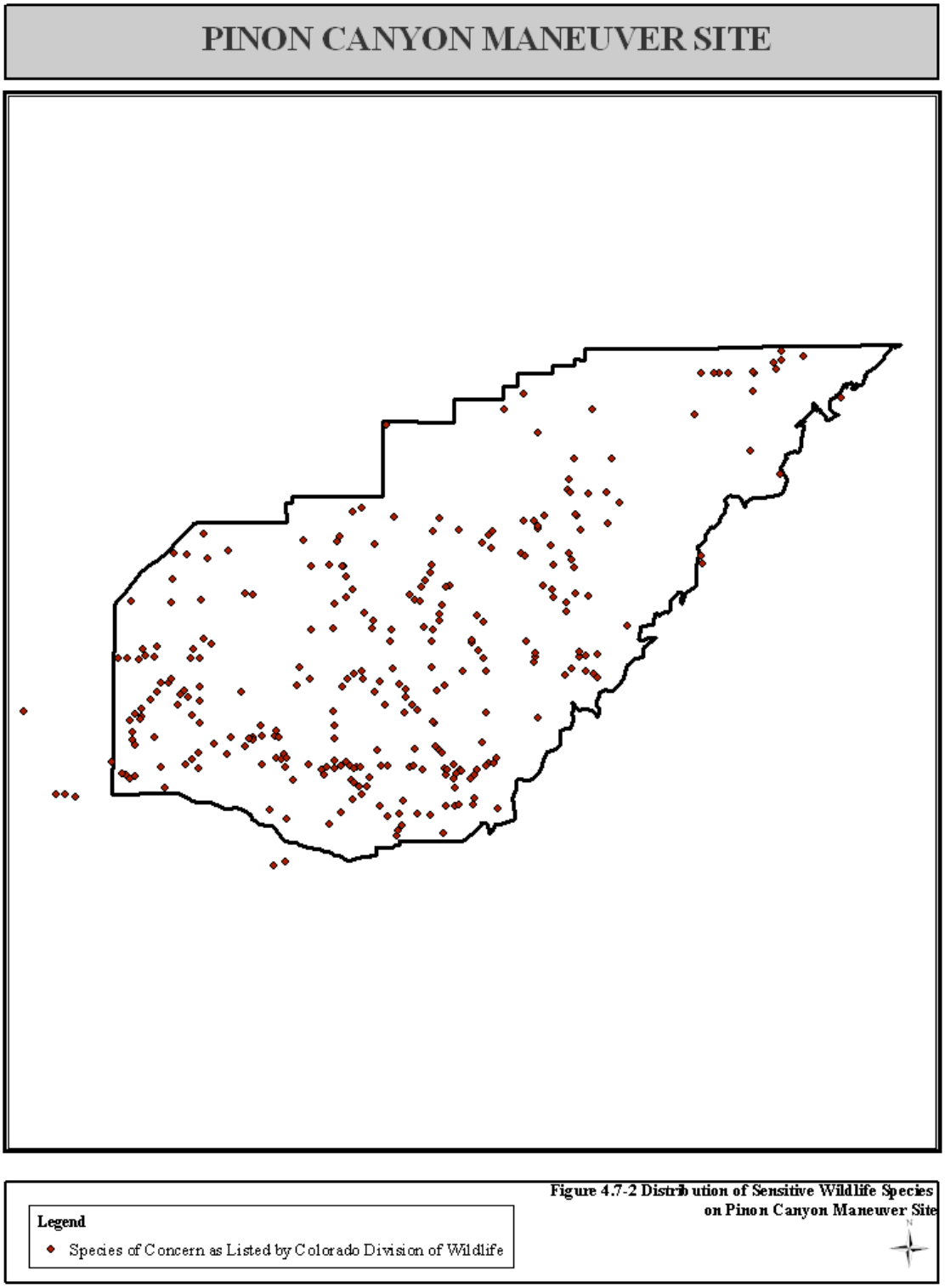

Figure 4.7-2 Distribution of Sensitive Wildlife Species on Pinon Canyon Maneuver Site

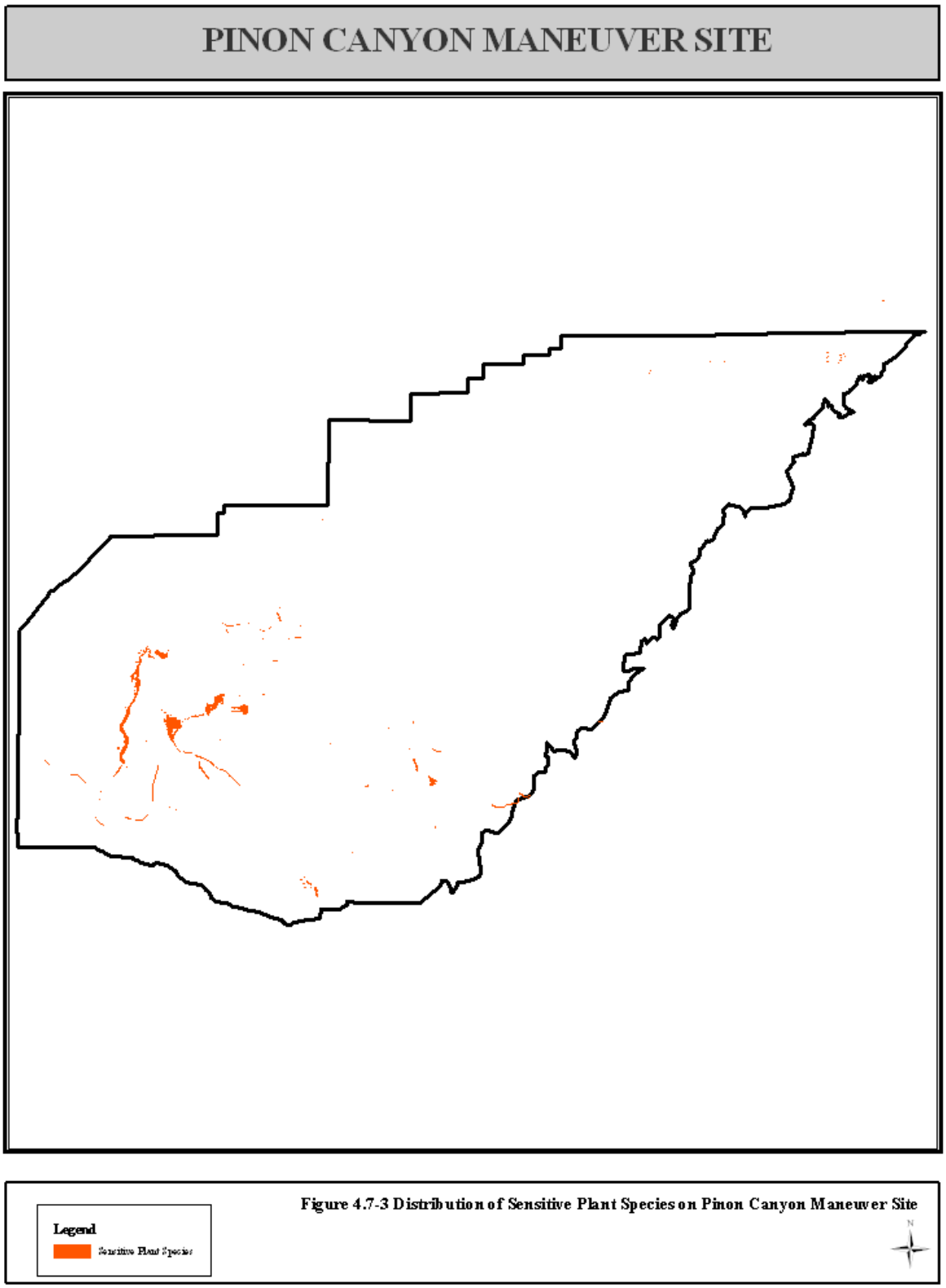

Figure 4.7-3 Distribution of Sensitive Plant Species on Pinon Canyon Maneuver Site

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Flathead chub	*Platyglobio gracilis*	Fish	SC	CDOW, CSP
Plains leopard frog	*Rana blairi*	Amphibian	SC	CDOW, CNHP, CSP
Canyon tree frog	*Hyla arenicolor*	Amphibian	SC	CNHP
Yellow mud turtle	*Kinosternon flavescens*	Reptile	SC	CDOW, CNHP, CSP
Corn snake	*Elaphe guttata emoryi*	Reptile	SC	CDOW, CSP
Texas blind snake	*Leptotyphlops dulcis*	Reptile	SC	CDOW, CSP
Western blackneck garter snake	*Thamnophis cyrtopsis cyrtopsis*	Reptile	SC	CNHP
Roundtail horned lizard	*Phrynosoma modestum*	Reptile	SC	CDOW, CNHP, CSP
Texas horned lizard	*Phrynosoma cornutum*	Reptile	SC	CDOW, CNHP, CSP
Short-horned lizard	*Phrynosoma douglassi*	Reptile	SC	CNHP
Triploid checkered whiptail	*Aspidoscelis neotessalatus*	Reptile	SC	CDOW, CNHP, CSP, SAR
Black-tailed prairie dog	*Cynomys ludovicianus*	Mammal	SC	CDOW, CNHP, CSP
Swift fox	*Vulpes velox*	Mammal	SC	CDOW, CNHP, CSP
Colorado chipmunk	*Tamias quadrivittatus*	Mammal	SC	CNHP
Southern Plains woodrat	*Neotoma micropus*	Mammal	SC	CNHP
Big free-tailed bat	*Nyctinomops macrotis*	Mammal	SC	CNHP
Brazilian free-tailed bat	*Tadarida brasiliensis*	Mammal	SC	CNHP
Townsend's big-eared bat	*Plecotus townsendii pallescens*	Mammal	SC	CDOW, CNHP, CSP
Bald Eagle	*Haliaeetus leucocephalus*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Northern Harrier	*Circus cyaneus*	Bird	SC	PIF, USFWS
Swainson's Hawk	*Buteo swainsoni*	Bird	SC	PIF, USFWS
Ferruginous Hawk	*Buteo regalis*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Golden Eagle	*Aquila chrysaetos*	Bird	SC	USFWS
Northern Goshawk	*Accipter gentilis*	Bird	SC	CNHP
Peregrine Falcon	*Falco peregrinus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Prairie Falcon	*Falco mexicanus*	Bird	SC	CNHP, PIF, USFWS
American White Pelican	*Pelecanus erythrorhynchos*	Bird	SC	CNHP
Mountain Plover	*Charadrius montanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Western Snowy Plover	*Charadrius alexandrinus*	Bird	SC	CNHP, CSP, PIF, USFWS

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site (continued)				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Piping Plover	*Charadrius melodus*	Bird	SC	CNHP, CSP, PIF, USFWS
Solitary Sandpiper	*Tringa solitaria*	Bird	SC	USFWS
Upland Sandpiper	*Bartramia longicauda*	Bird	SC	PIF, USFWS
Marbled Godwit	*Limosa fedoa*	Bird	SC	USFWS
Black-necked Stilt	*Mimantopus mexicanus*	Bird	SC	CNHP
Long-billed Curlew	*Numenius americanus*	Bird	SC	CDOW, CNHP, CSP, PIF, USFWS
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Bird	SC	USFWS
Burrowing Owl	*Athene cunicularia*	Bird	ST	CDOW, CNHP, CSP, PIF, USFWS
Short-eared Owl	*Asio flammeus*	Bird	SC	CNHP, PIF, USFWS
Flammulated Owl	*Otus flammeolus*	Bird	SC	PIF, USFWS
Lewis' Woodpecker	*Melanerpes lewis*	Bird	SC	CHNP, PIF, USFWS
Red-headed Woodpecker	*Melanerpes erythrocephalus*	Bird	SC	USFWS
McCown's Longspur	*Calcarius mccownii*	Bird	SC	CNHP, CSP, PIF, USFWS
Willet	*Catoptrophorus semipalmatus*	Bird	SC	CNHP, PIF
Least Tern	*Sterna antillarum*	Bird	SC	CNHP, CSP, PIF
Ovenbird	*Seiurus aurocapillus*	Bird	SC	CNHP
Band-tailed Pigeon	*Columba fasciata*	Bird	SC	PIF
Red-naped Sapsucker	*Sphyrapicus nuchalis*	Bird	SC	PIF, USFWS
White-faced Ibis	*Plegadis chihi*	Bird	SC	CNHP
Wilson's Phalarope	*Phalaropus tricolor*	Bird	SC	CNHP, USFWS
Bobolink	*Dolichonys oryzivorus*	Bird	SC	CNHP, USFWS
Loggerhead Shrike	*Lanius ludovicianus*	Bird	SC	USFWS
Pinyon Jay	*Gymnorhinus cyanocephalus*	Bird	SC	USFWS
Curve-billed Thrasher	*Toxostoma curvirostre*	Bird	SC	CNHP
Virginia's Warbler	*Vermivora virginiae*	Bird	SC	PIF, USFWS
Grace's Warbler	*Dendroica graciae*	Bird	SC	CNHP, PIF
MacGillivray's Warbler	*Oporornis tolmiei*	Bird	SC	PIF
Wilson's Warbler	*Wilsonia pusilla*	Bird	SC	PIF
Green-tailed Towhee	*Pipilo chlorurus*	Bird	SC	PIF

Table 4.7-2 Special Status Wildlife Species Observed on Piñon Canyon Maneuver Site (continued)				
Species	**Scientific Name**	**Species Type**	**Status**	**Authority**
Chestnut-collared Longspur	*Calcarius ornatus*	Bird	SC	CSP, USFWS
Dickcissel	*Spiza americana*	Bird	SC	USFWS
Gray Vireo	*Vireo vicinior*	Bird	SC	CNHP, USFWS
Bell's Vireo	*Vireo bellii*	Bird	SC	PIF, USFWS
Barrow's Goldeneye	*Bucephala islandica*	Bird	SC	CNHP
Broad-tailed Hummingbird	*Selasphorus platycercus*	Bird	SC	PIF
Cassin's Sparrow	*Aimophila cassinii*	Bird	SC	CNHP, CSP, PIF, USFWS
Rufous-crowned Sparrow	*Aimophila ruficeps*	Bird	SC	CNHP
Brewer's Sparrow	*Spizella breweri*	Bird	SC	PIF, USFWS
Sage Sparrow	*Amphispiza belli*	Bird	SC	CNHP, PIF
Lark Bunting	*Calamospiza melanocorys*	Bird	SC	PIF, USFWS
Grasshopper Sparrow	*Ammodramus savannarum*	Bird	SC	PIF, USFWS
Bewick's Wren	*Thryomanes bewickii*	Bird	SC	USFWS
Lazuli Bunting	*Passerina amoena*	Bird	SC	PIF

CDOW = Colorado Division of Wildlife
CNHP = Colorado Natural Heritage Program
CSP = Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative (Reference No. 73) (now called the Shortgrass Prairie Partnership)
PIF = Partners in Flight (PIF 2000)
SAR = Species at Risk; SC = Species of Special Concern
ST = Colorado State Threatened
USFWS = U.S. Fish and Wildlife Service (USFWS 2002)

The Burrowing Owl is a summer/breeding resident on PCMS. Numbers of breeding pairs fluctuate annually due to many variables but appear to be most attributed to availability of nesting sites in black-tailed prairie dog colonies and other abandoned burrowing mammal dens. During the 2007 breeding season, 30 nesting pairs with young were observed. In addition, recent observations show that Burrowing Owls may be adapting to reside over the winter during years when favorable weather conditions prevail.

The state does not maintain a list of threatened or endangered plants. The following Colorado Species of Special Concern (as listed by the CNHP) plants are known to either occur or potentially occur on PCMS (Reference No. 215 and 78):

- Southern maidenhair fern (*Adiantum capillus-veneris*) - Potential to be on PCMS; has been found in adjacent Baca County; CNHP imperiled.

- Dwarf indigo amorpha (*Amorpha nana*) - Resident, CNHP imperiled; confirmed in Taylor and Spring canyons (Reference No. 78 and 216).
- Sidecluster milkweed (*Asclepias oenotheroides*) - Potential to be on PCMS; only Colorado collection was from near Troy, Mesa de Maya; CNHP critically imperiled.
- Dwarf milkweed (*Asclepias uncialis*) - Confirmed in 1990 collection near 'Sue site'; eight populations now known (Reference No. 78).
- Ebony spleenwort (*Asplenium platyneuron*) - Potential to be on PCMS; CNHP critically imperiled.
- Eaton's lip fern (*Cheilanthes eatonii*) - Potential to be on PCMS; found chiefly in Arkansas River drainage; CNHP imperiled.
- Giant helleborine (*Epipactis gigantea*) - Potential to be on PCMS; CNHP imperiled.
- Colorado green gentian (*Frasera coloradensis*) - Potential to be on PCMS. None found during 1996 surveys (Reference No. 78), but the species was documented in 2006 on the Comanche Grasslands.
- Rayless goldenweed (*Oönopsis foliosa* var. *monocephala*) - Resident in upper Burke, Taylor, and Van Bremer Arroyo watersheds (Reference No. 216); former federal Category C3; CNHP imperiled.
- Yellow stargrass (*Hypoxis hirsuta*) - Potential to be on PCMS; reported in western Las Animas County over 30 years ago; CNHP critically imperiled.
- Arkansas Valley evening primrose (*Oenothera harringtonii*) - Confirmed on PCMS in upper Burke, Taylor, and Van Bremer Arroyo watersheds (Reference No. 216); CNHP imperiled.
- Round-leaf four o'clock (*Oxybaphus rotundifolius*) - Confirmed in southcentral portions of PCMS during 1995 and 1997 surveys (Reference No. 78 and 79).
- Purple cliff brake (*Pellaea atropurpurea*) - Potential to be on PCMS; found elsewhere in Las Animas County; CNHP imperiled.
- Wright's cliff brake (*Pellaea wrightiana*) - Potential to be on PCMS; CNHP imperiled.
- Dwarf purslane (*Portulaca parvula*) - Resident, CNHP critically imperiled.
- Southern soapberry (*Sapindus saponaria drummondii*) - Resident, CNHP critically imperiled.
- Twinevine (*Sarcostemma crispum*) - Found in 2001.
- Long hood milkweed (*Asclepias macrotis*) - Found in 1985 and again in 1999 in Bravo Canyon (Reference No. 216).
- Texas beargrass (*Nolina texana*) - Found at the base of Mesa de Maya, with potential to exist on PCMS.

Of these Colorado Species of Special Concern, round-leaf four o'clock, dwarf milkweed, and Arkansas Valley evening primrose are well represented at PCMS in terms of known sites and numbers of individuals (Reference No. 81). Approximately 12 percent of the known range (acres) of the round-leaf four o'clock occurs on PCMS (Reference No. 79). Dwarf milkweed is known to inhabit approximately 400 acres in Colorado, 96 of which (approximately 24 percent) are found on PCMS. Arkansas valley evening primrose is known to inhabit approximately 2100 acres in Colorado, of which 361 acres (approximately 17 percent) are found on PCMS. Rayless goldenweed is known to inhabit approximately 460 acres in Colorado, of which 364 acres (approximately 80 percent) are found on PCMS (Reference No. 222) Geographic ranges for these species are much larger than the known inhabited acreages, and continuing surveys in Colorado may identify more populations in the future. Surveys are also ongoing at PCMS. Natural resources management at PCMS is increasingly important for the overall rangewide survival of these species.

4.7.1.4. Wetlands

In 2007, the USACE re-issued a Regional Permit under Section 404 of the CWA (33 U.S.C. 1344) for Fort Carson and *PCMS Erosion Control Activities* (Reference No. 63). This regional permit authorizes Fort Carson to conduct erosion control activities that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

Natural water bodies and wetlands are generally small and infrequent on PCMS but are important in contributing to wildlife habitat diversity. The total wetland area on PCMS is estimated to be 361 acres, of which approximately 290 acres are man-made (Reference No. 6). Most wetlands on PCMS are associated with side canyons of the Purgatoire River and water developments such as erosion control dams, rock check dams and other erosion control features. Playas (flat-bottomed depressions that are periodically covered by water) are also present, and additional small wetlands are associated with springs and other water bodies, such as erosion control impoundments, stock watering ponds, and the overflow from windmills.

4.7.2. Environmental Consequences

Training, as described in the 2007 Fort Carson and PCMS Transformation EISs, is accomplished adaptively, based on the commanders' intent for the training exercise and/or the availability of limited

training resources (maneuver area and firing range availability). This does not change with the IBCT and CAB facilities siting alternatives that occur at Fort Carson, and remains constant across all alternatives depending on the units training at Fort Carson and PCMS at any given time. The Proposed Action does not include any construction at PCMS; however, PCMS will support the training needs of the additional IBCT and potential CAB. Therefore, only the Proposed Action (to train an additional IBCT and potential Medium CAB at PCMS), and the No Action alternative (no additional IBCT and CAB training), are analyzed.

As a general guideline to projected impacts, the addition of one IBCT would increase overall quantifiable training impacts to land-based natural resources by approximately 9 percent, considering the type of unit and number of Soldiers involved; while the CAB would add approximately 6 percent.

4.7.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

A comprehensive description of training impacts from the Proposed Action and No Action alternative is in Section 3.7.2.2. Impacts discussed in Section 3.7.2 also apply to PCMS. To avoid redundancy, only PCMS specific impacts are discussed here.

4.7.2.1.1. Vegetation

Training at PCMS includes the establishment of temporary command operations bases. These are areas chosen by unit commanders for strategic and tactical value to their individual training scenarios. Depending on the size of the unit, 5 to 20 or more acres can be impacted where the unit sets up its operating base for the duration of the exercise. The concentration of Soldiers and equipment in these areas can cause temporary severe impacts to vegetation. Bivouacking causes similar impacts, in a generally smaller area. Because of the temporary nature of these impacts, they are not considered significant.

Training an additional IBCT and CAB at PCMS under the Proposed Action could increase potential impacts to vegetation. Impacts to dismounted training areas and maneuver training areas could increase under the Proposed Action, in extent (number of acres), magnitude (severity), or a combination of both, as previously described and depending on land sustainability considerations.

4.7.2.1.2. Noxious Weeds

Russian knapweed occurs at PCMS and is a difficult weed to control. Soldiers and their equipment can spread this weed across the installation to suitable habitats (Section 3.7.2.2.2 Noxious Weeds). The greater potential for noxious weed infestations under the Proposed Action would continue to be addressed by the weed prevention strategies and weed control methods that are part of the *Fort Carson Invasive Plants Management Plan* (Reference No. 203).

4.7.2.1.3. Wildlife

The following impacts to wildlife from military training occur and would occur at a higher frequency due to training an additional IBCT and potential CAB as part of the Proposed Action.

Military training can reduce wildlife populations indirectly by damaging soils and vegetation, potentially leading to altered plant communities that are unsuitable as habitat for the wildlife species that once used them. Dismounted military training can flush or startle small mammals, ground nesting birds, and reptiles. This may lead to increased predation on young or the displacement and death of eggs or young. Impacts to reproductive success can cause decreased populations (Reference No. 90).

Mule deer, elk, pronghorn, and many species of raptors are more readily flushed or displaced by pedestrians than by moving vehicles. Wildlife species can be affected by mounted military training through direct disturbance and by indirect alteration of their habitat. Small animals that den, nest, or live exclusively on the ground can be killed directly from maneuver training. Eggs and young of ground-nesting birds can be destroyed. Human presence and noise from training exercises can disrupt wildlife species from foraging or reproducing. For example, some raptors abandon nests or territories as a result of human presence in the vicinity (Reference No. 90).

Limited research exists on the indirect, habitat-related impacts of mounted military training on reptiles, amphibians, or aquatic species (Trame 1997); however, military training results in the creation of two-track roads and wider corridors cleared of vegetation. Effects of these types of vegetation removal and surface disturbance on wildlife have been studied extensively (Reference No. 91, 93, 94, 95, 96, 97, 98, 99 and 100).

Training an additional IBCT and CAB as part of the Proposed Action would increase potential impacts to wildlife. In general, species adapted to reduced vegetation, bare ground, or disturbance would be

increasingly favored. Depending on training frequency and intensity, species that prefer these conditions, such as the Mountain Plover, might be attracted into the area in greater numbers.

Training an additional IBCT and CAB might displace maneuvers on the grassland/pinyon-juniper interface farther into current pinyon-juniper habitat, which would exacerbate impacts to species using this habitat. Direct disturbance to wildlife species would increase in areas where vehicular activity, fire, and noise increase, which would occur during both maneuver and live-fire training exercises.

Increased dismounted training activity of the IBCT would increase disturbance of wildlife species sensitive to human presence. Species that are more tolerant of human presence, vehicular activity, and noise would be increasingly favored in areas where military training occurs, while species that are less tolerant of these factors would decline.

4.7.2.1.4. Rayless goldenweed

Populations of rayless goldenweed, a species known to increase on disturbed ground at PCMS, are likely to expand in response to increased ground disturbance in maneuver training areas and other training areas where they occur (Reference No. 217).

4.7.2.1.5. Swift Fox

Direct impacts to swift fox caused by military training are minimal. Extensive studies have been conducted on swift fox on PCMS from 1987 to 1989 and 1997 to 2006 to understand their ecology better. Those studies indicate that the species is doing well on PCMS and needs little management to survive (Section 3.7.2.2.2).

Maintaining the range in good condition allows a diversity of small mammal populations needed to sustain viable swift fox populations. Overall degradation of shortgrass prairie habitat on a large scale would likely result in a localized decline in swift fox populations (Reference No. 103).

4.7.2.1.6. Wetlands

Few direct impacts to wetlands occur from ongoing training activities. Training an additional IBCT and CAB could result in indirect impacts to wetlands from erosion and sedimentation processes in drainages upstream of man-made erosion control dams. Sediments could silt in these small wetlands, changing their nature or converting them to upland habitats if erosion-control dams are not properly maintained.

Most direct impacts to wetlands are avoided, and those that cannot be avoided are mitigated through the Section 404 process (through complying either with the Fort Carson/PCMS regional permit or by applying for coverage under a nationwide or individual permit).

Wetland and riparian area buffers are generally protected from vehicular and mechanized training due to the surrounding topography, which makes these areas unsuitable for this type of training. Because of avoidance and minimization efforts Fort Carson currently implements as part of its INRMP and ITAM procedures, direct effects to wetlands do not occur. Erosion control measures are protective of surface water, including wetlands and riparian areas.

From 1996 to 1997, a Legacy grant was used to study wetland community constituents and their distribution as well as various physical parameters at 10 sites on Fort Carson[10] and five sites on PCMS[11]. No decline was noted in representative wetlands, and no statistically significant increases in measured constituents were identified. These studies would be used to provide baselines for future wetland evaluations (Reference No. 6).

4.7.2.1.7. Summary of Known PCMS Impacts from Training

Table 4.7-3 summarizes known effects of military training on biological resources at PCMS (see Section 3.7.2.2.2), and identifies effects that are specific to PCMS, but many also apply to Fort Carson.

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources

Resource	Effects of Military Training	Reference
Aquatic habitat	Between 1985 and 1987, military maneuvers caused no measurable effect on streamflow, water quality, and estimated sediment load yields deceased. Since 1987, cumulative effects of maneuvers have developed to a point that there is potential for increased runoff and sediment yields and degradation of water quality.	USGS (undated) von Guerard *et al*. (1993) and USGS John Kuzmiak 2008
General vegetation	Training exercises result in less resource degradation than former grazing regimes, particularly for canyon and wetland habitats.	Canestorp *et al.* (1995)

[10] Wetland Program for Fort Carson, Colorado, 1996.
[11] Wetlands Monitoring Program for Piñon Canyon Maneuver Site (PCMS), Model, Colorado, 1998.

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
General vegetation	Live and litter basal cover decreased and bare ground increased in tracked areas following training. Species composition shifted from perennial warm-season grasses to annual cool-season grasses and annual warm-season forbs in tracked areas. Shrubby and woody plant densities were significantly reduced by training.	Shaw and Diersing (1989 and 1990)
General vegetation and range condition	Disturbance by tracked vehicles resulted in lower grass and vegetative basal cover with the loss of prostrate growth forms. Litter cover declined. Vehicular maneuvering reduced woody life-forms in tall-height classes to a generally greater extent than short-height classes. Low-growing forms of cacti were relatively susceptible to crushing. Long-lived perennials declined in all communities in tracked locations; bare ground created was replaced by short-lived perennials in only shrub-grassland. Annuals and exotics did not show distinct temporal trends or relations with intensity of disturbance. Patterns in species diversity or richness were not related to intensity of disturbance. Plant communities on PCMS display a high resistance to aboveground disturbance, but a low resilience when an alternate state is reached. PCMS may be in a transient stage where release from grazing had as much or more impact on plant community dynamics as did imposition of training. Fine textured soils may be more susceptible to cumulative effects of soil compaction and erosion associated with heavy vehicular loads.	Milchunas *et al.* (1999)
General vegetation and range condition	Through the exclusion of livestock, the vegetation biomass appears to have rebounded significantly, primarily evident through litter accumulation.	Milchunas *et al.* (2000)
Range condition	Overall, range condition improved on PCMS from 1989 to 1991.	Gordon and Linn (undated)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Niobrara shale barrens vegetation	Most Niobrara shale barrens endemic species are not adversely affected by moderate disturbance, particularly *Oxybaphus rotundifolius*, which appears to increase abundance where disturbance reduces competition. Weed invasions are not generally significant problems on these barrens. The report has baseline data (six plots at Gilligan's Island) that could be used to compare effects of current military training.	Kelso *et al.* (1999)
Fish	No observed effects.	Bramblett (1989), Bramblett and Fausch (1991a and 1991b)
General birds	During 1987-88 in cholla grasslands four species were detected more frequently and one species was detected less frequently in areas with training than control areas. In pinyon-juniper areas, four species were detected more frequently and one species was detected less frequently. Total numbers of birds detected in areas with training was significantly higher than the control for both habitat types, but species richness was significantly greater in control areas in cholla grasslands in 1987 and 1988 and significantly greater in areas with training in pinyon-juniper in 1988.	Youkey and Meslow (1989)
General birds	Only one species (Grasshopper Sparrow) showed an abundance decline after initiation of military training. The pinyon-juniper bird community decreased in species richness with military disturbance.	Tazik (1991)
Raptors	Increased size of areas used and made extra- home range movements more frequently.	Andersen *et al.* (1988, 1990)
Red-tailed Hawk	Habituated to low-level helicopter traffic. (Study includes both PCMS and Fort Carson.)	Andersen *et al.* (1989)
General wildlife	No known long term negative impacts.	Canestorp *et al.* (1995)
Pronghorn	Shifted forage selection in response to forb increases on sites disturbed by tracked vehicles. Females and fawns increased home area sizes during maneuvers; males did not. Pronghorns (winter 1987) exposed to military training spent less time bedded.	Gerlach and Vaughan (1990)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Mule deer	Female deer seasonal home ranges were larger in maneuver areas compared to nonmaneuver areas. Female nonsummer home ranges were larger in previous-maneuver areas than nonmaneuver areas. Fawn summer home ranges were larger in maneuver than previous maneuver areas. Bucks in maneuver areas had large home ranges than in nonmaneuver areas. Deer may exhibit a more negative response to unpredictable than predictable disturbances. Buck and doe survival rates and fawn:doe ratios did not differ prior to military maneuver and during 1986 and 1987. Population estimates increased from 1984 through early 1988; a decline was noted in late 1988. Cattle grazing during the baseline study and a coyote control program during 1987 and 1988 made it difficult to assess effects of military use on deer demographics.	Stephenson (1989)
Coyote	Three of 16 radio-collared coyotes temporarily abandoned home ranges in response to military activities (one returned one week later). Most coyotes that changed home ranges during military activities resumed original home ranges after maneuvers ceased. Responses were related to amount of available cover, topography, and intensity of military activity. Day activity increased while sunrise, sunset, and night activity remained the same during military activities.	Gese *et al*. (1989)
Coyote	Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends.	Kitchen *et al*. (2000a)
Coyote	Coyotes shifted to higher levels of diurnal activity under Army training, due to less exploitation (trapping and gunning). No other changes detected.	Kitchen *et al*. (2000b)
Swift fox	No mortality was associated with training activities, either through direct mortality or the destruction of den sites. There was little difference in fox movements between times of military activity and no military activity.	Rongstad *et al*. (1989)

Table 4.7-3 Known Effects of Military Training on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Swift fox	No negative effects of military training on swift foxes were documented (2000 to 2004). Both grazed and military training sites had higher survival and density than unused sites, with populations on military sites showing more stable dynamics. Fox survival rate did not differ between different disturbance regimes.	Thompson (2006)
Elk	Elk moved onto PCMS after acquisition and initiation of military training, indicating no significant negative effects of training and possible positive effects.	

[1]Impacts described in Table 4.7-3, *Known Effects of Military Training on PCMS Biological Resources*, are likely applicable to Fort Carson in many cases.

4.7.2.2. No Action Alternative

Under the No Action Alternative, the IBCT and potential CAB would not be stationed at Fort Carson, therefore no additional training at PCMS would occur. Under the No Action Alternative, the addition of Soldiers at Fort Carson associated with Transformation will continue in accordance with BRAC 2005, GDPR and AMF as discussed in the 2007 Fort Carson and PCMS Transformation EISs. Training impacts already analyzed in the 2007 PCMS Transformation EIS are included as part of this No Action Alternative. For purposes of this EIS, impacts to vegetation, wildlife, and wetlands from training currently occurring at PCMS would continue to occur at similar levels under the No Action Alternative.

Impacts to vegetation, wildlife, and wetlands from training as described under the Proposed Action both this section and Section 3.7 occur at PCMS and would continue to occur under the No Action Alternative. PCMS already trains an existing IBCT and has had aviation training ongoing in different formations over the years, based on stationing and National Guard/Reserve training. Impacts from the increased frequency from training the additional IBCT and CAB would not occur, however, under the No Action Alternative.

4.7.2.3. Mitigation Measures

See Section 3.7.2.6 Mitigation. Mitigation measures for Fort Carson include PCMS.

Besides the swift fox's natural requirements, one potential threat that needs to be monitored is the range expansion of the red fox. Red fox are a known predator of swift fox and a range extension onto PCMS would be a scenario where management actions would need to be considered.

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4.8. Cultural Resources

This section describes the affected environment and environmental consequences to cultural resources.

4.8.1. Affected Environment

Archeological and historical studies have been conducted on the land encompassed by PCMS for the past 60 years. Prehistoric, historic, and multi-component sites eligible for inclusion in the National Register occur throughout the installation. Studies of the built environment, similar to those on Fort Carson, have not been conducted, as the only structures not designated as historic archaeological sites are contained within PCMS cantonment area and date from the mid-1980s.

Between June 8 and July 27, 2008, PCMS experienced six wildland fire events affecting 46,971 acres. The Bridger and Dillingham fires were the most severe, encompassing 46,451 acres. Fort Carson's CRM and Senior Archaeologist were on site as RAs and conducted immediate cultural resources site assessments following the DOI BAER standards. The initial assessment identified 315 archaeological sites eligible for inclusion in the National Register, including a portion of the Hogback Traditional Site.

4.8.2. Prehistoric and Historic Background

Refer to Section 3.8.2 for a regional prehistoric and historic background, which includes a discussion of PCMS.

4.8.3. Section 106 Compliance and the Army Alternate Procedures

Refer to Section 3.8.3 for a discussion regarding Army Section 106 compliance and AAP.

4.8.4. Cultural Resources Investigations

4.8.4.1. Archaeological Resources

Though both vocational and professional archaeologists identified sites in PCMS area prior to 1980, large-scale archaeological investigations of the region did not occur until the early-1980s in preparation for the opening of PCMS. Archaeological research has intensified since that time in association with CRM Program development. As discussed in Section 3.8.1, the CRM Program at Fort Carson includes management of PCMS. The listing of Fort Carson's/PCMS's archaeological investigations, reports, and publications is summarized in Appendix G, however, is not an inclusive list of all Section 106 compliance actions as only large-scale archaeological investigations generate full reports. Large-scale investigations have not taken place on Fort Carson and PCMS since 2001.

Approximately 80 percent of PCMS has been inventoried for cultural resources, with 5,216 archeological sites having been recorded. Of these, 493 are currently determined to be eligible for inclusion in the National Register, with 4,723 sites determined to be not eligible. There are 2,589 prehistoric sites; 482 historic sites; 525 multi-component sites (i.e., having both prehistoric and historic components); and 240 sites that contain either historic or prehistoric rock art. All of the cantonment area of Fort Carson has been 100 percent surveyed for cultural resources and is devoid of known prehistoric sites. Additional information pertaining to cultural resources management for Fort Carson and PCMS is in Sections 3.8.2, 3.8.3, and 3.8.8, and may be found in Section 3.8 of the 2007 PCMS Transformation FEIS (Reference No. 184).

4.8.4.2. Paleontological Resources

Though not strictly classified as cultural resources, paleontological resources are managed by the Fort Carson Cultural Resources Program, as the management issues surrounding paleontological locales and collections are essentially consistent with those of archaeological resources. To date, 14 paleontological localities have been identified on PCMS. A Memorandum of Agreement is currently being drafted between PCMS and the USFS, Comanche National Grasslands, that will address paleontological resources, as well as wildland fire coordination and natural/cultural resources assessment partnerships.

4.8.4.3. Native American Consultation Status and Initiatives

Background information for this area is in Section 3.8.8. Information presented in the following discussion is specific to PCMS.

The TCP and sacred sites identified for PCMS are presented in *Our Footprints Are There: Report of Native American Consultation to Identify Traditional Cultural Properties and Sacred Sites on Land Administered by Fort Carson, Colorado* (Reference No. 121). On PCMS, five sacred site locations were identified, along with three TCPs and two Areas of Concern (AOCs).

Native American tribes are not the only groups that may have traditional and historical ties to PCMS. Other ethnic groups, such as those of Hispanic, Italian, or German descent, or family/social groups also have historic ties to southern Colorado. Fort Carson makes every attempt to include these groups/individuals in background research and decision-making processes when they can be identified. On PCMS, such groups have included many local families, as well as individuals who had a close association with the Piñon Booster Station (1920s – 1950s). Cultural resources personnel respond to all family and community inquiries for access to or information about historic properties located on PCMS.

4.8.5. Environmental Consequences

4.8.5.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The locations and actions analyzed in this EIS as the Proposed Action and alternatives are detailed in Section 2.0. No facilities construction at PCMS is part of the Proposed Action. A greater number of rotations is likely from the Proposed Action, and pose potential impacts to cultural resources.

The impacts from training an additional IBCT and potential CAB at PCMS could directly and indirectly affect nearly all available training areas within the boundaries of PCMS. Military training activities have the potential to result in adverse impacts to cultural resources.

Military training activities have the potential to result in adverse impacts to cultural resources. The extent of the impact is contingent upon two factors: the type of training and the landform where the training takes place. All training activities that could affect properties eligible for inclusion in the National Register must be considered undertakings in accordance with NHPA Section 106. Archaeological investigations in unsurveyed areas are required prior to training use. Archaeological work on PCMS is ongoing, and the unsurveyed acreage will continue to decrease.

4.8.5.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, therefore, no additional training at PCMS would occur. Range and training land use would remain the same as described in the 2007 PCMS Transformation FEIS. Levels of training above those analyzed in the 2007 PCMS Transformation FEIS would not occur. Maximum use of training lands was assumed in the 2007 PCMS Transformation FEIS. Impacts to cultural resources from an additional IBCT and CAB training would not occur.

4.8.5.3. Mitigation Measures

For the Bridger wildland fire (42,951 acres), Fort Carson cultural resources personnel began individual site assessment work during the fire, and it is anticipated that this phase will be completed in October 2008. Due to the sheer scope of burned area assessment and recovery efforts, it is estimated that the Phase I/II Archaeological Inventory work will take five to seven years to complete, with 3,000 to 5,000 new sites projected. This work is scheduled to start in the spring of 2009.

The demands of training these additional units combined with Transformation actions of training three HBCTS, one IBCT, 43rd Sustainment BCT, Special Forces, and Reservists, make cultural resource protection a very important component of the overall environmental protection and sustainable principles adhered to by Fort Carson. These principles also apply to PCMS. Fort Carson would continue to enforce all cultural resource protection regulations and policies as described in this section to prevent adverse impacts to known cultural resources.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents in force prior to training use (unless a project-specific agreement has been developed through the consultation process), the following would apply:

- Use of areas that have been inventoried for cultural resources and that contain no historic properties eligible for inclusion in the National Register would not be restricted because there is no potential for adverse impacts to significant resources.
- Areas that have been inventoried for cultural resources and contain known historic properties eligible for inclusion in the National Register would be used only for dismounted training until the area has been evaluated to determine that cultural resources can be protected against adverse impacts. If impacts cannot be avoided, further consultation with the SHPO and/or Native American Tribes (if applicable) regarding mitigation would occur prior to ground-disturbing activities.
- Areas that have not been inventoried for cultural resources would not be used for activities other than dismounted training until an archaeological investigation has been conducted and resources determined for eligibility in the National Register have been evaluated against potential adverse effects. If impacts could not be avoided, further consultation with the COSHPO and/or Native American Tribes (if applicable) regarding mitigation would occur prior to ground-disturbing activities.

4.9. Socioeconomics

This section describes the affected environment and environmental consequences to socioeconomics to include: demographics, housing, economic development, public finance, quality of life, Environmental Justice in minority and low-income populations, and the protection of children from environmental health risks and safety risks.

The ROI for the Proposed Action at PCMS comprises Huerfano, Las Animas, and Otero counties. The major communities in the vicinity of PCMS are Trinidad, in Las Animas County, and La Junta, in Otero County.

4.9.1. Affected Environment

4.9.1.1. Demographics

PCMS does not support a resident population. All troops that train at PCMS are permanently stationed either at or near Fort Carson or travel from other locations.

Demographic information is based on data from the US Census Bureau (Reference No. 138) and the Colorado State Demography Office (Reference No. 134). The ROI population remained approximately the same over the 26-year period between 1980 and 2006 (from 43,904 to 43,937). Growth was highest in the 1990s, with an average annual growth rate of 0.82 percent. This rate slowed to 0.27 percent between 2000 and 2006. Between 1980 and 1990, all three counties decreased in population (Reference No. 134).

The share of the regional population contributed by Otero County decreased steadily from 51.4 percent in 1980 to an estimated 44.3 percent in 2006. The contribution of Las Animas County increased slightly from 33.9 percent in 1980 to an estimated 37.5 percent in 2006. Huerfano County's contribution, the smallest of the three counties, increased from 14.7 percent to an estimated 18.3 percent from 1980 to 2006 (Reference No. 134).

Each of the three counties in the ROI is characterized by a single population concentration. Walsenburg, in Huerfano County, makes up 46 percent of the county population; Trinidad, in Las Animas County, is comprised of 58 percent of the county population; and La Junta and Rocky Ford, in Otero County, together make up 59 percent of the county population.

4.9.1.2. Housing

Soldier housing not required at PCMS because no Soldiers permanently stationed. Family housing and barracks for Soldiers training at PCMS are located at Fort Carson.

In 2000, approximately 21,000 housing units were documented in the three-county ROI. The vacancy rate varied from approximately 15 percent in Otero County to 19 percent in Las Animas County and 39 percent in Huerfano County (Reference No. 134). The high vacancy rate in Huerfano County is attributable to the high number of units having seasonal, recreational, and occasional use. The proportion of owner-occupied housing units was about 70 percent in all counties and, of these, between 75 and 80 percent was single-family units. Few structures contain ten or more units. Mobile homes comprise between 8 and 15 percent of the housing units. The housing stock is relatively old; the median age (year built) of the units is oldest in Las Animas County (1953) and most recent (1967) in Huerfano County. The proportion of units lacking complete plumbing and kitchen facilities (a surrogate measure for quality) is low in Otero County, but rises to 4 percent in Las Animas County and 5 percent in Huerfano County. Median rent values are $351 per month in Huerfano County, $316 per month in Las Animas County, and $301 per month in Otero County. Median home values are approximately $80,000 in Huerfano County, $86,000 in Las Animas County, and $68,000 in Otero County (Reference No. 138).

Residential construction activity is cyclical and highly responsive to economic conditions. The number of housing units authorized varied for construction in the ROI from 1985 through 2005 (Reference No. 124). Building activity remained relatively constant from 1985 through 1993 and then rose rapidly to peak in 1999. This was followed by an equally steep decline in building activity through 2005.

4.9.1.3. Economic Development

Characteristics of economic development include employment and its distribution across industrial sectors; unemployment; earnings; sources of income; and contributions to the regional economy by military installations, their personnel, and retired service members.

4.9.1.3.1. Employment

The counties in the ROI are rural; ranching and agriculture support much of the local economy. Employment data for the ROI were obtained from the Colorado Department of Labor and Employment (State of Colorado, 2008). Between 2006 and 2007, the number of jobs increased from approximately 19,400 to approximately 20,000 at a rate of 3.0 percent. Most of the growth took place in Las Animas County, which accounted for approximately 58 percent of the growth in employment.

Compared with the State of Colorado, where only 1.4 percent of the workforce is engaged in farming, the three counties in the ROI have high employment in farming—9 percent in Huerfano County and approximately 8 percent in Las Animas and Otero counties. Employment in government and government enterprises (federal, state, and local) is high in Las Animas County (23 percent) and Otero County (20 percent). Huerfano County (13.2 percent) is slightly above the state average (13.1 percent). Federal, civilian, and military employment is below the state average, whereas employment in state and local government is high in Las Animas and Otero counties (21.9 percent and 18.1 percent, respectively) compared to the state (10.1 percent) (Reference No. 128).

Major employers in Las Animas County include Burlington Northern/Santa Fe Railroad, Trinidad State Junior College, oil and gas drilling enterprises, and related support businesses. A new minimum-security correctional facility opened in 2003. The economy of Otero County is closely linked to agriculture, including livestock (primarily cattle) production and farming. Major crops include dry land wheat, irrigated corn, and alfalfa hay. The largest employers are local and county government entities. Huerfano County has a larger, medium-security correctional facility that provides employment in the area.

PCMS retains 12 full-time employees to maintain PCMS range facilities.

4.9.1.3.2. Unemployment

The unemployment rate in all counties of the ROI has consistently been above that of the state. The rate gradually fell from highs between 7.5 and 10 percent in 1992 to lows between 4 and 5.5 percent in 2000. Between 2000 and 2003, the unemployment rate ranged between 6.5 and 9 percent, and it fell again slightly through 2006. Unemployment rate for the ROI averaged 6.0 for 2006 (Reference No. 129).

4.9.1.3.3. Earnings and Income

Total non-farm wage and salary earnings in the ROI in 2006 totaled more than $607 million. The majority was contributed by Otero County (42 percent) and Las Animas County (43 percent). The concentration of well-paying jobs in the government sector is evident when comparing the share of earnings contributed by the sector to the share of employment in the same sector. The share of earnings is noticeably higher than the share of employment.

Earnings from the private sector are lower for each of the three counties in the ROI than for the state. This is also true for earnings in the federal, civilian, and military sectors. Earnings in the state and local

government sectors are noticeably higher than the state average, especially for Las Animas County where this category comprises almost 30 percent of total earnings.

4.9.1.3.4. Military Activities

Little permanent employment is directly associated with PCMS. The majority of supplies needed for training activities at PCMS are assembled at Fort Carson and transported to PCMS with the troops. No other military installations exist within the ROI, and only limited contracts are awarded to businesses in the ROI. Contracts totaling $3,123,102 were awarded to businesses in Las Animas and Otero counties by the Army during fiscal year 2006 (Reference No. 133).

4.9.1.4. Public Finance

For the three counties of the ROI, the main sources of revenue are transfers from the state government, property taxes, and transfers from the federal government (Reference No. 134). Intergovernmental transfers account for 48.8 percent to 52.1 percent of county revenues.

The major operating expenditure categories for the counties are social services, public works, and public safety. The provision of social services consumes about 36 percent of operating expenditures in Las Animas County, 34 percent in Otero County and 19.5 percent in Huerfano County. Expenditures on public safety comprise 14 to 17 percent of operating expenses for the three counties (Reference No. 134).

4.9.1.5. Quality of Life

No Soldiers are permanently stationed at PCMS. Units that train at PCMS travel from Fort Carson or other locations for field training that may last from several days to several weeks. Soldiers have limited access to off-post facilities and retail markets located over 25 miles away. Emergency medical and dental care is located on-post during training exercises.

4.9.1.6. Environmental Justice

On February 11, 1994, President William Clinton signed EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. The order requires federal agencies to identify and address any disproportionately high and adverse environmental or economic effects that its programs and policies might have on minority or low-income populations.

Environmental Justice: Guidance Under the National Environmental Policy Act (CEQ, 1997) defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American, and Hispanic. A minority population should be identified

when the minority population of the affected area exceeds 50 percent or when it is meaningfully greater than the minority population percentage in the general population.

Low-income populations are identified using the US Census Bureau's statistical poverty threshold, which varies by household size and the number of children. For example, the 2007 poverty threshold for a family of four with two children was $21,027. The nationwide poverty rate was 12.4 percent at the 2000 Census (Reference No. 140). The US Census Bureau defines a poverty area as a census tract where 20 percent or more of the residents have incomes below the poverty threshold; an extreme poverty area has 40 percent or more of the residents below the poverty level (Reference No. 140).

The populations of the census tracts surrounding PCMS have a slightly lower percentage of minority population than Las Animas County and the ROI (Reference No. 138). For the counties in the ROI, the black population comprises 1.3 percent. The Hispanic or Latino population ranges from 35.1 percent in Huerfano County to 37.6 percent in Otero County and 41.5 percent in Las Animas County.

None of the census tracts surrounding PCMS meet the 20 percent definition of a poverty area (Reference No. 138). The poverty rate in these areas was about the same as that for Las Animas County and the ROI; however, the poverty rates in PCMS area, Las Animas County, and the ROI are about twice the state level.

4.9.1.7. Protection of Children

On April 21, 1997, President William Clinton issued EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which seeks to protect children from disproportionately incurring environmental health or safety risks that might arise because of government policies, programs, activities, and standards.

No children live on PCMS, and PCMS is secured to prevent trespassing. There are few residences immediately adjacent to PCMS.

4.9.2. Environmental Consequences

4.9.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Aviation Brigade

Slight economic benefit to certain businesses from the training of an additional IBCT and potential CAB would occur in the ROI. Local purchases for vehicle maintenance, equipment rentals, and other services would potentially increase during training exercises.

4.9.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. A slight economic benefit to the local economy from activities associated with that training would not occur.

4.9.2.3. Mitigation Measures

The following socioeconomic mitigation measures were derived from the *Department of the Army Response to the National Defense Authorization Act; Section 2831, National Defense Authorization Act Section 2831(a) Report on the Piñon Canyon Maneuver Site, Colorado*. Though the report was in response to Congressional requests for information regarding the proposed expansion of PCMS, these mitigation measures also apply to the Army's intentions to contribute to the economy of southeast Colorado whether PCMS expands or not. The following discussion highlights some of the mitigation measures being considered.

The Army recognizes that citizens in Southeastern Colorado have significant concerns about current unemployment in the region. The Army plans to establish permanent Garrison operations at the installation. This includes the generation of more than 100 full-time, civilian and contractor positions, representing as much as $5 million in payroll. Consistent with past practice, the Army would attempt to fill the majority of the positions locally, based on availability of qualified applicants.

The report includes an analysis of economic considerations not related to the proposed expansion, including procuring additional goods and services from local businesses, creation of an economic development fund, establishment of an outreach office for small business contracting, establishment of partnerships to expand regional tourism, and additional investments in Army missions and personnel at PCMS.

Buying from local businesses is a proposition that the Army supports as a general principle, not only to help mitigate the impact of Army presence, but also in keeping with commitments to sustainability principles. Many of the goods and services that support Soldiers are purchased by centralized agencies rather than by the Fort Carson Garrison. Additionally, many of these specialized military items are not produced or sold by firms in PCMS area.

The Army does need some local products and services to support training at PCMS and that need will grow as more Soldiers and units travel to PCMS to conduct training. Consistent with Army policy on the

use of government purchase cards, Fort Carson is encouraging units to purchase goods in support of future battalion and BCT level training events at PCMS from local merchants near PCMS when possible, authorized, and financially feasible.

In another measure to enhance local purchases via contract, the Army has taken steps to help local businesses become more competitive for Fort Carson contract awards.

It should be recognized, however, that the Army's ability to direct its purchases to PCMS-area businesses is limited by laws and regulations such as the *Competition in Contracting Act and the Federal Acquisition Regulation*. The Fort Carson staff, at the direction of the Commanding General and Garrison Commander, is making every effort to apply those laws and regulations in a way that will result in local businesses being able to compete effectively for Army business.

The land comprising PCMS and the region surrounding it include certain resources of historic, cultural, and environmental significance. Members of the public have expressed understandable concern about the protection of and public access to these important and valuable resources. The Army is more than willing to enhance current efforts and work more closely with interested members of the public and local governments to ensure the long-term protection of, and public access to the resources under the Army's management responsibility. Through discussions with members of the public and local government leaders, the Army has identified several potential efforts that could enhance public access to the cultural resources currently managed by Fort Carson. The Army will explore the following activities:

- **Develop a Historic Ranch Site.** The Army and Fort Carson, in connection with local governments, academic institutions, and interested community residents, intends to explore options for developing a plan for a curation, scientific education, and awareness facility located at PCMS. The Army is also willing to explore the possibility of making other protected historic ranch sites on the existing or proposed expansion areas more accessible to the public as examples of ranching heritage in Southeast Colorado.
- **Loan Artifacts to Academic Institutions.** The Army has regulations specifying how it will manage archeological resources in its possession, and specifying the conditions that need to be met for proper curation. Under certain circumstances, the Army has the ability to loan artifacts to institutions meeting specific criteria. The Army has been, and intends to continue exploring opportunities to work with local governments or academic institutions to identify additional academic or government facilities capable of meeting the criteria to house and maintain the Army's collection of historic artifacts. The continued loaning of the artifacts to an entity outside

of the Army would make the historic collections more readily available to the public, while also ensuring their long-term protection. In the near term, it is important to note that all historic artifacts currently in the Army's possession are available upon request, for valid scientific research purposes.

- **Enhance Historic Tourism in Southeastern Colorado.** The Army intends to explore options to work with the local governments and communities in Southeastern Colorado to develop a partnership promoting tourism and recreation opportunities. The Fort Carson, Public Affairs Office and Directorate of Morale, Welfare, and Recreation (MWR) have taken steps to establish a tourism program for Fort Carson Soldiers and Families. The Army envisions that this program would consist of regularly scheduled day-trips via bus transportation from Fort Carson to selected historic points in and around PCMS. The Army will explore its authority to expand this program to include the general public. This could increase tourism revenue opportunities for Las Animas County, while expanding the recreational and cultural learning opportunities for Fort Carson Soldiers and Families. In coordination with the Fort Carson Cultural Resource Manager, other Federal Agencies, and the State Historic Preservation Officer, Fort Carson MWR personnel would work with a designated Las Animas County Chamber of Commerce or other County point of contact to develop an appropriate itinerary for visitors to see and experience.

4.10. Transportation

This section describes the affected environment and the environmental consequences to transportation in PCMS study area.

4.10.1. Affected Environment

4.10.1.1. Regional Transportation

4.10.1.1.1. Roadway Network

The sole public access point to PCMS is provided via US 350, approximately 30 miles northeast of Trinidad. Deployments from Fort Carson follow a fixed route along I-25 approximately 117 miles south to US 160, along US 160 approximately 7 miles northeast to US 350, and then along US 350 approximately 24 miles northeast to the main gate at PCMS cantonment area.

I-25 is the primary north-south interstate highway through Colorado. The City of Pueblo, located approximately 30 miles south of the Fort Carson cantonment area, is the only city transected by the I-25 portion of the deployment route. The remainder of the route runs through sparsely populated rural areas.

4.10.1.1.2. Traffic

I-25 is a four-lane, designated truck route that connects Fort Carson and Trinidad. The posted speed limit along the majority of I-25 is 75 mph and 55 mph through the urban areas of Pueblo and Trinidad. Traffic volumes on I-25 vary from a high of 72,200 ADT through downtown Pueblo to a low of 8,300 ADT near Walsenburg. Volumes on I-25 between Fort Carson and Pueblo range from 28,100 ADT to 44,300 ADT near SH 16. According to the CDOT, there is sufficient excess roadway capacity along the majority of this segment of I-25. However, near capacity conditions exist through Pueblo and in the immediate proximity of Fort Carson at SH 16, I-25 (Reference No. 218).

US 160 is a two-lane, designated truck route between I-25 and US 350. Speed limits on US 160 are 35 mph near Trinidad and 60 to 65 mph elsewhere. Traffic volumes on US 160 vary from 3,800 ADT near Trinidad to 1,900 ADT at US 350. Traffic volumes on US 160 drop substantially east of the junction of US 160 and US 350, which is a two-lane, designated truck route between US 160 and the main gate at PCMS cantonment area. The posted speed limit for US 350 is 65 mph. Traffic volumes on US 350 vary from 1,300 ADT near US 160 to 740 ADT near the main gate at PCMS. According to CDOT, excess roadway capacity exists because of minimal traffic volumes on both US 160 and US 350 (References 219 and 220).

The full-time staff at PCMS is limited to 12 civilian maintenance and administrative staff. No troops are stationed at PCMS; therefore, traffic to the installation is primarily generated during training deployments from Fort Carson.

Military convoy traffic between Fort Carson and PCMS is generally limited to wheeled vehicles. Tracked vehicles are generally transported to and from PCMS by rail. Special circumstances could require the movement of a limited number of tracked or other vehicles that cannot travel on public roads or by commercial transport truck. The use of the Heavy Equipment Transporter System in support of deployments between Fort Carson and PCMS is prohibited by CDOT. To reduce traffic conflicts, current military convoy movements are scheduled to avoid peak traffic periods in the Pueblo metropolitan area. IBCTs use mostly wheeled equipment and convoy down to PCMS. The IBCT would travel to the PCMS primarily by using Gate 20 (located south of Colorado Springs most heavily used traffic areas) and immediately enter 1-25, traveling down to Trinidad.

4.10.1.2. Installation Transportation

4.10.1.2.1. Roadway Network

The roadway network at PCMS is divided into three categories; cantonment area roads, MSRs, and secondary roads in the training areas. Each roadway category serves a function in moving people and freight at PCMS cantonment area. Roads serve the movement of people and freight within the cantonment area and funnel them onto the MSRs; the cantonment area roads provide a direct connection between the off-post deployment route and the MSRs; MSRs serve the movement of Soldiers' equipment and supplies over extended distances throughout PCMS; and secondary roads provide access from the MSRs to adjacent training areas and move vehicle traffic through the training areas.

With the exception of 1 mile of paved road in the cantonment area, the roadway network at PCMS consists almost entirely of unpaved roads. There are approximately 107 miles of MSRs and 490 miles of secondary roads on PCMS.

4.10.1.2.2. Traffic

Traffic volumes on PCMS road network vary widely between training deployment and nondeployment periods. During nondeployment periods, traffic on PCMS is limited to a small number of maintenance and administrative vehicles, and traffic on the main entrance road is limited to light administrative and maintenance-related traffic totaling fewer than 25 vehicles per day. During deployments to PCMS, daily vehicle traffic entering the cantonment area increases by approximately 350 vehicles for a period of

approximately three days. After this initial peak traffic period, administrative and service support traffic remain slightly increased during the training rotation. At the completion of training and the departure of the unit vehicles, traffic entering PCMS returns to an ADT of 25 vehicles per day.

During a full HBCT rotation, as many as 1,500 additional vehicles use the road network. The volume of traffic on a given section of road, with the exception of the main entrance road into PCMS, is variable because it is contingent on the nature of the maneuver training and variations of training mission requirements.

4.10.1.3. Other Transportation

The remote location of PCMS limits access to the installation by modes other than vehicular transportation. Descriptions of the rail, aviation, and transit systems that serve PCMS are presented as follows.

4.10.1.3.1. Rail

Freight rail service is provided to and from PCMS. The movement of tracked and other vehicles that cannot use public roads between Fort Carson and PCMS is almost exclusively by rail. PCMS railyard is designed to accommodate the large-scale movement of military vehicles and material. The railhead has six spurs and can accommodate up to 165 train cars at a one time.

A typical HBCT movement requires four trains (approximately 225 rail cars total) to meet its one-way rail transport requirement. The movement schedule for this type of unit generally consists of one train per day for four days. The average travel time for a rail shipment between Fort Carson and PCMS is 18 hours.

4.10.1.3.2. Aviation

The two small municipal airports located near PCMS are the Perry F. Stokes Airport in Trinidad and the La Junta Municipal Airport in La Junta. Both facilities support general aviation. Neither airport is serviced by a commercial passenger air carrier.

The military airstrip at PCMS is 5,000 feet long and can accommodate C-130 traffic. An apron and parallel taxiway allow four C-130 aircraft to be on the ground at one time.

4.10.1.3.3. Transit

No public bus or rail transit is servicing the area surrounding PCMS. Private charter buses are used by the Army to transport military personnel to and from PCMS for training. The number of personnel per bus is usually limited to 35 to allow adequate room for the Soldiers and their personal equipment. These buses travel individually or in limited numbers, independent of the military vehicle convoys.

4.10.2. Environmental Consequences

4.10.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

IBCT convoys to PCMS would not cause significant traffic increases because there is sufficient roadway capacity to accommodate the limited number of anticipated convoys.

A minimal amount of wheeled support vehicles would accompany CAB helicopters that would fly to PCMS to train. CABs typically do not train as an entire brigade. Elements of the CAB train with ground units in a support mode, therefore the numbers of wheeled support vehicles would vary with the size and type of training exercise.

4.10.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at PCMS would occur. Therefore, no impacts from the Proposed Action to transportation would occur.

4.10.2.3. Mitigation Measures

Mitigation measures are not warranted for transportation.

4.11. Utilities

This section describes the affected environment and environmental consequences to potable water, wastewater, energy sources, communications, and solid waste.

4.11.1. Affected Environment

The PCMS is a training installation with a small cantonment area and minimal utility services. Management plans and programs applicable to utilities under which the installation operates are listed in Appendix A.

As noted in the *Real Property Master Plan Digest, Piñon Canyon Maneuver Site* (Reference No. 221), PCMS information on utilities infrastructure is limited. The *2005 Piñon Canyon Maneuver Site Master Plan Digest* is currently undergoing minor revisions and updates to reflect mission requirements. The information presented in this analysis is based on the best available published data.

4.11.1.1. Potable Water Supply

4.11.1.1.1. Regional Setting

Potable water for PCMS and the surrounding area is supplied by the City of Trinidad. The recently upgraded 12-inch diameter main water line, which originates as a 16-inch diameter line in Trinidad, provides service for PCMS and a state prison facility.

4.11.1.1.2. Project Setting

PCMS purchases treated potable water from the City of Trinidad for use in the cantonment area (Reference No. 6 and 221). The potable water enters the installation west of the cantonment area via a connection to a water supply pipeline adjacent to US 350. After the water is delivered to PCMS, it is chlorinated and stored in a 50,000-gallon tank. Both the chlorination and storage facilities were built in 1987 and are now undergoing repair.

From the storage tank, potable water is distributed to the cantonment area via approximately 14,000 LF of underground water line (Reference No. 221) and to the training areas by water truck. The location of the potable water supply and distribution lines in the cantonment area is generally known (Reference No. 221).

The potable water system is adequate to support approximately 5,000 people based on a water consumption rate of 35 gallons per person per day and other installation-related support activities (such as

dust control and emergency fire suppression) (Reference No. 221). The water tank and potable water distribution system in the cantonment area is operating within capacity and would support water demands from additional training units.

The Army and the City of Trinidad have a contract for the supply of potable water to PCMS, which allows for delivery of up to approximately 2,700,000 cubic feet (20,200,000 gallons) annually. In fiscal year 2006 (October 2005 through September 2006), the Army purchased approximately double the contract-allowed amount from the City of Trinidad. The difference between the contracted water supply amount and the purchased amount is attributed to the deteriorated water supply line. Historical consumption of water at PCMS has been approximately 6 million gallons per year. The Army completed a project to repair the water line in 2007.

Existing wells are present on previously occupied ranches at PCMS (Reference No. 6). Potable water for consumption in the training areas is trucked from the cantonment area. Water from the wells is used for emergency fire suppression and made available to wildlife (Reference No. 6).

4.11.1.2. Wastewater System

The cantonment area primarily uses evaporative, nondischarging treatment/oxidation lagoons, originally constructed in 1985 for both sanitary wastewater and stormwater treatment (Reference No. 15). The cantonment area is sloped to drain to a central collection pipe, connected by underground pipe to a dedicated lagoon equipped with a dedicated oil water separation. The combined treatment facility is located in the southwestern corner of the cantonment area. The treatment/oxidation lagoons are currently operating at levels well below their capacity (Reference No. 221).

The combined treatment facility was originally designed for continuous use by a brigade-sized unit (Reference No. 221). The number of personnel at the cantonment area varies over time from fewer than ten to several thousand. The treatment/oxidation lagoons were upgraded in summer 2006 and subdivided into smaller ponds to more readily accommodate the fluctuation in flows (Reference No. 15). The lagoons' impervious liners, which prevent seepage into groundwater, were recently replaced. The modified system was designed for an average daily flow capacity of 10,052 gpd. The wastewater lagoons do not have a discharge permit because the lagoons are designed to be nondischarging.

Sanitary wastewater and stormwater are conveyed to the treatment ponds through separate underground pipes. Wastewater and stormwater from the cantonment area are conveyed via approximately 7,000 feet

of 8-inch-diameter and 12-inch-diameter mains (Reference No. 15). The location of this conveyance system is generally known.

Not all facilities in the cantonment area direct their sanitary wastewater to the treatment lagoons. The guard trailer, Headquarters building, the chlorination building, and wastewater at those facilities is treated using septic systems (Reference No. 15). A new 2,000-gallon septic system was constructed in 2006 for use by the Headquarters building (Reference No. 15).

Most facilities located outside of the cantonment area have septic systems and leach fields (Reference No. 221). Portable toilets are used in the training areas when septic systems are not available.

4.11.1.3. Energy Sources

4.11.1.3.1. Regional Setting

Electricity is supplied to the region by San Isabel Electric Association via high-voltage overhead power lines that parallel US 350. Colorado Interstate Gas (CIG), a subsidiary of El Paso Corporation, owns and operates a 10-inch diameter, high-pressure gas main that runs through the PCMS from southwest to northeast. The City of Trinidad owns an existing 10-inch diameter, low-pressure, odorized natural gas main that is operated by El Paso Gas. The low-pressure gas main is located adjacent to the CIG high-pressure main and extends from the southwest to the northeast for approximately one-third of the distance of the CIG high-pressure line (the line ends on the PCMS) (Reference No. 221). The City of Trinidad and CIG each have an easement for their respective gas lines, and CIG maintains the access road that extends the full length of its pipeline.

4.11.1.3.2. Project Setting

PCMS purchases electricity from San Isabel Electric Association (Reference No. 6). High-voltage overhead power lines enter the installation on the west side of the cantonment area, where the power lines connect to an electrical substation. The capacity of the existing transformer is 2,000-kilovolt ampere (kVA), and the existing demand is 300 kVA; therefore, electricity demand at the site is below the design capacity of the existing transformer.

The substation supplies electricity to buildings in PCMS cantonment area through underground distribution lines located adjacent to the roads. During the summer of 2008, the substation required routine repair to maintain the existing electrical capacity.

Electric service is not available outside the cantonment area (Reference No. 221). Batteries and portable generators are used to supply power to the training areas. Fort Carson anticipates that there will be power at ranges 1, 3, 5, and 7 by the end of 2009.

Trucked-in heating oil and propane currently provide adequate fuel for heating at PCMS. Most buildings in the cantonment area are heated by oil-fueled furnaces. Heating oil is trucked to the cantonment area and stored in building-specific USTs. Heating oil is not used outside the cantonment area. Propane is used to heat some buildings at the PCMS. Distribution lines are not required because storage of these fuels occurs at the point of use.

Natural gas is not currently used at PCMS but future development plans have analyzed the installation of a natural gas line for the heating of large buildings within the cantonment area. DPW is also evaluating the use of ground source heating and cooling with heat pumps as an alternative for heating small buildings. This option would only require electric energy resources for these buildings and would be more cost efficient. These are being considered for inclusion in the updated *PCMS Master Plan Digest*.

4.11.1.4. Communications

4.11.1.4.1. Project Setting

The communication infrastructure at PCMS consists of fiber cables that enter the cantonment area from US 350. In 2006, a project was completed to provide upgraded information/communication infrastructure downrange on Fort Carson and PCMS and to provide connectivity between Fort Carson and PCMS. This included installing approximately 125 miles of fiber optic lines, six guyed communication towers, and equipment shelters. A combination of towers and several equipment shelters at Pueblo Chemical Depot and Cedar Crest, Colorado, provide connectivity between Fort Carson and PCMS.

4.11.1.5. Solid Waste

4.11.1.5.1. Project Setting

Solid waste pickup at PCMS is managed via a contract with Waste Connections, and wastes are transported to appropriately permitted disposal facilities in Trinidad. The ISWMP, Fort Carson, Colorado (Reference No. 156), contains details of this program at PCMS. The ISWMP complies with AR 200-1 and AR 420-49. PCMS is included as a source in Fort Carson's solid waste goals. The goals would achieve a 50 percent annual reduction/diversion rate of Fort Carson's solid waste sent to landfills by 2010 (based on a 1992 baseline generation rate). Refuse and construction-related solid waste and are managed

by DPW. Solid waste generated in the training areas is collected and returned to the cantonment area for disposal. From the cantonment area, solid wastes are transported to appropriately permitted facilities.

There is currently no recycling program at PCMS because there are an insufficient number of personnel at the cantonment area to manage a recycling program in addition to the other program areas. PCMS is evaluating how to facilitate a recycling program at this installation in the future.

4.11.2. Environmental Consequences

4.11.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The Proposed Action would not impact utilities at PCMS. There are no IBCT or CAB facilities planned for construction at PCMS as part of the Proposed Action. Upgrades and utilities construction to accommodate maximum training loads were analyzed in the 2007 PCMS Transformation EIS. This would accommodate the additional IBCT and potential CAB units as well.

4.11.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No increased impacts to utilities would occur at PCMS.

4.11.2.3. Mitigation Measures

Mitigation measures are not warranted for utilities.

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4.12. Hazardous and Toxic Substances

This section describes the affected environment and environmental consequences to the storage, use, and handling of hazardous materials and toxic substances (including petroleum-based products); the potential generation of hazardous waste (including disposal, site contamination, and cleanup); and special hazards (including the generation of medical waste) within the cantonment area and the training areas.

4.12.1. Affected Environment

Hazardous materials used at the PCMS include gasoline, diesel fuel, oil, and lubricants used during routine maintenance; pesticides; and explosive and pyrotechnic devices used in military training operations.

Any residual hazardous materials including oil, lubricants, solvents, and batteries generated during routine maintenance are recovered for reuse or recycling. Other hazardous materials such as pesticides, and fuel, are consumed in the process. Hazardous materials brought to the PCMS by maneuvering units are recovered as material and taken back to their home station for further use, or classification and turn-in for reissue or proper disposal. In the event that hazardous wastes are generated at the PCMS, they will be managed under the rules and regulations as they pertain to a Conditionally Exempt Small Quantity Generator (CESQG) under the RCRA.

Explosive and pyrotechnic devices are employed in military training operations at PCMS; however, high explosives are not used. Approximately 230,000 munition items were used at PCMS in calendar year 2007, consisting of 5.56mm, 7.62mm, 9mm, and .45 and .50 caliber bullets.

A small amount of biohazardous waste or infectious waste could be generated by injuries or casualties. All biohazard waste generated at Fort Carson and PCMS is disposed of through a MEDDAC contractor permitted to dispose of biohazardous or infectious waste. Any medical waste generated at PCMS is transported to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with the MEDDAC plans; *Evans Army Community Hospital Hazardous Materials/Hazardous Waste Program; MEDDAC Regulation Number 40-5-6* (Reference No. 222) and *Fort Carson Management of Regulated Medical Waste, MEDDAC Regulation Number 40-5-5* (Reference No. 223).

4.12.1.1. Uses, Storage, and Handling of Hazardous Materials

4.12.1.1.1. Cantonment Area

Activities involving the use of hazardous materials, including petroleum-based products, at the PCMS involve the operation and maintenance of vehicles. Gas and diesel are stored in 20,000 gallon USTs with

bulk and retail dispensing mechanisms, and heating fuel is stored in smaller USTs located in the cantonment area. ASTs (1,000- to 2,000-gallon) are located at Big Canyon, Biernackis, Sharps, and Red Rocks Ranches for fuel storage. The 11 USTs and 10 ASTs have a combined capacity of approximately 130,000 gallons. The Army implements the requirements of AR 200-1 to minimize the risk of storage and potential spills into the environment. A SPCCP has been developed and is under review for the PCMS.

As required by Army policies, the PCMS emphasizes integrated pest management. Pesticides and herbicides could be required for insect and rodent control in structures and control of undesired vegetation, including noxious weeds (Reference No. 155). Potential areas of pesticide application include the grounds surrounding support facilities and ranges. A small inventory of DoD-approved pesticides are maintained and managed on site in accordance with the *Installation Pest Management Plan* (Reference No. 160).

Asbestos-containing materials and lead-based paint could be present in buildings constructed before 1978 (Reference No. 161). The cantonment area facilities were constructed after 1985 and are unlikely to contain asbestos or lead-based paint. Lead can potentially be found in chipped or cracking painted walls or in surrounding soils. Paint in liquid form can also contain hazardous lead concentrations (Reference No. 162).

4.12.1.1.2. Training Areas

Petroleum-based products are used in the training areas for the routine repair and maintenance of vehicles and replacement of obsolete or malfunctioning target systems, such as electrically powered lifters, that contain minute amounts of lubricating oil. Major repairs are done at Fort Carson. Electric lifters from mobile targets are stored at the small arms live-fire ranges.

Asbestos-containing materials and lead-based paint might be found in buildings constructed before 1978. The former ranch buildings in the training areas might contain asbestos and lead-based paint.

4.12.1.2. Hazardous Waste Disposal

4.12.1.2.1. Cantonment and Training Areas

In the event that hazardous wastes are generated at the PCMS, they will be managed under the rules and regulations as they pertain to a CESQG under the RCRA.

4.12.1.3. Site Contamination and Cleanup

No solid waste management units as defined and regulated under RCRA have been identified at PCMS.

4.12.1.4. Special Hazards

4.12.1.4.1. Cantonment Area

A small amount of biohazardous waste or infectious waste could be generated by training related injuries. All medical waste generated at Fort Carson and PCMS is disposed of through a MEDDAC contractor permitted to dispose of biohazardous or infectious waste. Any medical waste generated at PCMS is transported by medical personnel to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with MEDDAC regulations.

4.12.1.4.2. Training Areas

Small arms ranges located at PCMS are used by Fort Carson units for training. Approximately 230,000 munition items were used at PCMS in calendar year 2007, consisting of 5.56mm, 7.62mm, 9mm, and .45 and .50 caliber bullets.

PCMS has not been required to submit a Toxic Release Inventory Report (TRI) as *Section 313 of the Emergency Planning and Community Right-To-Know Act* (EPCRA) exempts facilities with fewer than 10 full-time employees. However, with the anticipated growth in personnel at PCMS, it is expected a TRI report will need to be submitted for calendar year 2008, as preliminary data indicates lead used in munitions exceeds the reporting threshold for TRI.

High explosives are not used by the Army at PCMS, therefore UXO is not anticipated. Non-explosive practice grenades are used at an existing grenade launcher range.

A small amount of medical waste could be generated by injuries or casualties in the training areas. Any medical waste generated at PCMS is transported by medical personnel to Evans Army Community Hospital at Fort Carson to be disposed of in accordance with MEDDAC regulations.

4.12.2. Environmental Consequences

4.12.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The Proposed Action would not adversely impact the generation, use and handling of hazardous and toxic substances at PCMS. Treatment of these substances was analyzed under maximum training loads in the 2007 PCMS Transformation EIS. The anticipated requirement to submit a TRI report for calendar year 2008 is not dependent on the Proposed Action.

4.12.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore would not train at PCMS. No adverse impacts to the generation, use, and handling of hazardous and toxic substances would occur at PCMS.

4.12.2.3. Mitigation Measures

Mitigation measures are not warranted for hazardous and toxic substances.

4.13. Sustainability

This section describes the affected environment and environmental consequences regarding sustainability. Sustainability initiatives at PCMS fall under the Fort Carson guidelines for training lands, energy, water, procurement, transportation, land use, buildings, solid and hazardous waste, HAPs, Community of One and Partnerships, and SEMS.

4.13.1. Affected Environment

PCMS lands and mission fall under Fort Carson's sustainability program. See Section 3.13.1.1 for a description of sustainability policies for training lands.

4.13.2. Environmental Consequences

4.13.2.1. Proposed Action – Training an Additional Infantry Brigade Combat Team and Potential Combat Aviation Brigade

The stationing of the IBCT and CAB units at Fort Carson and training at the PCMS would not alter the status of the sustainability initiatives. Use of PCMS for training activities is expected to increase over the next several years, resulting in more focus on sustainability at PCMS. The Fort Carson sustainability team is currently developing program initiatives to address opportunities for sustainable training and development at PCMS.

4.13.2.2. No Action Alternative

Under the No Action Alternative, an additional IBCT and potential CAB would not be stationed at Fort Carson, and therefore no additional training at the PCMS would occur. As with the Proposed Action, this would not alter the status of the sustainability initiatives. Even under No Action, the use of PCMS for training activities is expected to increase over the next several years due to Transformation activities, resulting in more focus on sustainability at PCMS. The Fort Carson sustainability team is developing program initiatives to address opportunities for sustainable training and development at PCMS.

4.13.2.3. Mitigation Measures

Mitigation measures are not warranted for sustainability.

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5. Cumulative Impacts

CEQ regulations implementing NEPA define a "cumulative impact" as follows:

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

EPA guidance to reviewers of cumulative impacts analyses further adds:

> …the concept of cumulative impacts takes into account all disturbances since cumulative impacts result in the compounding of the effects of all actions over time. Thus the cumulative impacts of an action can be viewed as the total effects on a resource, ecosystem, or human community of that action and all other activities affecting that resource no matter what entity (federal, non-federal or private) is taking the action (Reference No. 224).

For the purposes of this EIS, significant cumulative impacts would occur if incremental impacts of the Proposed Action[12], added to the environmental impacts of past, present, and reasonably foreseeable actions, would result in significant adverse effects to resources for Fort Carson and/or PCMS and the surrounding regions. Since the baseline conditions (i.e., the implementation of Transformation) are not projected to fully occur until the end of fiscal year 2011, the impacts from Transformation and the Proposed Action are best understood if analyzed together as cumulative impacts in this chapter.

The Army considered a wide range of past, present, and reasonably foreseeable future actions in this chapter by researching existing literature and contacting local area planners and state and federal agencies to identify other projects in the region that could contribute to cumulative environmental impacts. The Army considered other past, present, or foreseeable future actions regardless of whether the actions are similar in nature to the Proposed Action or outside the jurisdiction of the Army.

5.1. Impacts Methodology

This cumulative impacts analysis considers direct and indirect impacts determined from the alternatives analysis and recommended mitigation measures presented in Chapters 3 and 4 and the past, present, and future projects considered relevant to the analysis. The geographic scope and time frame are discussed

[12] Unless otherwise stated, statements concerning "the Proposed Action" would have the same impact or effect if applied to Alternatives 1 or 2.

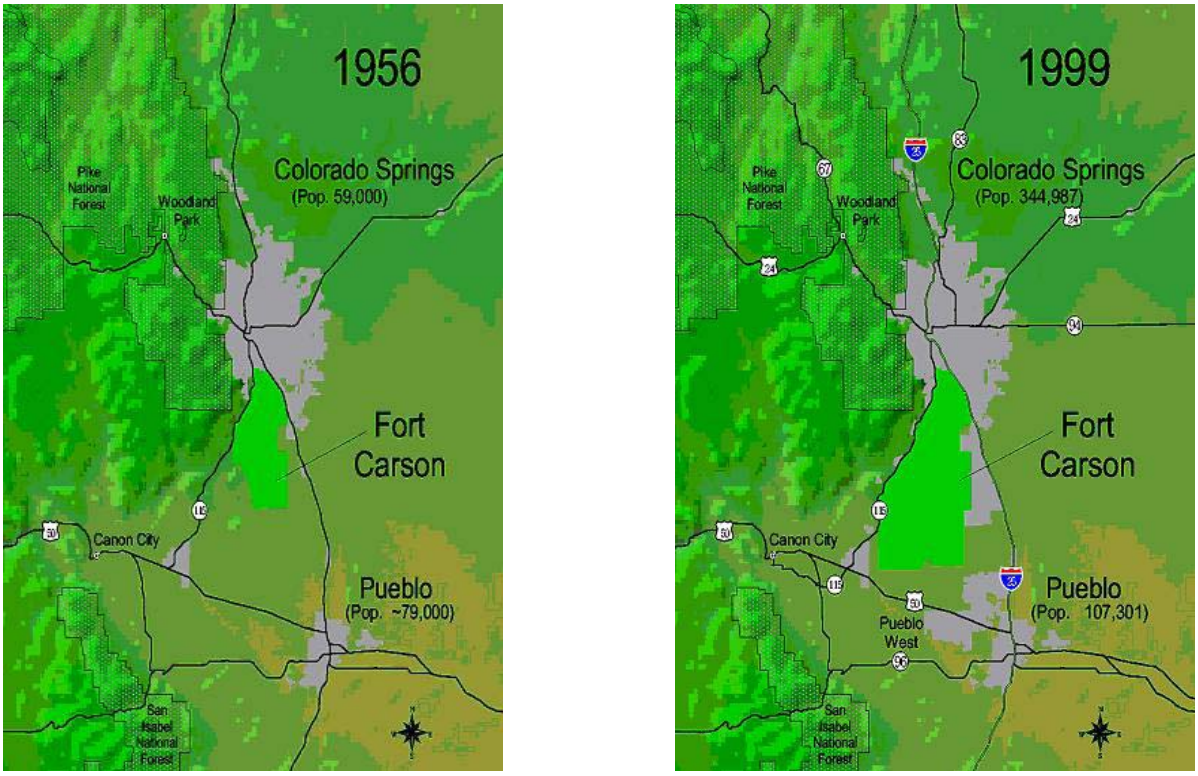
for each resource. In general, the geographic scope is limited to Fort Carson or PCMS and adjacent lands (including communities around these installations).

Though certain direct and indirect impacts are determined insignificant, they require further evaluation as elements of cumulative impacts to the resource. Only resource areas that are considered to be potentially significantly impacted by cumulative actions are discussed in detail. There may be some overlap of discussion in some resource areas as the cumulative actions may affect more than one resource area (e.g., loss of vegetation can affect soils, wildlife habitat, water, and air quality). Impacts may also be discussed in a more regional context or, when appropriate, limited to either Fort Carson, PCMS, or both.

5.2. Overall Regional Development and Army Actions

No cumulative impacts analysis to Fort Carson's regional resources can be initiated without an overall view of the increase in human development that has taken place along the Front Range of Colorado. Following the 2000 Census, the population living within 10 miles of Fort Carson's installation boundaries was estimated to be approximately 370,000 individuals (Reference No. 225). By 2015, more than 481,000 people are predicted to live within 10 miles of Fort Carson's boundaries. This represents an increase in population of more than 30 percent in 15 years, and the stationing of additional Soldiers as part of 2007 GTA stationing decisions will further increase this rate of growth surrounding the installation. Figure 5-1 shows the suburban encroachment trend around Fort Carson from 1956 to 1999 (Reference No. 40). As shown in the two images in Figure 5-1, growth around Fort Carson, especially along the eastern boundary along I-25 and from the City of Pueblo has been considerable.

Similar growth has occurred along much of the Colorado Front Range. This urbanization has resulted in conversion of native grasslands, shrublands, and woodlands to non-natural land cover on the Great Plains, which has significantly impacted many wildlife species throughout the region. Actions having the most widespread impacts on the Great Plains and Colorado Front Range have been cultivation for row crop agriculture and urbanization. Generally, species that commonly occur around Fort Carson have been most impacted by increasing urbanization through a loss of suitable habitat. Although some increase in urbanization is attributed to Army growth (i.e., additional family housing/infrastructure), a majority of this urbanization has been caused by overall economic development within the region. Overall human development has caused incremental adverse impacts primarily to land use, but also including the loss of open space and degradation of air quality, soils, and water resources. Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development along the Front Range anticipated by state and local governments (Reference No. 190).



Source: Reference No. 40

Figure 5-1 Encroachment Trend Around Fort Carson from 1956 to 1999

As part of the development and population growth in the region, several reasonably foreseeable future actions may take place in approximately the same time as the implementation of the Army's Proposed Action at Fort Carson. These actions have been considered in the Army's assessment of cumulative impacts. They are:

- Various maintenance and capital improvements projects near Fort Carson pertaining to housing, roadways, utilities, and other infrastructure.
- Constructing the arrival/departure air control group facility at the Colorado Springs Airport to support deployment of Fort Carson troops.
- Various capital improvements projects to municipal and county facilities now being planned or constructed.
- Improvements to roadway connections directly from I-25 to the Colorado Springs Airport, as currently being evaluated in the City's South Metro Accessibility Study and the SH 16 EA.
- Improvements to Powers Boulevard/SH 16 and the I-25 interchange east of the installation.
- Improvements to Academy Boulevard north of the installation.
- Improvements to SH 115 west of the installation.

- Development of lands throughout the Pikes Peak region and greater Colorado Springs area.
- Bureau of Reclamation Southern Delivery System – proposal to construct new water storage reservoirs and an extensive network of delivery piping.
- Reconstruction of Powers Boulevard to a freeway with interchanges to enhance traffic movement around the eastern side of Colorado Springs.
- Future improvements to the roadway network to improve capacity on Drennan Road and Powers Boulevard to provide a more direct connection between I-25 and the airport.
- Future improvements to the roadway network to Banning-Lewis Ranch developments, and other features on the east and south sides of Colorado Springs.
- Future foreseeable improvements to SH 115 along the western boundary of the post.

Figure 5-1 also shows the growth of Fort Carson itself between 1956 and 1980. Camp Carson was created in WWII and consisted of 60,048 acres of land at the northern end of the current installation. In 1965 and 1966, the post was expanded to the south, bringing Fort Carson to its current size of approximately 137,000 acres. The acquisition and historical training use of a majority of this acreage has preserved open space in contrast to the rapid development and urbanization that has occurred along the I-25 corridor and north of Pueblo.

PCMS and the area immediately around it have experienced relatively little alteration of native habitats by urbanization or cultivation, but impacts from these activities throughout the rest of the Great Plains has contributed to declines in some wildlife species that also occur at PCMS. Little development in the vicinity of PCMS has taken place or is currently planned (Reference No. 190). According to Las Animas County (Reference No. 226), there are no permitted or anticipated projects in the vicinity of PCMS because water and sewer infrastructure is not available. The potential exists for future wind-power projects in Las Animas County, but no specific development plans are under consideration. According to the Otero County Engineering Department (Reference No. 227), no large-scale projects have been approved within Otero County. The only planned development consists of approved projects for 14 individual homes located throughout the county. More recently, the Trinidad Correctional Facility is evaluating expanding its capabilities, from 400 prisoners to 2,400. This would likely mean more water use, increased facilities, more energy consumed, a potential increase in traffic on US 350 and other related impacts. In Lamar, a former factory is being converted to build wind turbine parts, which creates the potential for more wind farm development in the region.

These regional cumulative changes, augmented by the present Proposed Action and past Army actions on Fort Carson and PCMS, have had varying degree of cumulative effects to regional resources. In addition to regional development projects discussed above, Table 5-1 lists past, present, and reasonably foreseeable Army actions, other than the Proposed Action that were reviewed to complete the cumulative impact analysis.

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions

Project or Activity	Time Frame		
Troop Movements at Fort Carson and PCMS	Pre- 2005	2005-2008	2009-2013
2nd Brigade 4th ID at Fort Carson was inactivated.	X		
10th Special Forces Group (Airborne) arrived at Fort Carson.	X		
4IDHQ, one maneuver brigade (1st Brigade), and support units of the 4ID at Fort Carson were reassigned to Fort Hood. One brigade remained at Fort Carson. The 2nd Armored Division at Fort Hood was re-flagged as the 4ID, and the 3ACR was relocated to Fort Carson from Fort Bliss, Texas.	X		
Overseas deployment of military personnel.	X		
7ID was formed at Fort Carson.	X		
2BCT-2ID was transferred from Korea to Fort Carson and reflagged to 4BCT-4ID in 2008.		X	
52nd Engineer Battalion at Fort Carson was inactivated.		X	
7 ID Headquarters at Fort Carson was inactivated.		X	
1st Army Training Support Division- West (TSD-W), 2-Star HQs in charge of all Army National Guard and Army Reserve Units West of the MI River, was activated at Fort Carson.		X	
Implementation of Army Transformation by 2011.		X	
5th Armored Brigade (Reserve) restationed from Fort Carson to Fort Bliss.		X	
1-6 Cavalry Squadron (Aviation) restationed from Fort Carson to Fort Riley.			X
52nd Engineer Battalion reactivated at Fort Carson.			X
GTA (Proposed Action) additional IBCT and a CAB (approximately 6,700 Soldiers and their families) that would train at both installations.			X
Program and Policy Changes Fort Carson and PCMS	X	X	
Implemented PCMS rest/rotation program to build sustainable land use to recover training areas following mechanized maneuver rotations.	X		
PCMS rest/rotation program adjusted to provide more site-specific rehabilitation options and increase military training options.	X		
Fort Carson implemented the ACUB program.	X	X	X

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions (continued)

Project or Activity	Time Frame		
Construction Activities at Fort Carson	Pre- 2005	2005-2008	2009-2013
WWII Wood Demolition program.	X		
Fort Carson Major Construction (Main Cantonment and Adjacent Areas).			
10th Special Forces Group (Airborne) Battalion Complex.	X	X	X
Army Reserve and National Guard Training.	X		
Barracks construction.	X	X	X
Utilities Upgrades.	X	X	X
Privatization of family housing and renovation of substandard housing.	X	X	X
Gates upgraded and security fence installed.	X		
Centennial Training Site was constructed to support the Colorado Army National Guard, and is expanding.	X	X	X
Railhead upgraded and expanded.	X		
Construction to support Army restationing and conversions for CS/CSS Units.		X	X
Road Improvements.	X	X	X
Commissary/Post Office.			X
Lifestyle Village.			X
Army Space Command.			X
SIMS Center.			X
Rock Crusher training facility added to support training for the 96th Regional Readiness Command.	X		
Range 127 (Platoon Assault Course) upgrade.	X		
CACTF and an UAC and a Breach Facility constructed near Camp Red Devil.	X		
Hot Refuel Pads (BAAF).	X		
Bulk fuel facility constructed on Butts and Wilderness Rd and in cantonment area.	X		
TUAV support complex constructed near BAAF.		X	X
ORTC barracks constructed on Wilderness Road near BAAF.		X	X
DMPRC and MPTR upgrades.		X	X
Range 49 upgraded into a QTR to support training for the Colorado Army National Guard.		X	
Air Support Operation SQ Complex.			X
Range Upgrades.	X	X	X
Sniper Range.			X
Indoor Range.			X
71st EOD Complex.			X
Security Fence.			X
Ammunition Supply Point relocation.			X

Table 5-1 Past, Present, and Reasonably Foreseeable Army Actions (continued)

Project or Activity	Time Frame		
PCMS Actions (Main Cantonment and Adjacent Areas)	Pre- 2005	2005-2008	2009-2013
Construction of Piñon Village (Tuff Sheds in the cantonment).	X		
Maintenance facility (pole barn style).	X		
Butler building storage facility.	X		
Installation Information Infrastructure Modernization Program project (communications towers).		X	
Construction of PCMS cantonment facilities (administrative, clinic, etc.).			X
Establishment of PCMS as a sub-installation of Fort Carson.			X
Live-fire was introduced to PCMS with the construction of five small arms ranges.	X		
Special Use Airspace.			X
Training Areas B and C opened to mechanized military maneuver due to recovery from pre-acquisition erosion.		X	
Urban assault course and shoot house.			X
Live fire, convoy maneuver range.		X	
Two mock villages comprised of Tuff Sheds	X		
Road and trail improvements.	X		
Ammunition holding area, live grenade range.			X

The population of Fort Carson has fluctuated through time in accordance with the Army's need to train Soldiers and deploy them abroad to support the nation's mission requirements. Various Army initiatives and stationing decisions have increased or reduced the troop stationing levels of Fort Carson and training support requirements of both Fort Carson and PCMS. Figure 5-2 portrays the troop levels at Fort Carson over time.

5.2.1. Fort Carson Construction and Other Actions

5.2.1.1. Cantonment and Adjacent Areas

New construction has increasingly been sited outside of the area currently designated as the cantonment area. Encroachment on training lands and mission impacts are the major results of this trend.

5.2.1.2. Downrange Area

Most range construction within the downrange area at Fort Carson occurred within and prior to the 1980s. Since then, most of the range construction projects have been range upgrades (i.e., improvements to

existing ranges, not siting of new ranges). Table 5-1 contains major range construction projects that have been completed, are ongoing, or are planned for Fort Carson downrange areas.

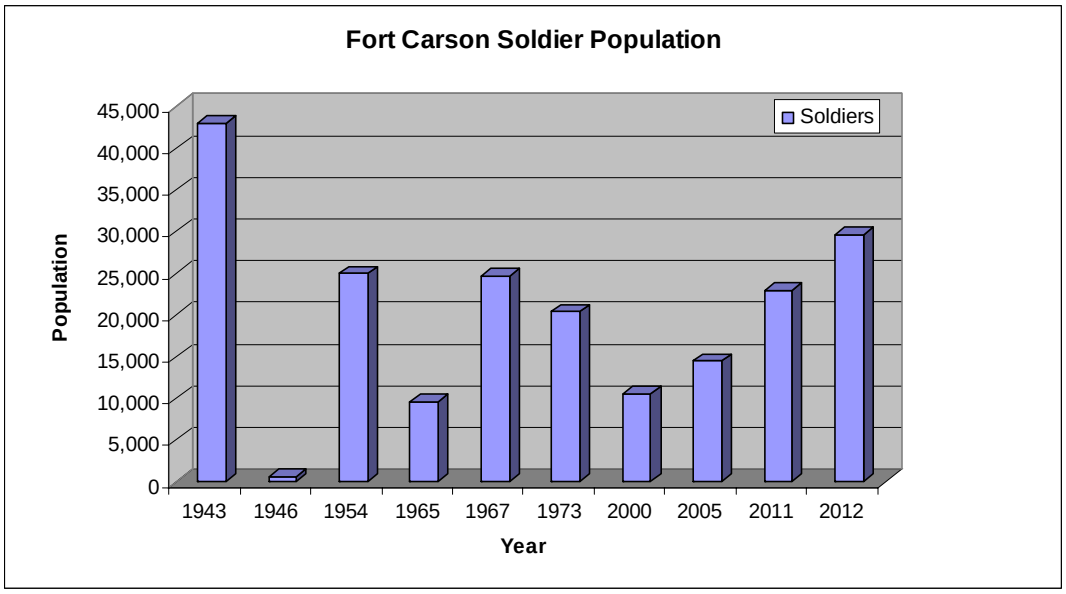


Figure 5-2 Fort Carson Soldier Population

5.2.1.3. Training

Some of the development (existing and planned) within the cantonment area and most of the construction in the downrange area continues to encroach on Fort Carson's existing training lands and ranges. This, in turn, increases impacts to natural and cultural resources on remaining training lands due to increased frequency and intensity of maneuver on these lands.

The combination of Transformation actions and the addition of the GTA and CAB units would approximately double the troop strength at Fort Carson. Theoretically, training the higher numbers of units and Soldiers could increase the adverse effects to soils, vegetation, wildlife, and cultural resources in the downrange areas. Given the adaptive management of the training lands, as discussed in Section 2.2.4, however, the adverse effects on these resources are subject to sustainability limits. Also, empirical data concerning effects is exceedingly difficult to produce in light of the considerable influence of unpredictable and uncontrollable variables such as climate conditions and the frequency of unit deployments.

The ability to satisfy training needs of units and Soldiers has been somewhat hampered by their increased numbers, the increased areas in which they must train to meet doctrinal standards, and the reductions in

available training lands. To date, this impact can be controlled by adapting training durations, frequencies, methods, and availability of training areas.

5.2.1.4. Cumulative Impacts

5.2.1.4.1. Land Use

The cumulative impact to land use consists of past, present, and reasonably foreseeable future changes to land use on and around Fort Carson. As discussed in Section 5.2 and shown in Table 5-1, increasing development has occurred both within Fort Carson and along the Front Range. Regionally, the Proposed Action would not result in a change of land use or present a conflict with existing land uses in areas adjacent to Fort Carson. The actions and construction activities, if implemented, would occur within Fort Carson. The percentage of developed areas within the approximate 6,000-acre cantonment area would increase under the Proposed Action, as additions to the Fort Carson cantonment area construction projects discussed in Table 5-1. This result is not adverse in that the cantonment area is designed to be developed. The amount of development may be reduced, however, through efficient land use planning and programs and renovation and replacement of existing facilities in ways that better use already developed areas.

The Proposed Action would change approximately 200 acres from training area to administrative and operational use, a change that has no impact on the community around Fort Carson. This change of land use would reduce the amount of maneuver area for training exercises and could cause reduction in flight corridors due to light encroachment. As the downrange area before this EIS consisted of approximately 96,000 acres of unimproved or open lands, and a majority of existing and proposed range construction projects deal with upgrades and re-use of existing ranges, any reductions caused by the Proposed Action would present minor direct, indirect and cumulative impacts to land use. The proposed improvements to Gate 19 with an improved access road to the ORTC or the Tent City area would encroach on the Land Navigation course south of BAAF.

As ranch and agricultural lands within the Colorado Springs area and other communities along the Colorado Front Range continue to be sold and developed, the approximate 96,000 acres in the downrange area of Fort Carson would constitute a growing percentage of remaining open space within the Front Range region. Also, Army programs such as ACUB both prevent land use incompatibility issues with neighboring areas and slow the reduction of undeveloped or open spaces in the region.

5.2.1.4.2. Air Quality

The cumulative impact to air quality consists of past, present, and future actions resulting in air emissions on and around Fort Carson within the Colorado Springs Urbanized Area in El Paso County. Cumulative impacts would result from the construction and operation phases of numerous activities at or near Fort Carson that are sponsored by federal, state, or local agencies. The following projects (also see Table 5.1) could contribute to regional emissions:

- Proposed Action;
- Various ongoing construction projects on Fort Carson (such as housing, barracks, motor pools, administration buildings, etc.);
- Existing sources on Fort Carson; and
- Transportation improvements off-post in the Colorado Springs Urbanized Area.

Construction activities would result in fugitive dust emissions from soil disturbance and wind erosion, and combustion product emissions (PM, NO_x, and CO) from worker vehicles and non-road equipment. Fugitive dust emissions are well mitigated due to regulatory requirements; therefore, impacts should be minimal and short-term, as discussed in Section 3.3.4.6.

Regional PM (both PM_{10} and $PM_{2.5}$) concentrations are approximately half of the NAAQS (Reference No. 20), and cumulative emissions from construction projects are unlikely to lead to a violation of the NAAQS because regional concentrations would have to double over the existing emissions to approach the regulatory threshold. The largest source category of CO emissions is mobile sources.

General Conformity

In accordance with the CAA, all regional highway improvement projects that receive federal funding must undergo a transportation conformity review for mobile source emissions to verify conformance to the maintenance plan and TIP. Project proponents must conduct an evaluation to determine whether the project would comply with the air conformity regulations under the CAA. Similarly, all other federal actions not addressed by the Transportation Conformity rule must undergo a review process to evaluate and document project-related air pollutant emissions, local air quality impacts, and the potential need for emission mitigation.

All of the demolition, construction, and renovation projects on Fort Carson fall well below the de minimis threshold for CO and result in a Record of Non-Applicability. The activities that were analyzed in the 2007 Fort Carson Transformation EIS resulted in a full Conformity Determination as the emissions of CO

exceeded that threshold. These construction activities are still occurring on Fort Carson and troop relocation must be completed by 2012. Conformity with the SIP was demonstrated as the POV emissions could be accounted for in the TIP and the remaining emissions conformed as there was sufficient emissions budget in the SIP. A General Conformity determination also was completed for the Proposed Action (for all three siting scenarios).

Because of the regulatory limits that are enforced for CO, cumulative emissions associated with these projects are unlikely to lead to a violation of the NAAQS, and the TIP has already accounted for many of the highway projects. For those projects that were unknown at the time of the updated TIP, sufficient budget exists to accommodate those additional emissions. Further, CO monitoring by CDPHE, El Paso County, and Colorado State University would identify any violations. Corrective action would be taken by the region so the effects would be short-lived.

Modeling Analyses

Cumulative emissions during the operation phase of the Proposed Action at Fort Carson were calculated on a 24-hour and annual basis in the Air Quality Analysis Modeling Report and summarized in Tables 5-2 and 5-3 (Reference No. 227).

Table 5-2 Projected Actual Annual Missions

Source Type	Total Emissions (tpy)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
External combustion	5.2	5.2	49.9	57.2	0.6	3.7
Internal combustion	1.2	1.2	21.3	5.3	2.4	1.4
Misc non-combustion	12.1	10.2	0.1	0.0	0.0	35.5
Fugitive dust from training	94.0	23.8	0.0	0.0	0.0	0.0

Table 5-3 Projected Actual Hourly Emissions

Source Type	Total Emissions (lb/hr)					
	PM	PM_{10}	NO_X	CO	SO_X	VOC
External combustion	6.4	6.4	60.5	66.5	10.9	4.4
Internal combustion	1.1	1.1	27.1	7.2	4.9	1.6
Misc non-combustion	18.0	17.4	0.0	0.0	0.0	29.9
Fugitive dust from training	10695.0	2388.0	0.0	0.0	0.0	0.0

Air dispersion modeling was performed to assess the cumulative impacts of existing, recently added and proposed emission sources at Fort Carson on ambient air quality. The modeling includes new and

proposed emissions from the Transformation, GTA, ongoing MCA and DPW projects, and existing sources. Modeling procedures and results are provided in the Air Quality Analysis Modeling Report and are summarized as follows (Reference No. 227).

The near-field/off-base concentrations of criteria pollutants were determined using the *American Meteorological Society (AMS)/EPA Regulatory Model AERMOD* (Version 07026).

Particulate matter near-field 24-hour concentrations were determined using the dust transport atmospheric modeling system, DUSTRAN, which was developed by the US Department of Energy's Pacific Northwest National Laboratory (PNNL) to assist the DoD in addressing particulate air quality issues at military training sites.

The far-field (>50 kilometers) AQRV impacts were analyzed using the CALPUFF dispersion model in a screening mode (CALPUFF-Lite).

Maximum AERMOD predicted ambient concentrations of criteria pollutants (modeled maximum concentration plus background concentration) are shown in Table 5-4. None of the AERMOD predicted ambient concentrations exceed the corresponding NAAQS or Colorado Ambient Air Quality Standards (CAAQS).

Table 5-4 AERMOD Results AERMOD Predicted Impacts

Pollutant (Emissions Scenario)[1]	Averaging Period	Maximum Predicted Concentration (µg/m^3)	Background Concentration (µg/m^3)	Maximum Predicted + Background Concentration (µg/m^3)	National Primary AAQS (µg/m^3)	Colorado AAQS (µg/m^3)
NO_2	Annual	2.4	55	57.4	100	100
CO	1-Hour	230.2	5355	5585.2	10,000	10,000
	8-Hour	51.3	3609	3660.3	40,000	40,000
SO_2	Annual	0.2	8	8.2	80	80
	3-Hour	47.7	24	71.7	365	365
	24-Hour	6.6	59	65.6	1,300	700
PM_{10} (1)	24-Hour	76.6	56	132.6	150	150
PM_{10}	24-Hour	79	56	135	150	150
$PM_{2.5}$ (1)	24-Hour	9.5	19	28.5	35	35
$PM_{2.5}$	24-Hour	14.4	19	33.4	35	35
PM_{10}	Annual	13.6	24	37.6	NA	50
$PM_{2.5}$	Annual	4.4	8	12.4	15	15

1. Emissions inputs vary only for 24-hour average fugitive particulate matter models (see Section 4.1 of the Air Quality Analysis Modeling Report for description of scenarios).

µg/m^3 = microgram/cubic meter; AAQS = ambient air quality standards; CO = carbon monoxide; PM = particulate matter; SO_2 = sulfur dioxide

Likewise, DUSTRAN-modeled 24-hour particulate concentrations do not exceed the applicable NAAQS and CAAQS, although the model predicts a definite measurable impact.

The CALPUFF-Lite results show maximum modeled NO_x, SO_x and PM_{10} annual average concentrations below their respective Class I increment significant impact levels (SILs), while maximum modeled PM_{10} 24-hour average concentrations are above the SIL. Concentrations above the SILs do not necessarily indicate that negative impacts would occur. Instead, the results indicate that further analysis is necessary to predict whether any negative impacts will occur.

The visibility assessment is expressed in terms of the number of days, for each modeled year, that the deciview change exceeds 1.0 (a change of one deciview is approximately equal to a 10 percent change in atmospheric light extinction). A deciview is a measure of visibility; higher deciview levels represent poorer visibility. A one- or two-deciview change translates to a "just noticeable" change in visibility for most individuals. Visibility changes greater than one deciview are observed for several days across most of the modeled Class I and sensitive Class II areas during both emissions periods. The highest number of days with visibility changes occur at the Great Sand Dunes National Monument, located about 80 kilometers from the site.

Deposition rates are compared to a deposition analysis threshold (DAT) value of 0.005 kilogram per hectare per year (kg/ha/yr). Maximum predicted nitrogen deposition rates exceeded the DAT threshold of 0.005 kg/ha/yr at the Florrisant Fossil Beds National Monument for three of the five years modeled. The modeling did not indicate any other nitrogen deposition DAT exceedances in Class I or sensitive Class II areas. No sulfur deposition DAT exceedances were shown in any of the Class I or sensitive Class II areas.

It should be re-iterated that these CALPUFF-Lite results of the far-field analysis of AQRVs are conservatively high modeled results due to the model design and intended use as a screening tool. Further analysis is needed to determine whether negative AQRV impacts will occur.

Prevention of Significant Deterioration

Fort Carson is considered a major stationary source under PSD review requirements (40 CFR 52.21) as its installation-wide stationary source PTE for NO_x is greater than 250 tpy. Furthermore, the boilers and hot water generators are also considered a major listed source category because they are in one of the 28 individually regulated PSD categories (i.e., fossil fuel boilers [or combination thereof] totaling more than

250 MMBtu per hour (hr) heat input), which has a PTE of 100 tpy. As such, Fort Carson's boilers are a major stationary source because they have a PTE of more than 100 tpy for NO_x and CO (40 CFR 52.21[b][1][i][a]).

In 1998, CDPHE determined that at some point prior to Fort Carson's initial Title V permit, the combined capacity of boilers had made the installation subject to the 250 MMBtu/hr PSD category threshold. In support of issuing the Title V permit to Fort Carson, CDPHE prepared a Technical Review Document and discussed the PSD issue as cited below:

> A thorough review of the available information was conducted and numerous meetings were held within the Division and with Fort Carson personnel to discuss the findings. The effort resulted in total frustration in trying to re-create the historic record of when sources were added, and trying to decide if a PSD review should have been done. An effort to try to determine when the Category 24 100 tpy threshold may have been established resulted in the same frustration. The source of the problems was the lack of available documentation to re-create the history of events. After much discussion and deliberation, the Division final reached the following decisions:
>
> 1) Fort Carson achieved the major source PSD category for sulfur dioxide emissions with the construction of the two boilers in 1979.
> 2) Fort Carson at some uncertain point in time achieved major source status for VOC emissions.
> 3) At an undefined point in time regulated criteria pollutants achieved major source status at 100 tpy because of PSD Category 24.
> 4) If the PSD major source status thresholds had been properly recognized, subsequent construction permits and permit modifications could have been developed to avoid the major source status.
> 5) Even if a historic point in time could be established when a particular source should have been subject to a PSD/NSR review, the performance of this review now would require spending a large amount of resources with little or no air quality benefit.
> 6) The resolution of the issue was to document that Fort Carson is now to be a major source for PSD considerations. The documentation of the regulated criteria pollutants with major source status would be done by issuing construction permits for all existing sources, including grandfathered sources, with emissions above the construction permit thresholds. The

construction permits limits established federally enforceable limits that would establish the Fort Carson PTE levels. Fugitive emissions must be included in the PTE values.

7) The sum of the existing boiler heating input design was evaluated. If the value exceeded the PSD/NSR Category 24 250 MMBtu/hr threshold, the PSD/NSR threshold will be 100 tpy for each regulated criteria pollutant. Colorado Springs is a non-attainment area for carbon monoxide. A carbon monoxide PTE above 100 tpy would require future source additions, changes or modifications to address carbon monoxide under the NSR provisions.

In 2002, Fort Carson reviewed every significant project that had occurred in the most recent five-year period (January 1999 to December 2003) for PSD applicability. Sources evaluated included the installation of 13 small boilers (under 10 MMBtu/hr) at various motorpools, a 1,620-horse-power (hp) emergency generator at the WWTP and a 1,550-hp emergency generator at the hospital. Since that time, during the preparation of permit applications and/or APENs, Fort Carson continues to evaluate significant projects, such as the Contractor Owned, Contractor Operated Bulk/Retail Fuel Facilities, main heat plant (Building 1860) high temperature hot water generator upgrades, blended fuel at Building 1860, Building 8000 paint booth, and emergency generator upgrades at the hospital, and the Transformation projects.

Air Quality Sustainability

Since 2002, the Fort Carson air program has been implementing various initiatives to minimize criteria and HAP emissions from stationary sources on the installation. All boilers/hot water generators installed are required to have low NO_x burners, and some have flue gas recirculation, which minimizes NO_x emissions. Emissions from traffic paint striping activities have been dramatically reduced by replacing the paint type and installing permanent markings on cross-walks. In 2002, HAP emissions were approximately six tons from this painting operation, and in 2006 they were 0.4 tons.

Fort Carson staff and community stakeholders originally developed 12 sustainability goals for the installation. One of these goals was to reduce the weight of HAP emissions to zero. This goal is not attainable within a foreseeable timeframe. Discussion is currently underway to revise it to either reflect what is feasible or define what types or HAP sources can be reduced to zero (http://sems.carson.army.mil/).

Greenhouse Gas Emissions

There is broad scientific consensus that humans are changing the chemical composition of Earth's atmosphere. Activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the accumulation of trace greenhouse gases (GHGs), such as CO_2, in our atmosphere. An increase in GHG emissions is said to result in an increase in the Earth's average surface temperature, which together are commonly referred to as global warming. Global warming is expected, in turn, to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, precipitation rates, etc., which is commonly referred to as climate change. The Intergovernmental Panel on Climate Change (IPCC) best estimates are that the average global temperature rise between 2000 and 2100 could range from 0.6 degrees Celsius (°C) (with no increase in GHG emissions above year 2000 levels) to 4.0°C (with substantial increase in GHG emissions). Large increases in global temperatures could have considerable detrimental impacts on natural and human environments.

GHGs include water vapor, CO_2, CH_4, N_2O, O_3, and several hydrocarbons (HCs) and chlorofluorocarbons (CFCs). Each GHG has an estimated Global Warming Potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. A gas GWP provides a relative basis for calculating its Carbon Dioxide Equivalent (CO_2e) or the amount of CO_2 a gases emission would be equal to. CO_2 has a GWP of 1, and is therefore the standard to which all other GHGs are measured.

Water vapor is a naturally occurring GHG and accounts for the largest percentage of the greenhouse effect. Next to water vapor, CO_2 is the second-most abundant GHG. Uncontrolled CO_2 emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because CO_2 and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend upon the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions).

Regulatory Climate

There have been no significant environmental regulations enacted in the US at the national level to specifically address increasing concentrations of GHGs or climate change. In April 2007, the US Supreme Court determined that the EPA has the regulatory authority to list GHGs as pollutants under the federal CAA. The EPA has sought comments from the public and other federal agencies, but has not yet

proposed or adopted any regulations pertaining GHGs. Numerous proposals and bills have been circulated and have been considered in the US Congress to regulate GHGs, but no legislation has been adopted.

Although GHG emissions are not currently regulated at the federal level, certain state and local governments are passing legislation and adopting action plans to reduce GHG emissions under cap-and-trade or other market-based initiatives. The State of Colorado does not participate in a regional initiative at present. The State of Colorado has produced a *Climate Action Plan* that sets the framework for future requirements, and the Governor has issued an EO directing the state government to reduce overall energy consumption and petroleum use by the state vehicle fleet. The plan also states the Governor's commitment to join the Western Climate Initiative if the federal government fails to enact GHG legislation, provided the Initiative is compatible with Colorado's resources.

Need for Analysis

While NEPA does not mandate specific limits for pollution or any other specific environmental impact, provided whatever outcome produced is one which provides for some degree of stewardship consistent with NEPA's goals, it does require project proponents to analyze reasonably foreseeable direct and indirect consequences of the action that could be farther removed in distance or later in time. The analysis must include cumulative, and/or trans-boundary impacts as a result of the proposed action.

Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. GHG emissions are precisely the type of cumulative and trans-boundary impacts which NEPA analysis should consider.

Of the states that have adopted their own NEPA-like programs, a few have implemented guidance, or are formulating guidance, to use for analysis and mitigation requirements by the project proponent. Currently, no federal or Colorado guidance exists for establishing threshold criteria for GHG emissions or mitigation methodologies for climate change analysis.

Fort Carson's GHG Emissions Assessment

In May 2008, Fort Carson became the first Army installation nationwide to perform a comprehensive carbon equivalent emissions analysis for its operations. This analysis was based on guidance provided in the *Green House Gas Protocol, A Corporate Accounting and Reporting Standard, 2007* (Reference No. 228). The protocol was established by the World Business Council on Sustainable Development

(WBCSD) in partnership with the World Resources Institute (WRI), with the goal to help businesses, governments, and environmental groups engage climate change through the establishment of effective, credible programs. The Fort Carson carbon emissions analysis was developed for scope 1 and 2 sources on-post for which it has total operational control. The scope sources include direct emissions (scope 1) units such as boilers, furnaces, emergency generators and government-owned vehicles and indirect (scope 2) units such as emissions from local utilities which are estimated for the production of electricity that Fort Carson consumes. The model does not consider PCMS base operations, privatized family housing, POVs operated on Fort Carson, or tenant operations other than Evans Army Community Hospital.

Baseline GHG Emissions

The Fort Carson GHG model uses numerous widely available emissions factors and accepted methodologies for estimating emissions from a variety of sources. The level of detail considered by the model is beyond the scope of this document and several simplifying assumptions about emissions units and operational parameters have been made to facilitate the emissions projection analysis.

For example, for fuel burning sources nearly all of the fuel carbon (98.5 – 99.9 percent) is converted to CO_2 during the combustion process (both internal and external), regardless of fuel type. Fuel carbon not converted to CO_2, due to incomplete combustion, results in CH_4, CO, and/or HC emissions. Even in units operating with poor combustion efficiency, the amount of CH_4, CO, and HC produced is insignificant compared to CO_2 levels. Additionally, there is sufficient data to suggest that carbon monoxide, which is not considered a GHG, would become completely oxidized to CO_2 in the atmosphere within one to two months from being emitted, thus adding to the total GHG global burden. The data provides enough rationale to make the simplified assumption that all carbon contained in the source's fuel stocks should be considered emitted as CO_2. To account for the various quantities and GWPs of non CO_2 GHG emissions produced, the ratio of CO_2e to CO_2 was analyzed from the Fort Carson model to produce a source category specific emissions factor multiplier. The emissions factor multiplier is applied to the fuel carbon estimates to produce total CO_2e for the baseline and projection analysis. Table 5-5 summarizes the input parameters and results, in CO_2e units, from the simplified baseline analysis. For the purposes of this section, "Baseline" is defined as emissions resulting from operations in the year 2007 (i.e., pre Transformation emissions data analysis and/or estimations).

Table 5-5 Baseline Green House Gas Emissions Summary			
Source Type	**Input Parameter**	**Input data (2007)**	**Emissions (tons)**
External Combustion Units	Natural Gas, Fuel Oil, & Propane	Annual Fuel Use	51,390
Internal Combustion Units	JP-8, E85, ULSD, Gasoline, VMT (vehicle miles traveled)	Annual Fuel Use	17,125
Munitions	DODIC Type	Annual Use Rates	78
Refrigerants	Refrigerant Types	Annual Refrigerants Purchased	0.965
Electricity Production	Electricity Consumption	Annual MWh Consumed	88,663
CO_2e / CO_2 Ratio	Ratio Multiplier for Direct and Indirect Fuel Combustion Sources	1.009 (Utilities Ave.) 1.003 (Combustion Ave.)	N/A
	BASELINE	**TOTAL TONS of CO_2e**	**157,257**

E85 = ethanol; CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; JP = jet propellant; ULSD = ultra-low sulfur dioxide; VMT = vehicle miles traveled

Direct Emissions - Fuel Combustion Units

Emissions units in this category are broken out into two subcategories for both internal and external combustion sources and include fuel-consuming sources such as heating and hot water boilers, furnaces and space heaters, emergency generators, tactical vehicles, GOVs, grounds maintenance equipment and other non-road engines. Inputs for this source category include natural gas, No. 2 fuel oil, propane, jet propellant (JP)-8, ethanol (E)85, ultra-low sulfur diesel (ULSD), gasoline, and vehicle miles travelled (VMT). VMT data, along with the corresponding average fuel efficiency and emissions factors for each vehicle class, was used to estimate emissions from sources where fuel use records were otherwise not available.

Direct Emissions - Munitions

Emissions units in this category are made up of the individually expended ammunition rounds of various sizes for weapons systems used in training and qualifying soldiers for combat. Emissions consist primarily of CO_2 resulting from the ignition of gun powder and/or propellant. The number in the Table 5-5 also includes approximately 19.64 tons of CO (considered by this analysis to be an indirectly emitted GHG) along with the CO_2 estimates. Oxides of nitrogen are also emitted. The composition of species, however, is unknown making it impossible to determine potential N_2O emissions.

Direct Emissions - Refrigerants

Emissions units in this category are made up of the individual gases used for replenishing refrigeration and air conditioning units on post. New units installed are shipped fully charged, and therefore Fort Carson's model assumes that all refrigerants purchased are for replenishing existing systems and that any corresponding releases would be equal to the amount of refrigerant purchased per calendar year. Emissions are reported in CO_2e.

Indirect Emissions - Electricity Consumption

Emissions units in this category are based on supply records and operational data from the local publicly owned utilities.

Proposed Action Emissions Projections

Projections of emissions were made from existing data used for the GHG baseline summary, and several assumptions were made for each source category to estimate future potential emissions. Table 5-6 presents GHG emissions estimates for the 2009 and 2012 project years, which represent the 2007 Fort Carson Transformation EIS and this EIS, respectively.

Table 5-6 Projected GHG Emissions

Source Type	2009 Greenhouse Gas Estimates (tons)	2012 Greenhouse Gas Estimates (tons)	Total Emissions (including baseline, tons)
External Combustion Units	16,900	14,940	83,230
Internal Combustion Units	8,746	6,885	32,756
Munitions	40	32	150
Refrigerants	0.025	0.025	1.015
Electricity Production	29,598	26,166	144,427
Annual Projected Total Tons of CO_2e	**55,284**	**48,023**	**260,564**

CO_2e = carbon dioxide equivalent

Projection Methodology

External combustion unit emissions estimates were derived from the projected increase in facility space. The analyses done for the 2007 Fort Carson Transformation EIS and subsequent project tracking indicate facility space expanding by 2.9 million square feet. Current Army construction planning documents for this EIS show new facilities totaling 2.6 million square feet. Although all these new facilities would be constructed to higher energy conservation and efficiency standards, the analysis assumed a worst case or

conservative scenario for the projections by using 2007 standards for energy requirements and associated emissions per square foot.

Internal combustion unit emissions were estimated for the various sources by using population data and a multiplier to obtain reasonable fuel use projection. Each source type and corresponding input have a different multiplier since functions of source types vary considerably. For example, ground fuel use total increases were modestly estimated to be 30 percent by 2012. This estimate is based in part on the fact that the Proposed Action has virtually no increases in the civilian or contract workforce, facilities would be designed with low impact/maintenance landscaping, and trip generation is likely to decrease as a whole as facility density increases. Therefore, straight population increases could not be used to account for projected emissions, unlike tactical vehicle use which was estimated on a per capita basis. Other estimation factors include accounting for mandatory increased renewable fuel use (3 percent per year per EO 13423), determining what percentage of the renewable fuel could be considered carbon neutral, and estimating what impact newer fleet vehicles with higher fuel efficiency standards will have on fuel use.

Munitions emissions estimates were made from population and existing emissions data.

Refrigerant emission estimates were based on virtually no new leaking equipment being used on the site. All of the proposed facility equipment would be new or almost new by 2012. Future emissions projections equivalent to the useful economic life of the facilities could easily double the current annual emissions level.

Emissions from electricity consumption were estimated the same way as external combustion units, and are therefore considered reasonably conservative.

Long-Term Projections

Long-term foreseeable emissions are dependent upon unforeseeable circumstances such as energy supply and demand, technological developments, energy policy, politics, regulations, and future federal actions. Given the stability, increasing concentration, and atmospheric lifetime of GHG emissions, it makes sense to develop long-term emissions projections to assess the addition of potential worst-case, “business as usual” emissions as a result of the Proposed Action.

For the Proposed Action, emissions are estimated on the basis of a 25-year economic life expectancy for the facilities. For this analysis emissions are assumed to stay consistent. GHG emissions would total

approximately 1,200,575 short tons and would be considered cumulative in the atmosphere. The Proposed Action would raise atmospheric concentrations of CO_2e by 0.000142 ppm by 2037. Cumulatively, operations at Fort Carson under this same scenario and time could raise atmospheric concentrations of CO_2e by 0.000835 ppm. As mitigation, increases in the use of renewable fuels and alternate forms of energy are expected to reduce emissions.

5.2.1.4.3. Noise

The cumulative impact to noise consists of past, present, and reasonably foreseeable future actions resulting in increased noise frequency (extension of noise contours) and increase of noise duration to sensitive receptors on and around Fort Carson. Noise contours would remain unchanged as a result of the Proposed Action. Although noise contours would remain unchanged, an adverse cumulative impact could result from the increased duration and frequency of training. The occurrence (duration) of noise produced and noise generating activities associated with live-fire training are expected to increase by approximately 27 percent. Other range projects (i.e., range upgrades and construction) presented in Table 5-1 would also allow for additional training, potentially increasing the occurrence of noise within the training areas. The projects within Table 5-1 would occur within or adjacent to existing training ranges, and would therefore not likely extend beyond existing noise contours. This is supported by CHPPM's 2006 and 2008 noise studies, which evaluated existing noise conditions and assessed potential future actions and concluded that there would be no significant change. Because a majority of noise energy generated by training activities remains within the installation boundaries, there is little cumulative interaction with other off-post sources of noise.

Alternative 1 may increase the intensity and duration of traffic-related noise due to the increases in Soldiers, vehicles (both tactical and non-tactical), and population density in the cantonment area. This noise is not anticipated to travel beyond the cantonment area and would only potentially impact areas currently used as motor pools or other industrial operations. In the Proposed Action and Alternative 2, the increases in noise generating activities would occur downrange, with virtually no possibility of traffic noise traveling to off-post receptors. A significant cumulative increase in noise generating activities could occur from the Proposed Action and the alternatives in combination with range construction, cantonment area construction, and training activities listed in Table 5-1 and those actions that will be taken to implement the actions studied in the 2007 Fort Carson Transformation EIS.

5.2.1.4.4. Geology and Soils

The cumulative impact to geology and soils consists of past, present, and reasonably foreseeable future actions resulting from soil erosion and loss of surface soils on and around Fort Carson.

The implementation of cantonment area construction and range construction/upgrades on Fort Carson have and will continue to have temporary impacts of soil erosion and loss of surface soils through erosion of disturbed construction sites. Past, present, and future construction projects within the cantonment area presented in Table 5-1 would not result in an adverse cumulative impact of soil erosion. Reasonably foreseeable past present and future projects would use similar BMPs as the Proposed Action to control wind and water erosion and stabilize sites following construction activities. There would be a potentially significant cumulative loss of soil resources across the region, however, as development of military projects in concert with community transportation projects and other regional initiatives continue.

The cumulative erosion of soils from range firing activities will occur on designated range areas and impact areas and generally will not affect non-military activities. As discussed in Sections 3.5 and 4.5, range firing activities and the increased volume of live-fire under the Proposed Action are projected to cause less than significant soil erosion. Surface disturbance caused by training activities and munitions impact would result in larger areas of bare ground than experienced under current conditions, both for the Proposed Action and for those projects presented in Table 5-1 and other projects discussed in Section 5.2. Cumulative impacts would be reduced through Fort Carson/PCMS's ITAM program, INRMP implementation, and adaptive management of training lands.

As discussed in Chapter 2, Army would adaptively manage maneuver training activities, but implementation of the Proposed Action could result in an approximate 15 percent increase in projected MIMs at Fort Carson. Increased maneuver activities of the Proposed Action are predicted to have significant but mitigable cumulative increases in soil erosion at Fort Carson. It is predicted that there would be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, and indirect effects of increased potential for fire and lost vegetative cover. Those activities listed in Table 5-1, which increase the frequency of training and training activity/footprint, would be anticipated to have similar effects on soils, causing the potential for adverse cumulative soil erosion in Fort Carson/PCMS's downrange area training lands. There would be limited cumulative increases in soil erosion in maneuver training areas from activities other than training, though deposition of soils from wind erosion could occur outside of maneuver training areas.

When the Proposed Action is considered in connection with the increased maneuver activities of units stationed at Fort Carson as a result of implementation of the Transformation activities studied in the 2007 Fort Carson Transformation EIS, the projected surface disturbance, compaction of soils, and loss of vegetative cover could approximately double. Maneuver training to support Transformation activities, and GTA could result in significant cumulative impacts. This potential adverse cumulative impact would be reduced through Fort Carson/PCMS's adaptive training management, erosion control, and land rehabilitation programs including the ITAM program and limited use programs. The stationing of a CAB at Fort Carson would further add to significant cumulative impacts to soils through wind based erosion caused by low-level flying activities which could destabilize soils and vegetation, but this impact would also be reduced through the ITAM and installation land management programs.

5.2.1.4.5. Water Resources

The cumulative impacts to water resources consist of past, present, and reasonably future actions resulting in changes to water quality or availability on and around Fort Carson. Construction of Camp Carson began in 1942, and there has been considerable development since (Table 5-1). In predevelopment conditions, stormwater runoff occurred but was far less due to the natural infiltration and evapotranspiration processes that dominated the landscape. More than 55 percent of the cantonment area is now impervious surface, and many of the drainages have been rerouted (such as the northwestern portion of B-Ditch) or straightened (such as Clover Ditch) to allow for various phases of construction and growth. The dynamics of the watershed characteristics within the cantonment area have changed considerably as a result of the development, reflecting an unbalanced system. Stormwater runoff has increased due to the increase of impervious surface area. Erosion in the southeastern-most stretches of the drainages, and both point and non-point source discharges are prevalent throughout the drainages. During the development of the Fort Carson hydrologic baseline models, it was determined that, over the last 50 years, nine major storm events have occurred, resulting in significant flooding and damage to the area and the installation.

In 2005, the Army completed a preliminary evaluation of Fort Carson's storm sewer capacity. The study concluded that the existing Fort Carson storm sewer system was at or near capacity. Increased development of Fort Carson's cantonment area would result in cumulative increased stormwater runoff. The increased runoff could contribute to flooding, high peak flows that cause erosion, and degradation of water quality. The study recommended that Fort Carson implement additional BMPs for new and existing development to control and properly treat stormwater flows and reduce cumulative adverse impacts (Reference No. 199).

In 2006, the Fountain Creek Vision Task Force was initiated by El Paso County to develop a comprehensive strategic plan for the Fountain Creek Watershed. Fountain Creek is the receiving water body for the four watersheds located in the northern portion of the installation (B-Ditch, Clover Ditch, Unnamed Ditch, and Rock Creek). This watershed has become unstable due to increased development in the Colorado Springs region. Some of the effects of this urbanization are a decrease in water quality, increased bank erosion in Fountain Creek, and localized flooding.

In 2007, Fort Carson increased its emphasis on the *Stormwater Program* to better address Municipal MS4 permit requirements and start proactively managing stormwater runoff on the installation. Hydrologic modeling, water quality sampling, and increased public outreach are some of the main efforts that have been targeted. In December 2007, Fort Carson also began implementing the intent of *Section 438, Storm Water Runoff Requirements for Federal Development Projects*, of the *Energy Independence and Security Act of 2007 (Title IV, Subtitle C)*, which has significant impacts on project development with regard to stormwater runoff management. The Act states that the sponsor of any development or redevelopment project involving a federal facility with a footprint that exceeds 5,000 SF shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow. This proactive management of stormwater would address stormwater runoff impacts associated with the Proposed Action and other Army actions discussed in Table 5-1, reducing adverse cumulative stormwater impacts. If BMPs and stormwater plans and permits are adhered to for the Proposed Action and future projects, cumulative impacts would be minor.

As stated in Section 3.6, increased training activities under the Proposed Action may increase groundwater use which would be accommodated through existing subsurface water rights. Other on-going or proposed Army actions as presented in Table 5-1 are not anticipated to cause a cumulative adverse impact on local or regional water supplies. In addition, the Proposed Action would not release any water or pollutants that could infiltrate aquifers at Fort Carson, as Fort Carson would continue to implement all applicable hazardous waste management plans to address leaks or spills of hazardous materials as described above.

5.2.1.4.6. Biological Resources

The cumulative impact to biological resources consists of past, present, and reasonably foreseeable future actions that change the ecosystem on and around Fort Carson. The Proposed Action results in a variety of potential impacts, including mortality, disturbance or displacement, and loss of habitat or nesting or

foraging territory (Reference No. 190). The Proposed Action includes continuation of a number of management measures to avoid and minimize impacts, as described in Section 3.7.2.2 Analysis of Fort Carson's biological resources is generally of the downrange areas since the cantonment area is largely developed.

Ongoing natural resources programs, such as described in the INRMP (Reference No. 6), and ITAM programs at Fort Carson are providing mitigation for past (and ongoing) cumulative impacts associated with early training at Fort Carson. Of particular importance is Fort Carson's involvement in regional efforts to address natural resources issues. Fort Carson continues to be a leader in sustainability and ecosystem management by proactively seeking partners to facilitate natural resources conservation, while concomitantly maintaining the installation training mission. Examples of such regional efforts include (Reference No. 6):

- Fort Carson ACUB program;
- Greenprint Initiative (assessing potential buffer zones);
- Shortgrass Prairie Partnership;
- Upper Arkansas Cooperative Weed Management Area;
- Lower Fountain Creek Water Quality Management Association;
- Wildlife Habitat Council;
- Front Range Eco-Regional Management Team initiative;
- Arkansas River Habitat Partnership Program (mitigates elk damage);
- Colorado Mountain Plover Working Group;
- Colorado Black-tailed Prairie Dog Working Group;
- Multi-State Prairie Dog Working Group; and
- Mexican Spotted Owl Working Group.

Positive results either completed or initiated through these efforts include grassland prairie ecosystem assessments, noxious weed management and control, forest health assessments, regional fire management plan development, and establishment of conservation easements on land adjacent to Fort Carson.

Cumulative impacts from the Proposed Action in combination with other present and planned future actions are occurring and would continue to occur at Fort Carson and in the region. It will continue to be necessary to adaptively assess the cumulative impacts on vegetation and wildlife. The rapid rate of development of the military installation, range areas, and the surrounding community will continue to

collectively contribute to significant cumulative impacts on vegetation and wildlife and lead to a reduction of quality available habitat. Fort Carson will continue to play a key role in sustaining native wildlife and vegetation in the region through its land management and natural resources programs to minimize these impacts.

As these determinations of specific effects of cumulative impacts are better understood, Fort Carson would use adaptive management to adjust management programs to mitigate adverse impacts to vegetation or specific species to the best extent possible. The INRMP would continue to document the overall installation management plan, while the ITAM program would continue to be directed to repair and restoration efforts in response to maneuver damages downrange.

5.2.1.4.7. Cultural Resources

The cumulative impact to cultural resources consists of past, present, and reasonably foreseeable future actions which affect archeological resources or historic resources or their viewsheds on and near Fort Carson. As is true of cultural and historic resources world-wide, impacts to such places are tied to land use; i.e., a particular culture's view of the landscape it occupies and the societal functions that the land fulfills for that group. Each subsequent population or activity that occupies a landscape produces an impact to past land use practices and cultural remains. The foundation of archaeological and anthropological investigation was formed within these tenets of human progress in order to understand the past, present, and future. Landscapes with repeated use tend to contain high site densities, as human populations are drawn to natural resources, such as water, arable land, minerals, and climates hospitable for game and crops. Repeated land use also means re-use of both natural and man-made materials, such as is seen in the remnants of numerous stone structures scattered throughout Colorado.

The implementation of the Proposed Action may result in direct or indirect loss of cultural resources in the State of Colorado through training maneuvers or increased frequency of wildfires that military training could generate. It is anticipated that the Proposed Action would not result in significant adverse cumulative impacts with the continued cultural resource management program and policies in place to preserve Fort Carson's historic and archaeological resources. Procedures and processes that Fort Carson implements to protect cultural resources are discussed in further detail below.

As mandated by federal law, Fort Carson conducts archaeological and historic building inventories and evaluations on all resource areas prior to use by impact-generating activities, whether those activities be military training, construction, or other land management actions, such as erosion control and re-seeding

efforts. For archaeological sites, once identified, each site is recorded, evaluated for eligibility on the National Register, and the cultural landscape is analyzed. If applicable, significant sites are set apart using a variety of site protection methods. In this way, the information gained ensures that the cultural characteristics and lifeways of those who have come before us is not lost to history, but rather contributes to it. The information acquired is used for future land management, and is also made available to qualified researchers for professional purposes and used in the Program's considerable educational outreach efforts.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents in force prior to training use (see Section 3.8), resources within Fort Carson/PCMS would be surveyed and evaluated for National Register eligibility, providing a greater protection and overall preservation to these resources and greater understanding of their cultural significance than is true for those located on private lands which are not bound to these regulations and standards. New construction and training activity under the Proposed Action include the possibility of inadvertent damages to cultural resources that occur on rare occasion despite education and awareness programs to prevent them. It is anticipated that, with continued active management which is currently in place to preserve Fort Carson's historic and archaeological resources, the Proposed Action would not result in significant adverse cumulative impacts.

5.2.1.4.8. Socioeconomics

The cumulative impact to socioeconomics consists of past, present, and reasonably foreseeable future actions that affect economy, employment, demographics, housing, quality of life, schools, community services, or Environmental Justice on and around Fort Carson. As discussed in Section 3.9, implementation of the Proposed Action would result in an increase in active duty military employment of approximately 3,800 Soldiers by 2012 and approximately 16 civilian jobs. EIFS modeling results indicate an increase in the on-post residential population of approximately 3,100 persons and an increase in the on-post workforce population of 3,816 persons. This increase is occurring against a background of rapid regional population growth that was discussed in Section 5.1. Although the potential CAB is included in the Proposed Action, it was not included in the EIFS analysis, as too many assumptions would have to be made. If the decision is made to bring the CAB to Fort Carson, a new EIFS will be conducted at that time and disclosed in follow-on NEPA documentation.

This increase in both the personnel and residential population on Fort Carson, as well as increases in nearby communities (see Section 3.9) would translate into increased Army and individual expenditures

for purchases of goods, contracting of services, utilities, and rent and lease payments and would, therefore, have a net positive cumulative impact to the local and regional economy. This increase is occurring against a rapid increase in regional population density around Fort Carson that was discussed in Section 5.1 and will increase the rate of projected growth in the area.

The increased population associated with the Proposed Action, along with the general trend of development and population growth with the Front Range, could cause a cumulative strain on housing and public services. Adverse cumulative effects would be reduced by provision of barracks and housing for single Soldiers and supporting the housing needs of the married Soldiers and their Families through the Residential Communities Initiative on the installation to decrease the number of Soldiers and Families requiring housing off-post. The *Fort Carson Regional Growth Plan* estimates that the housing market should be able to absorb the additional proposed Fort Carson growth. Housing and apartment space is available in the vicinity of Fort Carson. The many military Families who would reside off-post would generate upward pressure on the housing and apartment rental markets and to the extent they choose to live in new homes, increase property tax revenues for local jurisdictions.

School enrollment would increase as a result of the cumulative increase in regional population. Adverse cumulative effects would be partially offset through the provision of federal impact aid to offset costs of providing public education to families of military personnel. In addition, as discussed in Section 3.9, four of the seven school districts that would likely absorb additional growth have new or expanded facilities planned. The other three have sufficient capacity to absorb foreseeable future growth.

Other impacts associated with the Proposed Action such as construction would involve temporary boosts to the local Colorado Springs economy. These impacts would last for a period of 1-3 years depending on the project.

5.2.1.4.9. Transportation

The cumulative impact to transportation consists of past, present, and reasonably foreseeable future actions which increase the frequency or intensity (load) of the transportation network on and around Fort Carson. Troops travel via the region's roads, rails, and airports for daily commuting, training, and deployments for decades, adding incrementally to traffic volumes generated by civilian residents and nonmilitary commercial activities. The cumulative effects of the Proposed Action are considered significant but mitigable to less than significant through the implementation of transportation projects on the installation and across the region.

The city, county, and state transportation departments maintain road networks in the region. Approximately $148 million in transportation projects are currently underway to accommodate current and future needs, including SH 16/I-25 improvements near Gate 20, construction of Defense Access Road and connection of the Rapid Deployment Route to Arrival/Departure Control Group and South Academy Boulevard/ Gate 4 access improvements. Implementation of additional recommendations to accommodate future transportation needs of the post will require additional funding. These recommendations include: continued planning and construction of capacity improvements to SH 115 between Gates 1 and 6, continued planning for access road improvements to support activation of Gate 19, and completion of a non-motorized transportation plan to enhance bike and pedestrian access on- and off-post (Reference No. 30). CDOT is currently reconstructing Powers Boulevard to a freeway with interchanges to enhance traffic movement around the eastern side of Colorado Spring. Future improvements to the roadway network also may include improving capacity on Drennan Road and Powers Boulevard to provide a more direct connection between I-25 and the airport, Banning-Lewis Ranch developments, and other features on Colorado Springs' south and east sides. Although specific planning is not yet underway, improvements would likely be made to SH 115 along the western boundary of the post south of Gate 6.

The addition of personnel and Families to Fort Carson as described under the Proposed Action would result in several types of transportation impacts: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, increased transit ridership, and potential increase in rail and aviation for deployment. Additional personnel would result in short-term cumulative adverse impacts on transportation based on incremental interaction with other growth in the region. In the long term, the impact to transportation would be negligible because current and future transportation improvement projects would provide sufficient infrastructure to accommodate the expected 60 percent increase in regional population. The growth at Fort Carson would constitute approximately 5 percent of the projected regional population increase (Reference No. 10).

The *PPAGC 2035 Regional Transportation Plan* established a vision, mission, and principles in order to meet the transportation needs for the Pikes Peak Region (Reference No. 148). Fort Carson would continue to work with the City of Colorado Springs, PPACG, and CDOT to assure that the design and construction of on-post roadways are consistent with the *2035 Regional Transporation Plan* and to ensure adequate traffic operations are sustained and adverse impacts are minimized to the extent possible.

5.2.1.4.10. Utilities

The cumulative impact to utilities consists of past, present, and reasonably foreseeable future actions which affect the capacity or use of utilities on and around Fort Carson. As stated in Section 3.11, the Proposed Action would result in an increase in Fort Carson Soldiers and Families. This increase in population would cause an increased demand for water, wastewater treatment, and electricity.

The result of the Proposed Action in combination with other Army actions and regional growth and development discussed in Section 5.2.1 would put usage of water by CSU closer to the firm yield for raw water by 2012. Adverse cumulative effects could be offset if Fort Carson continues to aggressively pursue water conservation and work with CSU to implement the *CSU Water Conservation Plan* (Reference No. 151) as discussed in Section 3.11.1.1. In addition, actions such as replacing existing deteriorating water lines on-post and the proposed Southern Delivery System would offset cumulative impacts to firm yield for raw water.

As discussed in Section 3.11, implementation of the Proposed Action could be accommodated by existing wastewater handling and energy systems. Upgrades to Fort Carson's existing utility infrastructure would be built to handle increased demand, such as the construction of electrical substations or on-site wastewater disposal systems. Thus, less than significant cumulative effects are anticipated for utilities.

5.2.1.4.11. Hazardous and Toxic Substances

The cumulative impact to hazardous and toxic substances consists of past, present, and reasonably foreseeable future actions that increase the handing of these substances or the generation of hazardous wastes on Fort Carson. Under the Proposed Action, the addition of personnel and training would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes derived from these materials. The installation has the capacity to handle these wastes and would continue to implement installation SOPs and plans for their reduction, disposal, and handling. Only minor cumulative impacts are predicted.

5.2.1.4.12. Sustainability

The cumulative impact to sustainability consists of past, present, and reasonably foreseeable future actions that place a strain on sustainability principles within Fort Carson. The Proposed Action would increase the population at Fort Carson and could increase the frequency of training at Fort Carson. The Proposed Action in concert with the projects in Table 5-1 could pose a significant cumulative impact to sustainability in the region through increased demand for energy, water use, facility construction, and

land use, unless prescribed mitigation measures are taken. Also, in the regional context, the actions on Fort Carson are only a small fraction of anticipated regional growth; however, that regional growth, with the resulting strain on the environment, make it imperative that Fort Carson both continue and increase its own sustainability measures and encourage similar actions throughout the region.

To ensure the continued availability of quality training lands, the Proposed Action would continue to implement Fort Carson's land and environmental management programs on Fort Carson. These programs are designed to maintain a sustainable balance of land use and sustainability.

In addition to existing programs and policies, Fort Carson has adopted 12 aggressive, long-term (25-year) sustainability goals in 2002 (http://sems.carson.army.mil). Those that pertain directly to sustaining the military mission are as follows:

- Further integrate sustainability principles into the Fort Carson land use planning, real property master planning, and Military Construction, Army programming processes.
- Key stakeholder groups are trained, compliant and motivated toward sustainability principles.
- Training Ranges capable of supporting current and future military training to standard.
- Advance a sustainable mission at Fort Carson by adopting a SEMS and by imparting (passing on) a personal commitment and enthusiasm for sustainability.

The Army would continue to implement these programs and develop new sustainability programs to promote effective and efficient use of regional resources. Because of the rapid pace of growth and development in Fort Carson's ROI, reduction of significant cumulative impact to sustainability will remain both a challenge and a priority for the installation.

5.2.2. Piñon Canyon Maneuver Site

PCMS was purchased by the Army in the early 1980s, followed by development of the current approximately 1,600 acre austere cantonment area. Primarily, development has occurred within the cantonment area, with the exception of limited training infrastructure in downrange area locations. The land previously supported large grazing operations and several residences. Military training operations began at the site in 1985. Until 2005, when several small arms ranges were built, only maneuver and dismounted operations took place at PCMS. Despite the construction of some limited range infrastructure, the primary function of PCMS remains supporting the maneuver requirements of Soldiers stationed at Fort Carson.

Limited development of the area, settlements, Army training, and past agricultural practices have disturbed natural areas and affected biological resources, soils, and water resources to some extent. Cultural and paleontological resources are present throughout the area and at PCMS. These past and present activities have disturbed some of these resources. Some are present on federal lands, such as the Comanche National Grassland, and are protected from development and related disturbance. Historical grazing has affected wildlife, vegetation, soils, and water resources (Reference No. 119). Similar to Fort Carson, the majority of land at PCMS consists of undeveloped maneuver training area.

The combination of Transformation actions and the addition of the GTA and CAB units will approximately double the troop strength at Fort Carson. Theoretically, the resulting training of these higher numbers of units and Soldiers could increase the adverse effects to soils, vegetation, wildlife, and cultural resources in the downrange areas. Given the adaptive management of the training lands as discussed in Section 2.2.4, however, the adverse effects on these resources are subject to sustainability limits. Also, empirical data concerning effects is exceedingly difficult to produce in light of the considerable influence of unpredictable and uncontrollable variables such as weather and deployments of units.

The ability to satisfy the doctrinal training needs of units and Soldiers is predicted to be somewhat limited as a result of the increases in Soldier numbers and the increased areas in which they must train to meet doctrinal standards. To date, this impact can be controlled by adapting training durations, frequencies, methods, and areas.

5.2.2.1. Potential Expansion of Piñon Canyon Maneuver Site

As discussed in Section 2.1.6, this EIS, including this chapter, does not include expansion of PCMS. Whether any such expansion may occur, where it might occur and to what extent, and whether it would receive Congressional approval and funding are all unknown. The impact of PCMS expansion is therefore, not included in this cumulative analysis because it is not reasonably foreseeable. It is important to note, however, that before any expansion could occur, NEPA review would be required, including analysis of the cumulative impact of such expansion combined with past actions, including the Proposed Action in this EIS.

5.2.2.2. Cumulative Impacts

This section discusses the past, present, and reasonably foreseeable future cumulative impacts that are predicted to result at PCMS and in the surrounding region as a result of implementing the Proposed

Action and alternatives. A list of actions considered in this Section is presented in Table 5-1. No stationing, cantonment area construction, or range projects are part of the Proposed Action and the cumulative impacts of the Proposed Action are primarily related to possible increases in maneuver training. Some actions, such as changes in weapons systems or prepositioning of equipment at PCMS, could occur in the future but are not considered reasonably foreseeable at this time. Because maneuver training is the primary action affecting PCMS as part of the Proposed Action, cumulative impacts analysis is limited to those resources that are anticipated to be incrementally affected by maneuver training. These resources include land use, air quality, noise, soils, surface water quality, biological resources, and cultural resources, which are the focus of this section's discussion.

Use of PCMS has varied with the level of troop stationing at Fort Carson and other mission-related factors since it was first established and used for training in 1985. Since 2001, levels of training at the site have been lower than anticipated because of the high operations tempo and frequency of Fort Carson troop deployments to support mission in Iraq, Afghanistan, and other locations. Future use of PCMS is projected to increase with the stationing of additional Soldiers as part of Transformation and GTA.

5.2.2.2.1. Land Use

The cumulative impact to land use consists of past, present, and reasonably foreseeable future changes to land use on and around PCMS or changes in land use that would adversely impact adjacent land use compatibility. Prior to 1985, the land comprising PCMS was used to support large grazing operations and several residences. In 1985, military maneuver training operations began at the site. In 2005, several small arms ranges were constructed allowing for up to .50 caliber rounds to be fired. PCMS has been used for military training exercises, on average, approximately four to six months per year, though it has been used much less frequently since 2001 because of the increase in operational deployments of Fort Carson's units. In the 1980s and 1990s, units trained mostly in larger, battalion and brigade-sized elements. Since the start of the wars in Iraq and Afghanistan, utilization of PCMS by smaller units (company and below) has increased.

The Proposed Action would not change existing land use classifications, and it would not pose a conflict with adjacent land uses. Increased maneuver training would not result in significant cumulative impacts to land use.

5.2.2.2.2. Air Quality

The cumulative impact to air quality would consist of past, present, and reasonably foreseeable future actions resulting in increased air pollution on and around PCMS. The primary sources of air pollution would be combusted fuels and particulate matter generated by maneuver training activities. Cumulatively, the projected increase in training maneuvers at PCMS resultant from the need to train more Soldiers is expected to result in less than significant impacts. As stated in Chapter 2, PCMS will be adaptively managed to ensure the sustainability of training areas. The installation will revegetate and rehabilitate "high use" areas to reduce the amounts of fugitive dust and particulate matter released into the atmosphere. Increased vehicle maneuvers will add additional CO_2, NO_x, and other byproducts of combustion to the regional airshed in greater quantities. As existing and foreseeable development is anticipated to be limited and the region surrounding PCMS is in attainment, however, cumulative impacts to air quality are predicted to be less than significant.

5.2.2.2.3. Noise

The cumulative impact to noise consists of past, present, and reasonably foreseeable future actions resulting in increased noise frequency (extension of noise contours) and increase of noise duration to sensitive receptors on and around PCMS. As stated in Section 4.4, increased convoy movements would result in increased traffic noise levels. Based on the expected traffic increases, however, hourly average traffic noise levels at locations along area roadways where convoy movements would occur are estimated to increase between 0 and 2 decibels (acoustic) (dBA), which would not be a perceptible change to area residents. Additionally, there are no known noise-sensitive receptors located in the areas outside the installation boundaries where noise increases are anticipated. As no existing or foreseeable planned development (noise receptor) is known for the PCMS area, no adverse cumulative noise impacts would be expected as a result of the Proposed Action.

5.2.2.2.4. Geology and Soils

The cumulative impact of geology and soils consists of past, present, and reasonably foreseeable future actions resulting from soil erosion and loss of surface soils on around PCMS. Potential increased maneuver activities of the Proposed Action are predicted to have significant cumulative impacts to soil erosion at PCMS. When assessing this action in connection with maneuver and construction activities of the 2007 PCMS Transformation EIS, it is predicted that there would be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, and indirect effects of increased potential for fire and lost vegetative cover. Those activities listed in Table 5-1 which increase the frequency of training would be anticipated to have similar effects on soils, causing the potential for

increased cumulative soil erosion on PCMS training lands. There would be limited, if any, impacts of soil erosion in maneuver training areas from activities other than training, though training could cause the deposition of soils from wind erosion to occur outside of maneuver training areas.

When the Proposed Action is considered in connection with the increased training proposed in past, present, and reasonably foreseeable actions, the projected surface disturbance, compaction of soils, and loss of vegetative cover could approximately double in connection with proposed increases in maneuver activities. These adverse cumulative impacts would be reduced through PCMS's adaptive training management, erosion control, and land rehabilitation programs including INRMP implementation, the ITAM and limited use programs, but these programs would not reduce impacts to below less than significant levels. The maneuver training of a CAB at Fort Carson would increase susceptibility of soils to wind based erosion through low level flying activities which could destabilize soils and vegetation, but this impact would also be reduced through the ITAM and installation land management programs.

5.2.2.2.5. Water Resources

The cumulative impacts to water resources consist of past, present, and reasonably future actions resulting in changes to water quality or availability on and around PCMS. Impacts to water resources are predicted to be less than significant. To support the Proposed Action the Army would not expand the existing cantonment area or the amount of impervious surface which would lead to the channeling of surface waters. The major impact to water resources would stem from sedimentation into the Purgatoire River and Arkansas River basin during large storm events (Reference No. 229). Increased maneuver training would result in a loss of vegetation and increase in surface disturbance exposing soils to water erosion during large storms. This impact along with agricultural inputs into surface waters could potentially lead to degradation of water quality in the Purgatoire and Arkansas River basin. Inputs of sediments into the surface waters, however, are highly correlated with unpredictable factors such as the number and intensity of large storm events in a given year (Reference No. 229).

5.2.2.2.6. Biological Resources

The cumulative impacts to biological resources consist of past, present, and reasonably foreseeable future actions resulting in changes to vegetation, wildlife, and habitat on and around PCMS. Table 5-7 summarizes known effects of early (1985 through early 1990s) and present (mid-1990s until now) military training on biological resources. Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development.

As part of the original PCMS acquisition process, specific studies were conducted on PCMS prior to and after the initiation of training, specifically to assess impacts of early (1985 through early 1990s) training on vegetation and wildlife. There have been a few similar studies on these effects since that period. Table 5-7 summarizes the results of these studies.

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources

Resource	Effects of Military Training	Reference
General	This baseline provides a means to measure success of the Fort Carson sustainability program, including PCMS. The report has information on the status of water, air quality, energy, transportation, lands, materials, wildlife, noise, and cultural programs and their challenges with regard to sustainability.	DECAM (2002): Reference No. 6
Aquatic habitat	Conducted field investigations and computer simulations on Taylor Arroyo, which could be used as baseline data to compare effects of current military training on infiltration, overland flow, and channel flow.	Doe (1992): Reference No. 230
Aquatic habitat	These reports have 1985-87 data on streamflow, water quality, and sediment load yields that could be used to compare effects of current military training.	USGS (undated) von Guerard et al. (1993): Reference No. 191
Wetlands	Six wetland sites being monitored were described, including monitoring results for 1998. The report has baseline data that could be used to compare effects of current military training.	DECAM (1998): Reference No. 200
General vegetation	Reports have baseline data that could be used to compare effects of current military training.	Shaw and Diersing (1989, 1990): Reference No. 85 and 86
General vegetation	Reports have 1985-1988 baseline vegetation data that could be used to compare effects of current military training.	Shaw et al. (1989): Reference No. 85 and 232
General vegetation	Training exercises result in less resource degradation than former grazing regimes, particularly for canyon and wetland habitats.	Canestorp et al. (1995): Reference No. 231
General vegetation	Live and litter basal cover decreased and bare ground increased in tracked areas following training. Species composition shifted from perennial warm-season grasses to annual cool-season grasses and annual warm-season forbs in tracked areas. Shrubby and woody plant densities were significantly reduced by training.	Shaw and Diersing (1989 and 1990): Reference No. 85 and 86

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
General vegetation and range condition	Disturbance by tracked vehicles resulted in lower grass and vegetative basal cover with the loss of prostrate growth forms. Litter cover declined. Vehicular maneuvering reduced woody life-forms in tall-height classes to a generally greater extent than short-height classes. Low-growing forms of cacti were relatively susceptible to crushing. Long-lived perennials declined in all communities in tracked locations; bare ground created was replaced by short-lived perennials in only shrub-grassland. Annuals and exotics did not show distinct temporal trends or relations with intensity of disturbance. Patterns in species diversity or richness were not related to intensity of disturbance. Plant communities on PCMS display a high resistance to aboveground disturbance but a low resilience once an alternate state is reached. PCMS may be in a transient stage where release from grazing had as much or more impact on plant community dynamics as did imposition of training. Fine textured soils may be more susceptible to cumulative effects of soil compaction and erosion associated with heavy vehicular loads.	Milchunas et al. (1999): Reference 233
General vegetation and range condition	Reports have baseline data that could be used to compare effects of current military training. Through the exclusion of livestock, the vegetation biomass appears to have rebounded significantly, primarily evident through litter accumulation.	Milchunas et al. (1999, 2000): Reference 233 and 234
Trees	PCMS (and Fort Carson) forest inventory that could be used to compare effects of current military training.	Betters and Reich (2002): Reference No. 235
Niobrara shale barrens vegetation	Most Niobrara shale barrens endemic species are not adversely affected by moderate disturbance, particularly Oxybaphus rotundifolius, which appears to increase abundance where disturbance reduces competition. Weed invasions are not generally significant problems on these barrens. The report has baseline data (six plots at Gilligan's Island) that could be used to compare effects of current military training.	Kelso et al. (1999): Reference No. 236
Range condition	The report has 1991 data that could be used to compare effects of current military training. Overall, range condition improved on PCMS from 1989 through 1991.	Gordon and Linn (undated): Reference No. 237
Aquatic habitat	1985-87 military maneuvers caused no measurable effect on streamflow, water quality, and estimated sediment load yields deceased. Since 1987 cumulative effects of maneuvers have developed to a point that there is potential for increased runoff and sediment yields and degradation of water quality.	USGS (undated) von Guerard et al. (1993): Reference No. 191
Fish	A 1993-94 survey in the Piñon Canyon stretch of the Purgatoire River and its intermittent canyon tributaries on PCMS, which has data that could be used to compare effects of current military training.	Lohr and Fausch (1994): Reference No. 205
Fish	No observed effects.	Bramblett (1989), Bramblett and Fausch (1991) Reference No. 204, 208 and 209

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
General birds	These reports have 1987-88 data that could be used to compare effects of current military training. During 1987-88 in cholla grasslands four species were detected more frequently and one species was detected less frequently in areas with training than control areas. In pinyon-juniper areas four species were detected more frequently and one species was detected less frequently. Total numbers of birds detected in areas with training was significantly higher than the control for both habitat types, but species richness was significantly greater in control areas in cholla grasslands in 1987 and 1988 and significantly greater in areas with training in pinyon-juniper in 1988.	Youkey and Meslow (1989): Reference No. 238
General birds	Only one species (Grasshopper Sparrow) showed an abundance decline after initiation of military training. The pinyon-juniper bird community decreased in species richness with military disturbance.	Tazik (1991): Reference No. 239
Mountain Plover	Mountain Plover surveys were conducted on PCMS during 1995-96 summers. These data could be used to compare effects of current military training.	Maynard (1996) : Reference No. 240
Raptors	Increased size of areas used and made extra- home range movements more frequently.	Andersen et al. (1988, 1990): Reference No. 112 and 241
Red-tailed hawk	Habituated to low-level helicopter traffic. (Study includes both PCMS and Fort Carson.)	Andersen et al. (1989): Reference No. 242
General wildlife	No known long term negative impacts.	Canestorp et al. (1995) 231
Pronghorn	The report has 1985-89 data that could be used to compare effects of current military training. Shifted forage selection in response to forb increases on sites disturbed by tracked vehicles. Females and fawns increased home area sizes during maneuvers; males did not. Pronghorns (winter 1987) exposed to military training spent less time bedded.	Gerlach and Vaughan (1990): Reference No. 101
Mule deer	The report has 1986-87 data that could be used to compare effects of current military training. Female deer seasonal home ranges were larger in maneuver areas compared to non-maneuver areas. Female non-summer home ranges were larger in previous-maneuver areas than non-maneuver areas. Fawn summer home ranges were larger in maneuver than previous-maneuver areas. Bucks in maneuver areas had larger home ranges than in non-maneuver areas. Deer may exhibit a more negative response to unpredictable than predictable disturbances. Buck and doe survival rates and fawn:doe ratios did not differ prior to military maneuver and during 1986-87. Population estimates increased from 1984 through early 1988; a decline was noted in late 1988. Cattle grazing during the baseline study and a coyote control program during 1987-88 made it difficult to assess effects of military use on deer demographics.	Stephenson (1989): Reference No. 243
Deer	CDOW, in cooperation with PCMS Biologist, has data from annual aerial surveys that could be used to compare effects of current military training.	CDOW data (unpublished)
Elk	Elk moved onto PCMS after acquisition and initiation of military training, indicating no significant negative effects of training and possible positive effects.	

Table 5-7 Known Effects of Current Military Training and Potential Baseline Data on Piñon Canyon Maneuver Site Biological Resources (continued)		
Resource	**Effects of Military Training**	**Reference**
Coyote	These reports have 1996-97 data that could be used to compare effects of current military training. Most changes in coyote movement from military activity are temporary, and coyotes resume their previous activity patterns and occupy similar home ranges after military activity ends. Coyotes shifted to higher levels of diurnal activity under Army training, due to less exploitation (trapping and gunning. No other changes detected.	Kitchen et al. (2000): Reference No. 105
Coyote	Three of 16 radio-collared coyotes abandoned home ranges in response to military activities (one returned one week later). Most coyotes that changed home ranges during military activities resumed original home ranges after maneuvers ceased. Responses were related to amount of available cover, topography, and intensity of military activity. Day activity increased while sunrise, sunset, and night activity remained the same during military activities.	Gese et al. (1989): Reference No. 104
Swift fox	The study concluded that the swift fox population at PCMS was saturated in 1998-2000. No negative effects of military training on swift foxes were documented. These data could be used to compare effects of current military training.	Karki (2003) Karki et al. (2007): Reference No. 244 and 245
Swift fox	No negative effects of military training on swift foxes were documented. These 1997-98 population data could be used to compare effects of current military training.	Schauster (2001) Schauster et al. (2002): Reference No. 246 and 247
Swift fox	No negative effects of military training on swift foxes were documented (2000-04). Both grazed and military training sites had higher survival and density than unused sites, with populations on military sites showing more stable dynamics. Fox survival rate did not differ between different disturbance regimes.	Thompson (2006): Reference No. 248
Swift fox	No mortality was associated with training activities, either through direct mortality or the destruction of den sites. There was little difference in fox movements between times of military activity and no military activity.	Rongstad et al. (1989): Reference No. 249
Small mammals	Survey data collected in 1989 could be used to compare effects of current military training.	Kuenzi (1991): Reference No. 212

Populations of rayless goldenweed, a species known to increase on disturbed ground at PCMS, are likely to expand in response to increased ground disturbance in maneuver training areas and other training areas where they occur (Reference No. 217).

Direct impacts to swift fox caused by military training are minimal. Extensive studies were conducted on swift fox on PCMS in 1987-1989 and 1997-2006 to better understand its ecology. Those studies indicate that the species is doing well on PCMS and needs little management to survive as long as sufficient prey sources and suitable habitat are available.

Maintaining the range in good condition allows a diversity of small mammal populations needed to sustain viable swift fox populations. Although overall degradation of shortgrass prairie habitat on a large scale has not occurred at PCMS, should it occur it would likely result in a localized decline in swift fox populations (Reference No. 103).

Besides the swift fox's natural requirements, one potential threat that needs to be monitored is range expansion of the red fox, a known predator of swift fox. Should expansion in the range of the red fox reasonably threaten to extend to PCMS, coordination with other agencies such as USFWS and DOW might be in order.

Cumulative impacts from the Proposed Action in combination with past actions are anticipated to be significant but assessments of impact would change as monitoring data and better information are acquired. Impacts would likely be similar to those past actions documented in Table 5-1.

As determinations of specific effects of cumulative impacts of the ongoing military mission are completed, the Army would use the adaptive management process to adjust management programs to mitigate adverse impacts to vegetation or specific species to the best extent possible. The INRMP would continue to document the overall installation management plan, while the ITAM program would continue to be directed to repair and restoration efforts in response to maneuver damages downrange.

5.2.2.2.7. Cultural Resources

The cumulative impact to cultural resources consists of past, present, and reasonably foreseeable future actions which affect archeological resources or historic resources or their viewsheds on and around PCMS. The implementation of the Proposed Action may result in direct or indirect loss of cultural resources during PCMS maneuver training rotations through direct physical disturbance or through indirect loss from wildfires that military training could generate. It is anticipated that the Proposed Action would not result in significant adverse cumulative impacts with the continued cultural resource management program and policies in place to preserve historic and archaeological resources of PCMS. Procedures and processes implemented to protect cultural resources of PCMS are discussed in further detail below.

As mandated by federal law, archaeological and historic building inventories and evaluations on all resource areas are conducted prior to use by impact-generating activities, whether those activities are military training, construction, or other land management actions, such as erosion control and re-seeding

efforts. For archaeological sites, once identified, each site is recorded, evaluated for eligibility on the National Register, and the cultural landscape is analyzed. If applicable, significant sites are set apart using a variety of site protection methods. In this way, the information gained ensures that the cultural characteristics and lifeways of those who have come before us is not lost to history, but rather contributes to it. The information acquired is used for future land management, and is also made available to qualified researchers for professional purposes and used in the Program's considerable educational outreach efforts.

In accordance with NHPA Sections 110 and 106 and the stipulations of all agreement and management documents, resources within PCMS would be surveyed and evaluated for National Register eligibility, providing a greater protection and overall preservation to these resources and understanding of cultural significance than those located on private lands which are not bound to these regulations and standards. Training activity under the Proposed Action includes the possibility of inadvertent damages to cultural resources that occur on rare occasion despite education and awareness programs to prevent them. It is anticipated that, with continued active management which is currently in place to preserve Fort Carson's historic and archaeological resources, the Proposed Action, along with the activities listed in Table 5-1, would not result in significant adverse cumulative impacts.

5.2.2.2.8. Socioeconomics

The cumulative impacts to socioeconomics consist of past, present, and reasonably foreseeable future actions which affect socioeconomics on and around PCMS. The Proposed Action involves no construction activities at PCMS, and current training practices involve only minor expenditures in the PCMS area. Thus, there are no anticipated cumulative socioeconomic effects. The Army has committed to taking actions to increase local purchases to support training at PCMS, but measure of the extent or impact of these actions is not yet possible. In 2008, Fort Carson also began a conceptual planning process to establish PCMS as a sub-installation, which may involve permanent assignment of support personnel to PCMS. That action has not yet reached the stage of characterization as reasonably foreseeable, however. Before it is implemented, it will receive NEPA analysis.

5.2.2.2.9. Transportation

The cumulative impact to transportation consists of past, present, and reasonably foreseeable future actions on and around PCMS. There is anticipated to be a less than significant cumulative impact to traffic and transportation. This takes into account the present and future personnel, equipment, and convoys to PCMS. The major impact to transportation would be from military convoys between PCMS

and Fort Carson in addition to existing regional traffic. Some additional traffic would occur as a result of new construction projects proposed in the 2007 PCMS Transformation EIS. This traffic would be temporary and would result in less than significant impacts.

5.2.2.2.10. Utilities

The cumulative impact to utilities consists of past, present, and reasonably foreseeable future actions on and around PCMS. As stated in Section 4.10, the Proposed Action would not impact utilities or the need for additional utilities at PCMS. Upgrades and utilities construction to accommodate maximum training loads have been previously identified and analyzed in the 2007 PCMS Transformation EIS. This past analysis concluded that PCMS would be able to accommodate the additional IBCT and potential CAB units. The region remains relatively undeveloped, with no known large-scale projects that would significantly increase demands on utilities; no adverse cumulative impacts are anticipated.

5.2.2.2.11. Hazardous and Toxic Substances

The cumulative impact to hazardous and toxic substances consists of past, present, and reasonably foreseeable future actions that increase the handing or the generation of hazardous wastes on and around PCMS. Cumulatively, the Proposed Action would result in an increase in the use of hazardous materials and generation of petroleum based waste products. This would lead to an increase in requirements to handle, store, and dispose of hazardous waste. Any adverse cumulative impacts resulting from this increase or from additional increases caused by those projects listed in Table 5-1, however, would be offset through the Army's continued implementation of SOPs and plans (*P2 Plan*, HWMP, SPCCP, and the *Installation Pest Management Plan*). Thus, no significant cumulative impacts are anticipated.

5.2.2.2.12. Sustainability

The cumulative impact to sustainability consists of past, present, and reasonably foreseeable future actions that place a strain on sustainability principles on and around PCMS. The Proposed Action and other actions listed in Table 5-1 would increase the frequency of training at PCMS and would impact sustainable land use of PCMS. The region surrounding PCMS is projected to have limited population growth and additional need for energy and new facilities. Because of this, the primary sustainability challenges are predicted to be with the Army's internal management of PCMS to promote sustainable land use.

To ensure the continued availability of quality training lands, the Proposed Action would continue to implement land and environmental management programs on PCMS. These programs are designed to

maintain a sustainable balance of land use and sustainability. The ITAM program, INRMP implementation, and limited use programs are predicted to reduce adverse cumulative effects to significant but mitigable levels at PCMS.

5.2.3. Cumulative Impacts Summary

The preceding discussion of cumulative impacts is summarized in Table 5-8 below.

Table 5-8 Summary of Cumulative Effects				
Resource	**Proposed Action**	**Past, Present, and Future Actions**	**Mitigation[13],[14]**	**Cumulative Effect**
Fort Carson				
Land Use	• Changes to Land Use within Fort Carson	• Increasing development both within Fort Carson and along the Front Range. • Loss of open space within the Front Range and potential encroachment/adjacency of incompatible land uses.	• ACUB program would continue to both prevent land use incompatibility issues with neighboring areas and slow the reduction of undeveloped or open spaces in the region.	• The Proposed Action would result in negligible adverse cumulative effects.
Air Quality	• Emissions increase anticipated during construction, operations, and military training.	• Operations, training, and construction-introduced emissions beginning over 60 years ago that have affected air quality. • Local Metropolitan Planning Organization monitors regional trends for criteria pollutants and all below the NAAQS. • Conformity applicability and PSD analysis performed for projects. • Emissions increase from other regional construction and operations, added primarily by vehicle travel.	• Maintenance plan will continue to monitor CO emissions.	• The Proposed Action is not anticipated to result in violations of NAAQS. • None of the AERMOD predicted ambient concentrations exceed the corresponding NAAQS or CAAQS. Further analysis is needed, however, to determine whether negative air quality related value impacts will occur.

[13] As appropriate, Fort Carson will update the environmental management plans cited.
[14] Mitigation measures are subject to approval in the ROD and funding.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Noise	• Noise contours would remain unchanged as a result of the Proposed Action. The occurrence (duration) of noise produced, and noise generating activities associated with live-fire training are expected to increase by approximately 27 percent.	• Other past, present, and future projects occur within or adjacent to existing training ranges, potentially causing an adverse cumulative increase of noise within and areas adjacent to Fort Carson.	• Fort Carson would continue to implement the installation "Fly Neighborly" program, of which works to lessen the noise aircraft produce when flying in developed areas. • Noise complaint management procedures would continue to be implemented by logging, investigating, and applying corrective actions where applicable. • Other possible mitigation measures are siting adjustments for noise sensitive facilities, management of training activities, use of noise reduction technologies for receptors located within NZ II and NZ III.	• The Proposed Action would not result in a significant adverse change to noise outside of Fort Carson. • A significant cumulative increase in noise generating activities within Fort Carson could occur from the Proposed Action in combination with other range construction, cantonment area construction, and training activities.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Geology and Soils	• Minor adverse impacts would occur to soil resources within the cantonment area through the loss of soils resources and temporary increased potential for soil erosion during construction. Potentially adverse impact to soil resources could occur within downrange areas. It is predicted that there will be increased surface disturbance of soil, removal of vegetation, soil compacting and rutting, reduced infiltration, from range activities and increased training.	• The implementation of past, present, and future cantonment area construction and range construction/upgrades on Fort Carson have and will continue to have temporary impacts on soil erosion and loss of surface soils through erosion of disturbed construction sites. • Increase training frequencies and training activity/footprint would cause the potential for adverse soil erosion effects on Fort Carson/downrange area training lands.	• BMPs would be utilized to control wind and water erosion and stabilize sites following construction activities. • Fort Carson's ITAM program and training land deferment programs would continue to restore training lands and to reduce future erosion potential. • The INRMP and adaptive management of training lands would be implemented.	• The Proposed Action would result in significant, but mitigable cumulative impacts to soil erosion. There would be a potentially significant cumulative loss of soil resources, however, across the region as development of military projects in concert with community transportation projects and other regional initiatives continue.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Water Resources	• Increased training activities under the Proposed Action may increase groundwater use which would be accommodated through existing subsurface water rights. The Proposed Action would not release any water or pollutants that could infiltrate aquifers at Fort.	• Past development of the cantonment area has led to over 55 percent of the cantonment area containing impervious surface and alteration of natural drainage patterns. • Stormwater runoff has increased due to the increase of impervious surface area, erosion processes have become dominant in the southeastern-most stretches of the drainages, and both point and non-point source discharges are prevalent throughout the drainages. • Fort Carson has begun proactive management of stormwater to address stormwater runoff impacts associated with construction activities.	• Fort Carson would continue use of BMPs in construction and training activities and would adhere to BMPs and stormwater plans and permits to address impervious surface and stormwater runoff.	• The Proposed Action would result in adverse cumulative, but mitigable, effects to water resources. Increased impervious surface and stormwater runoff but would be mitigable. Other on-going or proposed Army actions as well as the Proposed Action are not anticipated to cause a cumulative adverse impact on local or regional water supplies.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Biological Resources	• The Proposed Action would result in a variety of potential impacts, including mortality, disturbance or displacement, and loss of habitat or nesting or foraging territory.	• Increasing development both within Fort Carson and along the Front Range. • Loss of vegetation and habitat within the Front Range from private and federal land development.	• Ongoing natural resources programs, such as described in the INRMP and ITAM programs at Fort Carson would continue to be implemented and provide mitigation for past (and ongoing) cumulative impacts. • Fort Carson will continue to adaptively assess the cumulative impacts on vegetation and wildlife and play a key role in sustaining native wildlife and vegetation in the region through its land management and natural resources programs to minimize these impacts.	• The Proposed Action would result in adverse cumulative, but mitigable, effects to biological resources. • Cumulative effects from the Proposed Action in combination with other present and planned future actions are and would continue to occur at Fort Carson and in the region.
Cultural Resources	• The Proposed Action may result in direct or indirect loss of cultural resources in the state of Colorado through training maneuvers or increased frequency of wildfires that military training could generate.	• Development in Fort Carson and downrange training prior to Section 106 requirements and ICRMP procedures have impacted cultural resources • Increasing private development along the Front Range has resulted in a loss of cultural resources.	• Fort Carson would continue cultural resource management program and policies to preserve Fort Carson's historic and archaeological resources.	• The Proposed Action would result in negligible adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Socioeconomics	• The Proposed Action would result in an increase in active duty military employment of approximately 6,700 Soldiers by 2012 and approximately 27 civilian jobs. EIFS modeling results indicate an increase in the on-post residential of approximately 3,100 persons and an increase in the on-post workforce population of 9,700 persons.	• Increasing development both within Fort Carson and along the Front Range resulting in an increase of population, jobs, and an overall growing economic trend. • Increasing populations has caused the overall need for additional housing and public services.	• Strains on local housing markets would be reduced through the provision of barracks and housing for single Soldiers and supporting the housing needs of the married Soldiers and their families through the Residential Communities Initiative on the installation to decrease the number of Soldiers and Families requiring housing off-post. Adverse cumulative effects would be partially offset through the provision of federal impact aid to offset costs of providing public education to families of military personnel.	• The Proposed Action would result in beneficial and adverse, but mitigable, cumulative effects. The increase in both the personnel and residential population on Fort Carson and within the surrounding communities would have a net positive cumulative impact to the local and regional economy. • The increased population associated with the Proposed Action, along with the general trend of development and population growth with the Front Range, could cause a cumulative strain on housing and public services, including schools.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Transportation	• The addition of personnel and families to Fort Carson as described under the Proposed Action would result in five types of transportation impacts: increasing on-post and regional traffic and altering traffic patterns, temporary construction disturbances, increased rail use related to training at PCMS, increased transit ridership, and potential increase in rail and aviation for deployment.	• Increasing population and economic development has decreased the LOS within Fort Carson and along adjacent roadways. • Approximately $148 million in transportation projects are currently underway to accommodate current and future needs.	• Continue to provide federal funds for transportation improvement projects within Fort Carson and surrounding roadways to accommodate increase of base populations.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
Utilities	• The Proposed Action would result in is increase in an increased demand for water, wastewater treatment, and electricity.	• Increasing population and development has increased utility usage within Fort Carson and the region.	• Adverse cumulative effects could be offset if Fort Carson continues to aggressively pursue water conservation and work with CSU to implement the CSU *Water Conservation Plan.* Replacing existing deteriorating water lines on-post and the proposed Southern Delivery System would offset cumulative impacts to firm yield for raw water.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Hazardous and Toxic Substances	• The Proposed Action would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes from these materials.	• Past and present operations at Fort Carson have resulted in the use and generation of hazardous and toxic substances. • Future operations at Fort Carson will likely result in the use and generation of hazardous and toxic substances.	• Fort Carson would continue to implement installation SOPs for disposal and handling of hazardous and toxic substances.	• The Proposed Action would result in negligible adverse cumulative effects.
Sustainability	• The Proposed Action would result in an increased use of energy, water resources and increased use of training lands.	• Past and present training at Fort Carson has resulted in the degradation of some of its lands and increased energy and water demand. • Future training will likely continue to cause the potential for land degradation and result in increased use of energy and water demand. • Increased population levels have resulted in increased energy and water demand. • Fort Carson has adopted aggressive policies to promote a sustainable environment.	• Fort Carson would continue to implement land and environmental management programs designed to maintain a sustainable balance of land use and sustainability.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
PCMS				
Land Use	• The Proposed Action would not change existing land use classifications, and it would not pose a conflict with adjacent land uses.	• Prior to 1985, the land comprising PCMS was used to support large grazing operations and several residences. • PCMS has been used for military training exercises, on average, approximately four to six months per year though it has been used much less frequently since 2001 because of the increase in operational deployments of Fort Carson's units.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Air Quality	• Under the Proposed Action, the primary sources of air pollution would be combusted fuels and particulate matter generated by maneuver training activities.	• Existing and foreseeable development within and surrounding PCMS is anticipated to be limited; causing a low chance of additional sensitive receptors or sources of air pollutants.	• PCMS will be adaptively managed to ensure the sustainability of training areas. The installation will revegetate and rehabilitate "high use" areas to reduce the amounts of fugitive dust and particulate matter released into the atmosphere. Increased vehicle maneuvers will add additional CO2, NOx and other byproducts of combustion to the regional airshed in greater quantities.	• The Proposed Action would result in negligible adverse cumulative effects.
Noise	• Increased convoy movements would result in increased traffic noise levels, however, would not be a perceptible change to area residents.	• No existing or foreseeable planned development (noise receptor) is known for the PCMS area.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Geology and Soils	• The Proposed Action would result in potentially significant impacts to soil erosion within PCMS.	• Past and present training activities have has caused increase potential for erosion. • Future training activities and military use of PCMS will likely continue to increase the potential for erosion.	• PCMS would continue to implement adaptive training management, erosion control, and land rehabilitation programs including the ITAM program, INRMP implementation and limited use programs.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Water Resources	• The Proposed Action could impact water resources as increased maneuver training would result in a loss of vegetation and increase in surface disturbance exposing soils to water erosion during large storms.	• Past and present training activities have caused increased potential for sedimentation of local waterways. • Future training activities will likely increase the potential for sedimentation of local waterways. • Past, present, and future agricultural practices outside PCMS have and will continue to result in degradation of local water quality.	• PCMS would continue use of BMPs in construction and training activities to address soil erosion and stormwater runoff.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.
Biological Resources	• The Proposed Action would result in a variety of potential impacts, including disturbance and loss of habitat, nesting or foraging territory.	• Undisturbed grassland, shrubland, and woodland habitats in the region are likely to continue to shrink as a result of the population growth and economic development.	• Ongoing natural resources programs, such as described in the INRMP and ITAM programs at Fort Carson would continue to be implemented and provide mitigation for past (and ongoing) cumulative impacts. Continued regional partnering and education programs create awareness and protection of resources.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Cultural Resources	• The implementation of the Proposed Action may result in direct or indirect loss of cultural resources during PCMS maneuver training rotations through direct physical disturbance or through indirect loss from wildfires that military training could generate.	• Historical use of PCMS has impacted cultural resources. • Private development within the region, although limited, has the potential to result in a loss of cultural resources.	• PCMS would continue cultural resource management program and policies to preserve historic and archaeological resources.	• The Proposed Action would result in negligible adverse cumulative effects.
Socioeconomics	• The implementation of the Proposed Action would not result in adverse socioeconomic impacts.	• Limited development has occurred or is anticipated to occur within the region surrounding PCMS.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Transportation	• The Proposed Action would cause an adverse impact to transportation from military convoys deploying to and from PCMS from Fort Carson.	• Increased regional population growth has decreased the LOS along roadways servicing between Fort Carson and PCMS. • Past and present, personnel and equipment have been transported to and from PCMS and Fort Carson and will likely continue into the future.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.

Table 5-8 Summary of Cumulative Effects (continued)

Resource	Proposed Action	Past, Present, and Future Actions	Mitigation	Cumulative Effect
Utilities	• The Proposed Action would not impact utilities.	• Limited development has occurred within the region surrounding PCMS. • No future large-scale federal or private projects that would significantly increase demands on utilities are known.	• None required/identified.	• The Proposed Action would result in negligible adverse cumulative effects.
Hazardous and Toxic Substances	• The Proposed Action would result in an increase in the use of hazardous materials and petroleum and subsequent generation, handling, storage, and disposal of wastes from these materials.	• Past and present operations at Fort Carson have resulted in the use and generation of hazardous and toxic substances. • Future operations at Fort Carson will likely result in the use and generation of hazardous and toxic substances.	• PCMS would continue to implement installation SOPs for disposal and handling of hazardous and toxic substances.	• The Proposed Action would result in negligible adverse cumulative effects.
Sustainability	• The Proposed Action would result in an increase use of energy, water resources and increased use of training lands.	• The region surrounding PCMS is projected to have limited population growth and additional need for energy and new facilities.	• PCMS would continue to implement land and environmental management programs designed to maintain a sustainable balance of land use and sustainability.	• The Proposed Action would result in adverse, but mitigable, cumulative effects.

6. References

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8. Acronyms

2BCT-2ID	2nd Brigade Combat Team, 2nd Infantry Division
2BCT-4ID	2nd Brigade Combat Team, 4th Infantry Division
3BCT	3rd Brigade Combat Team
3BCT-4ID	3rd Brigade Combat Team, 4th Infantry Division
4BCT-4ID	4th Brigade Combat Team, 4th Infantry Division
4ID	4th Infantry Division
5-4ID	5th Brigade, 4th Infantry Division
AAFES	Army Air Force Exchange Service
AAP	Army Alternate Procedures
ACAM	Air Conformity Applicability Model
ACHP	Advisory Council on Historic Preservation
ACR	Armored Calvary Regiment
ACUB	Army Compatible Use Buffers
ADA	Average Daily Attendance
ADM	Air Dispersion Modeling
ADNL	A-weighted DNL (ADNL)
ADT	Average Daily Traffic
AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AFV	Alternative Fuel Vehical
AH	Attack Helicoper
AIRFA	American Indian Religious Freedom Act
AMF	Army Modular Force
AMS	American Meteorological Society
amsl	above mean sea level
AOAPL	Army Oil Analysis Program Laboratory
AOC	Area of Concern
AOI	Area of Interest
APCD	Air Pollution Control Division
APE	Area of Potential Effect
APEN	Air Pollutant Emission Notice
APHIS	Animal and Plant Health Inspection Service
AQCC	Air Quality Control Commission
AQRV	Air Quality Related Value
AR	Army Regulation
ASP	Ammunition Supply Point
AST	aboveground storage tank
AWSS	Aerial Weapons Scoring System

B.P.	Before Present
BAAF	Butts Army Airfield
BAER	Burned Area Emergency Response/Rehabilitation
BART	Best Available Retrofit Technology
BASH	Bird Air Strike Hazards
BCT	Brigade Combat Team
BH	Bridage Headquarters
BLM	Bureau of Land Management
BMP	Best Management Practice
BRAC	Base Realignment and Closure
°C	degrees celsius
C	Candidate
CA	Comprehensive Agreement
CAA	Clean Air Act
CAAQS	Colorado Ambient Air Quality Standards
CAB	Combat Aviation Brigade
$CaCO_3$	calcium carbonate
CALPUFF	California Puff Model
CCPA	Colorado Council of Professional Archaeologists
CCR	Colorado Code of Regulations
CDA	Colorado Department of Agriculture
CDNL	C-weighted DNL
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CEMML	Center for Environmental Management of Military Lands
CEQ	Council of Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFC	Cholorfluorocarbon
CFR	Code of Federal Regulation
CGS	Colorado Geological Survey
CH	Cargo Helicopter
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIG	Colorado Interstate Gas
CNHP	Colorado Natural Heritage Program
CO	Carbon Monoxide
CO_2e	Carbon dioxide equivalent
COD	Chemical Oxygen Demand
COF	Company Operations Facility
COSHPO	Colorado State Historic Preservation Office

CPI	Colorado Preservation, Inc.
CRM	Cultural Resource Management
CS	Combat Support
CSP	Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative
CSS	Combat Service Support
CSU	Colorado Springs Utilities
CTP	Combat Trail Maintenance Program
CWA	Clean Water Act
DAR	Defense Access Road
DAT	Deposition analysis threshold
dB	decibels
dBA	A-weighted decibel
DECAM	Directorate of Environmental Compliance and Management
DEIS	Draft Environmental Impact Statement
Divison	CDPHE's Water Quality Control Division
DMPRC	Digital Range Multi-Purpose Range Complex
DNL	Day-night average sound level
DoD	United States Department of Defense
DoDI	Department of Defense Instructions
DOI	Department of Interior
DOJ	Department of Justice
DPW	Directorate of Public Works
DUSTRAN	Dust Transport Model
E	Endangered
E	Ethanol
EA	Environmental Assessment
ECHO	EPA Enforcement and Compliance Online
EIFS	Economic Impact Forecast System
EIS	Environmental Impact Statement
ENMP	Environmental Noise Management Program
EO	Executive Order
EOD	Explosives Ordnance Detachment
EPA	United States Environmental Protection Agency
EPACT	Energy Policy Act
EPC Health	El Paso County Department of Health & Environment
EPCRA	Emergency Planning and Community Right-To-Know Act
ESPC	Energy Savings Performance Contract
FARRP	Forward Area Rearming and Refueling Points
FC	Fort Carson
FEIS	Final Environmental Impact Statement
FM	Field Manual

FMTV	Family of Medium Tactical Vehicle
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FWPCA	Federal Water Pollution Control Act
GDPR	Global Defense Posture Realignment
GHG	Greenhouse gas
GIS	Geographic Information System
GOV	Government Owned Vehicle
gpd	gallons per day
gpm	gallons per minute
GTA	Grow the Army
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
HBCT	Heavy Brigade Combat Team
HC	Hydrocarbon
HEMTT	Heavy Expanded Mobility Tactical Truck
HMCC	Hazardous Material Control Center
HMMWV	High Mobility Multipurpose Wheeled Vehicle
hp	horse-power
HPC	Historic Properties Component
HQ	Headquarters
HQ	Headquarters
hr	hour
HVAC	heating, ventilating, and air conditioning
HWMP	Hazardous Waste Management Plan
HWSF	Hazardous Waste Storage Facility
I	Interstate
IBCT	Infantry Brigade Combat Team
IBCT	Infantry Brigade Combat Team
ICRMP	Integrated Cultural Resource Management Plan
ID	Infantry Division
IED-D	Improvised Explosives Device-Defeat
IFS	Integrated Facilities System
INRMP	Integrated Natural Resource Management Plan
IPCC	Intergovernmental Panel on Climate Change
ISWMP	Integrated Solid Waste Management Plan
ITAM	Integrated Training Area Management
IWFMP	Integrated Wildland Fire Management Plan
IWTP	Industrial Wastewater Treatment Plant
JP	Jet propellant
kg/ha/yr	kilogram per hectare per year

kVA	kilovolt Ampere
LEED	Leadership in Energy and Environmental Design
LF	linear feet
LOS	Levels of Service
LRAM	Land Rehabilitation and Maintenance
LUPZ	Land Use Planning Zone
Ma	Million years ago
MAU	Make-Up Air Unit
MCA	Military Construction Army
mcf	million cubic feet
MEDDAC	Medical Department Activity
METL	Mission Essential Task List
mg/L	milligrams per liter
mgd	million gallons per day
MILCON	Military Construction
MILES	Multiple Integrated Laser Engagement System
MIMS	Maneuver Impact Miles
mm	millimeter
MMBtu	Million British Thermal Units
MOA	Memorandum of Agreement
mph	miles per hour
MPMG	Multipurpose Machine Gun
MPTR	Multi-Purpose Training Range
MRF	Modified Record Fire
MS4	Municipal Separate Storm Sewer System
MSR	Military Supply Route
MVA	Megavolts-Ampere
MWR	Office and Directorate of Morale, Welfare, and Recreation
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NCRS	Natural Resources Conservation Service
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants Program
NFA	No Further Action
NH3	Ammonia gas
NH4	ammonium
NHPA	National Historic Preservation Act
No.	Number
NO_2	Nitrogen Dioxide
NOA	Notice of Availability

NOE	Nap-of-the earth
NOI	Notice of Intent
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List
NRCS	Natural Resources Conservation Service
NSR	New Source Review
NZ	Noise Zones
O_3	Ozone
OD	Open Detonation
OH	Observation Helicopter
OH	hydroxyl radical
ORTC	Operational Readiness Training Center
OSD	Office of the Secretary of Defense
P2	Pollution Prevention
Pb	Lead
PCB	Polychlorinated Biphenyl
PCMS	Piñon Canyon Maneuver Site
PEIS	Programmatic Environmental Impact Statement
PIF	Partners in Flight
PM	Particulate Matter
PM_{10}	Particulate Matter, 10 micrometers or less in aerodynamic diameter
$PM_{2.5}$	Particulate Matter, 2.5 micrometers or less in aerodynamic diameter
PNNL	Pacific Northwest National Laboratory
POV	Privately Owned Vehicle
PPACG	Pikes Peak Area Council of Governments
PPSIP	Pikes Peak Sustainability Indicators Project
PRT	Personal Rapid Transit
PSD	Prevention of Significant Deterioration
PT	Physical training
PTE	Potential to emit
QTR	Qualification Training Range
RA	Resources Advisor
RCRA	Resource Conservation and Recovery Act
RDX	cyclotrimethylenetrinitramine
REC	Record of Environmental Consideration
RECCE	Reconnaissance
ROD	Record of Decision
ROI	Region of Influence
RTVs	Rational Threshold Values

SAPs	Satellite Accumulation Points
SARNAM	Small Arms Range Noise Assessment Model
SBCT	Stryker Brigade Combat Team
SC	Species of Special Concern
SDZ	Surface Danger Zone
SE	Colorado State Endangered
SEMS	Sustainability and Environmental Management System
SF	Square feet
SH	State Highway
SHPO	State Historic Preservation Office
SIEA	San Isabel Electric Association
SIL	Significant impact level
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SOP	Standard Operating Procedure
SPCCP	Spill Prevention Control and Countermeasures Plan
Special Forces	10th Special Forces Group (Airborne)
SRM	Service, Repair, and Maintenance
ST	Colorado State Threatened
STORET	STOrage and RETrieval
SWMU	Solid Waste Management Units
SWPPP	Stormwater Pollution Prevention Plan
T	Threatened
TC	Training Circular
TCP	Traditional Cultual Property
TIP	Transportation Improvement Program
TMDL	Total Maximum Daily Loads
TNC	The Nature Conservancy
TNT	trinitrotoluene
tpy	tons per year
TRI	Toxic Release Inventory Report
TUAVs	Tactical Unmanned Arial Vehicle Systems
U.S.C.	United States Code
UAC	Urban Assault Course
UAS	Unmanned Aircraft System
UH	Utility Helicopters
ULSD	Ultra-low sulfur dioxide
UPH	Unaccompanied Personnel Housing
US	US Highway
USACE	United States Army Corps of Engineers
USAEC	U.S. Army Environmental Command

USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
UXO	Unexploded Ordinance
v/c	volume to capacity
VMT	Vehicle miles traveled
VOC	Volatile Organic Compound
WBCSD	World Business Council on Sustainable Development
WQCC	Colorado Water Quality Control Commission
WRI	World Resources Institute
WWII	World War II
WWTP	Waste Water Treatment Plant

9. Index

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APPENDIX A
REGULATION MANAGEMENT PLANS

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A. Regulation Management Plans

Fort Carson and the Pinon Canyon Maneuver Site (PCMS) operate under management plans specific to the installations that provide guidance on operations, construction and demolition activities, waste management, the environment, and installation resources. Many of the management plans pertinent to the Proposed Action are required by Fort Carson Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement. Regulations and management plans pertinent to the proposed action are discussed in this appendix.

A.1. Regulations and Policies

A.1.1. Fort Carson Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement (1999)

This regulation prescribes policies and procedures, and assigns responsibilities for the conservation, protection, and enhancement of the environment at Fort Carson, the PCMS, and supported facilities. The regulation provides an overview of the Fort Carson Environmental Program and discusses specific management policies relating to water resources, air quality, solid waste management, hazardous and toxic materials, noise pollution, historic preservation, natural resources, energy conservation, and other environmental resources.

A.1.2. Fort Carson Regulation 350-4, Training: Piñon Canyon Maneuver Site (2004)

This regulation prescribes procedures and responsibilities used to support training activities at PCMS, including scheduling, logistics, and environmental management of training rotations at the PCMS.

A.1.3. Fort Carson Regulation 350-9, Training: Integrated Training Area Management (2001)

This regulation prescribes responsibilities, management requirements, and general guidance to implement Fort Carson's Integrated Training Area Management (ITAM) program. The ITAM program focuses on aligning training activities with sustainable land management methods.

A.1.4. Fort Carson Regulation 350-10, Training: Maneuver Damage Control Program (2004)

This regulation assists commanders in evaluating training against the cost and possible environmental effects of maneuver damage by providing information on maneuver damage control. The regulation

provides guidance on education and prevention of maneuver damage; reporting, correction, and repair of damage; consideration of inclement weather training issues; and areas of training restrictions.

A.1.5. Fort Carson Regulation 385-63, Firing Ammunition for Training, Target Practice, Administration and Control of Ranges and Training Areas (2006)

This regulation prescribes Fort Carson range operating procedures and safety policies/responsibilities for firing ammunition, lasers, guided missiles and rockets, as well as use of the military training areas of Fort Carson and PCMS.

A.1.6. Fort Carson Regulation 200-6, Wildlife Management (1999)

This regulation governs hunting and fishing on PCMS. Colorado Division of Wildlife (CDOW) state regulations (and associated permits and fees) also apply to hunting and fishing privileges at PCMS.

A.1.7. Army Regulation 420-90, Fire and Emergency Services (2005)

This Army Regulation (AR) prescribes policies and responsibilities covering all fire fighting (structural, aircraft, and wildland), emergency dispatching services by civilians or military, fire prevention (technical services), hazardous materials (HAZMAT)/Chemical, Biological, Radiological, Nuclear and High-yield Explosives (CBRNE) response, Weapons of Mass Destruction (WMD), Global War on Terrorism, emergency medical services (EMS), rescue services, disaster preparedness, and ancillary services.

A.1.8. Army Regulation 200-3, Land, Forest, and Wildlife Management (2000)

This regulation sets forth policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources consistent with the military mission and in consonance with national policies. The scope includes the conservation, management, and utilization of the soils, vegetation, water resources, croplands, rangelands, forests, and fish and wildlife species.

A.1.9. Army Regulation 200-4, Cultural Resources Management (1998)

This regulation prescribes policies, procedures, and responsibilities for meeting cultural resources compliance and management requirements. The scope of this regulation includes the National Historic Preservation Act (NHPA);, American Indian Religious Freedom Act (AIRFA) and Executive Order (EO) 13007, Native American Graves Protection and Repatriation Act (NAGPRA);, Archeological Resources Protection Act (ARPA), 36 Code of Federal Regulations (CFR) 79, and other requirements and policies affecting cultural resources management. These policies are designed to ensure that installations make

informed decisions regarding the cultural resources under their control in compliance with public laws, in support of the military mission, and consistent with sound principles of cultural resource management.

A.1.10. Army Regulation 200-1, Environmental Quality: Environmental Protection and Enhancement (1997)

This regulation covers environmental protection and enhancement. The regulation provides an overview of the Army Environmental Program and discusses specific management policies relating to water resources, air quality, solid waste management, hazardous and toxic materials, noise pollution, historic preservation, natural resources, energy conservation, and other environmental resources.

A.1.11. Army Regulation 350-19, The Army Sustainable Range Program (2005)

This regulation assigns responsibilities and provides policy and guidance for managing and operating US Army ranges and training lands to support their long-term viability and utility to meet the National defense mission; planning, programming, funding, and executing the core programs comprising the Army's Sustainable Range Program, the Range and Training Land Program, and the ITAM Program; integrating program functions to support sustainable ranges; assessing range sustainability; and managing the automated and manual systems that support sustainable ranges.

A.2. Management Plans

A.2.1. Plans Pertaining to Construction and Demolition

A.2.1.1. Fort Carson Lead Management Plan (2004)

The Lead Management Plan is a guidance document to direct all aspects of the lead management program for Fort Carson and PCMS. The plan is designed to direct health, safety, and disposal activities associated with demolition, renovation, construction, and sandblasting activities that are associated with lead-based paint, indoor firing ranges, and other lead contamination. The plan discusses procedures to follow in response to lead contamination as well as procedures for worker protection and identification of lead hazards on the installation.

A.2.1.2. Fort Carson Asbestos Management Plan (2004)

The Asbestos Management Plan sets forth activities and procedures designed to minimize exposure to airborne asbestos fibers, particularly in regards to renovation, demolition, and maintenance activities. The plan focuses on workers and outside contractors who perform building renovation and maintenance, with the objective of protecting these workers as well as the premises and other occupants of the premises.

This plan provides procedures to be followed when asbestos fibers are released. Specific work plans for asbestos abatement must be approved by the appropriate Fort Carson personnel and, in some cases, by regulatory agencies.

A.2.1.3. Fort Carson Fugitive Dust Control Plan (2004)

The Fugitive Dust Control Plan lists recommended measures to control fugitive dust resulting from construction and land development activities and from demolition, dismantling, and renovation activities.

A.3. Plans Pertaining to Operations

A.3.1. Fort Carson Integrated Natural Resources Management Plan (2002)

The Integrated Natural Resources Management Plan (INRMP) is a guide for the management of natural resources at Fort Carson and PCMS. Objectives of this plan are to manage natural resources on the installation and ensure environmental stewardship of public lands entrusted to the care of the Army, ensure compliance with relevant laws and regulations, and integrate resource management. This plan includes general policies regarding the conservation and protection of existing resources and the management of land resources in support of the military mission.

The plan provides for an inventory and description of the natural resource base at Fort Carson, including land management units, hunting areas, bivouac and training areas, and physiographic and land management zones. Natural Resource Management Program objectives and implementing management and monitoring programs are discussed for flora, fauna, threatened and endangered species, sensitive habitats, and related resources. An important element within this plan is a program for the monitoring, conservation, and protection of land resources to support the military training mission at Fort Carson and PCMS on a sustained basis. Included within the Land Management Program are training area conservation programs, such as the ITAM Program, soil and watershed management, rangeland management, prescribed burning/wildfire control programs, and a Landscape Management Program.

A.3.2. Fort Carson Integrated Cultural Resources Management Plan (2002)

The Integrated Cultural Resource Management Plan (ICRMP) provides guidance and procedures for the identification, evaluation, and protection of cultural resources while causing the least disturbance to the military mission. The plan details preservation and mitigation plans for specific archaeological and historic architectural resources at Fort Carson and PCMS. The plan also defines processes for identifying and evaluating cultural resources on the installations and describes specific projects for cultural resources management.

A.3.3. Master Planning Strategy, Smart Growth Principles (2005)

The Master Planning Strategy Smart Growth Principles outlines the 10 principles Fort Carson uses to evaluate facility siting layouts and infrastructure development decisions at Fort Carson and acts to assist decision makers in understanding the various positive and negative impact on future facility opportunities.

The 10 Smart Growth principles are: 1) promote military cohesiveness and efficiency in training; 2) minimize development of open spaces; 3) improve walk-ability of installation neighborhoods; 4) site facilities to promote mass transit opportunities; 5) site facilities based on analysis of interrelationships among users of facilities to adjacent facilities; 6) create high density mixed-use areas; 7) site facilities to leverage existing utility infrastructure and future renewable energy opportunities; 8) low-impact development; 9) encourage stakeholder collaboration in development decisions; and 10) use full life-cycle cost analysis instead of first cost criteria in making development decisions. Guidance on implementation of each principle and associated criteria to guide facility siting each project is described in the plan.

A.3.4. Fort Carson Pollution Prevention Plan (2004)

The Pollution Prevention (P2) Plan provides a comprehensive approach to waste and resource management that seeks to reduce the impact that an operation or activity has on the environment by reducing or eliminating the production of wastes, by using energy and raw materials more efficiently, and by promoting sustainable practices. The plan provides recommendations for green procurement, sustainable construction practices, a centralized hazardous materials control center, best management practices (BMPs) for vehicle maintenance, energy conservation, and materials substitutions, among others.

A.3.5. Prescribed Burn Plan (2003)

Fort Carson has prepared this plan to comply with the requirements of the Colorado Air Quality Control Commission Regulation No. 9, “Open Burning, Prescribed Fire and Permitting.” Pursuant to that regulation, this document summarizes Fort Carson’s use of prescribed fire as a land management tool and its integrated planning process related to fuel management. The plan incorporates requirements of other Army regulations and guidance, including Army Wildland Fire Policy Guidance (2002), AR 420-90 (Fire and Emergency Services), and AR 200-3 (Natural Resources - Land, Forest and Wildlife Management).

A.3.6. Fort Carson Polychlorinated Biphenyl Management Plan (2004)

The primary purpose of the Polychlorinated Biphenyl (PCB) Management Plan is to provide handling and control procedures for PCBs and a contingency plan for PCB spills. The plan includes the following requirements:

- During inspections, all transformers and light ballast fixtures are assumed to contain PCB waste unless otherwise marked.
- All personnel handling PCB waste will wear the proper personal protective equipment and comply with the Fort Carson Health and Safety Plan.
- PCB waste is properly packaged, labeled, weighed, catalogued, and stored within the hazardous waste storage facility (HWSF) under the supervision of Directorate of Environmental Compliance and Management (DECAM).
- Material safety data sheets (MSDSs) are prepared and laboratory samples are analyzed (if the contents are unknown or mixed) to ensure that safe handling procedures and accurate waste classification are met.
- All containers holding PCB must be in good condition and checked for leaks every 30 days.

A.3.7. Fort Carson Radon Management Plan (2004)

The Radon Management Plan documents results of surveys at Fort Carson and PCMS to determine the extent of radon exposure in buildings on the installations. The plan identifies survey locations with high potential for mitigation, and recommended time frames for retesting and/or mitigation at these sites.

A.3.8. Installation Pest Management Plan (2001)

The Installation Pest Management Plan describes Fort Carson pest management requirements and describes the administrative, safety, and environmental requirements for surveillance and control of pests. The Pest Management Program utilizes Department of Defense (DoD)-certified pest control personnel to control pests. Principles of Integrated Pest Management practices are stressed in the plan, which consists of judicious use of both chemical and non-chemical control techniques to achieve effective pest control with minimal environmental contamination.

A.3.9. Fort Carson Facility-Wide Spill Prevention, Control, and Countermeasures Plan (2004)

The Spill Prevention, Control and Countermeasures Plan (SPCCP) provides procedures to follow for employing spill prevention and response measures should a spill occur. The plan is applicable to all areas

of the installation that handle oil, hazardous waste, or hazardous substances. The plan includes a discussion of general types of spill prevention procedures, methods, and equipment used at Fort Carson facilities. The plan provides a summary of each location having the potential for a reportable spill including type and size of facility, quantity and material stored, probable spill route, and type of secondary containment provided in accordance with Title 40 of the CFR, Part 112.7(b). The primary goal of the plan is to prevent spills.

A.3.10. Fort Carson Facility Response Plan (2004)

The Facility Response Plan is designed to minimize hazards created by spills involving petroleum, oils, lubricant, or hazardous materials. The plan complements the Fort Carson SPCCP. Its purpose is to minimize the potential for spills, to prevent spills from reaching navigable waterways, and to correct causes of spills. The plan designates responsibilities and procedures for a proper response to spill events.

A.3.11. Army Regulation 200-1, Chapter 13, Underground Storage Tanks and Aboveground Storage Tanks (2004)

The underground storage tank (UST) and aboveground storage tank (AST) chapter includes information on the storage of hazardous waste, petroleum products and used oil, and practices implemented to minimize the risk of storage and potential spills into the environment. The report outlines the responsibilities of personnel involved with USTs and ASTs, the procedures involved in materials storage, UST and AST operations, maintenance, and record keeping requirements, and troubleshooting of facility repairs.

A.3.12. Ammunition Supply Point Standard Operating Procedure (2006)

This manual prescribes basic ammunition management procedures pertinent to ammunition and explosive support.

A.4. Plans Pertaining to Waste Management

A.4.1. Fort Carson Installation Recycling Plan (2004)

The Installation Recycling Plan sets forth the components of the Qualified Recycling Program that the installation is required to follow to meet federal, state, and ARs pertaining to recycling and environmental management. The plan provides direction on collecting and segregating waste materials intended for recycling and reuse of resources. Recycling efforts are required for construction and demolition activities.

A.4.2. Fort Carson Hazardous Waste Management Plan (2004)

The Hazardous Waste Management Plan (HWMP) establishes procedures, policies, and standards; assigns responsibilities; and provides guidance for personnel who generate, handle, manage, transport, and dispose of hazardous waste on Fort Carson. The plan discusses hazardous waste accumulation points, the centralized hazardous waste control center, and procedures for the management of existing facilities. The objective of the plan is to effectively manage hazardous waste generated from military operations in an environmentally safe manner from the point of generation to reuse or ultimate disposal without impairment to the mission at Fort Carson.

A.4.3. Integrated Solid Waste Management Plan (2004)

The Integrated Solid Waste Management Plan (ISWMP) describes the waste management program, procedures, and requirements for solid waste generated at Fort Carson. The plan identifies various types of wastes being generated and their current disposition. It also identifies source reduction and pollution prevention programs and projects implemented at Fort Carson. The plan provides guidelines for construction and demolition waste management and requires construction and demolition waste management plans for different types of waste.

A.5. Plans Pertaining to Erosion Management Reclamation Planning (2002)

Reclamation planning sustains training resources and offsets adverse effects associated with military training on soils by identifying improvements needed to reclaim rested areas and includes planning for the duration of rested and deferred areas. Reclamation planning includes identifying locations and justification for erosion control structures, check dams, and road and trail reclamation; reseeding disturbed areas; cost-benefit analysis; and project evaluations and monitoring data.

A.6. Permits

Fort Carson obtains project-specific permits for various operations and construction. Some operational permits are applicable to general operations at the installation and are described.

A.6.1. Clean Water Act Section 404 Regional Permit No. 2002-00707 (2002)

This regional permit authorizes Fort Carson to conduct erosion control activities on post and at PCMS that may result in minimal individual and cumulative impacts to wetlands from dredge and fill activities. Typical erosion control measures include erosion control and stock watering impoundments, banksloping of erosion courses, check dams, rock armor, hardened crossings, culverts and bridges, erosion control terraces and water diversions, water turnouts, and other erosion control activities approved by USACE.

A.6.2. Small Municipal Separate Storm Sewer System Permit No. COR042000 (2003)

In compliance with the provisions of the Clean Water Act (CWA), Fort Carson operates under a National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Federal Facility Small Municipal Separate Storm Sewer Systems (MS4) in Colorado. This permit authorizes Fort Carson to discharge pollutants (in the form of stormwater runoff) into the waters of the US in accordance with the conditions and requirements of the permit. The permit, which became effective June 23, 2003, and expires on June 22, 2008, requires Fort Carson to develop a stormwater management system that addresses six key areas. The six areas include public outreach, public involvement, illicit discharges, construction site storm water control, post-construction (i.e., new development or redevelopment) storm water control, and pollution prevention.

A.6.3. Resource Conservation and Recovery Act (RCRA) Part B Permit No. CO-95-09-29-03 (1995)

The installation maintains a Resource Conservation and Recovery Act Part B permit issued by the Colorado Department of Public Health and Environment (CDPHE), Hazardous Materials and Waste Management Division, for the storage of hazardous waste at Fort Carson. The Permit became effective on October 29, 1995, in accordance with the Colorado Hazardous Waste Act, Sections 25-15-301 through 316, C.R.S. and the regulations thereunder. The Permit will remain effective until October 28, 2006, at which time the renewed Part B permit No. CO-06-09-29-01 will become effective until October 29, 2016, unless revoked and reissued, or terminated under 6 Colorado Code of Regulations (CCR) 1007-3, Sections 100.61 or 100.25. The permit requirements are consistent with the Hazardous Waste Management Plan referenced in this section.

A.6.4. Title V of the Clean Air Act

In accordance with the provisions of Colorado Air Pollution Prevention and Control Act, Fort Carson operates under a Title V permit issued by the CDPHE, Air Pollution Control Division. The permit number 95OPEP110 was issued for Fort Carson on September 1, 1998, and last revised on October 24, 2001. Until the permit expires or is modified or revoked, Fort Carson is allowed to discharge air pollutants in accordance with the requirements, limitations, and conditions of the permit.

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APPENDIX B

Fort Carson Construction Projects

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B. Fort Carson Construction Projects

Project Name	Project Number	Brief Scope Description	Building Area (SF)	Paved Area (SF)	Construction Area (SF)	Demolition (SF)	Construction Start	Construction End
Cantonment								
Quartermaster	**69795**	Standard Company Operations, Vehicle and equipment maintenance and unit storage facilities.	38,530	263,759	302,289	-	July 2009	January 2011
Engineer Company	**67137**	Standard Group HQs Building, Brigade HQs Building, Battalion HQs Building, Company Operations facilities	152,499	195,203	347,702	41,007	June 2011	April 2013
ORTC								
Barracks and Dining Facility	**69121**	Standard BCT barracks and dining facility	553,540	33,804	587,344	10,500	March 2009	March 2011
Phys Fitness CTR	**71165**	Physical Fitness Facility: includes fitness, exercise, gym, and activity modules. Includes natatorium	64,799	129,598	194,397	-	March 2009	September 2010
Child Development CTR	**71171**	Standard Design CDC for 0-5 years of age and one for 6-10 years of age, one standard play and activity area for each age group	79,650	156,000	235,650	-	March 2009	September 2010
Headquarters	**71176**	BCT Brigade and Battalion headquarters	145,176	15,993	161,169	-	March 2009	March 2011
Company Ops	**71178**	Standard design BCT Company Operations Facilities	368,964	64,596	433,560	-	March 2009	March 2011
Tactical Equip Maintenance	**71198**	Standard BCT vehicle and equipment maintenance and storage facilities with parking	225,255	1,399,599	1,624,854	-	March 2009	March 2011
Infrastructure	**71208**	Includes road improvements, tank trail relocation, earthwork, parking and utilities		1,047,558			March 2009	March 2010
Fire station	**71221**	Construct a two-company main fire station	24,143	10,800	34,943	-	March 2010	March 2011
Central Vehicle Wash	**71222**	Centralized Wash Facility to include tank trail	-	51,390		-	March 2010	March 2011

Project Name	Project Number	Brief Scope Description	Building Area (SF)	Paved Area (SF)	Construction Area (SF)	Demolition (SF)	Construction Start	Construction End
Gate 6 ACP	**71223**	Access Control Point (ACP) at Gate 6 for Commercial, military, and registered passenger vehicles to include roads, parking, vehicle barriers, and buildings	3,504	260,640	264,144	-	March 2010	March 2011
Gate 19 ACP	**71249**	ACP at Gate 19 for Commercial, military, and registered passenger vehicles to include roads,parking, vehicle barriers, and buildings	3,504	107,479	110,983	-	March 2010	March 2011
Crows foot ACP	**71273**	ACP at Crow's Foot Gate for military and registered passenger vehicles. The ACP includes roadways, parking, passive and active vehicle barriers, with comprehensive control systems, and buildings	1,320	72,454	73,774	-	March 2010	March 2011
Ranges								
Modified Record Fire (MRF)	72170	Upgrade to Range 65 to a standard design Modified Record Fire (MRF) Range	5,418	32,103	18	-	March 2010	March 2011
Automated Multi-Purpose Machine Gun (MPMG)	72171	Upgrade to Range 121C to an Automated Multi-purpose Machine Gun	3,424	6,480	266	-	March 2010	March 2011
Scout Reconnaissance (RECCE) Gunnery	72172	Upgrade to Range 127 to a Scout Reconnaissance Gunnery Range	1,336	18,526	19,862	-	March 2010	March 2011
Convoy Live-Fire Training facility	72177	Upgrade to Range 127a to a Convoy Live Fire training facility	10,040	3,600	0.4	800	March 2010	March 2011
Urban Assault Course (UAC)	72173	Training Area 51 construction to an Urban Assault Course	1,120	17,100	7.5	-	March 2010	March 2011
Qualification Training Range (QTR)	71693	Upgrade to Range 115 to a Qualification Training Range	3,512	6,480	60	-	March 2010	March 2011

Source: Tom Wiersma, Fort Carson Master Planner, Directorate of Public Works

APPENDIX C
AIR QUALITY SUPPORTING DOCUMENTATION

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DRAFT

Prevention of Significant Deterioration (PSD) Applicability Analysis

for

US Army Garrison (USAG) Fort Carson

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson

Fort Carson, Colorado

URS

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June 2008

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PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPLICABILITY ANALYSIS

for

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Fort Carson, Colorado

Prepared for
USAG Fort Carson
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Under US Army Corps of Engineers, Contract No. W91278-07-D-0078,
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6 June 2008

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Appendices

Appendix A Emission Calculations for Grow the Army Projects - 2008 Construction EIS

List of Acronyms

AAFES	Army and Air Force Exchange Service
bhp	brake horsepower
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CY	calendar year
DECAM	Fort Carson Directorate of Environmental Compliance and Management
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
Fort Carson	US Army Garrison (USAG) Fort Carson
GTA	Grow the Army
km^2	square kilometers
MMBtu/hr	million British thermal units per hour
NO_x	nitrogen oxides
PM_{10}	Particulate Matter with an aerodynamic diameter less than 10 micrometers
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
SIC	Standard Industrial Classification
SO_x	sulfur oxides
tpy	tons per year
USAG	US Army Garrison
VOC	volatile organic compound

Executive Summary

New major stationary sources of air emissions or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology.

This document demonstrates that the proposed Grow the Army (GTA) activities at US Army Garrison (USAG) Fort Carson (Fort Carson) will not be subject to the PSD permitting requirements under New Source Review regulations based on the following findings:

- Fort Carson is currently classified as a major stationary source because it has the potential to emit (PTE) over 250 tons per year (tpy) of nitrogen oxides (NO_x), as shown in Table ES-1.
- Fort Carson's boilers and hot water generators are classified as a major stationary source because they have a combined heat input of over 250 million British thermal units per hour, and they have a PTE over 100 tpy of NO_x and carbon monoxide (CO).
- The increase in emissions due to GTA activities is less than the applicable major modification threshold for all criteria pollutants, as shown in Table ES-2.

Table ES-1. Current PTE at Fort Carson

Pollutant	Post-wide PTE (tpy)	Boilers and Hot Water Generators PTE (tpy)
NO_x	**312.29**	**168.95**
Sulfur Oxides (SO_x)	65.73	46.82
CO	210.56	**148.85**
Volatile Organic Compounds (VOCs)	94.58	9.77
Particulate Matter	55.84	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	55.20	14.95

Table ES-2. PTE Increase from Proposed Stationary Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOCs (tpy)	Lead (tpy)
Proposed Stationary Point Sources	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

1.0 Background

Due to activities associated with Grow the Army (GTA), the number of personnel at US Army Garrison (USAG) Fort Carson (Fort Carson) and its support facilities will increase. Consequently, emissions will increase due to the addition of the following emission sources:

- Stationary external combustion sources (i.e., boilers, hot water generators, furnaces, space heaters, and domestic water heaters) with a combined total heat input of approximately 90 million British thermal units per hour (MMBtu/hr); and
- Three stationary internal combustion sources (i.e., emergency generators) with a brake horsepower (bhp) rating of 749 each.

New major stationary sources or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology. This document demonstrates that the proposed modifications at Fort Carson are not a major modification and, therefore, will not be subject to PSD permitting.

2.0 Location Description

Fort Carson consists of military support facilities and extensive training areas, including over fifty ranges, other training locations, and the Butts Army Air Field. The Army installation is located in the east-central portion of Colorado at the foot of the Rocky Mountain Front Range. Fort Carson occupies land between the cities of Colorado Springs and Pueblo, a distance of approximately 25 miles. The northwest tip of the installation is located in El Paso County and lies within the Colorado Springs metropolitan area, approximately 8 miles south of downtown Colorado Springs (population 360,890). This area comprises approximately 22.3 square kilometers (km^2) and is known as the Cantonment Area. The Cantonment Area contains military housing, facilities, and the Post Headquarters. The balance of training rangeland occupies approximately 535 km^2 in southern El Paso, Fremont, and Pueblo Counties. Fort Carson's boundaries are adjacent to Colorado Springs to the north, State Highway 115 to the west, private land to the south, and Interstate 25 to the east. Land use adjacent to Fort Carson includes municipal, residential, agricultural, industrial, and other privately held interests. Fort Carson measures from 2 to 15 miles in width east to west and 24 miles in length north to south.

The majority of the air pollutant-emitting sources at Fort Carson are located in the Cantonment Area, which is located in El Paso County. Other than military training involving fog oil and graphite, there are no significant stationary point sources located in the training range area.

Fort Carson is located in an attainment area for all criteria pollutants. There are no federal Class I designated areas within 100 kilometers of the facility. Florissant Fossil Beds National Monument is a federal land area within 100 kilometers of the facility. Florissant Fossil Beds has been designated by the State of Colorado to have the same sulfur dioxide increment as a federal Class I area (Colorado Department of Public Health and Environment [CDPHE] 1998).

3.0 PSD Program Description

New major stationary sources or major modifications to existing stationary sources are required to obtain PSD preconstruction permits. The PSD permitting process requires the applicant to demonstrate that the project will have no significant deterioration of ambient air quality in an attainment area. The following are elements and associated information necessary for determining PSD applicability of a new source:

- Define the source by determining all related activities under the same two-digit Standard Industrial Classification (SIC) code that are controlled by the same owner or operator and located on contiguous or adjacent properties, including all support facilities.
- Define the applicability thresholds for the major stationary source.
- Define the source's potential to emit (PTE) by determining the sum of emissions for each pollutant from each emission unit. This calculation includes fugitive emissions from the 28 source categories listed in Table 3-1 and sources subject to New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants as of 7 August 1980.
- Assess local area attainment status by determining whether the area is in an attainment or unclassifiable region for at least one criteria pollutant. PSD applies only in attainment or unclassifiable regions.
- Determine the pollutants that are subject to PSD review. Each attainment and other regulated pollutant emitted in "significant" quantities are also included.
- Compare the source's PTE to the appropriate major source thresholds. The source is a major source if the emissions of any pollutant exceed applicable threshold regardless of the area designation (i.e., attainment, non-attainment, or non-criteria pollutants). If an individual unit is classified as one of the 28 regulated source categories (Table 3-1) and its emissions exceed 100 tons per year (tpy), then the unit is a major source. If the facility is not classified as one of the 28 regulated source categories and if its emissions exceed 250 tpy, then the facility is a major source.

Table 3-1. PSD Source Categories with 100 tpy Major Source Thresholds

1. Coal cleaning plants (with thermal dryers)	15. Coke oven batteries
2. Kraft pulp mills	16. Sulfur recovery plants
3. Portland cement plants	17. Carbon black plants (furnace process)
4. Primary zinc smelters	18. Primary lead smelters
5. Iron and steel mills	19. Fuel conversion plants
6. Primary aluminum ore reduction plants	20. Sintering plants
7. Primary copper smelters	21. Secondary metal production plants
8. Municipal incinerators capable of charging more than 250 tons of refuse per day	22. Chemical process plants
9. Hydrofluoric acid plants	23. Fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input
10. Sulfuric acid plants	24. Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
11. Nitric acid plants	25. Taconite ore processing plants
12. Petroleum refineries	26. Glass fiber processing plants
13. Lime plants	27. Charcoal production plants
14. Phosphate rock processing plants	28. Fossil fuel-fired steam electric plants of more than 250 MMBtu/hr heat input

Major modifications are subject to the PSD review only if:

- The existing source that is modified is a "major" source and the net emissions increase resulting from the modification is "significant"; or
- The modification is made at a minor source, and that change by itself qualifies as a new major source.

4.0 Current PSD Status

The first step in determining PSD applicability at Fort Carson is to determine whether the facility is classified as a major stationary source. This determination is based on the facility's PTE, which is defined as follows.

> "Potential to emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable." [40 *Code of Federal Regulations* (CFR) 52.21(b)(4)].

Several source categories at Fort Carson were not included when calculating PTE, based on United States Environmental Protection Agency (EPA) guidance:

- Mobile sources and non-road engines were excluded based on EPA guidance, which states "Nonroad engines are a category of units/equipment that, under the Clean Air Act Section 302(z), are excluded from the definition of 'stationary source,' and, hence, are exempt from stationary source permitting requirements." (EPA 2001).
- Sources under the control of the National Guard were excluded based on EPA guidance, which states "when making major source determinations at a military installation, the Agency believes it is appropriate to consider pollutant-emitting activities that are under the control of different military services not to be under common control. Activities under the control of the National Guard may be considered under separate control from activities under the control of military services." (EPA 1996).
- Certain personnel-related activities, including Army and Air Force Exchange Service gas stations (SIC code 55), residential housing (SIC code 95), and schools (SIC code 82) were excluded from PTE calculations based on EPA guidance, which states "Military installations include numerous activities that are not normally found at other types of sources. These types of activities include residential housing, schools, day care centers, churches, recreational parks, theaters, shopping centers, grocery stores, gas stations, and dry cleaners. These activities are located on military installations for the convenience of military personnel (both active duty and retired), their dependents, and Department of Defense (DoD) civilian employees working on the base, and they often do not represent essential activities related to the primary military activity(ies) of the base. Therefore, the EPA believes these types of activities may appropriately be considered not to be support facilities to the primary military activities of a base. As such, these activities may be treated as separate sources for all purposes for which an industrial grouping distinction is allowed. Such activities should be separately evaluated for common control, SIC code, and support facility linkages to determine if a major source is present." (EPA 1996).

- Fugitive emission sources were excluded based on EPA guidance, which states "if the primary activity of a stationary source falls within a source category that is not listed, then as a general matter, fugitive emissions from the emissions units at the source are not included in determining whether the source is a major stationary source. However, if the source also contains emission units which do fall within a listed source category (or categories), then you include fugitive emissions from these listed emissions units to determine if the source is a major stationary source." (EPA 2003).

The sources included in the PTE calculation are listed in Appendix A, Table A-1. The current PTE for each source and the assumptions used to calculate it are provided in Appendix A, Table A-2. Additional details on PTE calculations are provided in the Fort Carson Air Emission Inventory for Calendar Year (CY) 2006 (Fort Carson Directorate of Environmental Compliance and Management [DECAM] 2007).

Fort Carson is subject to regulation as a major stationary source if its PTE exceeds the following applicability thresholds:

- Boilers and hot water generators – 100 tpy threshold: Fort Carson's boilers and hot water generators have a total combined heat input of approximately 599 MMBtu/hr. Therefore, they are regulated as one of the 28 PSD source categories (i.e., Category 23, fossil-fuel boilers [or combination thereof] totaling more than 250 MMBtu/hr) and are subject to a major source threshold of 100 tpy [40 CFR 52.21(b)(1)(i)(a)]. This 100-tpy threshold applies only to the boilers and hot water generators.
- Post-wide - 250 tpy threshold: Fort Carson as a whole is subject to a major source threshold of 250 tpy based on its SIC of national defense (i.e., SIC code 97) [40 CFR 52.21(b)(1)(i)(b)].

As shown in Table 4-1, Fort Carson is currently classified as a major stationary source because it has a PTE over 250 tpy of nitrogen oxides (NO_x) (i.e., PTE of 312 tpy). Additionally, Fort Carson's boilers and hot water generators are classified as a major source (source within a source) because they have the PTE over 100 tpy of NO_x and carbon monoxide (CO) (i.e., PTE of 169 and 149 tpy, respectively). Based on its status as a major source, Fort Carson is subject to PSD permitting if it exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2.:

Table 4-1. Fort Carson Actual Emissions and Current PTE

Pollutant	Post-wide		Boilers and Hot Water Generators Only	
	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)
NO_x	61.6	**312.29**	34.18	**168.95**
Sulfur Oxides (SO_x)	2.0	65.73	0.39	46.82
CO	42.2	210.56	30.9	**148.85**
Volatile Organic Compounds (VOCs)	39.3	94.58	2.02	9.77
Particulate Matter	16.7	55.84	2.82	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	14.8	55.20	2.81	14.95

Table 4-2. Major Modification Thresholds Applicable to Proposed Sources at Fort Carson

	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Lead (tpy)
Major Source Modification Threshold	15	40	100	40	40	0.6

5.0 PSD Applicability

Based on its status as a major source, Fort Carson is subject to PSD permitting if the PTE increase from the proposed modification exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2. For purposes of this analysis, the modification is defined as the GTA sources included in the GTA Environmental Impact Statement (EIS). Although the Combat Aviation Brigade (CAB) is also included in the GTA EIS, this is done for convenience. The CAB is not considered part of the same modification and, therefore, is not included in this analysis. The treatment of the GTA and CAB sources as two separate modifications is supported by EPA guidance (EPA 1989) and a past CDPHE concurrence letter for a similar determination (CDPHE 2007).

Using Fort Carson specifications, new external combustion sources for this project were assumed to be equipped with low-NO_x burners with a NO_x emission concentration of 30 parts per million (ppm) or lower. Internal combustion sources for this project were assumed to meet Tier III emission standards (40 CFR Part 89.112), and be permitted with an operational limit of 250 hours per year.

Assumptions used to calculate the proposed PTE increase are provided in Table 5-1. The PTE for the proposed modification is shown in Table 5-2. Detailed emission calculations are provided in Appendix A, Tables A-3 through A-6.

Table 5-1. Proposed Combustion Sources at Fort Carson

Description	Size	Annual Hours of Operation
Proposed Exempt External Combustion Units, Low-NO_x (30 ppm)	90.3 MMBtu/hr Total	8,760
Proposed Exempt Internal Combustion Units, Emergency Generators >600 horsepower	2,247 bhp Total	250

Table 5-2. Potential Emission Increase from Proposed Combustion Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	VOC (tpy)	Lead (tpy)
Proposed Combustion Units	3.04	16.93	34.17	0.35	2.31	negligible
Major Modification Threshold	15	40	100	40	40	0.6

As shown in Table 5-2, the proposed modifications at Fort Carson will not be subject to PSD review because the proposed emission increase will be below the major modification threshold.

6.0 References

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Appendix A

Emission Calculations for Grow the Army Projects – 2008 Construction EIS

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Boilers and Hot Water Generators				
Bldg 1860 Hot Water Generators (2 @ 47 MMBtu/hr each)	Y	Y	Y	YES
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	Y	Y	Y	YES
Bldg 6290 Boilers (2 @ 40 MMBtu/hr each)	Y	Y	Y	YES
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	Y	Y	Y	YES
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	Y	Y	Y	YES
Bldg 8300 Boiler (12.553 MMBtu/hr)	Y	Y	Y	YES
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	Y	Y	Y	YES
Existing Categorically Exempt Boilers Standard Configuration	Y	Y	Y	YES
Existing Categorically Exempt Low NOx Boilers	Y	Y	Y	YES
Proposed Exempt Low NOx Boilers	Y	Y	Y	YES
Other External Combustion Sources				
Existing Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
Proposed Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
External Combustion Units in Residential Housing	Y	Y	N	NO
Internal Combustion Units				
Bldg 1550 Generator	Y	Y	Y	YES
Bldg 3909 Generator	Y	Y	Y	YES
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	Y	Y	Y	YES
Bldg 8000 Dynamometers	Y	Y	Y	YES
Butts Air Field Engine Test Stand	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators <600hp	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators >600hp	Y	Y	Y	YES
Categorically Exempt Natural Gas/Propane Emergency Generators	Y	Y	Y	YES
Auxiliary Ground Power Units	N	Y	Y	NO
Coating Activities				
Bldg 207 Paint Booth	Y	Y	Y	YES
Bldg 2427 Paint Booth	Y	Y	Y	YES
Bldg 8000 Paint Booths	Y	Y	Y	YES
Bldg 9551 Range Paint Booth	Y	Y	Y	YES
Bldg 9635 (Butts Air Field Paint Booth)	Y	Y	Y	YES
Fuel Dispensing				
Bldg 900 Service Station	Y	Y	N	NO
Bldg 1515 Service Station	Y	Y	N	NO
Bldg 3600 Service Station	Y	Y	N	NO
COCO Facility--Refueling (Service Stations and Bulk Fuel)	Y	Y	Y	YES
Categorically Exempt Storage Tanks and Associated Operations				
Diesel (No. 2 Oil) Storage Tanks	Y	Y	Y	YES
Glycol Storage Tanks	Y	Y	Y	YES
JP-8 Storage Tanks	Y	Y	Y	YES
MOGAS Storage Tanks	Y	Y	Y	YES
Military Training				
Munition Firing	N	N	Y	NO
Smoke Munitions	N	N	Y	NO
Open Burning/Open Detonation	N	N	Y	NO
Fog Oil and Graphite	Y	Y	Y	YES

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Chemical Usage				
Basewide Chemical Usage	N	N	Y	NO
Pesticide Use	N	N	Y	NO
Road Paint Striping	N	N	Y	NO
Solvent Use	Y	N	Y	NO
X-Ray	Y	N	Y	NO
Landfill-Related Emissions				
Municipal Landfill	Y	N	Y	NO
Miscellaneous Particulate Emissions				
Abrasive Blasting	Y	Y	Y	YES
Bldg 1864 Cooling Towers	Y	N	Y	NO
Bldg 7501 Cooling Towers	Y	N	Y	NO
LB&B Yard	Y	N	Y	NO
Rocky Mountain Asphalt Yard	Y	N	Y	NO
Troop Construction Yard	Y	N	Y	NO
Tank Trails	Y	N	Y	NO
Fire Training				
Fire Training Facility	Y	Y	Y	YES
Prescribed Burning				
Prescribed Burning	Y	N	Y	NO
Miscellaneous APEN/Permit Exempt Sources				
Industrial Wastewater Treatment Plant	Y	N	Y	NO
Sewage Treatment Plant	Y	N	Y	NO
Soil Vapor Extraction Systems	Y	Y	Y	YES

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Method of Determining PTE
Boilers and Hot Water Generators							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	2.01	2.01	23.00	12.83	19.60	0.85	Permit limits (95OPEP110)
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	1.08	0.83	7.95	7.26	9.80	0.48	Permit limits (07EP0205)
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.96	0.96	7.22	6.29	8.91	0.42	Permit limits (95OPEP110)
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.41	Permit limits (95OPEP110)
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.77	0.68	4.11	6.80	7.15	0.45	Permit limits (95OPEP110)
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.06	Permit limits (95OPEP110)
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.10	Permit limits (95OPEP110)
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.005	0.04	Permit limits (95OPEP110)
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.36	0.36	4.65	3.82	0.56	0.25	Permit limits (95OPEP110)
Existing Categorically Exempt Boilers Standard Configuration	8.15	8.15	107.21	90.05	0.64	5.90	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 20 ppm	1.00	1.00	3.15	11.04	0.08	0.72	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.10	8760 hours of operation
Source Category Total	**15.30**	**14.95**	**168.95**	**148.85**	**46.82**	**9.77**	
Other External Combustion Sources							
Categorically Exempt Miscellaneous External Combustion Units	3.33	3.33	43.83	36.81	0.26	2.41	8760 hours of operation
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.08	0.08	1.42	1.75	0.04	0.21	Permit limits (07EP0293)
Bldg 1550 Generator (1550 hp)	0.27	0.16	9.30	2.13	1.57	0.25	Permit limits (95OPEP110)
Bldg 3909 Generator (1620 hp)	0.28	0.16	9.72	2.23	1.64	0.26	Permit limits (95OPEP110)
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.26	0.26	29.03	4.62	9.43	0.26	Permit limits (05EP0230) & APEN
Bldg 8000 Dynamometers	1.10	1.10	15.50	3.34	2.02	1.26	Permit limits (95OPEP110)
Butts Air Field Engine Test Stand	0.34	0.34	3.03	4.33	1.71	1.63	Permit limits (95OPEP110)
Categorically Exempt Diesel Emergency Generators <600hp	1.66	1.66	23.40	5.04	1.55	1.86	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Diesel Emergency Generators >600hp	0.12	0.07	4.13	0.95	0.70	0.12	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Natural Gas/Propane Emergency Generators	0.047	0.047	3.87	0.47	0.0007	0.15	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Source Category Total	**4.16**	**3.87**	**99.40**	**24.86**	**18.65**	**5.99**	

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Method of Determining PTE
Coating Activities							
Bldg 207 Paint Booth	0.0013	0.0013	0	0	0	0.11	Actual emissions multiplied by a growth factor of 1.25
Bldg 2427 Paint Booth	0.0040	0.0040	0	0	0	0.29	Actual emissions multiplied by a growth factor of 1.25
Bldg 8000 Paint Booths	0.84	0.84	0	0	0	15.66	Permit limits (95OPEP110)
Bldg 9551 Range Paint Booth	0.0091	0.0091	0	0	0	0.65	CY 2002 actual emissions multiplied by a growth factor of 1.25
Bldg 9635 (Butts Air Field Paint Booth)	0.2744	0.2744	0	0	0	0.44	Permit limits (95OPEP110)
Source Category Total	**1.13**	**1.13**	**0.00**	**0.00**	**0.00**	**17.15**	
Fuel Dispensing							
COCO Facility--Refueling (Service Stations and Bulk Fuel)	0	0	0	0	0	7.69	Permit Limits (04EP0762)
Categorically Exempt Storage Tanks and Associated Operations							
Diesel (No. 2 Oil) Storage Tanks	0	0	0	0	0	0.42	24 turnovers per year
Glycol Storage Tanks	0	0	0	0	0	0.00036	24 turnovers per year
JP-8 Storage Tanks	0	0	0	0	0	9.5	24 turnovers per year
MOGAS Storage Tanks	0	0	0	0	0	9.73	Actual emissions multiplied by a growth factor of 1.25
Source Category Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.68**	
Military Training							
Mechanical Smoke Generators	31.82	31.82	0.00	0.00	0.00	31.82	Permit limits (95OPEP110)
Miscellaneous Particulate Emissions							
Abrasive Blasting	0.07	0.07	0	0	0	0	Permit limits (95OPEP110).
Fire Training							
Fire Training Facility	0.02	0.02	0.11	0.04	0.00	0.06	APEN limit of 4000 gal/CDPHE concurrence
Installation-wide Subtotal *(Boilers and Hot Water Generators Only)*	15.30	14.95	168.95	148.85	46.82	9.77	
Installation-wide Total	**55.84**	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**	

Table A-3. Criteria Pollutant
Grow the Army - Emission Summary

Potential Emissions

Pollutant	External Combustion		Internal Combustion		Total	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
NOx	3.19	13.95	23.78	2.97	26.96	16.93
CO	7.43	32.56	12.88	1.61	20.31	34.17
VOC	0.49	2.13	1.44	0.18	1.93	2.31
SO2	0.05	0.23	0.91	0.11	0.96	0.35
PM10	0.67	2.95	0.74	0.09	1.42	3.04

Table A-4. Grow the Army
Internal Combustion Heat Input Estimates

Grow the Force Projects (2008 Construction EIS)					
PROJECT NUMBER	**PROJECT NAME**	**SQUARE FOOTAGE[1]**	**Number of Bldg./ Stories**	**TOTAL HEAT INPUT (BTU/HR/Sq.Ft.)[2]**	**TOTAL HEAT INPUT (MMBtu/hr)**
71176	**Brigade Combat Team (L) H.Q.**	**145,176**			
Reviewed	Total Heated Sq. Ft.	**145,176**			
4/10/2008	Total Parking Sq. Ft.	**0**			
*	*Brigade H.Q.*	40,300	2	60	2.4
	Battalion H.Q.	104,876	2	60	6.3
69121	**BCT (L) Barracks and DFAC**	**587,344**			
Reviewed	Total Heated Sq. Ft.	**553,540**			
4/10/2008	Total Parking Sq. Ft.	**33,804**			
	Unac. Enl. Housing (barracks)	527,040	4/4	55	29.0
	POV Parking	33,804			
	Dinning Facility	26,500	1	150	4.0
71178	**BCT (L) Company Ops.**	**472,134**			
Reviewed	Total Heated Sq. Ft.	**368,964**			
4/10/2008	Total Parking Sq. Ft.	**103,170**			
	Company Operations Facilities	368,964	2	60	22.1
	Access and Service Surfaces	38,574			
	Company Operations Covered Hardstands	64,596			
71198	**BCT (L) TEMF Tact. Equip. Maintenance**	**1,638,215**			
Reviewed	Total Heated Sq. Ft.	**224,810**			
4/10/2008	Total Parking Sq. Ft.	**1,413,405**			
	Vehicle Maintenance Shop	159,870	1	75	12.0
	Organizational Vehicle Parking	1,399,599			
	Organizational Storage Facility	42,300	1	55	2.3
	Oil Storage Building	2,820	1	35	0.1
	HAZMAT Storage Building	2,820	1	35	0.1
	Tact. Unmanned Aerial Veh. Hanger	9,000	1	45	0.4
	Dist. Company Storage	8,000	1	45	0.4
	Open Dist. Company Storage	4,005	1		
69795	**Quarter Master Facilities**	**289,189**			
Reviewed	Total Heated Sq. Ft.	**38,530**			
4/10/2008	Total Parking Sq. Ft.	**250,659**			
	Vehicle Maintenance Shop	18,000	1	75	1.4
	Organizational Vehicle Parking	202,059			
	Company Operations Facilities	17,730	2	60	1.1
	Covered Hardstand	3,000			
	Organizational Storage Facility	2,800	1	55	0.2
67137	**EN BN Complex**	**326,415**			
Reviewed	Total Heated Sq. Ft.	**92,829**			
4/10/2008	Total Parking Sq. Ft.	**233,586**			
	Vehicle Maintenance Shop	25,152	1	75	1.9
	Organizational Vehicle Parking	62,136			
	POV Parking	171,450			
	Company Operations Facilities	64,802	2	60	3.9
	Oil Storage Building	660	1	35	0.0
	Deployed Equipment Storage	2,215	1	55	0.1
71171	**Child Development Center (2)(Totals)**	**71,650**			
Reviewed	Total Heated Sq. Ft.	**31,650**			
4/10/2008	Total Parking Sq. Ft.	**40,000**			
	Building	31,650	1	85	2.7
	Parking	40,000			
XXXX	**BCT Infrastructure (Cantonment)**	**0**			
Reviewed	Total Heated Sq. Ft.	**0**			
4/10/2008	Total Parking Sq. Ft.	**0**			
XXXX	**Land Fill Removal (partial or whole)**	**0**			
Reviewed	Total Heated Sq. Ft.	**0**			
4/10/2008	Total Parking Sq. Ft.	**0**			
Total Heated Sq. Ft. for Boilers/Other External Combustion Units		1,455,499		1,175	90.3

1.) Heated Sq. Ft. estimate made from Project 1391 numbers.
2.) BTU input taken from BRAC projects that were similar in scope and size for which we have estimates from the COE, or actual data from project plan reviews.

Table A-5. Grow the Army External Combustion Emissions

Fuel Heating Value (LHV)	1020	Btu/scf
Total Heat Rate (LHV)	90.27	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	775.24	MMscf/yr

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	PTE Hrs of Operation (hrs/yr)	Estimated Emissions		Source of Emission Factor
				(lb/hr)	(tpy)	
NOx	36.00	90.27	8760	3.19	13.95	Fort Carson[1]
CO	84.00	90.27	8760	7.43	32.56	AP-42[2]
VOC	5.50	90.27	8760	0.49	2.13	AP-42[3]
SO2	0.60	90.27	8760	0.05	0.23	AP-42[3]
PM10	7.60	90.27	8760	0.67	2.95	AP-42[3]

[1] NOx emissions based on natural gas-fired combustion equipment with NOx concentration of 30 ppm in exhaust per Fort Carson specifications.

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

Table A-6. Grow the Army Internal Combustion Emissions

Engine Usage	Emergency Generator	
Engine Configuration	Diesel	
Emission Controls	None	
Number of Engines	3	
Site Rating	749	BHP each
Potential Operation	250	hr/yr

Potential Emissions - Per Engine

Pollutant	Emission Factor		Nominal Rating	PTE Hrs of Operation	Estimated Emissions per Engine		Source of Emission Factor
	lb/hp-hr	(g/hp-hr)	(hp)	(hrs/yr)	(lb/hr)	(tpy)	
NOx	0.0106	4.80	749	250	7.93	0.99	40 CFR Part 89[1]
CO	0.0057	2.60	749	250	4.29	0.54	40 CFR Part 89[1]
VOC	0.00064	0.29	749	250	0.48	0.06	AP-42[2]
SO2	4.05E-04	0.18	749	250	0.30	0.04	AP-42[2]
PM10	0.00033	0.15	749	250	0.25	0.03	40 CFR Part 89[1]

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, CO and PM/PM10 are based on us EPA's Tier 3 emission standards for generators with a rated power of 130 to 560 KW. 3.0 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM10. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] EPA AP-42, Volume I, Fifth Edition - October 1996, Table 3.3-1, Uncontrolled Emission Factors for Diesel Industrial Engines

Total Emissions - All Three Engines

Pollutant	Estimated Emissions All Engines	
	(lb/hr)	(tpy)
NOx	23.78	2.97
CO	12.88	1.61
VOC	1.44	0.18
SO2	0.91	0.11
PM10	0.74	0.09

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Prevention of Significant Deterioration (PSD) Applicability Analysis

For

Combat Aviation Brigade (CAB), US Army Garrison (USAG) Fort Carson

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson

Fort Carson, Colorado

URS

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July 2008

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PREVENTION OF SIGNIFICANT DETERIORATION (PSD) APPLICABILITY ANALYSIS

for

Combat Aviation Brigade (CAB), US Army Garrison (USAG) Fort Carson Fort Carson, Colorado

Prepared for
USAG Fort Carson
Directorate of Public Works, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078,
Delivery Order 0005 (URS Project No. 39455606)

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15 July 2008

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Appendices

Appendix A Emission Calculations for Combat Aviation Brigade Projects - 2008 Construction EIS

List of Acronyms

AAFES	Army and Air Force Exchange Service
bhp	brake horsepower
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CY	calendar year
DECAM	Fort Carson Directorate of Environmental Compliance and Management
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
Fort Carson	US Army Garrison (USAG) Fort Carson
GTA	Grow the Army
km^2	square kilometers
MMBtu/hr	million British thermal units per hour
NO_x	nitrogen oxides
PM_{10}	Particulate Matter with an aerodynamic diameter less than 10 micrometers
ppm	parts per million
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
SIC	Standard Industrial Classification
SO_x	sulfur oxides
tpy	tons per year
USAG	US Army Garrison
VOC	volatile organic compound

Executive Summary

New major stationary sources of air emissions or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology.

This document demonstrates that the proposed Combat Aviation Brigade (CAB) activities at US Army Garrison (USAG) Fort Carson (Fort Carson) will not be subject to the PSD permitting requirements under New Source Review regulations based on the following findings:

- Fort Carson is currently classified as a major stationary source because it has the potential to emit (PTE) over 250 tons per year (tpy) of nitrogen oxides (NO_x), as shown in Table ES-1.
- Fort Carson's boilers and hot water generators are classified as a major stationary source because they have a combined heat input of over 250 million British thermal units per hour, and they have a PTE over 100 tpy of NO_x and carbon monoxide (CO).
- The increase in emissions due to CAB activities is less than the applicable major modification threshold for all criteria pollutants, as shown in Table ES-2.

Table ES-1. Current PTE at Fort Carson

Pollutant	Post-wide PTE (tpy)	Boilers and Hot Water Generators PTE (tpy)
Nitrogen Oxides (NO_x)	**312.29**	**168.95**
Sulfur Oxides (SO_x)	65.73	46.82
Carbon Monoxide (CO)	210.56	**148.85**
Volatile Organic Compounds (VOCs)	94.58	9.77
Particulate Matter	55.84	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	55.20	14.95

Table ES-2. PTE Increase from Proposed Stationary Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOCs (tpy)	Lead (tpy)
Proposed Stationary Point Sources	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

1.0 Background

Due to the addition of a Combat Aviation Brigade (CAB), the number of personnel and support facilities at US Army Garrison (USAG) Fort Carson (Fort Carson) will increase. Consequently, emissions will increase due to the addition of the following emission sources:

- Stationary external combustion sources (i.e., boilers, hot water generators, furnaces, space heaters, and domestic water heaters) with a combined total heat input of approximately 73 million British thermal units per hour (MMBtu/hr); and
- Three stationary internal combustion sources (i.e., emergency generators) with a brake horsepower (bhp) rating of 755 each.

New major stationary sources or major modifications to existing stationary sources are required to obtain Prevention of Significant Deterioration (PSD) preconstruction permits. A source that is subject to PSD permitting must demonstrate through dispersion modeling that no significant deterioration of ambient air quality will occur. Additionally, the applicant must control emissions using the Best Available Control Technology. This document demonstrates that the proposed modifications at Fort Carson are not a major modification and, therefore, will not be subject to PSD permitting.

2.0 Location Description

Fort Carson consists of military support facilities and extensive training areas, including over fifty ranges, other training locations, and the Butts Army Air Field. The Army installation is located in the east-central portion of Colorado at the foot of the Rocky Mountain Front Range. Fort Carson occupies land between the cities of Colorado Springs and Pueblo, a distance of approximately 25 miles. The northwest tip of the installation is located in El Paso County and lies within the Colorado Springs metropolitan area, approximately 8 miles south of downtown Colorado Springs (population 360,890). This area comprises approximately 22.3 square kilometers (km^2) and is known as the Cantonment Area. The Cantonment Area contains military housing, facilities, and the Post Headquarters. The balance of training rangeland occupies approximately 535 km^2 in southern El Paso, Fremont, and Pueblo Counties. Fort Carson's boundaries are adjacent to Colorado Springs to the north, State Highway 115 to the west, private land to the south, and Interstate 25 to the east. Land use adjacent to Fort Carson includes municipal, residential, agricultural, industrial, and other privately held interests. Fort Carson measures from 2 to 15 miles in width east to west and 24 miles in length north to south.

The majority of the air pollutant-emitting sources at Fort Carson are located in the Cantonment Area, which is located in El Paso County. Other than military training involving fog oil and graphite, there are no significant stationary point sources located in the training range area.

Fort Carson is located in an attainment area for all criteria pollutants. The Great Sand Dunes National Park and Preserve is a federal Class I designated area within 100 kilometers of the facility. Florissant Fossil Beds National Monument is a Class II area within 100 kilometers of the facility which has been designated by the State of Colorado to have the same sulfur dioxide increment as a federal Class I area. [Colorado Department of Public Health and Environment (CDPHE) Regulation 3, Part D, VIII.B]

3.0 PSD Program Description

New major stationary sources or major modifications to existing stationary sources are required to obtain PSD preconstruction permits. The PSD permitting process requires the applicant to demonstrate that the project will have no significant deterioration of ambient air quality in an attainment area. The following are elements and associated information necessary for determining PSD applicability of a new source:

- Define the source by determining all related activities under the same two-digit Standard Industrial Classification (SIC) code that are controlled by the same owner or operator and located on contiguous or adjacent properties, including all support facilities.
- Define the applicability thresholds for the major stationary source.
- Define the source's potential to emit (PTE) by determining the sum of emissions for each pollutant from each emission unit. This calculation includes fugitive emissions from the 28 source categories listed in Table 3-1 and sources subject to New Source Performance Standards or National Emission Standards for Hazardous Air Pollutants as of 7 August 1980.
- Assess local area attainment status by determining whether the area is in an attainment or unclassifiable region for at least one criteria pollutant. PSD applies only in attainment or unclassifiable regions.
- Determine the pollutants that are subject to PSD review. Each attainment and other regulated pollutant emitted in "significant" quantities is also included.
- Compare the source's PTE to the appropriate major source thresholds. The source is a major source if the emissions of any pollutant exceed the applicable threshold regardless of the area designation (i.e., attainment, non-attainment, or non-criteria pollutants). If an individual unit is classified as one of the 28 regulated source categories (Table 3-1) and its emissions exceed 100 tons per year (tpy), then the unit is a major source. If the facility is not classified as one of the 28 regulated source categories and if its emissions exceed 250 tpy, then the facility is a major source.

Table 3-1. PSD Source Categories with 100 tpy Major Source Thresholds

1. Coal cleaning plants (with thermal dryers)	15. Coke oven batteries
2. Kraft pulp mills	16. Sulfur recovery plants
3. Portland cement plants	17. Carbon black plants (furnace process)
4. Primary zinc smelters	18. Primary lead smelters
5. Iron and steel mills	19. Fuel conversion plants
6. Primary aluminum ore reduction plants	20. Sintering plants
7. Primary copper smelters	21. Secondary metal production plants
8. Municipal incinerators capable of charging more than 250 tons of refuse per day	22. Chemical process plants
9. Hydrofluoric acid plants	23. Fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr heat input
10. Sulfuric acid plants	24. Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels
11. Nitric acid plants	25. Taconite ore processing plants
12. Petroleum refineries	26. Glass fiber processing plants
13. Lime plants	27. Charcoal production plants
14. Phosphate rock processing plants	28. Fossil fuel-fired steam electric plants of more than 250 MMBtu/hr heat input

Major modifications are subject to the PSD review only if:

- The existing source that is modified is a "major" source and the net emissions increase resulting from the modification is "significant"; or
- The modification is made at a minor source, and that change by itself qualifies as a new major source.

4.0 Current PSD Status

The first step in determining PSD applicability at Fort Carson is to determine whether the facility is classified as a major stationary source. This determination is based on the facility's PTE, which is defined as follows.

> "Potential to emit means the maximum capacity of a stationary source to emit a pollutant under its physical and operational design. Any physical or operational limitation on the capacity of the source to emit a pollutant, including air pollution control equipment and restrictions on hours of operation or on the type or amount of material combusted, stored, or processed, shall be treated as part of its design if the limitation or the effect it would have on emissions is federally enforceable." [40 *Code of Federal Regulations* (CFR) 52.21(b)(4)]

Several source categories at Fort Carson were not included when calculating PTE, based on United States Environmental Protection Agency (EPA) guidance:

- Mobile sources and non-road engines were excluded based on EPA guidance, which states "Nonroad engines are a category of units/equipment that, under the Clean Air Act Section 302(z), are excluded from the definition of 'stationary source,' and, hence, are exempt from stationary source permitting requirements." (EPA 2001)
- Sources under the control of the National Guard were excluded based on EPA guidance, which states "when making major source determinations at a military installation, the Agency believes it is appropriate to consider pollutant-emitting activities that are under the control of different military services not to be under common control. Activities under the control of the National Guard may be considered under separate control from activities under the control of military services." (EPA 1996)
- Certain personnel-related activities, including Army and Air Force Exchange Service gas stations (SIC code 55), residential housing (SIC code 95), and schools (SIC code 82) were excluded from PTE calculations based on EPA guidance, which states "Military installations include numerous activities that are not normally found at other types of sources. These types of activities include residential housing, schools, day care centers, churches, recreational parks, theaters, shopping centers, grocery stores, gas stations, and dry cleaners. These activities are located on military installations for the convenience of military personnel (both active duty and retired), their dependents, and Department of Defense (DoD) civilian employees working on the base, and they often do not represent essential activities related to the primary military activity(ies) of the base. Therefore, the EPA believes these types of activities may appropriately be considered not to be support facilities to the primary military activities of a base. As such, these activities may be treated as separate sources for all purposes for which an industrial grouping distinction is allowed. Such activities should be separately evaluated for common control, SIC code, and support facility linkages to determine if a major source is present." (EPA 1996)

- Fugitive emission sources were excluded based on EPA guidance, which states "if the primary activity of a stationary source falls within a source category that is not listed, then as a general matter, fugitive emissions from the emissions units at the source are not included in determining whether the source is a major stationary source. However, if the source also contains emission units which do fall within a listed source category (or categories), then you include fugitive emissions from these listed emissions units to determine if the source is a major stationary source." (EPA 2003)

The sources included in the PTE calculation are listed in Appendix A, Table A-1. The current PTE for each source and the assumptions used to calculate it are provided in Appendix A, Table A-2. Additional details on PTE calculations are provided in the Fort Carson Air Emission Inventory for Calendar Year (CY) 2006. [Fort Carson Directorate of Environmental Compliance and Management (DECAM) 2007]

Fort Carson is subject to regulation as a major stationary source if its PTE exceeds the following applicability thresholds:

- Boilers and hot water generators – 100 tpy threshold: Fort Carson's boilers and hot water generators have a total combined heat input of approximately 599 MMBtu/hr. Therefore, they are regulated as one of the 28 PSD source categories [i.e., Category 23, fossil-fuel boilers (or combination thereof) totaling more than 250 MMBtu/hr] and are subject to a major source threshold of 100 tpy [40 CFR 52.21(b)(1)(i)(a)]. This 100-tpy threshold applies only to the boilers and hot water generators.
- Post-wide - 250 tpy threshold: Fort Carson as a whole is subject to a major source threshold of 250 tpy based on its SIC of national defense (i.e., SIC code 97) [40 CFR 52.21(b)(1)(i)(b)].

As shown in Table 4-1, Fort Carson is currently classified as a major stationary source because it has a PTE over 250 tpy of nitrogen oxides (NO_x) (i.e., PTE of 312 tpy). Additionally, Fort Carson's boilers and hot water generators are classified as a major source (source within a source) because they have the PTE over 100 tpy of NO_x and carbon monoxide (CO) (i.e., PTE of 169 and 149 tpy, respectively). Based on its status as a major source, Fort Carson is subject to PSD permitting if it exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2.

Table 4-1. Fort Carson
Actual Emissions and Current PTE

Pollutant	Post-wide		Boilers and Hot Water Generators Only	
	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)	CY 2006 Actual Emissions (tpy)	Current PTE (tpy)
NO_x	61.6	**312.29**	34.18	**168.95**
Sulfur Oxides (SO_x)	2.0	65.73	0.39	46.82
CO	42.2	210.56	30.9	**148.85**
Volatile Organic Compounds (VOCs)	39.3	94.58	2.02	9.77
Particulate Matter	16.7	55.84	2.82	15.30
Particulate Matter with an aerodynamic diameter less than 10 micrometers (PM_{10})	14.8	55.20	2.81	14.95

Table 4-2. Major Modification Thresholds Applicable to Proposed Sources at Fort Carson

	PM_{10} (tpy)	NO_X (tpy)	CO (tpy)	SO_X (tpy)	VOC (tpy)	Lead (tpy)
Major Source Modification Threshold	15	40	100	40	40	0.6

5.0 PSD Applicability

Based on its status as a major source, Fort Carson is subject to PSD permitting if the PTE increase from the proposed modification exceeds the major modification thresholds for any criteria pollutant listed in Table 4-2. For purposes of this analysis, the modification is defined as the CAB sources included in the Grow the Army (GTA) Environmental Impact Statement (EIS). Although the Combat Aviation Brigade (CAB) is included in the GTA EIS, this is done for convenience. The CAB is not considered part of the same modification as GTA; therefore, the GTA is not included in this analysis. The treatment of the CAB and GTA sources as two separate modifications is supported by EPA guidance (EPA 1989) and a past CDPHE concurrence letter for a similar determination (CDPHE 2007).

Using Fort Carson specifications, new external combustion sources for this project were assumed to be equipped with low-NO_x burners with a NO_x emission concentration of 30 parts per million (ppm) or lower. Internal combustion sources for this project were assumed to meet Tier III emission standards (40 CFR Part 89.112), and be permitted with an operational limit of 250 hours per year.

Assumptions used to calculate the proposed PTE increase are provided in Table 5-1. The PTE for the proposed modification is shown in Table 5-2. Detailed emission calculations are provided in Appendix A, Tables A-3 through A-6.

Table 5-1. Proposed Combustion Sources at Fort Carson

Description	Size	Annual Hours of Operation
Proposed Exempt External Combustion Units, Low-NO_x (30 ppm)	72.6 MMBtu/hr Total	8,760
Proposed Exempt Internal Combustion Units, Emergency Generators >600 horsepower	2,265 bhp Total	250

Table 5-2. Potential Emission Increase from Proposed Combustion Sources at Fort Carson

Potential Point Source Emissions (tpy)	PM_{10} (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	VOC (tpy)	Lead (tpy)
Proposed Combustion Units	2.46	14.22	27.80	0.30	1.90	negligible
Major Modification Threshold	15	40	100	40	40	0.6

As shown in Table 5-2, the proposed modifications at Fort Carson will not be subject to PSD review because the proposed emission increase will be below the major modification threshold.

6.0 References

CDPHE. 2007. Letter to Thomas L Warren, Director, Environmental Compliance & Management, regarding Review of PSD Follow-up Letter dated 7 December 2007.

DECAM. 2007. *Air Emission Inventory for Calendar Year 2006, Fort Carson Colorado.* April 2007.

EPA. 1989. US EPA Memorandum *Request for Clarification of Policy Regarding the "Net Emissions Increase,"* from John Calcagni, Director Air Quality Management Division to William B. Hathaway, Director Air, Pesticides, and Toxics Division. September 18, 1989.

EPA. 1996. US EPA OAQPS. *Major Source Determinations for Military Installations under the Air Toxics, New Source Review, and Title V Operating Permit Programs of the Clean Air Act.* August 1996.

EPA. 1998. US EPA Office of Air Quality Planning and Standards, Office of Air and Radiation (Management Division 10). *Potential to Emit (PTE) Guidance for Specific Source Categories Memorandum.* April 14, 1998.

EPA. 2001. US EPA Region IX. *Letter to the Law Office of Marc Chytilo.* December 14, 2001.

EPA. 2003. US EPA Air and Radiation Division (A-18J). *Clarification on Fugitive Emissions Policy letter to Janet McCabe, Indiana Department of Environmental Management.* March 6, 2003.

EPA. 2005. *Compilation of Air Pollutant Emission Factors (AP-42)*, Fifth Edition, Volume I Supplements A, B, C, D, E, F, Updates 2001 through 2008.

Appendix A

Emission Calculations for Combat Aviation Brigade Projects – 2008 Construction EIS

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Boilers and Hot Water Generators				
Bldg 1860 Hot Water Generators (2 @ 47 MMBtu/hr each)	Y	Y	Y	YES
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	Y	Y	Y	YES
Bldg 6290 Boilers (2 @ 40 MMBtu/hr each)	Y	Y	Y	YES
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	Y	Y	Y	YES
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	Y	Y	Y	YES
Bldg 8300 Boiler (12.553 MMBtu/hr)	Y	Y	Y	YES
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	Y	Y	Y	YES
Existing Categorically Exempt Boilers Standard Configuration	Y	Y	Y	YES
Existing Categorically Exempt Low NOx Boilers	Y	Y	Y	YES
Proposed Exempt Low NOx Boilers	Y	Y	Y	YES
Other External Combustion Sources				
Existing Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
Proposed Exempt Miscellaneous External Combustion Units	Y	Y	Y	YES
External Combustion Units in Residential Housing	Y	Y	N	NO
Internal Combustion Units				
Bldg 1550 Generator	Y	Y	Y	YES
Bldg 3909 Generator	Y	Y	Y	YES
Bldg 7501 Hospital Generators (2 @ 1310 hp each)	Y	Y	Y	YES
Bldg 8000 Dynamometers	Y	Y	Y	YES
Butts Air Field Engine Test Stand	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators <600hp	Y	Y	Y	YES
Categorically Exempt Diesel Emergency Generators >600hp	Y	Y	Y	YES
Categorically Exempt Natural Gas/Propane Emergency Generators	Y	Y	Y	YES
Auxiliary Ground Power Units	N	Y	Y	NO
Coating Activities				
Bldg 207 Paint Booth	Y	Y	Y	YES
Bldg 2427 Paint Booth	Y	Y	Y	YES
Bldg 8000 Paint Booths	Y	Y	Y	YES
Bldg 9551 Range Paint Booth	Y	Y	Y	YES
Bldg 9635 (Butts Air Field Paint Booth)	Y	Y	Y	YES
Fuel Dispensing				
Bldg 900 Service Station	Y	Y	N	NO
Bldg 1515 Service Station	Y	Y	N	NO
Bldg 3600 Service Station	Y	Y	N	NO
COCO Facility--Refueling (Service Stations and Bulk Fuel)	Y	Y	Y	YES
Categorically Exempt Storage Tanks and Associated Operations				
Diesel (No. 2 Oil) Storage Tanks	Y	Y	Y	YES
Glycol Storage Tanks	Y	Y	Y	YES
JP-8 Storage Tanks	Y	Y	Y	YES
MOGAS Storage Tanks	Y	Y	Y	YES

Table A-1
PSD Source Analysis

Emission Unit	Stationary?	Point Source?	Common Control?	Include in PSD Analysis?
Military Training				
Munition Firing	N	N	Y	NO
Smoke Munitions	N	N	Y	NO
Open Burning/Open Detonation	N	N	Y	NO
Fog Oil and Graphite	Y	Y	Y	YES
Chemical Usage				
Basewide Chemical Usage	N	N	Y	NO
Pesticide Use	N	N	Y	NO
Road Paint Striping	N	N	Y	NO
Solvent Use	Y	N	Y	NO
X-Ray	Y	N	Y	NO
Landfill-Related Emissions				
Municipal Landfill	Y	N	Y	NO
Miscellaneous Particulate Emissions				
Abrasive Blasting	Y	Y	Y	YES
Bldg 1864 Cooling Towers	Y	N	Y	NO
Bldg 7501 Cooling Towers	Y	N	Y	NO
LB&B Yard	Y	N	Y	NO
Rocky Mountain Asphalt Yard	Y	N	Y	NO
Troop Construction Yard	Y	N	Y	NO
Tank Trails	Y	N	Y	NO
Fire Training				
Fire Training Facility	Y	Y	Y	YES
Prescribed Burning				
Prescribed Burning	Y	N	Y	NO
Miscellaneous APEN/Permit Exempt Sources				
Industrial Wastewater Treatment Plant	Y	N	Y	NO
Sewage Treatment Plant	Y	N	Y	NO
Soil Vapor Extraction Systems	Y	Y	Y	YES

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)	Method of Determining PTE
Boilers and Hot Water Generators							
Bldg 1860 Hot Water Generator (1 @ 47 MMBtu/hr)	2.01	2.01	23.00	12.83	19.60	0.85	Permit limits (95OPEP110)
Bldg 1860 Low NOx Hot Water Generator (1 @ 47 MMBtu/hr)	1.08	0.83	7.95	7.26	9.80	0.48	Permit limits (07EP0205)
Bldg 1860 Hot Water Generators (31.25 MMBtu/hr)	0.96	0.96	7.22	6.29	8.91	0.42	Permit limits (95OPEP110)
Bldg 6290 Boilers (2 @ 42 MMBtu/hr each)	0.57	0.57	7.50	6.30	0.05	0.41	Permit limits (95OPEP110)
Bldg 7504 Hot Water Generators (2 @ 26 MMBtu/hr each)	0.77	0.68	4.11	6.80	7.15	0.45	Permit limits (95OPEP110)
Bldg 8000 Boilers (2 @ 5.525, 1 @ 2.163 MMBtu/hr)	0.08	0.08	1.00	0.84	0.01	0.06	Permit limits (95OPEP110)
Bldg 8000 Paint Booth (5.25 MMBtu/hr)	0.14	0.14	1.80	1.51	0.01	0.10	Permit limits (95OPEP110)
Bldg 8300 Boiler (12.553 MMBtu/hr)	0.06	0.06	0.75	0.63	0.005	0.04	Permit limits (95OPEP110)
Bldg 9609 Boilers (3 @ 7.333 MMBtu/hr each)	0.36	0.36	4.65	3.82	0.56	0.25	Permit limits (95OPEP110)
Existing Categorically Exempt Boilers Standard Configuration	8.15	8.15	107.21	90.05	0.64	5.90	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 20 ppm	1.00	1.00	3.15	11.04	0.08	0.72	8760 hours of operation
Existing Categorically Exempt Low NOx Boilers - 30 ppm	0.14	0.14	0.62	1.49	0.01	0.10	8760 hours of operation
Source Category Total	**15.30**	**14.95**	**168.95**	**148.85**	**46.82**	**9.77**	
Other External Combustion Sources							
Categorically Exempt Miscellaneous External Combustion Units	3.33	3.33	43.83	36.81	0.26	2.41	8760 hours of operation
Internal Combustion Units							
Bldg 1118 Generator (747.7 hp)	0.08	0.08	1.42	1.75	0.04	0.21	Permit limits (07EP0293)
Bldg 1550 Generator (1550 hp)	0.27	0.16	9.30	2.13	1.57	0.25	Permit limits (95OPEP110)
Bldg 3909 Generator (1620 hp)	0.28	0.16	9.72	2.23	1.64	0.26	Permit limits (95OPEP110)
Bldg 7501 Hospital Generators (3 @ 1555.2 hp each)	0.26	0.26	29.03	4.62	9.43	0.26	Permit limits (05EP0230) & APEN
Bldg 8000 Dynamometers	1.10	1.10	15.50	3.34	2.02	1.26	Permit limits (95OPEP110)
Butts Air Field Engine Test Stand	0.34	0.34	3.03	4.33	1.71	1.63	Permit limits (95OPEP110)
Categorically Exempt Diesel Emergency Generators <600hp	1.66	1.66	23.40	5.04	1.55	1.86	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Diesel Emergency Generators >600hp	0.12	0.07	4.13	0.95	0.70	0.12	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Categorically Exempt Natural Gas/Propane Emergency Generators	0.047	0.047	3.87	0.47	0.0007	0.15	Max. hours of operation allowed by Colorado Reg. 3 AQCC
Source Category Total	**4.16**	**3.87**	**99.40**	**24.86**	**18.65**	**5.99**	

Table A-2. Current Potential to Emit Summary

Emission Unit	PM (tpy)	PM10 (tpy)	NOX (tpy)	CO (tpy)	SOX (tpy)	VOC (tpy)	Method of Determining PTE
Coating Activities							
Bldg 207 Paint Booth	0.0013	0.0013	0	0	0	0.11	Actual emissions multiplied by a growth factor of 1.25
Bldg 2427 Paint Booth	0.0040	0.0040	0	0	0	0.29	Actual emissions multiplied by a growth factor of 1.25
Bldg 8000 Paint Booths	0.84	0.84	0	0	0	15.66	Permit limits (95OPEP110)
Bldg 9551 Range Paint Booth	0.0091	0.0091	0	0	0	0.65	CY 2002 actual emissions multiplied by a growth factor of 1.25
Bldg 9635 (Butts Air Field Paint Booth)	0.2744	0.2744	0	0	0	0.44	Permit limits (95OPEP110)
Source Category Total	**1.13**	**1.13**	**0.00**	**0.00**	**0.00**	**17.15**	
Fuel Dispensing							
COCO Facility--Refueling (Service Stations and Bulk Fuel)	0	0	0	0	0	7.69	Permit Limits (04EP0762)
Categorically Exempt Storage Tanks and Associated Operations							
Diesel (No. 2 Oil) Storage Tanks	0	0	0	0	0	0.42	24 turnovers per year
Glycol Storage Tanks	0	0	0	0	0	0.00036	24 turnovers per year
JP-8 Storage Tanks	0	0	0	0	0	9.5	24 turnovers per year
MOGAS Storage Tanks	0	0	0	0	0	9.73	Actual emissions multiplied by a growth factor of 1.25
Source Category Total	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**19.68**	
Military Training							
Mechanical Smoke Generators	31.82	31.82	0.00	0.00	0.00	31.82	Permit limits (95OPEP110)
Miscellaneous Particulate Emissions							
Abrasive Blasting	0.07	0.07	0	0	0	0	Permit limits (95OPEP110).
Fire Training							
Fire Training Facility	0.02	0.02	0.11	0.04	0.00	0.06	APEN limit of 4000 gal/CDPHE concurrence
Installation-wide Subtotal *(Boilers and Hot Water Generators Only)*	15.30	14.95	168.95	148.85	46.82	9.77	
Installation-wide Total	**55.84**	**55.20**	**312.29**	**210.56**	**65.73**	**94.58**	

Table A-3. Criteria Pollutant
Combat Aviation Brigade - Emission Summary

Potential Emissions

Pollutant	External Combustion		Internal Combustion		Total	
	(lb/hr)	(tpy)	(lb/hr)	(tpy)	(lb/hr)	(tpy)
NOx	2.56	11.22	23.97	3.00	26.53	14.22
CO	5.98	26.18	12.98	1.62	18.96	27.80
VOC	0.39	1.71	1.45	0.18	1.85	1.90
SO2	0.04	0.19	0.92	0.11	0.96	0.30
PM10	0.54	2.37	0.75	0.09	1.29	2.46

Table A-4. Combat Aviation Brigade
Internal Combustion Heat Input Estimates

Combat Aviation Brigade Projects (2008 Construction EIS)					
Project Number	**POV Parking**	**Square Footage[1]**	**Number of Bldg./ Stories**	**Total Heat Input (Btu/hr/sq.Ft.)[2]**	**Total Heat Input (MMBtu/hr)**
11120	**Rotary Wing Runway (Surfaced)**	**686,097**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	686,097			
11140	**Hover Points (4) 150' x 150'**	**22,500**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	22,500			
11221	**New and Rebuilt Taxi ways**	**90,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	90,000			
11320	**Rotary Runway Parking Apron**	**1,170,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,170,000			
11330	**Aircraft Maintenace Apon**	**126,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	126,000			
11340	**Hanger Access Apron**	**65,700**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	65,700			
11370	**Aircraft Wash Apron**	**56,988**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	56,988			
11610	**Aircraft Compass Swing Base**	**37,494**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	37,494			
13320	**Install FBPAR (radar)**	**350**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	350			
13410	**Radio Beacon (off post, est.)**	**250**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	250			
13430	**Ground Control Approach System (est.)**	**300**			
	Total Heated Sq. Ft.	300			0.0
	Total Parking Sq. Ft.	0			
13440	**Intrument Landing System (est.)**	**1,000**			
	Total Heated Sq. Ft.				0.0
	Total Parking Sq. Ft.	1,000			
13450	**Navigational Lighting (est.)**	**1,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,000			
13420	**Wind Direction Indicator (2, est)**	**200**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	200			
136	**Run-way lighting (est.)**	**1,480**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	1,480			
14112	**Aviation Unit Operations Bldg. (additional)**	**17,922**			
	Total Heated Sq. Ft.	17,922	2	60	1.1
	Total Parking Sq. Ft.	0			
14113	**Access Control Buildings (2)**	**60**			
	Total Heated Sq. Ft.	60	1	100	0.01
	Total Parking Sq. Ft.	0			
14182	**Brigade HQ**	**20,656**			
	Total Heated Sq. Ft.	20,656	2	60	1.2
	Total Parking Sq. Ft.	0			

Table A-4. Combat Aviation Brigade
Internal Combustion Heat Input Estimates

Combat Aviation Brigade Projects (2008 Construction EIS)					
Project Number	**POV Parking**	**Square Footage[1]**	**Number of Bldg./ Stories**	**Total Heat Input (Btu/hr/sq.Ft.)[2]**	**Total Heat Input (MMBtu/hr)**
14183	**Battalion HQ**	**63,305**			
	Total Heated Sq. Ft.	63,305	2	60	3.8
	Total Parking Sq. Ft.	0			
14185	**Company Head Quarters**	**302,623**			
	Total Heated Sq. Ft.	302,623	3	60	18.2
	Total Parking Sq. Ft.	0			
17119	**Battalion Classrooms**	**22,925**			
	Total Heated Sq. Ft.	22,925	2	60	1.4
	Total Parking Sq. Ft.	0			
17210	**Simulator bldgs.**	**50,939**			
	Total Heated Sq. Ft.	50,939	1	55	2.8
	Total Parking Sq. Ft.	0			
21110	**Aircraft Maintenance Hangers**	**173,894**			
	Total Heated Sq. Ft.	173,894	1	75	13.0
	Total Parking Sq. Ft.	0			
21113	**Aircraft Parts Storage**	**16,000**			
	Total Heated Sq. Ft.	16,000	1	45	0.7
	Total Parking Sq. Ft.	0			
21410	**Vehicle Maintenance Shop**	**46,192**			
	Total Heated Sq. Ft.	46,192	1	75	3.5
	Total Parking Sq. Ft.	0			
21470	**Oil Storage Bldg.**	**3,260**			
	Total Heated Sq. Ft.	3,260	1	35	0.1
	Total Parking Sq. Ft.	0			
44224	**Unit Storage**	**23,100**			
	Total Heated Sq. Ft.	23,100	1	45	1.0
	Total Parking Sq. Ft.	0			
55010	**Troop Med. Clinic**	**14,000**			
	Total Heated Sq. Ft.	14,000	1	120	1.7
	Total Parking Sq. Ft.	0			
72111	**UEPH**	**346,602**			
	Total Heated Sq. Ft.	346,602	3/4	55	19.1
	Total Parking Sq. Ft.	0			
72210	**DFAC**	**23,730**			
	Total Heated Sq. Ft.	23,730	1	150	3.6
	Total Parking Sq. Ft.	0			
74028	**Fitness Center**	**32,000**			
	Total Heated Sq. Ft.	32,000	1	45	1.4
	Total Parking Sq. Ft.	0			
85215	**Org. Vehicle Parking**	**855,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	855,000			
85210	**POV Parking**	**900,000**			
	Total Heated Sq. Ft.	0			0.0
	Total Parking Sq. Ft.	900,000			
Total Heated Sq. Ft. for Boilers/Other External Combustion		**1,157,208**			**72.6**

[1] Heated Sq. Ft. estimate made from project 1391 numbers.

[2] BTU input taken from BRAC projects that were similar in scope and size for which we have estimates from the COE, or actual data from project plan reviews.

Table A-5. Combat Aviation Brigade External Combustion Emissions

Fuel Heating Value (LHV)	1020	Btu/scf
Total Heat Rate (LHV)	72.58	MMBtu/hr
Potential Operation	8760	hr/yr
Potential Fuel Usage	623.3	MMscf/yr

Potential Emissions

Pollutant	Emission Factor (lb/MMscf)	Nominal Rating (MMBtu/hr)	PTE Hrs of Operation (hrs/yr)	Estimated Emissions		Source of Emission Factor
				(lb/hr)	(tpy)	
NOx	36.00	72.58	8760	2.56	11.22	Fort Carson[1]
CO	84.00	72.58	8760	5.98	26.18	AP-42[2]
VOC	5.50	72.58	8760	0.39	1.71	AP-42[3]
SO2	0.60	72.58	8760	0.04	0.19	AP-42[3]
PM10	7.60	72.58	8760	0.54	2.37	AP-42[3]

[1] NOx emissions based on natural gas-fired combustion equipment with NOx concentration of 30 ppm in exhaust per Fort Carson specifications.

[2] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-1, Emission Factors for Nitrogen Oxides (NOx) and Carbon Monoxide (CO) from Natural Gas Combustion

[3] EPA AP-42, Volume I, Fifth Edition - July 1998, Table 1.4-2, Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion

Table A-6. Combat Aviation Brigade Internal Combustion Emissions

Engine Usage	Emergency Generator	
Engine Configuration	Diesel	
Emission Controls	None	
Number of Engines	3	
Site Rating	755	BHP each
Potential Operation	250	hr/yr

Potential Emissions - Per Engine

Pollutant	Emission Factor		Nominal Rating	PTE Hrs of Operation	Estimated Emissions per Engine		Source of Emission Factor
	lb/hp-hr	(g/hp-hr)	(hp)	(hrs/yr)	(lb/hr)	(tpy)	
NOx	0.0106	4.80	755	250	7.99	1.00	40 CFR Part 89[1]
CO	0.0057	2.60	755	250	4.33	0.54	40 CFR Part 89[1]
VOC	0.00064	0.29	755	250	0.48	0.06	AP-42[2]
SO2	4.05E-04	0.18	755	250	0.31	0.04	AP-42[2]
PM10	0.00033	0.15	755	250	0.25	0.03	40 CFR Part 89[1]

[1] Criteria pollutant potential emissions were calculated assuming the generators are uncontrolled and operate a maximum of 250 hours per year. The emission factors for NOx, CO and PM/PM10 are based on us EPA's Tier 3 emission standards for generators with a rated power of 130 to 560 KW. 3.0 g/hp-hr for NOx (non-methane hydrocarbon+NOx standard), 2.6 g/hp-hr for CO, and 0.15 g/hp-hr for PM. All PM was assumed to be PM10. The remaining criteria pollutant emission factors are from Section 3.4 of AP-42. A sulfur content of 0.05 weight percent was assumed.

[2] EPA AP-42, Volume I, Fifth Edition - October 1996, Table 3.3-1, Uncontrolled Emission Factors for Diesel Industrial Engines

Total PTE - All Three Engines

Pollutant	Estimated Emissions All Engines	
	(lb/hr)	(tpy)
NOx	23.97	3.00
CO	12.98	1.62
VOC	1.45	0.18
SO2	0.92	0.11
PM10	0.75	0.09

DRAFT FINAL

Clean Air Act General Conformity Analysis and Determination

for

US Army Garrison (USAG)

Fort Carson, Colorado

Prepared for:

Department of the Army

Directorate of Public Works, Environmental Division

USAG Fort Carson, Colorado

URS

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August 2008

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DRAFT FINAL - CLEAN AIR ACT CONFORMITY ANALYSIS AND DETERMINATION

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Prepared for

USAG Fort Carson, Colorado
Directorate of Public Works, Environmental Division

Under US Army Corps of Engineers, Contract No. W91278-07-D-0078,
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List of Acronyms

ACAM	Air Conformity Applicability Model
AFCEE	Air Force Center for Environmental Excellence
bhp	brake horsepower
BTU/hr	British thermal units/hour
CAA	Clean Air Act
CAB	Combat Aviation Brigade
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CO	carbon monoxide
CS/CSS	Combat Support/Combat Service Support
CY	Calendar Year
DFAC	Dining Facility
DOPAA	Description of Proposed Action and Alternatives
EIS	Environmental Impact Statement
EN	Engineer Company
EPA	US Environmental Protection Agency
FY	Fiscal Year
GOV	Government-owned vehicle
GTA	Grow the Army
hr	Hour
IBCT	Infantry Brigade Combat Team
lb	pound
NAAQS	National Ambient Air Quality Standards
POV	Privately-owned vehicle
PPACG	Pikes Peak Area Council of Governments
QM	Quartermaster
RONA	Record of Non-applicability
sf	square feet
SIP	State Implementation Plan
TA	Training Area
TEMF	Tactical Equipment Maintenance Facility
TIP	Transportation Improvement Program
tpy	tons per year
USACHPPM	US Army Center for Health Promotion and Preventive Medicine

USACE	US Army Corps of Engineers
USAG	US Army Garrison
VMT	vehicle miles traveled
VOC	volatile organic compound

Executive Summary

The Department of the Army will expand activities at United States Army Garrison (USAG) Fort Carson, an Army installation located southwest of Colorado Springs, Colorado. The stationing of troops associated with this proposed federal action are planned for fiscal years (FYs) 2009 through 2013. Fort Carson could receive up to approximately 6,700 additional Soldiers consisting of the following units:

- One Infantry Brigade Combat Team (IBCT) of approximately 3,500 Soldiers;
- Two Combat Support/Combat Service Support (CS/CSS) units of approximately 400 Soldiers (total); and,
- Potentially, a medium Combat Aviation Brigade (CAB) of approximately 2,800 Soldiers (Fort Carson 2008).

To carry out the associated requirements with this stationing, and potential re-stationing action, there will be the construction of new facilities to support additional Soldiers, aircraft and support equipment, and an increase in privately-owned vehicle (POV)/government-owned vehicle (GOV) traffic. As a result of this, it is expected that an increase of air pollutants will occur that has the potential to impact existing air quality conditions.

Although the Colorado Springs Urbanized Area is currently in attainment for all criteria pollutants, it is classified as a maintenance area for carbon monoxide (CO) due to a previous violation of air quality standards. Since the installation's main cantonment area falls within the boundaries of the Colorado Springs maintenance area, CO is the only pollutant of concern that Fort Carson must consider for this analysis. Therefore, in accordance with the Clean Air Act Section 176(c), as amended in 1990, this report is an analysis and determination of the General Conformity Rule, and it examines the anticipated actual emissions associated with the proposed action from both mobile and stationary sources located and operated in Fort Carson's main cantonment area. Any initiatives related to the proposed action that occur outside of the maintenance area delineation within Fort Carson are not included in this analysis.

This document demonstrates that the growth activities at Fort Carson not only comply with the General Conformity Rule requirements, but also that the action conforms with the Colorado State Implementation Plan (SIP) to achieve attainment or to maintain status with national air standards. The results are based on the latest planning assumptions derived from the construction plans, population, employment, and travel data acquired from multiple sources to determine compliance with the General Conformity Rule, as well as all relevant requirements and milestones in the SIP.

Reasonable assumptions to reflect realistic activities, and the latest and most accurate emissions estimation techniques, were applied to address this action and the associated emission-generating activities. Three possible locations are being considered for the aforementioned unit stationing/re-stationing actions. For both scenarios, the CS/CSS facilities would be constructed in the main cantonment area (inside the maintenance area), and the CAB facilities would be constructed outside these areas on Wilderness Road. The IBCT is the only unit to change

location that would affect the conformity model; its facilities could be set either within the main cantonment area or at one of two locations outside of the maintenance area on Wilderness Road. As the Wilderness Road locations fall outside the maintenance area, for the purposes of this analysis, there were only two scenarios to consider.

For both scenarios, the maximum CO emissions increase from all applicable sources is estimated to occur in calendar year (CY) 2012. If either the Proposed Action or Alternative 2 (2008 GTA EIS) are implemented as the siting scenario for the IBCT facilities (i.e., either Wilderness Road location, referred to as Scenario 1 in this document) then the CY 2012 CO emissions would total 64.66 tons per year (tpy) (i.e., 54 tpy from POVs, 3.5 tpy from GOVs, and 7.16 tpy from all other sources). These emissions do not exceed the 100 tpy *de minimis* General Conformity threshold limit, and also are not considered to be regionally significant; therefore, demonstration of conformity is not required and is documented on a Record of Non-Applicability.

However, the Alternative 1 siting of IBCT facilities in the cantonment area (referred to as Scenario 2 in this document), results in CY 2012 maximum CO emissions of 156.05 tpy (i.e., 96.43 tpy from POVs, 34.09 tpy from GOVs, and 25.53 tpy from all other sources), which exceeds the regulatory *de minimis* limit for General Conformity. Fort Carson can demonstrate that Scenario 2 complies with the General Conformity Rule requirements and conforms with the Colorado SIP in the following way:

- The *FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area* allows a "sufficient margin of safety to the mobile source emissions budget[1] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Pikes Peak Area Council of Governments [PPACG] 2008(b)). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by CY 2015 (Prather 2008). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active duty troop population for Fort Carson after this proposed action (FY 2013) is estimated to be 32,000 Soldiers. However, "…[d]eployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Fort Carson 2008). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and criteria for demonstrating conformity (per 40 Code of Federal Regulations [CFR] 93.158(a)(5)(ii)), as those emissions will be certified as accounted for in the TIP by PPACG.
- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than

[1] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant; therefore, demonstration of conformity is not required and is documented on a Record of Non-Applicability.

1.0 Description of Federal Action[2]

US Army Garrison (USAG) Fort Carson will be undergoing additional growth in the near future due to decisions made by the Deputy Chief of Staff of the Army (G 3/5/7), as part of the 2007 Record of Decision for the Programmatic Environmental Impact Statement (EIS) for Army Growth and Force Structure Realignment. The plan to station and realign units to optimize training, leader development, and combat readiness will meet the strategic requirements of the contemporary global security environment (Fort Carson 2008). Stationing actions will occur at Fort Carson between fiscal years (FYs) 2009 and 2013, which will result in new construction, operation of additional emissions sources (e.g., HVAC equipment, additional vehicular traffic), and some demolition of facilities that are no longer needed. As a result of this decision to grow, it is expected that an increase in air pollutants will occur with the potential to impact existing air quality conditions.

To account for the worst case emissions, the potential re-stationing of a medium Combat Aviation Brigade (CAB) (approximately 2,800 Soldiers), which is reasonably foreseeable and has known activities, was included in this analysis.

Along with the CAB, the following stationing actions of new units are considered in this analysis:

- One Infantry Brigade Combat Team (IBCT) – approximately 3,500 Soldiers; and,
- Two Combat Support/Combat Service Support (CS/CSS) units – a Quartermaster (QM) Company and an Engineer (EN) Company (approximately 400 total Soldiers) (Fort Carson 2008(b)).

The stationing of these new units are referred to as Grow the Army (GTA), and together with the CAB, are considered one federal action for the purposes of this General Conformity Analysis. Although the Fort Carson GTA EIS includes the support units with the IBCT, referring to them together as the IBCT, this report retains their separate names due to the consideration of three possible locations for siting the new construction for these units. The addition of the GTA Units and CAB will increase Fort Carson's total active duty troop population by an estimated 6,700 active duty Soldiers, resulting in a total estimated force population of 32,000 Soldiers by FY 2013.

This report addresses the increased numbers of military units and associated emission-generating activities (both mobile and stationary) and assesses whether the resulting direct and indirect emissions in the Fort Carson's cantonment area conform with the State Implementation Plan (SIP) to attain and maintain clean air.

[2] Federal action is "any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that a department, agency or instrumentality of the Federal government supports in any way, provides financial assistance for, licenses, permits, or approves, other than activities related to transportation plans" (EPA 1993).

2.0 Location

Fort Carson is situated southwest of the City of Colorado Springs, Colorado, between Interstate 25 and Highway 115, east of the Rocky Mountain Front Range. The installation is approximately 137,000 acres and portions occupy El Paso, Pueblo, and Fremont counties. To the north, the City of Denver is approximately 65 miles away, and approximately 10 miles to the south is the City of Pueblo.

Fort Carson's northern portion is referred to as the main cantonment area (i.e., the condensed inhabited area where housing, administrative, and maintenance activities occur) and is located in El Paso County. The majority of this cantonment (north of Titus Boulevard and Specker Avenue) falls within the Colorado Springs maintenance area for carbon monoxide (CO) (see Figure 2-1 and Section 3.0). There are currently six active installation access gates. In anticipation of this growth, two new access gates (Nos. 6 and 19 on the west and east sides of Wilderness Road, respectively) will open in the near future to alleviate traffic congestion and provide more direct routes to areas outside the main cantonment area; thereby, minimizing any unnecessary travel through the main cantonment area to areas south of Titus Boulevard or downrange.

Three possible siting locations were considered for the federal action. However, the IBCT is the only unit that had possible variable locations; its facilities could be set either:

1) Within the main cantonment area (i.e., at Training Area [TA] Bravo on the eastern side), referred to in the Description of Proposed Action and Alternatives (DOPAA) as Alternative 1, or
2) South of Titus Boulevard (referred to in this report as "downrange") at one of two locations on Wilderness Road near Butts Army Airfield (i.e., at the Operational Readiness Training Complex [ORTC]or at the Tent City), referred to in the DOPAA as the Proposed Action and Alternative 2.

Regardless of where the IBCT could be located, the CS/CSS facilities would be constructed in the main cantonment area (i.e., inside the maintenance area), and the CAB facilities would be constructed outside these areas at the ORTC. The EN Company's facilities would be constructed between Magrath and Minick Avenues, south of O'Connell Boulevard. Facilities for the QM Company would be constructed nearby at Barkeley Avenue and O'Connell Boulevard. As the Wilderness Road locations fall outside the maintenance area, for the purposes of this analysis, there were only two scenarios to consider:

<u>Location Scenario 1 – Proposed Action or Alternative 2 (Fort Carson 2008):</u>

- IBCT outside cantonment/maintenance area (at either Wilderness Road location);
- CS/CSS inside cantonment/maintenance area; and
- CAB outside cantonment/maintenance area (at ORTC).

Location Scenario 2 – Alternative 1 (Fort Carson 2008):

- IBCT inside cantonment/maintenance area (at TA Bravo);
- CS/CSS inside cantonment/maintenance area; and
- CAB outside cantonment/maintenance area (at ORTC).

This analysis considers those activities occurring in the main cantonment area (i.e., associated construction activities, operation of emission sources, miscellaneous area sources, and vehicular travel), and only vehicular travel to/from the area south of Titus Boulevard. (See Appendix B for detailed descriptions of the reasonable assumptions made in the analysis for each scenario.)

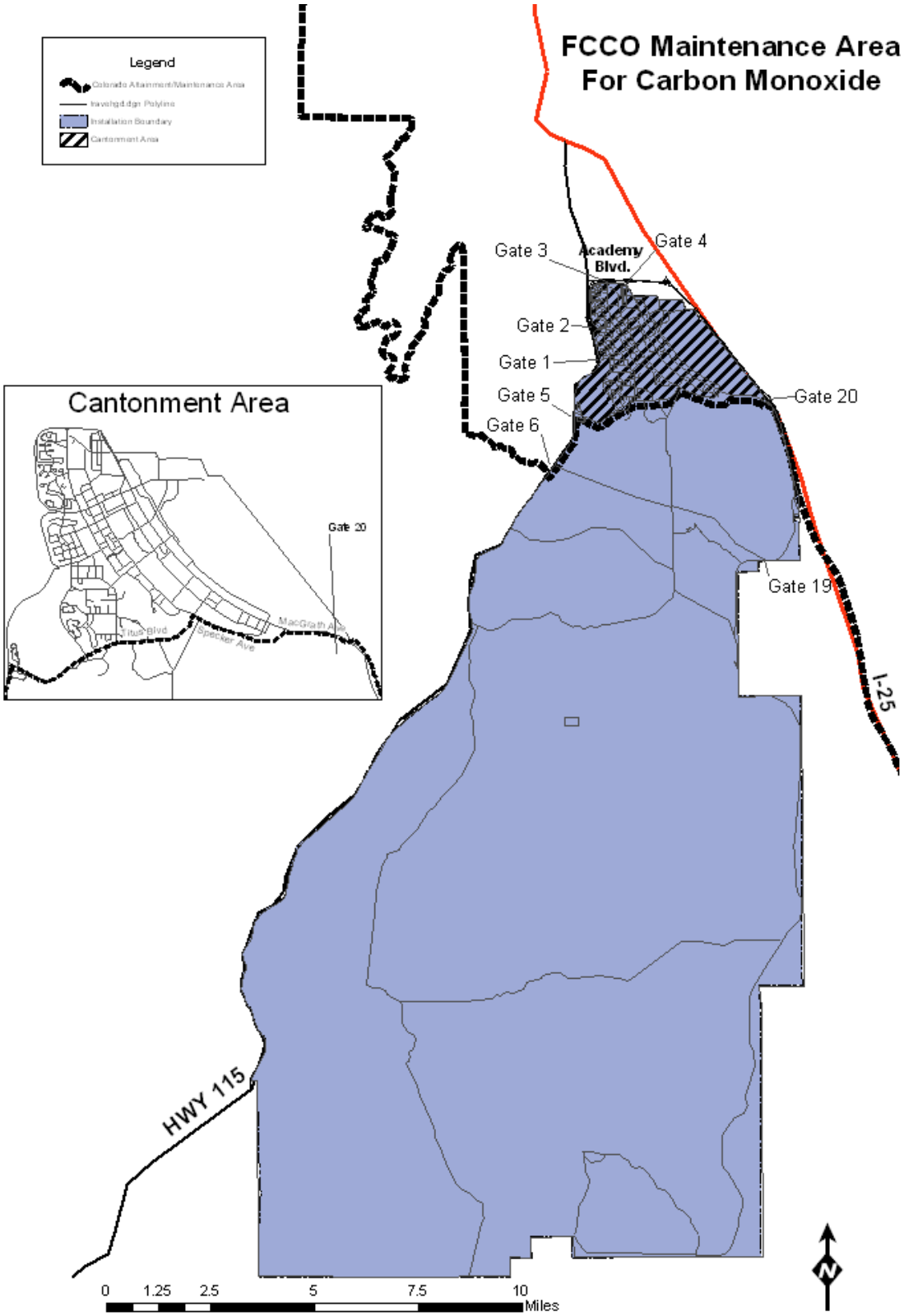
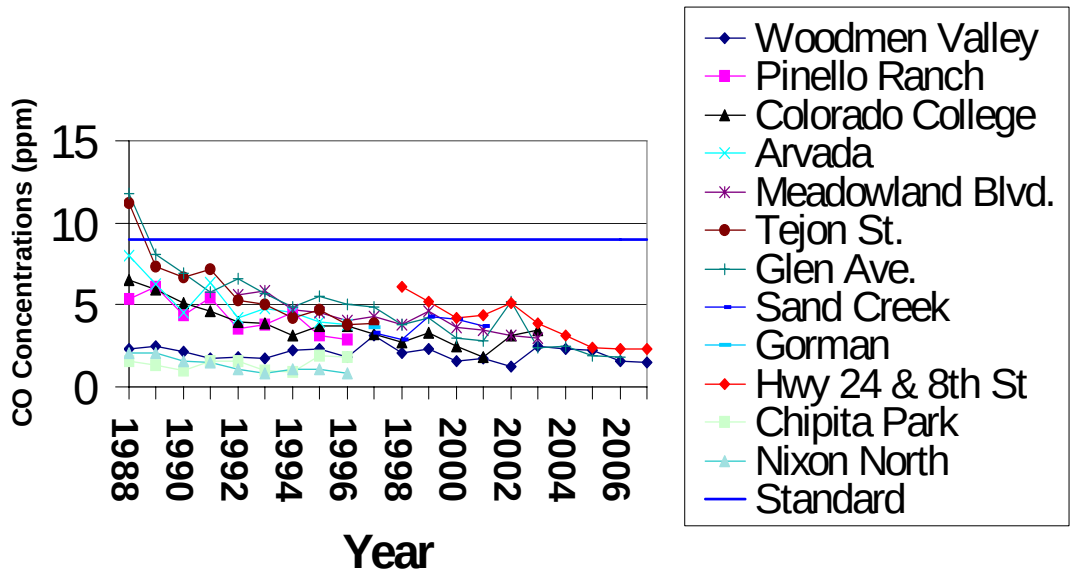


Figure 2-1. Fort Carson Maintenance Area for Carbon Monoxide

3.0 Local Air Quality

Criteria pollutants in the ambient air are measured at various locations in the Colorado Springs area. For the past few years, CO concentrations have been collected at two locations: the Woodmen Valley and Highway 24/8th Street monitoring stations. Figure 3-1 depicts the CO 8-hour concentrations compared with the 8-hour national air quality standard (NAAQS) and the trend shows that CO concentrations have been below the NAAQS since 1989. In fact, the concentrations have stabilized at less than 50% of the standard for approximately the last five years (Pikes Peak Area Council of Governments [PPACG] 2008[a]). Weather/seasons affect overall ambient pollutant concentrations, with winter conditions contributing to higher concentrations due to inversion layers (except ozone, which has higher concentrations in the summer months).

Figure 3-1. Carbon Monoxide Trends (2nd Max 8-hour Values)



The primary source of total CO emissions in Colorado Springs is vehicular traffic; the trend shows that although the number of vehicles has increased, the emissions per vehicle have decreased (PPACG 2008(a)). Other minor CO contributions in this area are from combustion sources, such as aircraft, power plants, boilers, generators, and open and wood burning. The emissions inventory estimates for CO emissions in the Colorado Springs maintenance area are 433.82 tons per day in 2010, which is expected to decline to 409.35 tons per day by 2015 (Colorado Department of Public Health and Environment [CDPHE] 2003). Since transportation sources are usually the main source of air pollutants, CDPHE works closely with PPACG to develop transportation plans that are consistent with the goals of the Clean Air Act (CAA) of 1970.

4.0 Regulatory Background and Applicability

The CAA, 42 United States Code 7401 *et seq*. (40 CFR Parts 50-99), amended in 1977 and 1990, is the primary federal statute governing outdoor air pollution. In 1990, the NAAQS (40 CFR Part 50) were established to protect human health and welfare, allowing for an adequate margin of safety. Primary and secondary standards exist for the most prevalent (criteria) air pollutants: O_3, CO, nitrogen dioxide (NO_2), sulfur dioxide, lead, and two types of particulate matter (i.e., particulate matter with a diameter of less than 10 micrometers and particulate matter with a diameter of less than 2.5 micrometers).

Federal regulations designate Air Quality Control Regions, or airsheds, that cannot attain compliance with the NAAQS as non-attainment areas and those areas with levels below the NAAQS as attainment areas. Maintenance areas were once designated non-attainment and now designated attainment for a certain time period. States with regions in violation of the NAAQS are mandated to submit a SIP to EPA; this plan details the steps that the state is taking to bring their air quality into compliance with the applicable standard(s). Currently, the Colorado Springs Urbanized Area is in attainment for all criteria pollutants, although it was reclassified as a maintenance area for CO in October 1999. This status currently extends through 2015, although the maintenance plan will be revised in 2009, which will continue the status until 2019. At that time, the Colorado Springs Urbanized Area will be re-designated as an attainment area, unless any NAAQS violations have occurred. The last such violation in the Colorado Springs region was for the 8-hour CO standard in 1988 (PPACG 2008). For now, there are no mandatory regulations to reduce CO emissions in El Paso County, as monitoring results show there have been decreases in CO concentrations since the late 80s; most recently El Paso County's vehicle inspection and maintenance program ended (January 2007). As Colorado Springs is in a maintenance area, its applicable SIP is the *Carbon Monoxide Maintenance Plan for the Colorado Springs Attainment/Maintenance Area*, approved by US Environmental Protection Agency (EPA) on 8 November 2004 (CDPHE 2003).

4.1 General Conformity Rule Requirements

In 1993, EPA established two conformity regulations (40 CFR Parts 6, 51, and 93) for federal transportation and non-transportation projects. Section 176(c) of the CAA requires that federal actions in non-attainment or maintenance areas must conform to a SIP to ensure, prior to the action occurring, that all activities associated with the planned action (i.e., all stationary, mobile, and area sources) do not adversely impact or interfere with achieving attainment of the NAAQS However, certain activities are exempt from the analysis: 1) actions covered by the Transportation Conformity Rule; 2) actions where the total net emissions are below regulatory *de minimis*[3] levels and are not considered to be regionally significant[4]; and 3) certain other actions (listed in 40 CFR 93.153(c)) that are exempt or presumed to conform per 40 CFR 93 Subpart B.

[3] *de minimis* levels are 100 tons per year for CO in a maintenance area (EPA 1993).

[4] Regionally significant action means "a Federal action for which the direct and indirect emissions of any pollutant represent 10 percent or more of a nonattainment or maintenance area's emissions inventory for that pollutant" (EPA 1993). Therefore, the General Conformity Rule applies to the proposed federal action.

The Conformity Analysis must utilize the latest and most accurate emission estimation techniques (e.g., motor vehicle emission models used to prepare or revise the SIP, factors for non-motor vehicle sources, databases, and models specified and approved by EPA), unless written approval to employ modifications or substitutions is obtained from the EPA regional administrator.

If a proposed federal action is not exempt, exceeds the regulatory *de minimis* threshold, or is considered regionally significant, then a Conformity Determination must be prepared. This determination is made to assess whether the total direct and indirect emissions that would result from the federal action would be in conformity with the SIP. That is, the emissions are in compliance or consistent with all relevant requirements and milestones in the applicable SIP, including reasonable further progress schedules; assumptions specified in the attainment or maintenance demonstration; and SIP prohibitions, numerical emission limits, and work practice requirements.

Conforming actions should not result in any of the following:

Cause or contribute to new NAAQS violations in any area;

- Increase the frequency or severity of an existing NAAQS violation; or,
- Delay timely attainment of any NAAQS or interim emission reductions.

4.2 Applicability of Requirements to Proposed Federal Action

Since this proposed federal action is a non-transportation project, the transportation conformity regulations do not apply. Instead the general conformity regulations apply, described in the final rule for *Determining Conformity of Federal Actions to State or Federal Implementation Plans*, which is incorporated by reference in the CDPHE Air Quality Control Commission Regulation No. 10, *Criteria for Analysis of Conformity*. Per Army policy, if the action is shown to be exempt, the Conformity Applicability Analysis must be documented in a Record of Non-applicability (RONA) and then the action can proceed as planned (US Army Center for Health Promotion and Preventive Medicine [USACHPPM] 2002).

Therefore, in accordance with the CAA, this report examines the anticipated actual emissions associated with the Proposed Action (and its Alternatives) from both mobile and stationary sources located and operated in Fort Carson's main Cantonment area. The Conformity Applicability Analysis was conducted for both scenarios and was based on the latest planning assumptions derived from the population, employment, and travel data acquired from the local PPACG. The comparison to the regulatory *de minimis* threshold is focused on the year with the maximum emissions for CO.

Any construction, demolition, or renovation to occur south of the CO maintenance area on Fort Carson are not included in this analysis. Furthermore, in accordance with the regulation, if the following criteria were met, these emissions were included:

1. The emissions must be caused by the federal action but may occur later in time and/or may be farther removed and discreet from the action itself, yet are still reasonably foreseeable (i.e., emissions from projected future federal actions that can be quantified at the time of the conformity determination); and,
2. The federal agency must be able to practicably control and maintain control over the emissions.

The Army's *Technical Guide for Compliance with the General Conformity Rule* indicates that "the Federal proponent of the action must have continuing control over the source of indirect emissions" (USACHPPM 2004). Therefore, emission sources that are not under the Army's control are exempt from this analysis (i.e., motor vehicle use for shopping trips and other errands, travel by dependents on post, commuter traffic not on post, and emissions associated with off-post housing) (US Army Corps of Engineers [USACE] 2007).

4.3 Criteria For Demonstrating Conformity

A federal action is determined to conform if the total direct and indirect emissions are in compliance or consistent with all relevant SIP requirements and milestones and meet any one or a combination of the requirements listed at 40 CFR 93.158:

- Direct and indirect emissions from the activity are specifically identified and accounted for in the attainment or maintenance demonstration of a SIP approved after 1990 (40 CFR 93.158(a)(1) or;
- The emissions are determined and documented by the State Agency responsible for SIP preparation to result in a level of direct and indirect emissions associated with the federal action are together with all other emissions in the non-attainment or maintenance area, would not exceed the emissions inventories specified by the approved applicable SIP (40 CFR 93.158(a)(5)(i)(A) or;
- If SIP conformity cannot be demonstrated by any of the above options then a conformity determination is possible only if the air quality management agency notifies EPA that appropriate changes will be made in the applicable SIP documents and the air quality management agency commits to a schedule for preparing an acceptable SIP amendment that accommodates the net increase in direct and indirect emissions from the federal action without causing any delay in the schedule for attaining the relevant federal ambient air quality standard (40 CFR 93.158(a)(5)(i)(B);
- The federal action (or portion thereof), as determined by PPACG, is specifically included in a current transportation plan and transportation improvement program (TIP), which have been found to conform to the applicable SIP under 40 CFR part 51, subpart T, or 40 CFR part 93, subpart A (40 CFR 93.158(a)(5)(ii) or;
- The federal action (or portion) fully offsets its emissions within the same nonattainment or maintenance area through a revision to the applicable SIP or an equally enforceable measure that effects emission reductions equal to or greater than the total of direct and indirect emissions from the federal action so that there is no net increase in emission of that pollutant; 40 CFR 93.158(a)(5)(iii).

5.0 Conformity Applicability Analysis – Scenario 1 (Proposed Action and Alternative 2)

5.1 Approach

The CO emissions are calculated using various tools and data. Emissions from mobile, stationary, and area sources are quantified using AP-42 emission factors (EPA 1995) and by employing two versions of the Air Conformity Applicability Model (ACAM), version 4.3.3 (Air Force Center for Environmental Excellence [AFCEE] 2006) and version 4.3.31 (Fort Carson 2007). The latest vehicular emission model, MOBILE6.2 (EPA 2002), is used as an input file to ACAM.

To understand the net effect of the change in emissions due to the proposed federal action, direct and indirect emissions occurring from 2009 through 2013 must be calculated. In this case, personnel data, demolition activities, new construction activities, and heating requirements for the new buildings were used in the analysis.

Sources of emissions affecting the maintenance area were assumed to include the following:

- Construction of CS/CSS facility structures, defined by projects numbered 69795 and 67137;
- Demolition associated with the CS/CSS EN Company, project number 67137;
- All CS/CSS Soldiers commuting within the cantonment area in privately-owned vehicles (POVs);
- IBCT and CAB Soldiers commuting in POVs from off-post housing, assuming a portion of them enters the installation through an access gate in the cantonment area and drive through this area before driving downrange to IBCT or CAB facilities;
- Driving of government-owned vehicles (GOVs) for a portion of CS/CSS employees;
- A small additional population regularly driving POVs from IBCT or CAB facilities to meetings in the cantonment area;
- Aircraft operations (in flight only) over the cantonment area;
- Facility heating for the CS/CSS buildings; and
- Miscellaneous mobile and stationary sources, which ACAM assumes to be part of any addition of personnel.

Details regarding the assumptions and calculations are discussed throughout this section and in Appendix B.

5.2 Personnel and Mobile Vehicle Emissions

The stationing/re-stationing of additional units will result in a total personnel increase of 6,700 military personnel at Fort Carson by FY 2013. For Scenario 1, only the 400 personnel of CS/CSS are to be located within the main cantonment area, with the 3,500 IBCT and 2,800 CAB personnel located downrange, outside the Cantonment/CO maintenance area (Table 5-1).

Mobile vehicle emissions include emissions from POVs commuting within the installation, GOVs (e.g., sedans, station wagons, buses, and passenger, utility, and heavy-duty trucks), and off-road support vehicles typically used at military installations. Only emissions generated on Fort Carson and within the cantonment area are included in this analysis.

Scenario 1 would result in an overall increase in full-time military personnel within the Cantonment/CO Maintenance area. Consequently, the number of vehicle miles traveled (VMT) and associated emissions are expected to increase.

Table 5-1. Scenario 1 – Estimated Increase in Active Duty Troops at Fort Carson by CY 2013

Unit	Military Personnel	Location in Scenario 1	In Cantonment/ CO Maintenance Area
IBCT	3,500	Wilderness Road or Tent City	No
CS/CSS	400	Cantonment area	Yes
CAB	2,800	Wilderness Road or Tent City	No
TOTAL	**6,700**		
TOTAL within cantonment area	**400**		

5.2.1 Methodology/Results

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop these emissions:

- New employee POV commuting distance: EPA has stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Based on precedence in other EISs in Colorado, the same assumption was used for this. Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.
- A portion of personnel associated with IBCT or CAB commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5 and 25% through Gate 20. The remaining 50% enter through gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area, are planned for reopening in conjunction with this proposed federal action.
- IBCT and CAB personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks: an estimated 1,440 of 3,500 IBCT personnel will be housed in downrange barracks.

- Similarly, an estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks.
- Estimated distance from Gate 5 to Brown Road and Titus Boulevard, is 2.02 miles. Estimated distance from Gate 20 to Brown Road and Titus Boulevard is 2.64 miles (Moeder 2008).
- The 400 CS/CSS personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on or off post (USACE 2007).
- It is assumed that all new Soldiers will arrive in the first quarter of CY 2012.
- A few additional senior and their support personnel were assumed to commute from the proposed downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). Number of personnel was estimated to be 120 for IBCT and 20 for CAB.
- GOV annual VMT per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

Additional descriptions of how these assumptions were used in the ACAM model are documented in Appendix B. Additional mobile source emissions are calculated for Off-Road Installation Support Vehicles based on the total number of personnel. For this calculation, only the 400 CS/CSS personnel were included in the emissions estimate.

By using these assumptions, the model shows that the maximum increase in CO emissions begin in CY 2012 from POVs and on- and off-road GOVs (Table 5-2). Further calculation details are provided in Appendix B.

Table 5-2. Summary of Mobile Vehicle Emissions for CO for Scenario 1 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
POV Employee Commute	0	0	0	53.99	53.99
GOV On-Road Vehicles	0	0	0	1.91	1.91
GOV Off-Road Installation Support Vehicles	0	0	0	1.58	1.58
TOTAL	**0**	**0**	**0**	**57.53**	**57.53**

5.3 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights is assumed to fly over the cantonment area. Emissions for these training flyovers were calculated using ACAM and by making some very conservative assumptions about the training practices. The results are shown in Table 5-3.

Table 5-3. Summary of Aircraft Flyover Emission of CO for Scenario 1 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Aircraft Flight Operations	0	0	0	0.05	0.05

5.4 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would result primarily from vehicles and fuel-driven tools used to implement construction activities. All construction in Scenario 1 would occur within previously undeveloped areas. In Scenario 1, two projects are planned in the Fort Carson cantonment area, subject to available funds, including more than 131,000 square feet (sf) of new building space (Table 5-4). These projects consist of:

- New CS/CSS QM and EN Company facilities, which include company operations, vehicle maintenance, and various storage areas.

The planned CS/CSS facilities will fit into the existing infrastructure footprint, therefore there are no emissions included related to upgrade or expansion of roads and utilities.

Table 5-4. Proposed Construction Projects at Fort Carson Cantonment Area

Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II Days
1st Qrtr/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
1st Qrtr/2011	67137 CS/CSS EN Company Complex	152,499	7.98	4.48	104/417
TOTAL		**191,029**	**14.92**	**10.54**	**182/730**

5.4.1 Methodology/Results

ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including:

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. See Appendix B for details.

Table 5-5 illustrates the CO emissions resulting from construction projects for both Phase I site grading and Phase II building construction.

Table 5-5. Summary of Construction Activity Emissions for CO from Scenario 1 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Construction Activity	2009	2010	2011	2012	2013
Phase I – Grading Equipment	0.15	0.00	0.23	0.00	0.00
Phase I – Grading Operations	0.00	0.00	0.00	0.00	0.00
Phase II – Acres Paved	0.00	0.00	0.00	0.00	0.00
Phase II – Mobile Equipment [c]	7.18	1.82	5.09	3.04	0.00
Phase II – Non-Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Stationary Equipment [a]	3.33	0.30	3.92	2.35	0.00
Phase II – Worker Trips [b,c]	19.93	10.94	2.27	1.35	0.00
TOTAL	**30.59**	**13.06**	**11.51**	**6.74**	**0.00**

[a] Adjustment for a combination of diesel engines and gasoline engines (90%/10%) for stationary equipment.

[b] Adjusted for altitude (USACE 2007).

[c] Includes mobile source emissions occurring within the Cantonment/CO maintenance area related to construction projects occurring downrange.

5.5 Facility Demolition

Demolition activities are planned to occur at the CS/CSS project site associated with the EN Company. This analysis includes 41,007 sf of demolition to occur in the first quarter of 2011.

5.5.1 Methodology/Results

The emissions from demolition activities are estimated based on the square footage and height of the buildings to be demolished, and the estimated duration of demolition.

Table 5-6 illustrates the CO emissions resulting from the demolition activities for CS/CSS EN Company.

Table 5-6. Summary of Demolition Activity Emissions for CO from Scenario 1 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Demolition Activity	2009	2010	2011	2012	2013
Phase I – Demolition Operations [a]	0.00	0.00	0.16	0.00	0.00

5.6 Stationary Sources

Facility Heating. The federal action would result in an increase of emissions due to the proposed operation of heating equipment in additional facilities. The buildings that contain heating power units in the cantonment area would also increase CO emissions (Table 5-7). Table 5-4 shows the building area inputs (in square feet) that are used to calculate emissions for facility boilers in the Fort Carson cantonment area.

5.6.1 Methodology/Results

Building Heating and Hot Water Heaters (Boilers). Building heating and hot water heater heat input were estimated to be 50 British thermal units per hour (BTU/hr) per square foot of new building construction, operating at 2,190 hours per year, based on past fuel usage (USACE 2007). The emissions factor for CO (AP-42, Table 1.4-1 1998) was used to determine yearly emissions (see Appendix B). CO emissions from boilers are shown for each year of the proposed federal action in Table 5-7.

Table 5-7. Summary of Proposed Boiler Emissions for CO from Scenario 1 -Federal Action at Fort Carson Cantonment Area (Tons/Year)

Point Source	2009	2010	2011	2012	2013
Facility Heating	0.00	0.13	0.13	0.39	0.64

5.7 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g., degreasing, surface coating, pesticides, and residential sources such as lawn mowers.) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregated to be calculated separately, so they have been considered as one category in ACAM.

5.7.1 Methodology/Results

For personnel actions, the ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action. Aggregate per employee or per capita factors were developed for ACAM.

For Scenario 1, no additional personnel are expected to live in housing on-post within the Cantonment/CO maintenance area; therefore, no emissions are calculated for this category.

5.8 Scenario 1 – Conformity Applicability Analysis Findings

Table 5-8 shows the total direct and indirect CO emissions for each source applicable to this analysis as a result of the federal action Scenario 1 at Fort Carson from CYs 2009 to 2013. The maximum CO emissions from all emissions sources are expected to occur in 2012 with 64.66 tpy. The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory *de minimis* levels. Since the threshold for CO emissions is 100 tpy, the maximum emissions do not exceed this regulatory threshold. Furthermore, these maximum emissions (equivalent to 0.18 tons per day) are not considered regionally significant, as the established emissions inventory for 2015 in the SIP is 409.35 tons per day, based on 149,412.75 TPY (CDPHE 2003), and therefore, a Conformity Determination is not required for the Fort Carson proposed federal action Scenario 1. A RONA documents that the General Conformity Rule requirements are not applicable (see Appendix A).

Table 5-8. Summary of Total CO Emissions from Federal Action Scenario 1 at Fort Carson Cantonment Area (Tons/Year)

Emissions Source	2009	2010	2011	2012	2013
Construction	30.59	13.06	11.51	6.74	0
Demolition	0	0	0.16	0	0
Mobile (POV)	0	0	0	53.99	53.99
Mobile (GOV)	0	0	0	3.49	3.49
Mobile (Aircraft)	0	0	0	0.05	0.05
Boilers	0	0.13	0.13	0.39	0.64
Emergency Generators	N/A	N/A	N/A	N/A	N/A
Miscellaneous	N/A	N/A	N/A	N/A	N/A
Total Estimated CO Emissions	**30.59**	**13.19**	**11.80**	**64.66**	**58.18**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

N/A = not applicable

6.0 Conformity Applicability Analysis – Scenario 2 – (Alternative 1)

6.1 Approach

The CO emissions are calculated using various tools and data. Emissions from mobile, stationary, and area sources are quantified using AP-42 emission factors (EPA 1995) and by employing two versions of the ACAM, version 4.3.3 (AFCEE 2006) and version 4.3.31 (Fort Carson 2007). The latest vehicular emission model, MOBILE6.2 (EPA 2002), is used as an input file to ACAM.

To understand the net effect of the change in emissions due to the proposed federal action, direct and indirect emissions occurring from 2009 through 2013 must be calculated. In this case, personnel data, new construction activities, and heating requirements for the new buildings were used in the analysis.

For this scenario, the CS/CSS and IBCT are both proposed to be located within the Cantonment/ CO maintenance area. Although Fort Carson has not determined yet where the CS/CSS would integrate into the cantonment area footprint, for the purposes of estimating mileage, it was assumed CS/CSS and IBCT would be located in TA Bravo. Sources of emissions occurring outside the cantonment area are not included in this analysis. Sources of emissions affecting the maintenance area were assumed to include the following:

- All CS/CSS and IBCT Soldiers commuting in POVs;
- CAB Soldiers commuting in POVs from off-post housing, assuming a portion of them enter the installation through an access gate in the cantonment area and drive through this area before driving downrange to CAB facilities;
- Driving of GOVs for a portion of IBCT and CS/CSS employees;
- A small additional population regularly driving POVs from CAB facilities to meetings in the cantonment area;
- Aircraft operations (in flight only) over the cantonment area;
- Construction of CS/CSS structures, defined by projects numbered 69795 and 67137;
- Demolition associated with the CS/CSS EN Company, project number 67137;
- Construction of IBCT structures defined by projects numbered 69121, 71171, 71176, 71178, and 71198;
- Facility heating for the CS/CSS and IBCT buildings;
- Installation and use of three 749 brake horsepower (bhp) emergency backup generators for IBCT headquarters buildings;
- Miscellaneous mobile and stationary sources, which ACAM assumes to be part of any addition of personnel.

Details regarding the assumptions and calculations are discussed throughout this section and in Appendix B.

6.2 Personnel and Mobile Vehicle Emissions

The stationing/re-stationing of additional units will result in a total personnel increase of 6,700 military personnel at Fort Carson by FY 2013. For Scenario 2, the 400 personnel of CS/CSS and the 3,500 personnel of IBCT are to be located within the cantonment area, with the 2,800 CAB personnel located downrange, outside the Cantonment/CO maintenance area (Table 6-1).

Mobile vehicle emissions include emissions from POVs commuting within the installation, GOVs (e.g., sedans, station wagons, buses, and passenger, utility, and heavy-duty trucks), and off-road support vehicles typically used at military installations. Only emissions generated on Fort Carson and within the cantonment area are included in this analysis.

Scenario 2 would result in an overall increase in full-time military personnel within the Cantonment/CO Maintenance area. Consequently, the number of VMT and associated emissions are expected to increase.

Table 6-1. Scenario 2 – Estimated Increase in Active Duty Troops at Fort Carson By 2013

Unit	Personnel	Location in Scenario 2	In Cantonment/ CO Maintenance Area
IBCT	3,500	TA Bravo	Yes
CS/CSS	400	Cantonment Area	Yes
CAB	2,800	Wilderness Road or Tent City	No
TOTAL	**6,700**		
TOTAL Within Cantonment	**3,900**		

6.2.1 Methodology/Results

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop these emissions:

- New employee POV commuting distance: EPA stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.
- A portion of personnel associated with CAB commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5, and 25% through Gate 20. The remaining 50% enter through Gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area, are planned for reopening in conjunction with this proposed federal action.

- CAB personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks, an estimated 1,440 of 3,500 IBCT personnel will be housed in cantonment area barracks.
- No CS/CSS personnel will be in on-post housing.
- An estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks.
- Estimated distance from Gate 5 to Brown and Titus Boulevard is 2.02 miles. Estimated distance from Gate 20 to Brown and Titus Boulevard is 2.64 miles (Moeder 2008).
- The 400 CS/CSS and 3,500 IBCT personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on- or off-post (USACE 2007).
- It is assumed that all new Soldiers arrive in the first quarter of 2012.
- A few additional senior personnel and their support personnel were assumed to commute from downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). Number of personnel was estimated to be 20 for CAB.
- GOV annual VMT per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

Additional descriptions of how these assumptions were used in the ACAM model are described in Appendix B. Additional mobile source emissions are calculated for off-Road Installation Support Vehicles based on the total number of personnel. For this calculation, the 400 CS/CSS and 3,500 IBCT personnel were included in the emissions estimate.

By using these assumptions, the model shows that the maximum increase in CO emissions begin in CY 2012 from POVs and on- and off-road GOVs (Table 6-2). Further calculation details are in Appendix B.

Table 6-2. Summary of Mobile Vehicle Emissions for CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
POV Employee Commute	0	0	0	96.43	96.43
GOV On-Road Vehicles	0	0	0	18.67	18.67
GOV Off-Road Installation Support Vehicles	0	0	0	15.42	15.42
TOTAL	**0**	**0**	**0**	**130.52**	**130.52**

6.3 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights is assumed to fly over the cantonment area. Emissions for these training flyovers were calculated using ACAM and by making some very conservative assumptions about the training practices. The results are shown in Table 6-3.

Table 6-3. Summary of Aircraft Flyover Emission of CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Aircraft Flying Operations	0	0	0	0.05	0.05

6.4 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would result primarily from vehicles and fuel-driven tools used to implement construction activities. All construction in Scenario 2 would occur within previously undeveloped areas. In Scenario 2, two projects are planned in the Fort Carson cantonment area, subject to available funds, including more than1,563,000 sf of new building space (Table 6-4). These projects consist of:

- New CS/CSS QM and EN Company facilities, which include company operations, vehicle maintenance, and various storage areas;
- IBCT Headquarters;
- IBCT Barracks and Dining Facility (DFAC);
- IBCT Company Operations Facilities;
- IBCT Tactical Equipment Maintenance Facility (TEMF), including vehicle maintenance and various storage areas;
- Child Development Center; and
- Construction of additional roads.

Table 6-4. Proposed Scenario 2 Construction Projects at Fort Carson Cantonment Area

Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II Days
1st Qrtr/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
1st Qrtr/2011	67137 CS/CSS EN BN Complex	152,499	7.98	4.48	104/417
1st Qrtr/2009	69121 IBCT Barracks and DFAC	553,540	13.48	0.78	104/417
1st Qrtr/2009	71171 Child Development Center	79,650	5.41	3.58	78/313
1st Qrtr/2009	71176 IBCT HQ	145,176	3.70	0.37	104/417
1st Qrtr/2009	71178 IBCT Company Operations	368,964	9.95	1.48	104/417
1st Qrtr/2009	71198 IBCT TEMF	225,255	37.30	32.13	104/417
1st Qrtr/2009	71208 IBCT New Road Construction	NA	24.05	24.05	104/417
TOTAL		**1,563,614**	**108.81**	**72.93**	**676/2711**

6.4.1 Methodology/Results

ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including:

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. See Appendix B for details.

Table 6-5 illustrates the CO emissions resulting from construction projects for both Phase I site grading and Phase II building construction.

Table 6-5. Summary of Construction Activity Emissions for CO from Scenario 2 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Construction Activity	2009	2010	2011	2012	2013
Phase I – Grading Equipment	2.80	0.00	0.23	0.00	0.00
Phase I – Grading Operations	0.00	0.00	0.00	0.00	0.00
Phase II – Acres Paved	0.00	0.00	0.00	0.00	0.00
Phase II – Mobile Equipment [c]	34.40	15.39	5.09	3.04	0.00
Phase II – Non-Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Residential Architectural Coatings	0.00	0.00	0.00	0.00	0.00
Phase II – Stationary Equipment [a]	25.42	11.32	3.92	2.35	0.00
Phase II – Worker Trips [b,c]	29.59	16.37	2.27	1.35	0.00
TOTAL	**92.20**	**43.09**	**11.51**	**6.74**	**0.00**

[a] Adjustment for a combination of diesel engines and gasoline engines (90%/10%) for stationary equipment.

[b] Adjusted for altitude (USACE 2007).

[c] Includes mobile source emissions occurring within the Cantonment/CO maintenance area related to construction projects occurring downrange.

6.5 Facility Demolition

Demolition activities are planned to occur at the CS/CSS project site associated with the EN Company. This analysis includes 41,007 sf of demolition to occur in the first quarter of 2011.

6.5.1 Methodology/Results

The emissions from demolition activities are estimated based on the square footage and height of the buildings to be demolished, and the estimated duration of demolition.

Table 6-6 illustrates the CO emissions resulting from the demolition activities for CS/CSS EN Company.

Table 6-6. Summary of Demolition Activity Emissions for CO from Scenario 2 – Federal Action at Fort Carson Cantonment Area (Tons/Year)

Demolition Activity	2009	2010	2011	2012	2013
Phase I – Demolition Operations [a]	0.00	0.00	0.16	0.00	0.00

6.6 Stationary Sources

Facility Heating. The federal action would result in an increase of emissions due to the proposed operation of heating equipment in additional facilities. The buildings that contain heating power units in the cantonment area would also increase CO emissions (see Table 6-7).

Table 6-4 shows the building area inputs in square feet that are used to calculate emissions for facility boilers at the Fort Carson cantonment area.

Emergency Generators. There are an estimated three new diesel-fired emergency generators, rated 749 bhp, proposed to be installed within the Cantonment/maintenance area. It was assumed they would operate 44 hours per year per generator, based on Fort Carson average actual operation. The three generators will begin operating in CY 2011 and will operate throughout the years of the proposed action.

6.6.1 Methodology/Results

Building Heating and Hot Water Heaters (Boilers). Building heating and hot water heater heat input were estimated to be 50 BTU/hr per square foot of new building construction, operating at 2,190 hours per year, based on past fuel usage (USACE 2007). The emissions factor for CO (AP-42, Table 1.4-1, 1998) was used to determine yearly emissions (see Appendix B). CO emissions from boilers are shown for each year of the proposed federal action in Table 6-6.

Emergency Generators. CO emissions from the three emergency generators are based on usage of 44 hours per generator per year. Emissions were estimated using AP-42 emission factors (AP-42-Table 3.3-1, 1998). The total CO emissions for these proposed units are shown in Table 6-7.

Table 6-7. Summary of Proposed Boiler and Generator Emissions for CO from Scenario 2 - Federal Action at Fort Carson Cantonment Area (Tons/Year)

Point Source	2009	2010	2011	2012	2013
Facility Heating	0.00	1.68	2.97	3.23	3.49
Emergency Generators	0.00	0.00	0.21	0.27	0.27
TOTAL	0.00	1.68	3.17	3.50	3.76

6.7 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g., degreasing, surface coating, pesticides, and residential sources such as lawn mowers) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregate to be calculated separately, so they have been considered as one category in ACAM.

6.7.1 Methodology/Results

For personnel actions, the ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action. Aggregate per employee or per capita factors were developed for ACAM. As mentioned earlier in the section, it was assumed that 1,440 of the 3,900 added personnel were in on-post/in-cantonment housing. Total emissions are shown below in Table 6-8.

Table 6-8. Summary of Miscellaneous Source Emissions of CO for Scenario 2 (Tons/Year) at Fort Carson

Mobile Source Activity	2009	2010	2011	2012	2013
Miscellaneous Point Sources	0	0	0	15.23	15.23

6.8 Scenario 2 – Conformity Applicability Analysis Findings

Table 6-9 shows the total direct and indirect CO emissions for each source applicable to this analysis as a result of the federal action Scenario 2 at Fort Carson from FYs 2009 to 2013. The maximum CO emissions from all emissions sources are expected to occur in 2012 with 156.05 tpy. The year with the greatest emissions is used to determine whether the emissions that result from the federal action exceed the specified regulatory *de minimis* levels. Since the threshold for CO emissions is 100 tpy, the maximum emissions do exceed this threshold, and therefore a Conformity Determination is required for the Fort Carson federal action Scenario 2.

Table 6-9. Summary of Total CO Emissions from Federal Action Scenario 2 at Fort Carson Cantonment Area (Tons/Year)

Emissions Source	2009	2010	2011	2012	2013
Construction	92.20	43.09	11.51	6.74	0
Demolition	0	0	0.16	0	0
Mobile (POV)	0	0	0	96.43	96.43
Mobile (GOV)	0	0	0	34.09	34.09
Mobile Aircraft	0	0	0	0.05	0.05
Boilers	0	1.68	2.97	3.23	3.49
Emergency Generators	0	0	0.21	0.27	0.27
Miscellaneous	0	0	0	15.23	15.23

Emissions Source	2009	2010	2011	2012	2013
Total Estimated CO Emissions	**92.20**	**44.77**	**14.85**	**156.05**	**149.57**
CO *de minimis* Threshold	**100**	**100**	**100**	**100**	**100**

N/A = not applicable

6.9 Statement of Conformity

Based on the criteria outlined in Section 4.2, the CY 2012 CO emissions for the alternative siting of unit facilities (Scenario 2) exceeds the *de minimis* limit by totaling 156.05 tpy (i.e., 96.43 tpy from POVs, 34.09 tpy from GOVs, and 25.53 tpy from all other sources). Fort Carson can demonstrate that the Scenario 2 planned federal action complies with the General Conformity Rule requirements and conforms with the Colorado SIP in the following ways:

- The *FY 2008 Through FY 2013 Transportation Improvement Program for the Colorado Springs Urbanizing Area* allows a "sufficient margin of safety to the mobile source emissions budget[5] buffer to maximize the flexibility for determining conformity in future years due to mobile source growth beyond projected levels for future years or for model changes that revise projected emissions" (Pikes Peak Area Council of Governments [PPACG] 2008(b)). The PPACG updated the Transportation Improvement Program (TIP) by significantly revising its travel demand model for forecasting traffic and specifically, Fort Carson has been attributed enough growth in the TIP to allow for a total population of 30,000 active duty troops by CY 2015 (Prather 2008). As the Soldier numbers used in this Conformity Analysis are rounded up to be conservative, the worst case total active duty troop population for Fort Carson after this proposed action (FY 2013) is estimated to be 32,000 Soldiers. However, "…[d]eployments overseas mean that many of the troops assigned to Fort Carson are not physically located on the post or training at PCMS" (Fort Carson 2008). Therefore, there is a low probability that Fort Carson will ever realize that population potential for any sustained period of time. Based on discussions with PPACG, it is asserted that their TIP will be able to accommodate Fort Carson's growth based on the remaining available budgeted emissions for the region. Therefore, the 96.43 tpy of POV emissions meet the requirements and criteria for demonstrating conformity (per 40 Code of Federal Regulations [CFR] 93.158(a)(5)(ii)), as those emissions will be certified as accounted for in the TIP by PPACG.
- The remaining emissions (i.e., 59.62 tpy) related to GOVs, facility construction, stationary sources (i.e., boilers and generators), and miscellaneous area source emissions, are less than the regulatory thresholds outlined for General Conformity at 40 CFR 93.158(c)(1) and are considered to be *de minimis*. These emissions are also not considered regionally significant;

[5] Emissions budgets are "those portions of the applicable SIP's projected emissions inventories that describe the levels of emissions (mobile, stationary, area, etc.) that provide for meeting reasonable further progress milestones, attainment, and/or maintenance for any criteria pollutant or its precursors" (EPA 1993).

therefore, demonstration of conformity is not required and is documented on a Record of Non-Applicability.

Appendix A – Records of Non-Applicability

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Action Name:	**US Army Garrison (USAG) Fort Carson – Grow the Army and Combat Aviation Brigade**
Action Identification Number:	**Scenario 1- Proposed Action and Alternative 2**
Action Point of Contact:	**Tom Warren, Deputy Garrison Commander PCMS 719-526-2022**
Begin Date: Calendar Year (CY) 2009	**End Date: CY 2013**

General Conformity under the Clean Air Act, Section 176(c) has been evaluated for the federal action described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because total annual direct and indirect emissions from it have been estimated:

Carbon Monoxide (CO) Emissions (CY 2012)

Construction and Demolition Phase	6.74 tpy
Operations Phase – Mobile Sources	57.53 tpy
Operations Phase – Point Sources	0.39 tpy
TOTAL Annual Emissions	**64.66 tpy**

These emission rates are below the conformity threshold values established at 40 CFR 93.153(b):

Conformity Threshold Rate

CO	100 tpy

Also, under 40 CFR 93.153(i), the federal action is not considered regionally significant, as the calculated emissions are less than 10% of the maintenance area emissions for CO. The maximum annual emissions from the proposed project are estimated to be 0.18 tons/day of CO, which is about 0.04 percent of the area-wide emissions.

Supporting documentation and emissions estimates are discussed in the Clean Air Act General Conformity Analysis and Determination report, which supports the USAG Fort Carson's *Grow the Force Environmental Impact Statement*.

SIGNED _____

Thomas L. Warren,
Deputy Garrison Commander PCMS

GENERAL CONFORMITY – RECORD OF NON-APPLICABILITY

Action Name:	**US Army Garrison (USAG) Fort Carson – Grow the Army and Combat Aviation Brigade**
Action Identification Number:	**Scenario 2- Alternative 1**
Action Point of Contact:	**Tom Warren, Deputy Garrison Commander PCMS 719-526-2022**
Begin Date: Calendar Year (CY) 2009	**End Date: CY 2013**

General Conformity under the Clean Air Act, Section 176(c) has been evaluated for the federal action described above according to the requirements of 40 CFR 93, Subpart B. The requirements of this rule are not applicable to this project/action because total annual direct and indirect emissions from it have been estimated:

Carbon Monoxide (CO) Emissions (CY 2012)

Construction and Demolition Phase	6.74 tpy
Operations Phase – Mobile Sources	49.37 tpy
Operations Phase – Point Sources	3.5 tpy
TOTAL Annual Emissions	**59.61 tpy**

These emission rates are below the conformity threshold values established at 40 CFR 93.153(b):

Conformity Threshold Rate

CO	100 tpy

Also, under 40 CFR 93.153(i), the federal action is not considered regionally significant, as the calculated emissions are less than 10% of the maintenance area emissions for CO. The maximum annual emissions from the proposed project are estimated to be 0.18 tons/day of CO, which is about 0.04 percent of the area-wide emissions.

Supporting documentation and emissions estimates are discussed in the Clean Air Act General Conformity Analysis and Determination report, which supports the USAG Fort Carson's *Grow the Force Environmental Impact Statement*.

SIGNED _____

Thomas L. Warren,
Deputy Garrison Commander PCMS

Appendix B – Carbon Monoxide Emissions Calculations/Assumptions

This section provides greater detail of the use of ACAM and other emission calculation methods to develop the carbon monoxide (CO) emission calculations for this general conformity analysis. Only that information pertinent to Fort Carson, CO conformity is included.

B1.0 USE OF ACAM SOFTWARE

The CO emissions are calculated using two versions of the Air Conformity Applicability Model (ACAM): the standard Air Force version 4.3.3 (AFCEE 2006) and a modified version 4.3.31 developed especially for Fort Carson (Fort Carson 2007). ACAM 4.3.31 was used for most emission categories. ACAM 4.3.3 was used to calculate on-road POV and GOV emissions using the MOBILE6.2 software supplied with and run through ACAM. This method was chosen due to technical difficulty in getting the MOBILE6 software to operate properly from the ACAM 4.3.31 model. In addition, the unique assumptions used for the POV calculations made it necessary to use different personnel assumptions for MOBILE6.2 and other population-based ACAM calculations.

In addition, ACAM 4.3.3 was used for generating the Aircraft Flying Operations emissions, because the module had been disabled in ACAM 4.3.31.

Emissions generated from each model were assembled and tabulated using a Microsoft Access database linking to the underlying data tables used by each of the ACAM versions.

B2.0 METHODS, ASSUMPTIONS, AND INPUT PARAMETERS

For all of the emission sources involved in this analysis, ACAM was used for the initial emissions development. For certain source categories, the emissions produced by ACAM were modified to account for unique conditions related to the Fort Carson facility. The document U.S. Air Force Air Conformity Applicability Model Version 4.3 Technical Documentation, December 2005, should be referred to for any questions about particular emissions methods, emission factors, or input definitions. The intent of this appendix is to describe and document any special assumptions or modifications made to the ACAM results used in this report.

B2.1 Personnel and Mobile Vehicle Emissions

ACAM uses MOBILE6.2 (EPA 2002) to calculate emissions from POV and GOV on-road vehicle emissions. The following assumptions were used to develop the emissions for each scenario:

- New employee POV commuting distance: EPA has stated that only commuting travel inside the installation's boundary needs to be considered in the Conformity Determination (USACE 2007). Emissions associated with other household travel are not under Army control; therefore, these indirect emissions are excluded from the Applicability Analysis calculations.

- A portion of personnel associated with downrange units commute to work from off-post housing and enter the installation through access gates within the Cantonment/CO maintenance area. It is assumed 25% enter through Gate 5 and 25% through Gate 20. The remaining 50% enter through gates outside the Cantonment/CO maintenance area.
- Gates 19 and 6, located outside the CO maintenance area are planned for reopening in conjunction with this federal action.
- Downrange unit personnel housed in downrange barracks do not create POV emissions within the Cantonment/CO maintenance area while commuting to work.
- Based on the maximum number of available spaces in the proposed barracks: an estimated 1,440 of 3,500 IBCT personnel will be housed in barracks (downrange in Scenario 1, cantonment area in Scenario 2.)
- Similarly, an estimated 1,008 of 2,800 CAB personnel will be housed in downrange barracks in both scenarios.
- Estimated distance from Gate 5 to Brown Road and Titus Boulevard is 2.02 miles. Estimated distance from Gate 20 to Brown Road and Titus Boulevard is 2.64 miles (Moeder 2008)
- The 400 CS/CSS personnel located within the cantonment area had an average 2 mile one-way commute, whether or not personnel live on or off post. (USACE 2007)
- It is assumed that all new personnel arrive in the first quarter of 2012.
- A few additional senior personnel and their support staff were assumed to commute from the proposed downrange facilities to daily meetings within the cantonment area. Commute length was assumed to be 2 miles, the measured distance from Brown Road and Titus Boulevard to the cantonment area center point of Prussman Street and Specker Avenue (Google Earth 2008). The number of personnel was estimated to be 120 for IBCT and 20 for CAB.
- For GOV annual vehicle miles traveled per new Soldier: the ACAM default value of 229 miles per year per employee was used (AFCEE 2005).

B2.1.1 MOBILE6.2 POV and GOV On-Road Emission Calculations

The assumptions listed above were incorporated into a spreadsheet that determined total POV vehicle miles traveled (VMT) occurring within the CO maintenance area for each scenario. From this, the one-way commute was calculated to use as the ACAM input, based on the total number of in-cantonment area personnel added. This was necessary because the number of in-cantonment area personnel is also used by ACAM for the GOV On-Road emission calculations, and needs to represent only personnel at units in the cantonment area; while the POV calculation is attempting to include emissions from personnel in units outside the maintenance area that may produce some emissions within the maintenance area. Table B-1 shows the ACAM 4.3.3 inputs and MOBILE6.2 non-default assumptions used for each Scenario calculation. Note that the one-way commute mileage is much higher for Scenario 1 since mileage is included for a large number of downrange personnel passing through the cantonment area during their commute.

Table B-1. ACAM 4.3.3 Inputs for MOBILE6.2 Calculations

Input	Scenario 1	Scenario 2
One-Way Commute (miles)[6]	13.92[7]	2.55[8]
Added Active Duty Personnel (1Q2012)	400	3900
New Employees Living On Base (%)	0	0
Government VMT (miles/person/year)	229	229
MOBILE6.2 POV/GOV Oxygenated Fuels	25 % Alcohol at 0.027% by weight RVP to exceed limit	
MOBILE6.2 POV/GOV Fuel Program	Conventional Gasoline West	

B2.1.2 Off-Road Base Support Vehicle Emission Calculations

Additional mobile source emissions are calculated for Off-Road Base Support Vehicles based on the total number of personnel. For this calculation, only the personnel stationed within the cantonment area were included in the emissions estimate. The ACAM 4.3.31 input values are shown in Table B-2. The standard ACAM calculation method was used.

Table B-2. ACAM 4.3.31 Inputs for Personnel and Off-Road Base Support Vehicle Calculations

Input	Scenario 1	Scenario 2
Added Active Duty Personnel (1Q2012)	400	3900
New Employees Living On Base (%)[9]	0%	37%[10]

B2.2 Aircraft Flight Operations

Additional aircraft will be re-stationed at Fort Carson associated with the CAB unit. Since the CAB and Butts Army Airfield are located outside the cantonment area, most emissions related to operation (take off/landing) and maintenance of the re-stationed aircraft would occur outside the CO maintenance area and would be excluded from this conformity analysis. However, a portion of the training flights are assumed to fly over the cantonment area. Emissions for these training

[6] One-way Commute (miles) = (Total VMT within cantonment area by all personnel) / (# cantonment personnel)
[7] 13.92 = 5567.58 total VMT / 400 cantonment area personnel
[8] 2.55 = 9927.68 total VMT / 3900 cantonment area personnel
[9] Since ACAM is an Air Force-developed software, "Base" is used instead of "Post".
[10] Percent of new Soldiers living on post and in cantonment area = 1440/3900 = 37%

flyovers were calculated using ACAM 4.3.3 and by making the following conservative assumptions about the training practices:

- All operations performed by Blackhawk UH-60M helicopters with two T700-GE-701C engines.
- Used readily available emission factors for T700-GE-700, an older version of the same engine. It is assumed that CO emissions are similar or higher for the older engine type.
- All operations within the cantonment area airspace are in "Climb" mode.
- Each flyover consists of one minute of "Climb" mode operation within the cantonment area airspace.
- Conduct 50 operations per day with 10% flying north through the cantonment area airspace.
- Assume all operations fly below the mixing zone. The mixing zone varies, with 12,000 ft as the maximum average mixing zone elevation for this region (Cook 2008).
- Operations conducted five days per week, 52 weeks per year.

The ACAM 4.3.3 input values are shown in Table B-3. The standard ACAM calculation method was used.

Table B-3. ACAM 4.3.3 Inputs for Aircraft Operation Emission Calculations

Input	Scenarios 1 & 2
Aircraft Type	UH-60A
Engine Type	T700-GE-700
Quantity	5[11]
Time in Climb Mode	1 minute[12]
Sorties per year	260[13]

B2.3 Facility Construction

The CO emissions from new construction in the Fort Carson cantonment area would primarily result from vehicles and fuel-driven tools used to implement construction activities. ACAM calculates emissions for a number of different construction activities that would occur during Phase 1 (site preparation and grading) and Phase II (building construction), including,

[11] Number of aircraft = 50 operations per day x 10% that fly through the cantonment area airspace
[12] All other mode times set to zero.
[13] Sorties = 1/aircraft x 5/week x 52 weeks/year. All other types of operations and support equipment set to zero.

- Phase I – Grading Equipment: diesel truck emissions;
- Phase I – Grading Operations: dust generation;
- Phase II – Acres Paved: volatile organic emissions from asphalt;
- Phase II – Mobile Equipment: diesel truck emissions;
- Phase II – Non-residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Residential Architectural Coatings: volatile organic emissions from painting;
- Phase II – Stationary Equipment: non-mobile diesel and gasoline-powered equipment; and
- Phase II – Worker Trips: construction worker POV commuting emissions.

The emissions for the above categories are estimated based on the square footage of the buildings to be constructed, the area graded, the area to be paved, and the estimated length of time of each phase of construction. This data is shown in Table B-4, with the first two columns indicating whether the project was part of Scenario 1 or Scenario 2.

Some of the construction-related emissions generated by ACAM were modified for certain source types in order to take into account the added complexity of considering the impact of construction occurring downrange, outside the cantonment area. These and other special assumptions are explained in each subsection below.

Table B-4. ACAM 4.3.31 Inputs for Construction Projects at Fort Carson

Scenario 1	Scenario 2	Begin Construction	Project Number/ Project Name	Building Size (sf)	Graded Area (acres)	Paved Area (acres)	Phase I/ Phase II[14] Days
Yes	Yes	1Q/2009	69795 CS/CSS QM Facilities	38,530	6.94	6.06	78/313
Yes	Yes	1Q/2011	67137 CS/CSS EN BN Complex	152,499	7.98	4.48	104/417
No	Yes	1Q/2009	69121 IBCT Barracks and DFAC	553,540	13.48	0.78	104/417
No	Yes	1Q/2009	71171 Child Development Center	79,650	5.41	3.58	78/313
No	Yes	1Q/2009	71176 IBCT HQ	145,176	3.70	0.37	104/417
No	Yes	1Q/2009	71178 IBCT Company Operations	368,964	9.95	1.48	104/417
No	Yes	1Q/2009	71198 IBCT TEMF	224,810	37.30	32.13	104/417
No	Yes	1Q/2009	71208 IBCT New Road Construction	NA	24.05	24.05	104/417

B2.3.1 Phase I – Grading Equipment

This is a calculation of diesel truck emissions, based on the graded acres for each project, as shown in Table B-4. Because these emissions occur primarily at the project site, it is assumed

[14] Phase II days for ACAM input equal the project data Phase II + Phase III duration.

that only projects within the Cantonment should be included. The standard ACAM calculation method was used.

B2.3.2 Phase I – Grading Operations

This is a calculation of particulate dust emissions, based on the graded acres for each project, as shown in Table B-4. Because these emissions occur primarily at the project site, it is assumed that only projects within the Cantonment should be included. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.3 Phase II – Acres Paved

This is a calculation of volatile organic emissions from asphalt paving. The calculation is based on paving footprint (acres), as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.4 Phase II – Mobile Equipment

This is a calculation of diesel truck emissions from mobile equipment used during Phase II of the construction, such as dump trucks and fork lifts. The calculation is based on building square footage and duration of each project, as shown in Table B-4. Because these emissions could occur away from the project site (e.g. diesel truck transporting building materials to the site), it is assumed that a portion of emissions for downrange projects should be included. This is intended to account for mobile equipment entering post through a cantonment area gate and passing through the cantonment area on the way to a downrange construction site. The standard ACAM calculation method was used for each in-cantonment area project. The resulting emissions were adjusted using the following methods and assumptions:

- Scenario 1– Added 5% of IBCT construction mobile source emissions calculated for Scenario 2[15] to account for a portion of downrange IBCT traffic passing through Cantonment. Added an additional 5% of IBCT construction mobile source emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic passing through the cantonment area.
- Scenario 2 – Added 5% of IBCT construction mobile source emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic passing through the cantonment area.
- It was assumed most downrange project construction vehicles would enter post through downrange gates (Nos. 6 and 19). Therefore the small value of 5% was chosen to estimate the maximum portion of downrange construction mobile sources to pass through the cantonment area.
- It was assumed that CAB construction levels were similar to IBCT construction levels.

[15] IBCT construction mobile source emissions = (Total calculated for Scenario 2 – IBCT and CS/CSS) – (Total calculated for Scenario 1 – CS/CSS only)

B2.3.5 Phase II – Non-residential Architectural Coatings

This is a calculation of volatile organic emissions from non-residential architectural coatings. The calculation is based on building square footage, as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.6 Phase II – Residential Architectural Coatings

This is a calculation of volatile organic emissions from residential architectural coatings. The calculation is based on building square footage, as shown in Table B-4. The standard ACAM calculation method was used. This does not contribute to the CO emissions.

B2.3.7 Phase II – Stationary Equipment

ACAM estimates emissions for stationary gasoline-powered equipment commonly used at a construction site (e.g. generators, saws, etc.). The calculation is based on building square footage and duration of each project, as shown in Table B-4. Since it is reasonable to assume that a combination of diesel-powered (90%) and gasoline-powered (10%) equipment will be used on post, a correction outside the model is made using AP-42 emission factors for gasoline and diesel engines (EPA 1995) according to the following equation:

$$\text{CO emissions}_{\text{stationary equipment}} = \text{CO emissions}_{\text{gasoline}} \times (0.9 \times 0.00668 + 0.1 \times 0.439)/0.439$$

where:
$\text{CO emissions}_{\text{gasoline}}$ is the ACAM result using the standard calculation method,
0.00668 lb/bhp-hr is the emission factor for CO from diesel engines (EPA 1995, Table 3.3-1), and
0.439 lb/bhp-hr is the emission factor for CO from gasoline engines (EPA 1995, Table 3.3-1).

Because these emissions occur primarily at the project site, it is assumed that only projects within the cantonment area should be included. The standard ACAM calculation method was used.

B2.3.8 Phase II – Worker Trips: construction worker POV commuting emissions.

ACAM estimates emissions for construction worker commuting in POV to the project site. The calculation is based on the project duration and building square footage, as shown in Table B-4. Because these emissions could occur away from the project site, it is assumed that a portion of emissions for downrange projects should be included. A factor of 50% was chosen as a conservative estimate based on similar assumptions made for POV gate usage, as described in section B2.1. This is intended to account for workers of downrange projects entering post through a cantonment area gate and passing through the cantonment area on the way to a downrange construction site. The standard ACAM calculation method was used for each in-cantonment area project. The resulting emissions were adjusted using the following methods and assumptions:

- Scenario 1– Added 50% of IBCT worker trip emissions calculated for Scenario 2[16] to account for a portion of downrange IBCT traffic entering post through a cantonment area gate. Added an additional 50% of IBCT worker trip emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic entering post through a cantonment area gate.
- Scenario 2 – Added 50% of IBCT worker trip emissions calculated for Scenario 2 to account for a portion of downrange CAB traffic entering post through a cantonment area gate.
- It was assumed that 50% of downrange project worker POVs would enter post through cantonment area gates.
- It was assumed that CAB construction levels were similar to IBCT construction levels.

In addition, these emissions were adjusted for altitude and oxygenated fuels without the inspection and maintenance program (USACE 2007) to account for the elevation at Fort Carson of greater than 500 feet above sea level. Adjustment was made with the following calculation:

$$\text{CO emissions}_{\text{adjusted}} = \text{CO emissions}_{\text{ACAM}} \times 1.035$$

B2.4 Facility Demolition

In order to construct the facilities associated with the CS/CSS EN Company, several demolition activities must occur during Phase I, in the first quarter of 2011 specifically. ACAM calculates emissions from demolition activities using the length, width, and height of the buildings to be demolished, and the duration. Therefore, the following parameters were estimated:

- A total square footage of 41,007;
- A height of 18 feet for all of the buildings; and
- A duration of one week, or five days.

B2.5 Stationary Sources

B2.5.1 Facility Heaters

ACAM has several methods available for calculating emissions from facility heating. In this case, facility heating emissions were calculated based on the building square footage, as listed in Table B-4. In addition to building area, ACAM requires definition of an average facility heating rate. Facility heating rate was estimated by the US Army Corps of Engineers (USACE 2007) to be 50 BTU/hr per square foot of new building construction. The heaters were assumed to operate only 2,190 hours based on past fuel usage.

ACAM 4.3.31 Input Facility Heating Rate = (50 BTU/hr-sf) x (2190 hr/yr) = 109,500 BTU/sf

[16] IBCT construction mobile source emissions = (Total calculated for Scenario 2 – IBCT and CS/CSS) – (Total calculated for Scenario 1 – CS/CSS only)

ACAM uses standard AP-42 emissions factor for CO (AP-42, Table 1.4-1 1998) was used to determine yearly emissions. The standard ACAM calculation method was used for each in-cantonment area project.

B2.5.2 Emergency Generators

ACAM calculates emissions for emergency generators based on fuel type, capacity rating, and annual fuel use. CO emission rates from the three emergency generators are based on usage of 44 hours per generator per year (average actual hours for 2006 and 2007). Emissions were estimated using AP-42 emission factors for diesel generators of less than 600 bhp capacity (EPA 1995, Table 3.3-1). The fuel consumption for use as ACAM input was calculated using the following equation:

749 bhp x 3 engines x 44 hr/yr/engine x 7,000 BTU/bhp-hr / (140,000 btu/gal) = 4,943.4 gal/yr
where:

- 749 bhp is the estimated capacity of each engine
- 3 engines are assumed to be installed within the cantonment area in Scenario 2
- 44 hr/yr is average actual use per engine based on Fort Carson's historic actual use (Meister 2008).
- 7,000 BTU/bhp-hr is average brake-specific fuel consumption, (EPA 1995, Table 3.3-1).
- 140,000 BTU/gal is heating value of distillate oil, (EPA 1995, Appendix A, p.A-5).

B2.5.3 Miscellaneous Sources

Additional emissions will be generated by miscellaneous source activities (e.g. degreasing, surface coating, pesticides, and residential sources such as lawn mowers) anticipated to occur as a result of increased personnel and construction of new facilities. These activities are too small and/or too disaggregated to be calculated separately, so they have been considered as one category in ACAM. The ACAM model calculates emissions from miscellaneous area sources based on an aggregate emission factor and the number of personnel living in on-post housing proposed to be added as a result of the federal action (see Table B-2). The standard ACAM calculation method was used.

Appendix C – References

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APPENDIX D
NOISE SUPPORTING DOCUMENTATION

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Prepared by

U.S. Army Center for
Health Promotion and Preventive Medicine

Under Contract to
Army Environmental Center

for

U.S. Army, Fort Carson, Colorado

APPENDIX D

Noise Supporting Documentation

How is noise modeled?

The primary means of assessing military environmental noise is through computer modeling. Computer noise models require various operational data, such as types of operations/weapons and number, location, and time of training. The output from the models is summarized on installation land use maps in the form of noise contours. This fact sheet presents information about the various computer models used to generate noise contour maps. *Note: Noise contours are not generated from actual noise measurements because the process would be too labor- and equipment-intensive, requiring months of monitoring at hundreds of measurement sites.*

Calculating Average Noise Levels

Department of Defense bases/installations use computer modeling programs to determine the average daily noise for aircraft operations generated over the period of one year. Generally, moments of quiet are averaged together with moments where loud noises can be heard. The models also add a 10-decibel penalty to nighttime noise (10 pm to 7 am) to account for higher annoyance usually associated with nighttime noise events. In California, a 5-decibel penalty is also included for evening noise events (7 pm to 10 pm).

High-Energy Impulsive Noise (abrupt, short-duration noise such as from explosions and artillery)

The noise simulation program used to assess large-caliber (20-millimeter and greater) weapons is BNOISE2. It models the noise from the muzzle blast, the explosive detonation at impact, and the bow shock caused by the round going down range. The effects of terrain on sound travel (propagation) are also included. The BNOISE2 program requires operational data concerning type of weapons fired from each range or firing point, including demolitions, the number and type of rounds fired from each weapon, the location of targets for each range or firing point, the amount of propellant used to reach the target and time of day.

Aircraft Noise

Noise contours for aircraft activity at an airfield are generated using the NOISEMAP computer program. The required inputs to the program are the location of the flight tracks, aircraft altitudes, the number of each type of aircraft using each flight track and time of day.

Rotary-wing noise, including helicopters and tilt-rotors, is modeled using the Rotorcraft Noise Model (RNM) originally developed by NASA. RNM includes sound hemispheres around the aircraft based on various performance parameters and propagates noise in the rotor plane. Thus, rotary wing noise can be described fore and aft of the aircraft as well as in front of and behind the advancing blade.

The noise zones for the helicopter Nap of the Earth (NOE) routes and low-altitude flight tracks are generated using the HELOSLICE computer program. HELOSLICE is a simplified version of the NOISEMAP computer program, developed to predict the noise from operations at remote landing areas, flight tracks, and NOE routes. The required inputs to this model include the number and type of helicopter using each area or route and the altitude of the helicopter at the point of interest.

ROUTEMAP is a model that calculates the noise levels on the ground along a military training route (MTR). The inputs to the model are the altitude, power setting, speed and number of operations by aircraft type for a one-month period.

Small Arms Noise

The Small Arms Range Noise Assessment Model (SARNAM) computer program is used to generate the noise contours for small arms (up to 50-caliber) ranges weapon systems. It includes an extensive selection of weapons in the source library and can incorporate information from multiple ranges of various types.

Predicting Noise and Annoyance from Infrequent Events

Average daily noise levels can sometimes understate the severity of an infrequent, single-noise event because annoying noise peaks can be "averaged out." So it is helpful to be able to measure specific noise levels from single events, such as artillery firings or explosive detonations. This information can be useful when predicting annoyance and potential complaints. The BNOISE2 and SARNAM computer models include the capability to predict the single-event levels. The following models are also used to predict single-event levels.

High-Energy Impulsive Noise

The single-event noise levels from impulsive activities are predicted using the SHOT computer model. The effect of topography features between the noise source and the receiver is included in the model. The inputs to this model are the explosive weight or weapon and propellant charge size, distance between the source and the receiver, burial depth or elevation height if applicable, and location and height of a barrier, berm or hill, if one exists, between the source and receiver.

PEAKEST is a computer model used to predict the peak levels from the demolition of standard engineering and named explosives. It is used when the noise levels from an explosive detonation are required for planning and siting of these activities and for National Environmental Policy Act (NEPA) documentation.

Other Aircraft Noise

MR_NMAP is a computer model used to calculate the subsonic noise impact from aircraft operations in a military operations area (MOA) and in special use airspaces. The model includes an operations input program that describes the aircraft flight operation in existing or new airspace.

PCBOOM3 is a program that computes single-event sonic boom footprints from any supersonic vehicle maneuver. The use specifies the aircraft, the maneuver, and the atmosphere. The primary output is the sonic boom footprint in terms of equal over pressure on the ground, relative to the aircraft's position.

For more information about the Army's noise management program contact:

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http://chppm-www.apgea.army.mil/dehe/morenoise/

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This fact sheet is part of *Tri-Services Community and Environmental Noise Primer.* This guide, along with its companion CD, can help you educate and engage stakeholders on and off your installation, and generate support for noise management activities.

NOISE ZONES DESCRIPTIONS AND LAND USE GUIDELINES

1. Day Night Level Descriptions.

(a) The Noise Zone III consists of the area around the source of the noise in which the level is greater than 70 decibels (dB), C-weighted day-night sound level (CDNL) for large caliber weapons, greater than 104 PK15(met) for small arms and greater than 75 dB, A-weighted day-night sound level (ADNL) for aircraft activity. The noise level within Noise Zone III is considered so severe that noise-sensitive land uses should not be considered therein.

(b) The Noise Zone II consists of an area where the day-night sound level is between 62 and 70 dB CDNL for large caliber weapons; 87 and 104 PK15(met) for small arms; and 65 and 75 dB ADNL for aircraft activity. Exposure to noise within this area is considered significant, and use of land within Noise Zone II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II areas must be used for residential purposes, then noise level reduction features of 25 to 30 decibels should be incorporated into the design and construction of the buildings.

(c) The Noise Zone I include all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons, less than 87 PK15(met) for small arms and 65 dB ADNL for aircraft activity. This area is usually acceptable for all types of land use activities.

(d) The Land Use Planning Zone (LUPZ) DNL noise contours, 57 dB CDNL and 60 dB ADNL, represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states "Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider." For residential land uses, depending on attitudes and other factors, a 57 CDNL or 60 ADNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps.

(e) See Table 1 for land use guidelines.

Table 1. Land Use Planning Guidelines.

Noise Zones	Large-Caliber Weapons (CDNL)	Aircraft Activity (ADNL)	Small Arms PK15(met)
LUPZ	57 – 62	60-65	NA
I	< 62	<65	<87
II	62 - 70	65-75	87-104
III	> 70	>75	>104

Note:
LUPZ = Land Use Planning Zone
< = less than
> = greater than

2. PK15(met) Noise Contour Description.

(a) Community annoyance due to many types of transportation and industrial noise is typically and appropriately assessed based on average noise level over a protracted time period. The DNL is the primary descriptor used for this purpose in the United States. The DNL is the time weighted energy average sound level with a 10-dB penalty added to the nighttime levels (2200 to 0700 hours). The use of average noise level over a protracted time period generally does not adequately assess community noise impact and complaint potential due to relatively infrequent blast noise events or weapon firing. For example, for a small arms range at which hundreds of rounds are fired each year, resultant peak levels (PK) can easily exceed 104 dB in regions that annual DNL values indicate to be adequately quiet for housing.

(b) To account for statistical variation in received weapons noise level due to weather, it is recommended that the PK15(met) noise level be calculated. The peak contours show the expected level that one would get on a sound level meter when a weapon was fired. Since weather conditions can cause noise levels to vary significantly from day to day (even from hour to hour) the programs calculate a range of peak levels. This range is based on weather conditions that favor or hinder sound propagation. By plotting the PK15(met) contour, events would be expected to fall within the contours 85% of the time. This gives the installation and the community a more realistic means to consider the areas impacted by training noise without putting stipulations on land that would only receive high sound levels under infrequent weather conditions that favor sound propagation. This metric represents the best available scientific quantification for assessing the complaint risk of large and small caliber weapons ranges. The complaint risk areas for PK15(met) noise contours are defined as follows:

(1) The high risk of complaint area consists of the area around the source of the noise in which PK15(met) noise contour is greater than 130 dB for large caliber weapons.

(2) The moderate risk of complaint area consists of an area where the PK15(met) noise contour is between 115 dB and 130 dB for large caliber weapons.

(3) The low risk of complaint area includes all areas around a noise source in which the PK15(met) noise contour is less than 115 dB for large caliber weapons.

(c) See Table 2 for complaint risk guidelines.

Table 2. Complaint Risk Guidelines.

Risk of Complaints	**Large Caliber Weapons (20mm and greater)**
	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

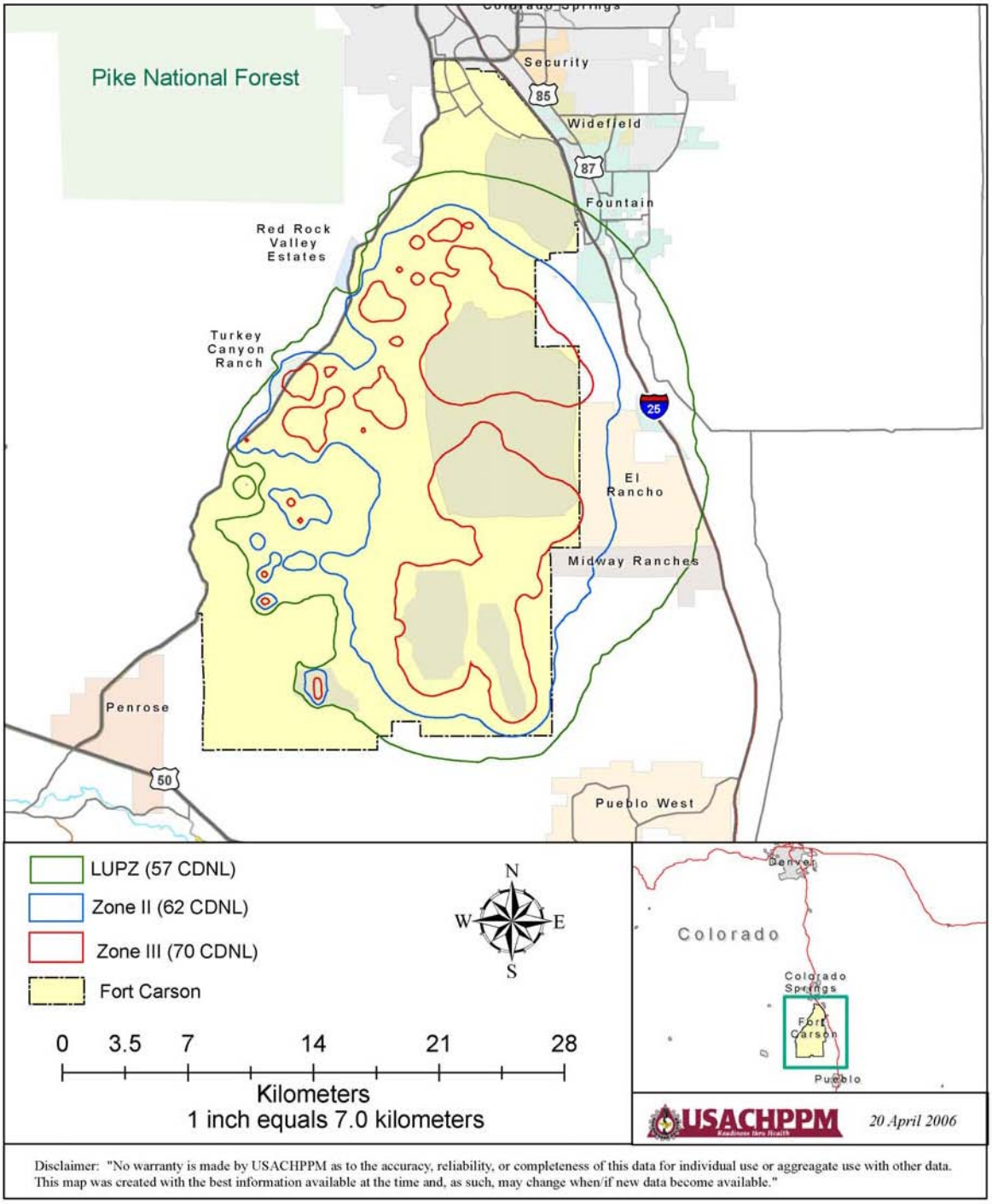

FIGURE D-2
Fort Carson Existing Large Caliber Operational Noise Contours

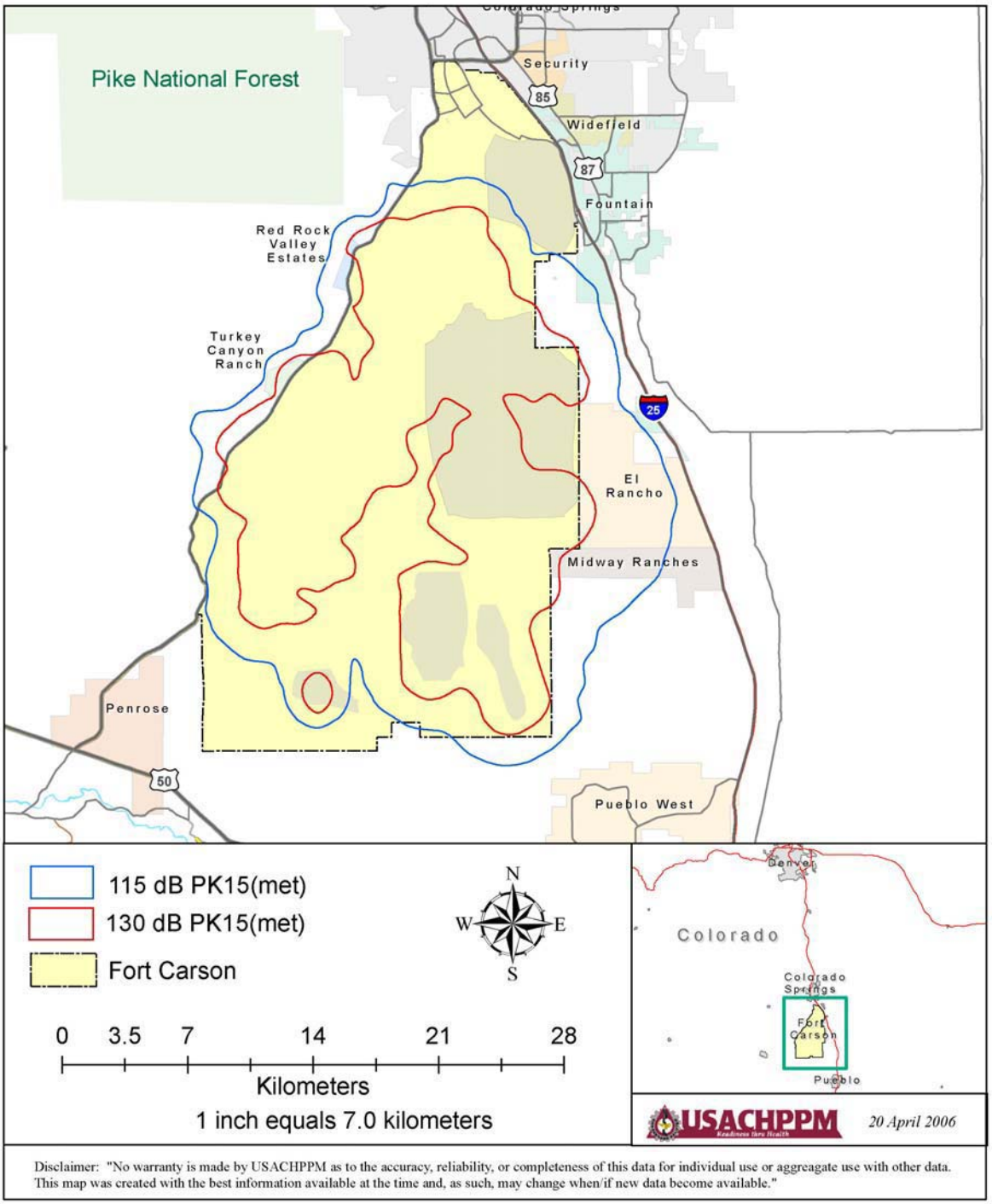

FIGURE D-3
Fort Carson Large Caliber Operational
PK15(met) Noise Contours

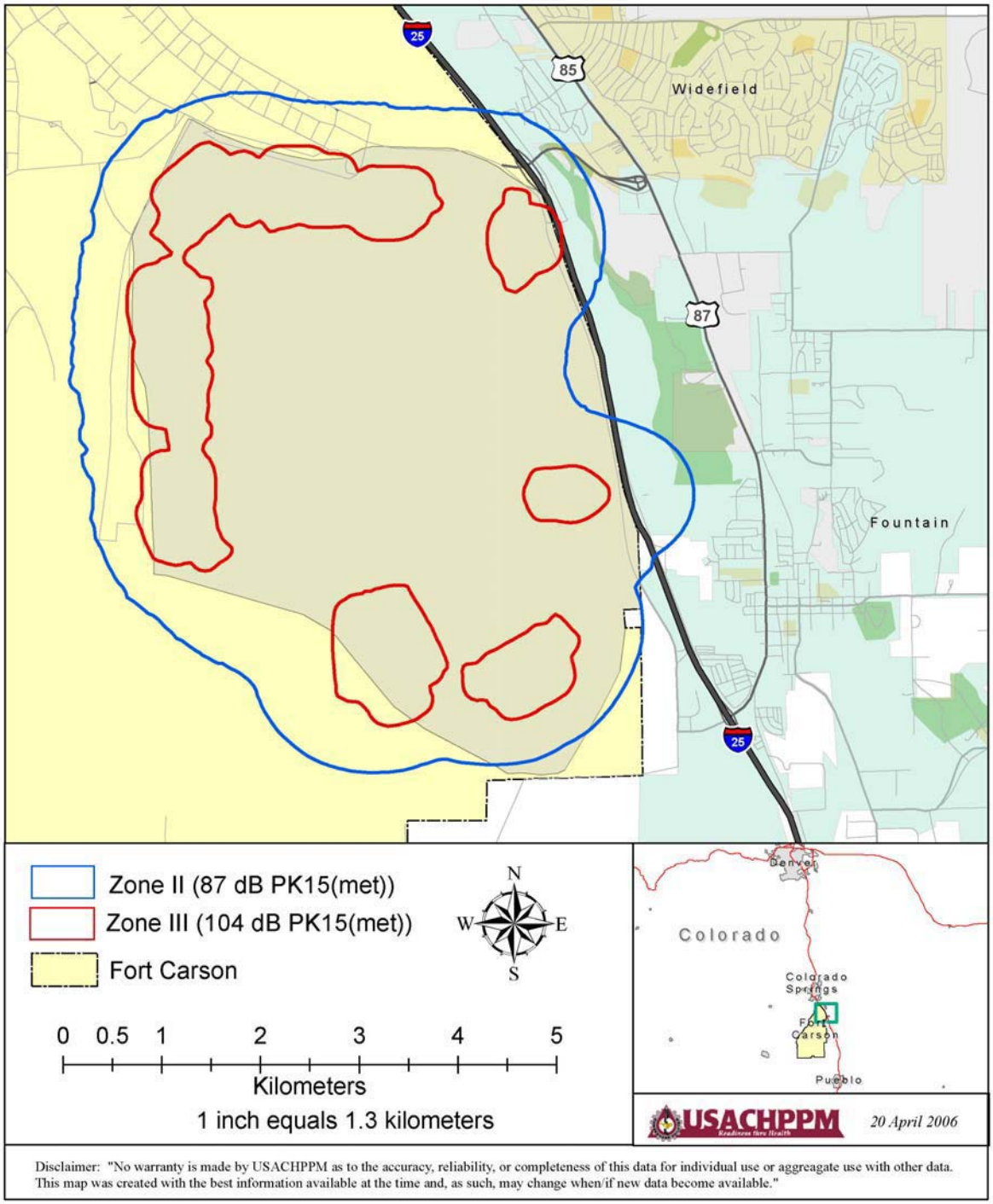

FIGURE D-4
Fort Carson Small Caliber Operational Noise Contours

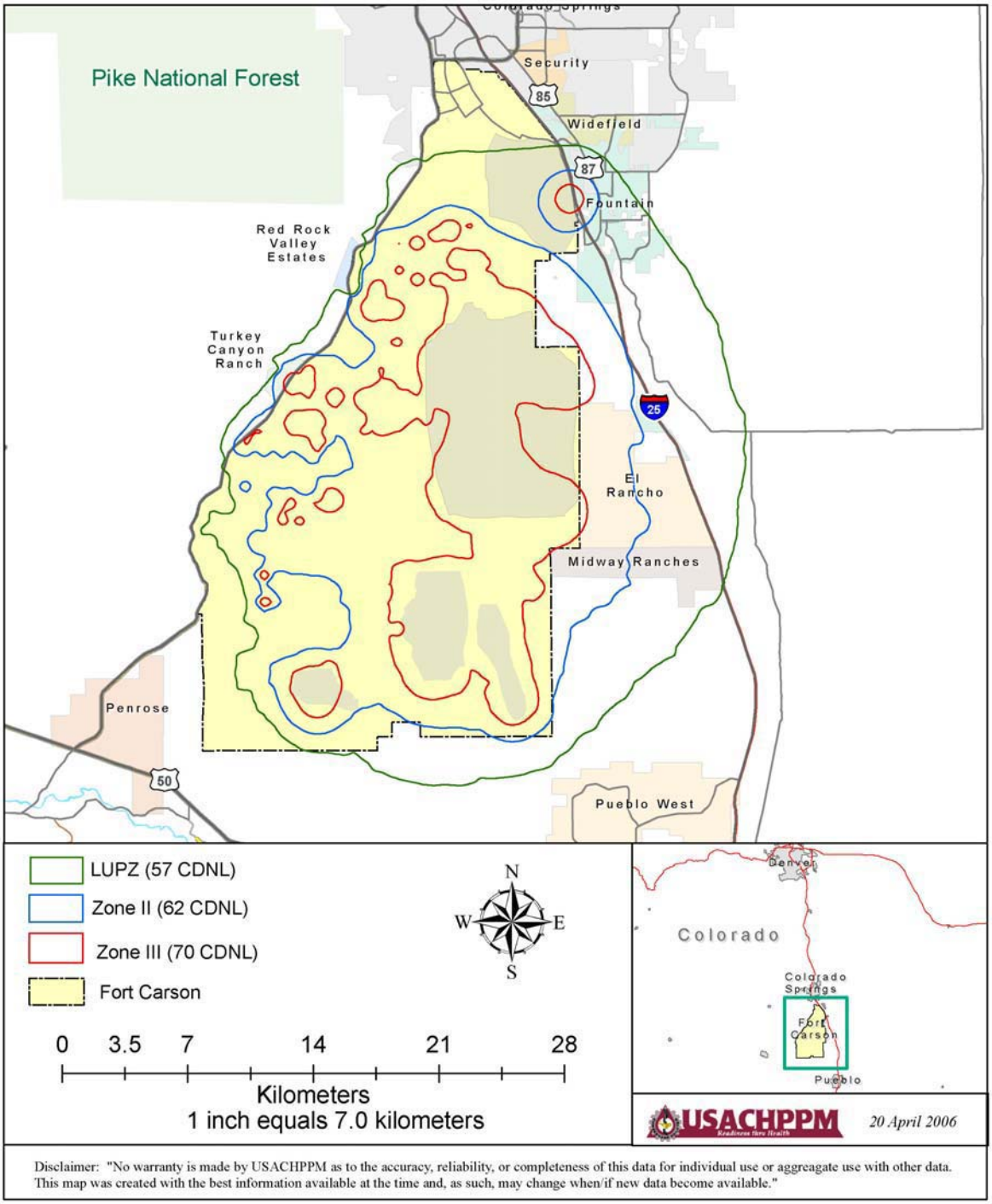

FIGURE D-5
Fort Carson Future Large Caliber Operational Noise Contours

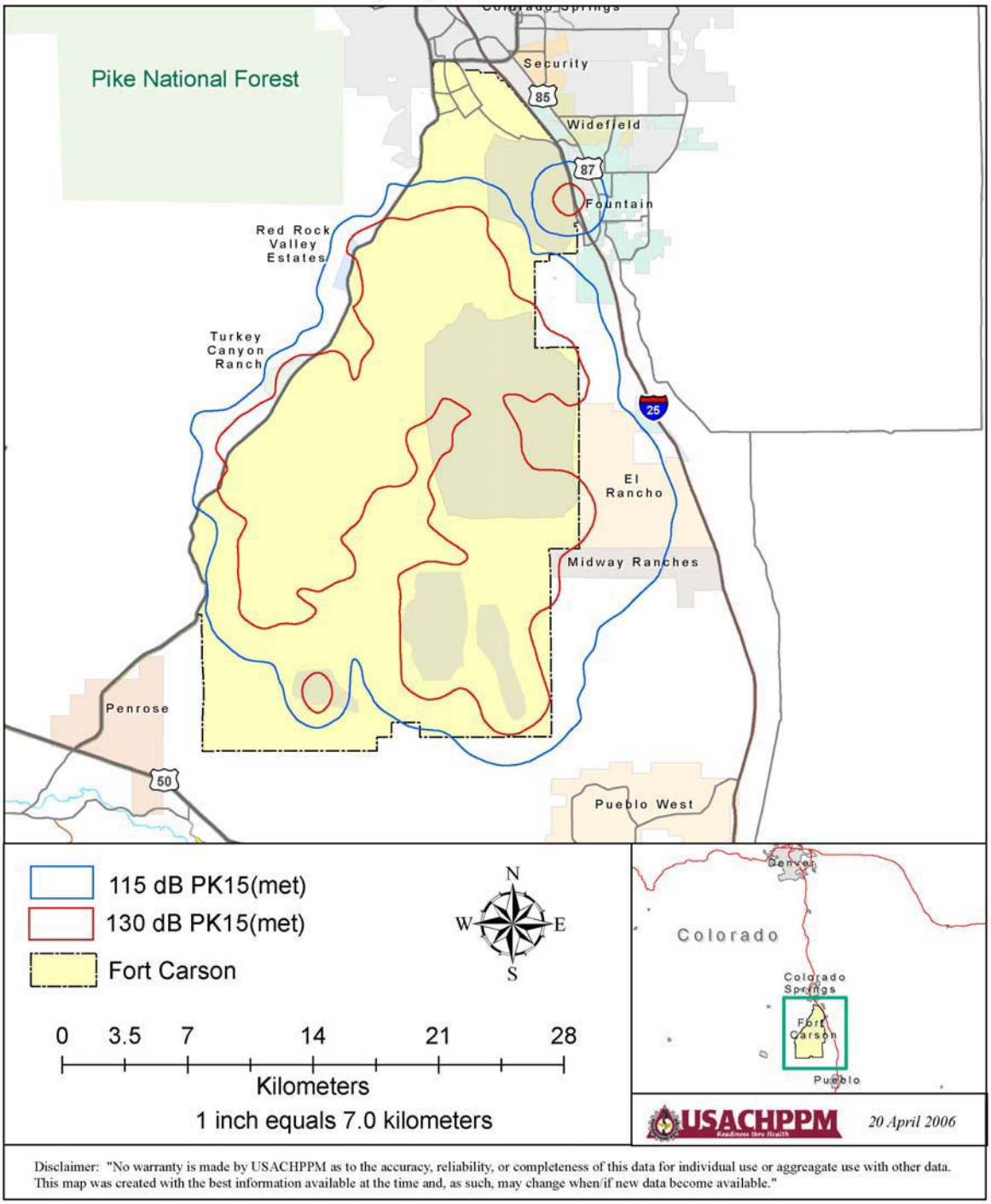

FIGURE D-6
Fort Carson Future Large Caliber Operational
PK15(met) Noise Contours

Prepared by

U.S. Army Center for
Health Promotion and Preventive Medicine

Under Contract to
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for

Piñon Canyon Maneuver Site, Colorado

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Noise Supporting Documentation

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Operational Noise Program
U.S. Army Center for Health Promotion and Preventive Medicine
MCHB-TS- EON
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410-436-3829
http://chppm-www.apgea.army.mil/dehe/morenoise/

For more information on the Navy's Noise Management Program contact:

Special Assistant for AICUZ and Encroachment
Commander Navy Installations
Naval Facilities Engineering Command
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For more information on the Air Force's Noise Management Program contact:

AICUZ/Noise Program Manager
Bases and Units Branch
HQ USAF/ILEPB
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703-604-5277

For more information on the Marine Corp's Noise Management Program contact:

Community and Land Use Planner for AICUZ
Headquarter Marine Corps
Washington DC, 20380-1775
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1. Day Night Level Descriptions.

(a) The Noise Zone III consists of the area around the source of the noise in which the level is greater than 70 decibels (dB), C-weighted day-night sound level (CDNL) for large caliber weapons, greater than 104 PK15(met) for small arms and greater than 75 dB, A-weighted day-night sound level (ADNL) for aircraft activity. The noise level within Noise Zone III is considered so severe that noise-sensitive land uses should not be considered therein.

(b) The Noise Zone II consists of an area where the day-night sound level is between 62 and 70 dB CDNL for large caliber weapons; 87 and 104 PK15(met) for small arms; and 65 and 75 dB ADNL for aircraft activity. Exposure to noise within this area is considered significant, and use of land within Noise Zone II should normally be limited to activities such as industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II areas must be used for residential purposes, then noise level reduction features of 25 to 30 decibels should be incorporated into the design and construction of the buildings.

(c) The Noise Zone I include all areas around a noise source in which the day-night sound level is less than 62 dB CDNL for large caliber weapons, less than 87 PK15(met) for small arms and 65 dB ADNL for aircraft activity. This area is usually acceptable for all types of land use activities.

(d) The Land Use Planning Zone (LUPZ) DNL noise contours, 57 dB CDNL and 60 dB ADNL, represent an annual average that separates the Noise Zone II from the Noise Zone I. Taking all operations that occur over the year and dividing by the number of training days generates the contours. But, the noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states "Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider." For residential land uses, depending on attitudes and other factors, a 57 CDNL or 60 ADNL may be considered by the public as an impact on the community environment. In order to provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is being included on the noise contour maps.

(e) See Table 1 for land use guidelines.

Table 1. Land Use Planning Guidelines.

Noise Zones	Large-Caliber Weapons (CDNL)	Aircraft Activity (ADNL)	Small Arms PK15(met)
LUPZ	57 – 62	60-65	NA
I	< 62	<65	<87
II	62 - 70	65-75	87-104
III	> 70	>75	>104

Note:
LUPZ = Land Use Planning Zone
< = less than
> = greater than

2. PK15(met) Noise Contour Description.

(a) Community annoyance due to many types of transportation and industrial noise is typically and appropriately assessed based on average noise level over a protracted time period. The DNL is the primary descriptor used for this purpose in the United States. The DNL is the time weighted energy average sound level with a 10-dB penalty added to the nighttime levels (2200 to 0700 hours). The use of average noise level over a protracted time period generally does not adequately assess community noise impact and complaint potential due to relatively infrequent blast noise events or weapon firing. For example, for a small arms range at which hundreds of rounds are fired each year, resultant peak levels (PK) can easily exceed 104 dB in regions that annual DNL values indicate to be adequately quiet for housing.

(b) To account for statistical variation in received weapons noise level due to weather, it is recommended that the PK15(met) noise level be calculated. The peak contours show the expected level that one would get on a sound level meter when a weapon was fired. Since weather conditions can cause noise levels to vary significantly from day to day (even from hour to hour) the programs calculate a range of peak levels. This range is based on weather conditions that favor or hinder sound propagation. By plotting the PK15(met) contour, events would be expected to fall within the contours 85% of the time. This gives the installation and the community a more realistic means to consider the areas impacted by training noise without putting stipulations on land that would only receive high sound levels under infrequent weather conditions that favor sound propagation. This metric represents the best available scientific quantification for assessing the complaint risk of large and small caliber weapons ranges. The complaint risk areas for PK15(met) noise contours are defined as follows:

(1) The high risk of complaint area consists of the area around the source of the noise in which PK15(met) noise contour is greater than 130 dB for large caliber weapons.

(2) The moderate risk of complaint area consists of an area where the PK15(met) noise contour is between 115 dB and 130 dB for large caliber weapons.

(3) The low risk of complaint area includes all areas around a noise source in which the PK15(met) noise contour is less than 115 dB for large caliber weapons.

(c) See Table 2 for complaint risk guidelines.

Table 2. Complaint Risk Guidelines.

Risk of Complaints	**Large Caliber Weapons (20mm and greater)**
	PK15(met) dB Noise Contour
Low	< 115
Moderate	115 - 130
High	> 130

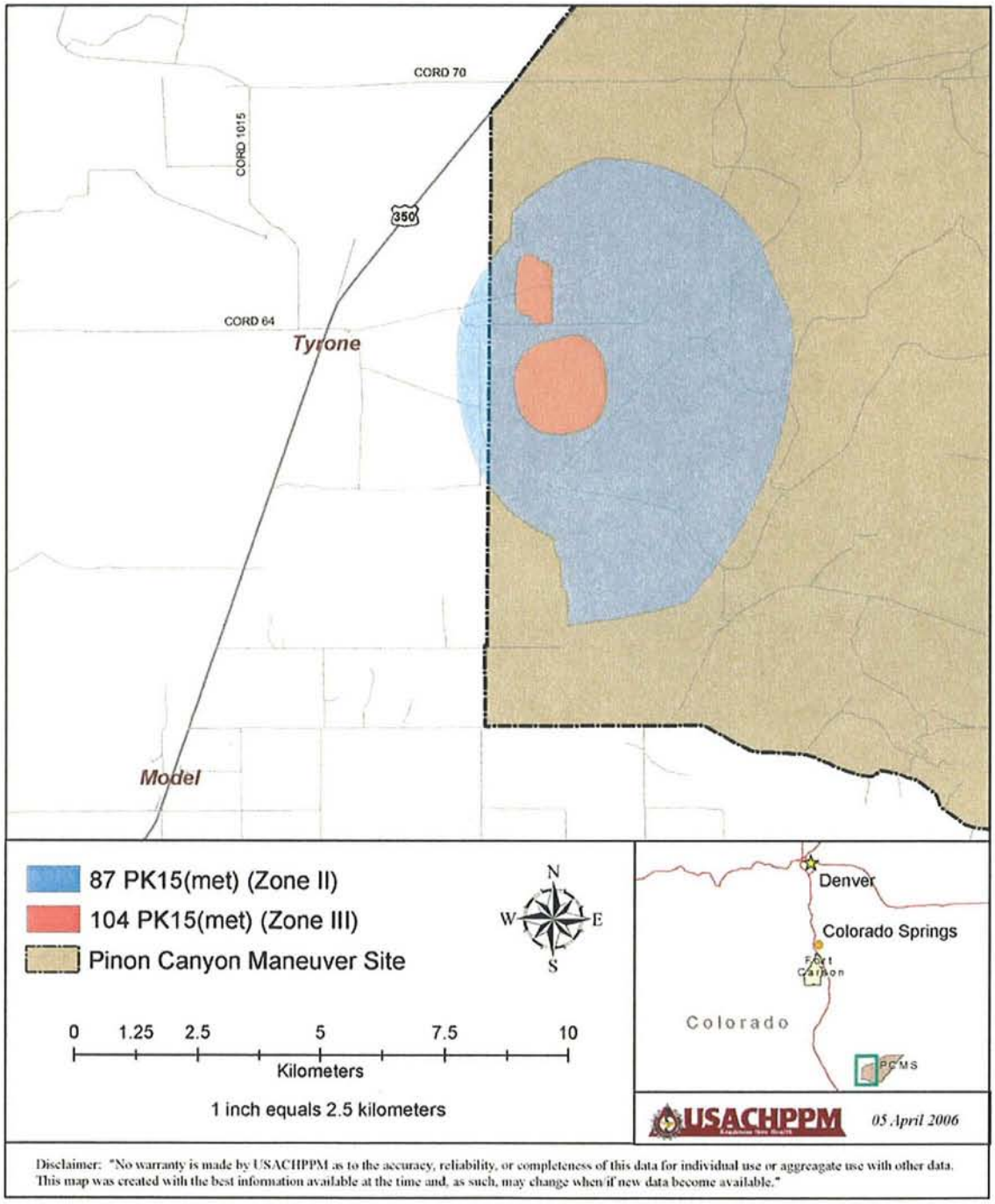

FIGURE D-1
PCMS Small Caliber Noise Contours

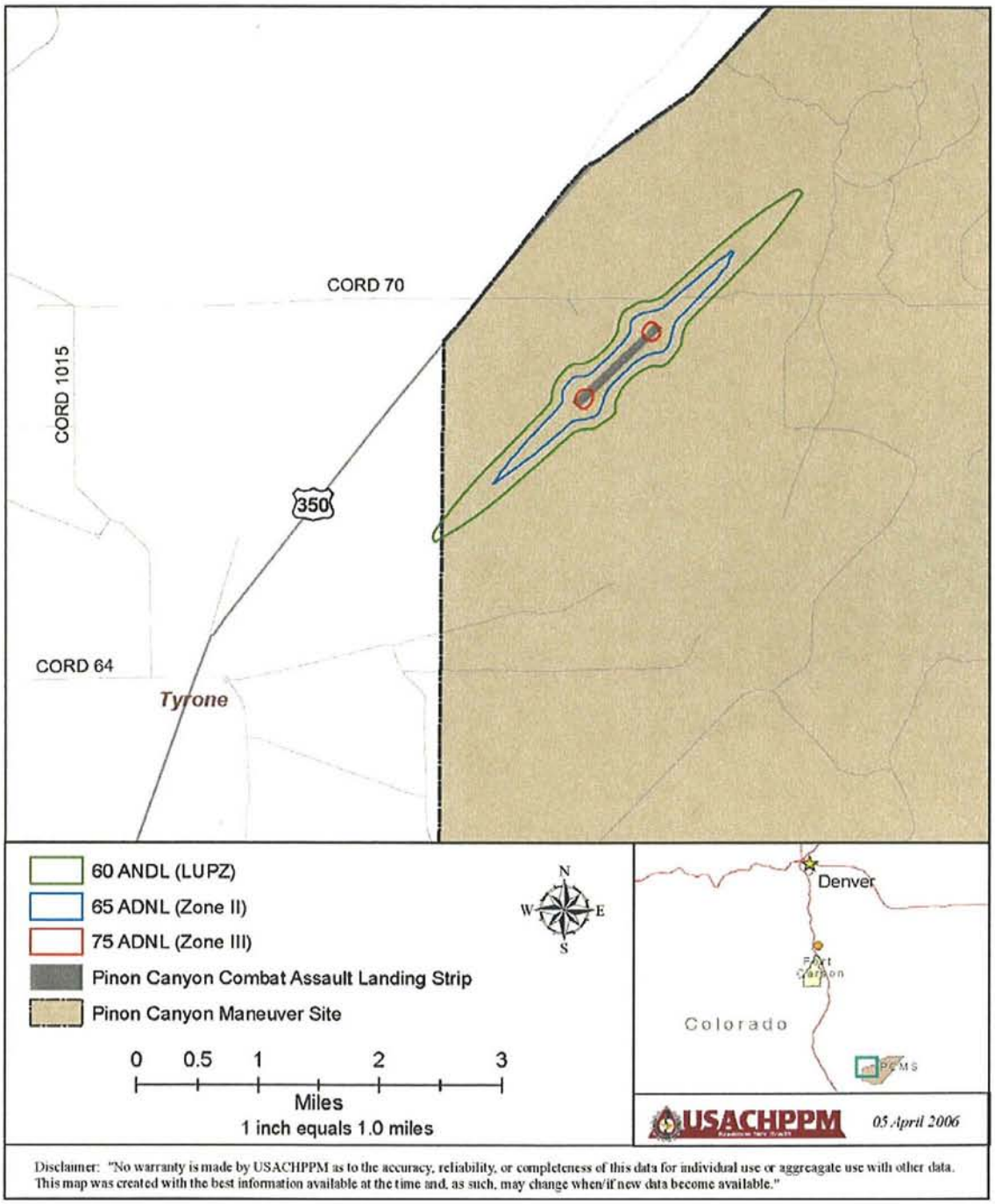

FIGURE D-2
PCMS Combat Assault Landing Strip
Existing Operations (C130)

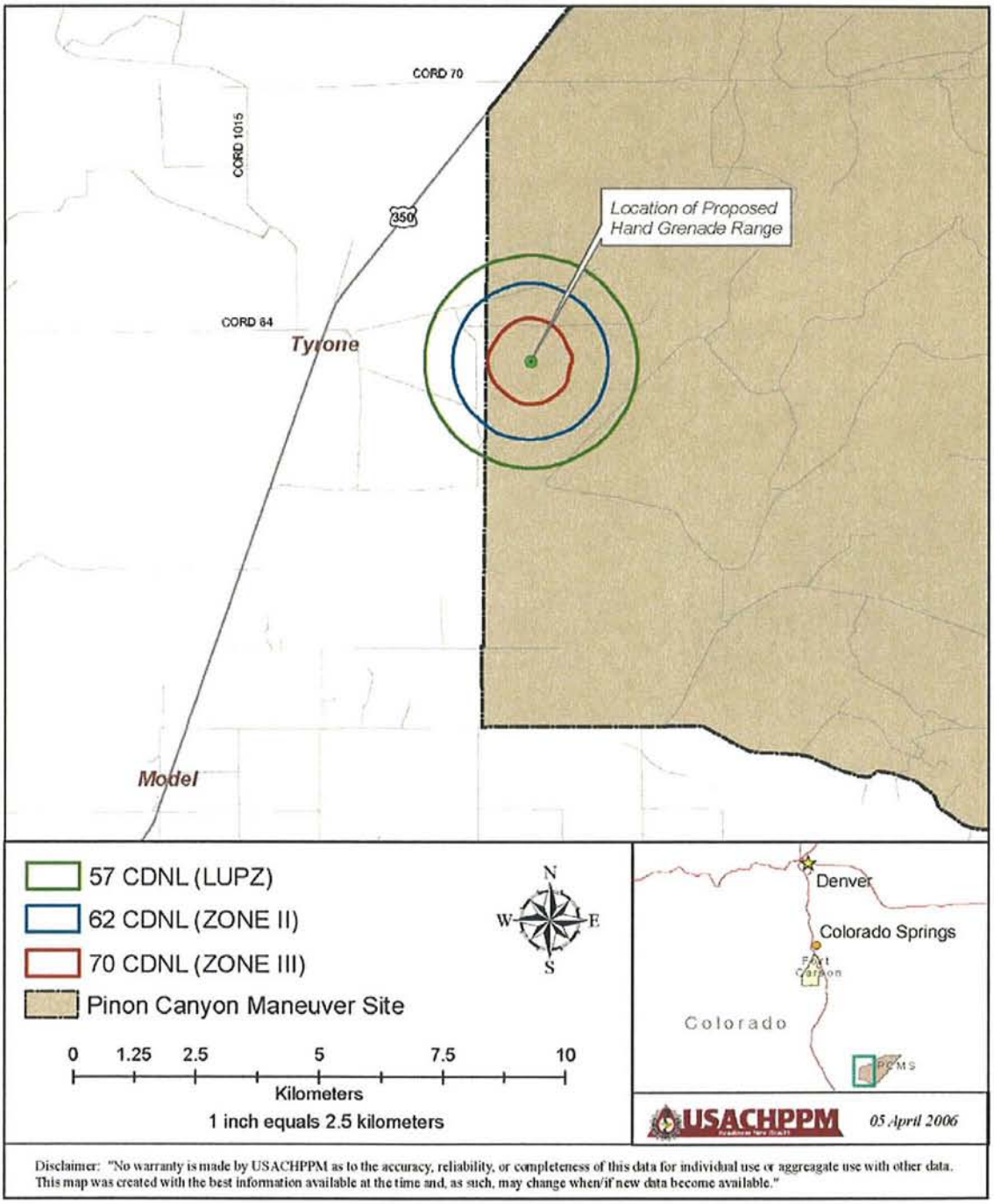

FIGURE D-3
PCMS Proposed Hand Grenade Range
Large Caliber Noise Contours

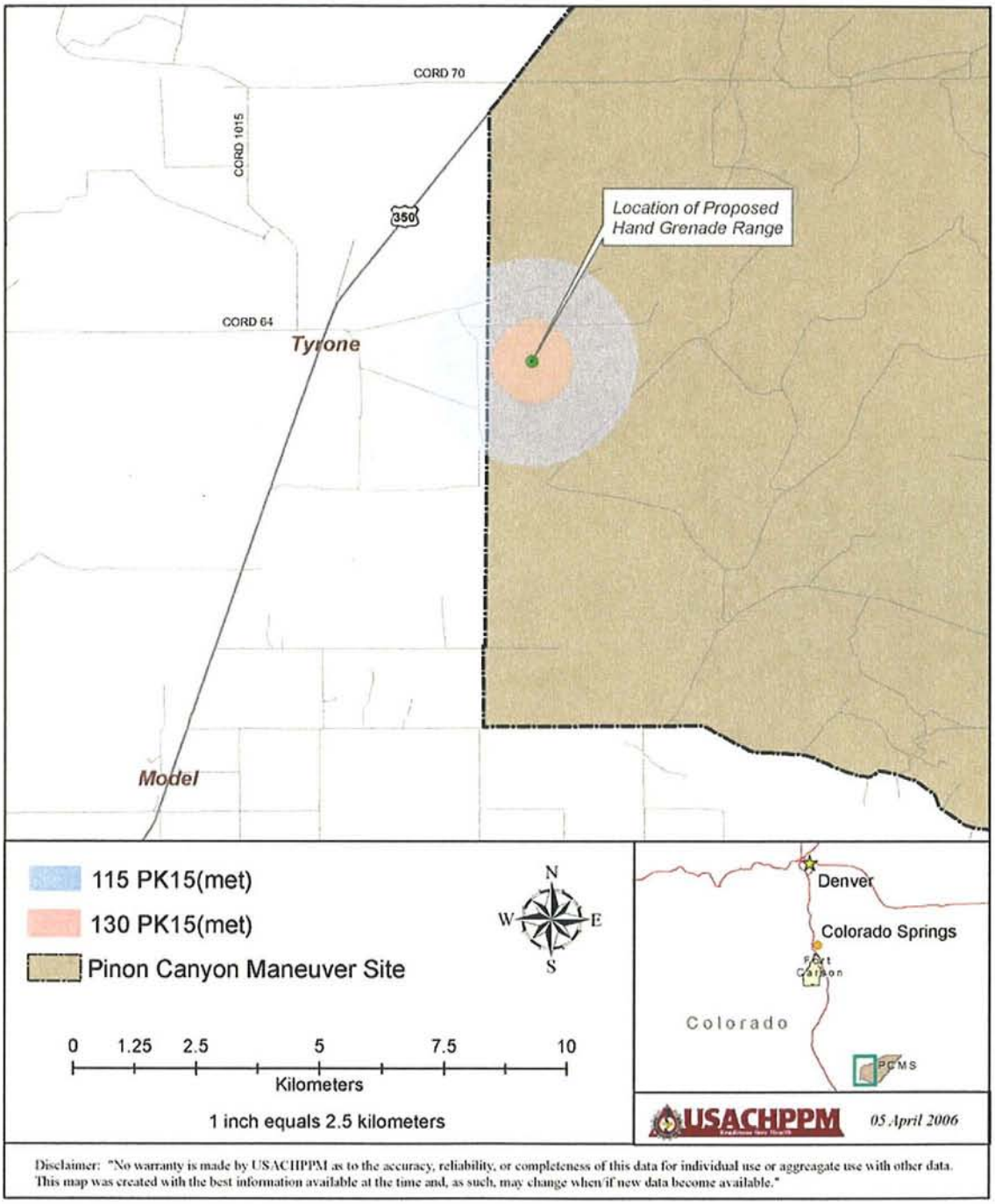

FIGURE D-4
PCMS Proposed Hand Grenade Range
Large Caliber PK 15(met) Noise Contours

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APPENDIX E
STORMWATER STIMULATIONS

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E. Stormwater

The *Stormwater Simulations for Grow The Army EIS Fort Carson*, has not yet been finalized, however, it will be available prior to the public meetings taking place on this Draft EIS.

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APPENDIX F

BIOLOGICAL RESOURCES SUPPORTING DOCUMENTATION

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APPENDIX F.1

Fort Carson
Biological Resources Supporting Documentation

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ATTACHMENT F.1.1

Plant Species Known to Occur at Fort Carson

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ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Angiosperms (Flowering Plants)					
Aceraceae (Maple Family)					
Acer glabrum	Mountain maple	P	N	T	C
Negundo aceroides, ssp. *interius*	Box elder	P	N	T	C
Agavaceae (Agave Family)					
Yucca glauca	Small soapweed	P	N	F	C
Alliaceae (Onion Family)					
Allium cernuum	Wild onion	P	N	F	W
Allium textile	Textile onion	P	N	F	C
Alsinaceae (Chickweed Family)					
Cerastium fontanum	Common mouse-ear	P	N	F	C
Eremogone fendleri	Fendler's sandwort	P	N	F	W
Eremogone hookeri	Hooker's sandwort	P	N	F	W
Paronychia jamesii	James nailwort	P	N	F	W
Amaranthaceae (Amaranth Family)					
Amaranthus retroflexus	Redroot amaranth	A	N	F	W
Anacardiaceae (Sumac Family)					
Rhus aromatica, ssp. *tribolata*	Skunkbrush, Lemonade bush	P	N	S	C
Toxicodendron rydbergii	Poison ivy	P	N	S	W
Apiaceae (Carrot Family)					
Berula erecta	Water parsnip	P	N	F	C
Conium maculatum	Poison hemlock	B	I	F	C
Cymopterus montanus	Mountain spring parsley	P	N	F	C
Heracleum sphondylium, ssp. *montanum*	Cow parsnip	P	N	F	C
Ligusticum porteri	Osha, Lovage	P	N	F	C
Lomatium orientale	Northern Idaho biscuitroot	P	N	F	C
Apocynaceae (Dogbane Family)					
Apocynum cannabinum	Indian hemp	P	N	F	W
Asclepiadaceae (Milkweed Family)					
Asclepias asperula	Spider milkweed	P	N	F	C
Asclepias engelmanniana	Englemann's milkweed	P	N	F	W
Asclepias incarnata	Swamp milkweed	P	N	F	W
Asclepias pumilla	Plains milkweed	P	N	F	W
Asclepias speciosa	Showy milkweed	P	N	F	C
Asclepias subverticillata	Whorled milkweed	P	N	F	W
Asclepias tuberose, ssp. *terminalis*	Butterflyweed	P	N	F	W
**Asclepias uncialis*	Dwarf milkweed	P	N	F	C
Asclepias viridiflora	Green milkweed	P	N	F	W
Asparagaceae (Asparagus Family)					
Asparagus officinalis	Garden asparagus	P	I	F	C

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Asteraceae (Daisy Family)					
Acosta diffusa	Diffuse knapweed, White knapweed	B	I	F	W
Acosta maculosa	Spotted knapweed	B/P	I	F	W
Acroptilon repens	Russian knapweed	P	I	F	W
Ambrosia psilostachya, var. *coronopifolia*	Western ragweed	P	N	F	W
Ambrosia trifida	Giant ragweed	A	I	F	W
Antennaria parvifolia	Littleleaf pussytoes	P	N	F	C
Antennaria rosea	Pink pussytoes	P	N	F	C
Arctium minus	Common burdock	P	I	F	W
Artemisia bigelovii	Bigelow's sagebrush	P	N	F	W
Artemisia frigida	Silver sagebrush	P	N	F	W
Artemisia ludoviciana	Louisiana sagebrush	P	N	F	W
Aster integrifolius	Thickstem aster	P	N	F	W
Aster porteri	Porter's aster	P	N	F	W
Baccharis wrightii	Wright's baccharis	P	N	F	W
Bahia dissecta	Ragleaf bahia	P	N	F	W
**Bolophyta tetraneuris*	Arkansas feverfew	P	N	F	W
Breea arvensis	Canada thistle	P	I	F	W
Brickellia californica	California brickellbush	P	N	F	W
Brickellia eupatorioides	False prairie boneset	P	N	F	W
Brickellia grandiflora	Tasselflower brickellbush	P	N	F	W
Brickellia rosmarinifolia, ssp. *chlorolepis*	Boneset	P	N	F	W
Carduus nutans, ssp. *macrolepis*	Musk thistle, Nodding plumeless thistle	P	I	F	W
Chrysothamnus nauseosus, ssp. *graveolens*	Rabbitbrush	P	N	S	W
Chrysothamnus parryi, ssp. *howardii*	Rabbitbrush	P	N	S	W
Cirsium undulatum	Wavyleaf thistle	P	N	F	W
Cirsium vulgare	Bull thistle	P	I	F	W
Conyza canadensis	Canadian horseweed	A	N	F	W
Coreopsis lanceolata	Lanceleaf tickseed	P	I	F	W
Coreopsis tinctoria	Plains coreopsis, Golden tickseed	A	N	F	W
Cyclachaena xanthifolia	Marsh-elder	A	N	F	C
Dyssodia aurea	Dogweed	A	N	F	W
Dyssodia papposa	Fetid marigold	A	N	F	W
Erigeron divergens	Spreading fleabane	P	N	F	W
Erigeron engelmannii	Engelmann's fleabane	P	N	F	W
Erigeron flagellaris	Trailing fleabane	P	N	F	W
Erigeron pumilus	Low fleabane	P	N	F	C
Erigeron subtrinervis	Threenerved fleabane	P	N	F	W
Gaillardia pinnatifida	Blanket flower	P	N	F	C
Grindelia revoluta	Rolled gumweed	B	N	F	W
Grindelia squarrosa	Curlycup gumweed	B	N	F	W
Gutierrezia sarothrae	Broom snakeweed	P	N	F	W

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Helianthus annuus	Annual sunflower	A	N	F	W
Helianthus petiolaris	Prairie sunflower	A	N	F	W
Heliomeris multiflora	Showy goldeneye	P	N	F	W
Heterotheca villosa	Shinners, Hairy goldaster	P	N	F	W
Hymenopappus filifolius	Fineleaf hymenopappus	P	N	F	C
Lactuca ludoviciana	Western wild lettuce	P	N	F	W
Lactuca serriola	Prickly lettuce	P	I	F	W
Lactuca tatarica, ssp. *pulchella*	Chicory lettuce	P	N	F	W
Leucanthemum vulgare	Ox-eye daisy	P	I	F	C
Leucelene ericoides	Sand aster	P	N	F	C
Liatris punctata	Dotted gayfeather	P	N	F	W
Lygodesmia juncea	Rush skeletonweed	P	N	F	W
Machaeranthera pinnatifida	Lacy tansyaster	P	N	F	C
Machaeranthera tanacetifolia	Tansyleaf aster	A	N	F	W
Melampodium leucanthum	Plains blackfoot daisy	P	N	F	C
Oligosporus caudatus	Sagewort wormwood	P	N	F	W
Oligosporus dracunculus, ssp. *glaucus*	Wild tarragon	P	N	F	W
Oligosporus filifolius	Sand sagebrush	P	N	S	W
Onopordum acanthium	Scotch thistle	B	I	F	W
* *Oonopsis foliosa*	Fremont goldenweed	P	N	F	W
Packera fendleri	Fendler groundsel	P	N	F	C
Packera neomexicana, ssp. *mutabilis*	Groundsel	P	N	F	C
Packera tridenticulata	Groundsel	P	N	F	C
Pectis angustifolia	Narrow-leaf pectis	P	N	F	W
Picradeniopsis oppositifolia	Plains bahia	P	N	F	W
Ratibida columnifera	Prairie coneflower	P	N	F	W
Rudbeckia lanciniata, var. *ampla*	Goldenglow	P	N	F	W
Senecio flaccidus, ssp. *douglasii*	Douglas groundsel	P	N	F	W
Senecio integerrimus	Lambstongue groundsel	P	N	F	W
Senecio spartioides	Broom groundsel	P	N	F	W
Solidago canadensis	Canada goldenrod	P	N	F	W
Solidago missouriensis	Prairie goldenrod	P	N	F	W
Solidago mollis	Velvety goldenrod	P	N	F	W
Solidago nana	Low goldenrod	P	N	F	W
Solidago velutina	Three-nerved goldenrod	P	N	F	W
Sonchus asper	Prickly sow thistle	A	I	F	C
Stephanomeria pauciflora	Desert wirelettuce	P	N	F	W
Taraxacum officinale	Common dandelion	P	I	F	C
Tetraneuris acaulis	Stemless hymenoxys	P	N	F	C
Thelesperma filifolium	Stiff greenthread	A	N	F	W
Thelesperma megapotamicum	Hopi-tea greenthread	P	N	F	C
Thelesperma subnudum	Navajo-tea greenthread	P	N	F	W

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Townsendia exscapa	Stemless townsendia	P	N	F	C
Townsendia grandiflora	Largeflower townsendia daisy	P	N	F	C
Tragopogon dubius, ssp. *major*	Western salsify	P	I	F	C
Virgulus ericoides	White aster	P	N	F	W
Virgulus falcatus	Aster	P	N	F	W
Virgulus fendleri	Fendler's aster	P	N	F	W
Ximenesia encelioides	Golden crownbeard	A	N	F	W
Zinnia grandiflora	Rocky Mountain zinnia	P	N	F	C
Betulaceae (Birch Family)					
Alnus incana, ssp. *tenuifolia*	Speckled alder	P	N	S	C
Boraginaceae (Borage Family)					
Cryptantha minima	Little catseye	A	N	F	C
Cynoglossum offinicale	Hound's tongue	P	N	F	C
Hackelia floribunda	Large-flowered stickseed	P	N	F	W
Lappula redowskii	Blueburr stickseed	A	N	F	C
Lithospernum incisum	Narrowleaf gromwell	P	N	F	C
Mertensia lanceolata	Lanceleaf bluebells	P	N	F	C
Onosmodium molle, var. *occidentale*	Western marbleseed	P	N	F	C
Oreocarya suffruticosa	James cryptantha	P	N	F	C
Oreocarya thyrsiflora	Cluster cryptantha	P	N	F	C
Brassicaceae (Mustard Family)					
Barbarea vulgaris	Winter cress	P	I	F	C
Camelina microcarpa	Littlepod falseflax	A	I	F	C
Cardaria draba	Pepperweed whitetop	P	N	F	C
Descurania incisa	Tansey mustard	A	N	F	C
Descurainia sophia	Flimweed tanseymustard	A	I	F	C
Erysimum asperum	Western wallflower	P	N	F	C
Erysimum capitatum	Western wallflower	P	N	F	C
Lepidium alyssoides	Mesa pepperwort	P	N	F	C
Lepidium densiflorum	Common pepperweed	A	N	F	C
Lesquerella fendleri	Fendler's bladderpod	P	N	F	C
Lesquerella ludoviciana	Foothill bladderpod	P	N	F	C
Lesquirella montana	Mountain bladderpod	P	N	F	C
Nasturtium officinale	Watercress	P	N	F	C
Schoenocrambe linearifolia	Slimleaf plains mustard	P	N	F	C
Schoenocrambe linifolia	Skeleton mustard	P	N	F	C
Sinapsis arvensis	Charlock	A	I	F	C
Sisymbrium altissimum	Jim Hill mustard	A	I	F	C
Stanleya pinnata	Prince's plume	P	N	F	C
Thlaspi arvense	Field pennycress	A	I	F	C
Cactaceae (Cactus Family)					
Coryphantha vivipara	Nipple cactus	P	N	F	C

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Cylindropuntia imbricata	Candelabra cactus	P	N	S	C
Echinocereus reichenbachii, var. *perbellus*	Claret cup	P	N	F	C
Echinocereus triglochidiatus	Claret cup	P	N	F	C
Echinocereus viridiflorus	Hens-and-chickens	P	N	F	C
Opuntia macrorhiza	Twisted spine prickly pear	P	N	F	C
Opuntia phaeacantha	New Mexican prickly-pear	P	N	F	C
Opuntia polyacantha	Plains prickly-pear	P	N	F	C
Pediocactus simpsonii, var. *minor*	Ball cactus	P	N	F	C
Calochortaceae (Mariposa Family)					
Calochortus gunnisonii	Sego lily, Mariposa lily	P	N	F	W
Cannabaceae (Hops Family)					
Humulus lupulus, ssp. *americanus*	Wild hops	P	N	V	W
Capparidaceae (Caper Family)					
Cleome serrulata	Rocky Mountain beeplant	A	N	F	W
Polanisia dodecandra	Roughseed clammyweed	P	N	F	C
Caprifoliaceae (Honeysuckle Family)					
Symphoricarpos albus	White coralberry	P	N	F	C
Symphoricarpos occidentalis	Western snowberry	P	N	F	C
Symphoricarpos oreophilus	Mountain snowberry	P	N	F	C
Caryophyllaceae (Pink Family)					
Melandrium dioicum	White campion	P	I	F	W
Chenopodiaceae (Goosefoot Family)					
Atriplex argenta	Tumbling saltbush	A	N	F	W
Atriplex canescens	Fourwing saltbush	P	N	S	C
Atriplex confertifolia	Shadscale saltbush	P	N	S	W
Atriplex patula	Spear saltbush	P	N	F	W
Bassia sieversiana	Ironweed	A	I	F	W
Chenopodium album	Lambsquarters	A	I	F	W
Chenopodium desiccatum	Desert goosefoot	A	N	F	W
Chenopodium fremontii	Fremont goosefoot	A	N	F	W
Chenopodium incanum	Mealy goosefoot	A	N	F	W
Chenopodium leptophyllum	Slimleaf goosefoot	A	N	F	W
Krascheninnikovia lanata	Common winterfat	P	N	F	C
Salsola australis	Russian thistle,Tumbleweed	A	I	F	W
Sarcobatus vermiculatus	Black greasewood	P	N	S	C
Suaeda calceoliformis	Sea-blite	P	N	F	C
Commelinaceae (Spiderwort Family)					
Commelina dianthifolia	Birdbill dayflower	P	N	F	W
Commelina erecta, var. *angustifolia*	Whitemouth dayflower	P	N	F	W
Tradescantia occidentalis	Prairie spiderwort	P	N	F	C
Convallariaceae (Mayflower Family)					
Maianthemum stellatum	False Solomon's seal	P	N	F	C

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Convolvulaceae (Morningglory Family)					
Convolvulus arvensis	Creeping jenny	P	I	F	W
Convolvulus equitans	Texas bindweed	P	N	F	C
Evolvulus nuttalianus	Arizona evolvulus	P	N	F	C
Ipomoea leptophylla	Bush morningglory	P	N	F	C
Cornaceae (Dogwood Family)					
Swida sericea	Red osier dogwood	P	N	T	C
Cucurbitaceae (Gourd Family)					
Cucurbita foetidissima	Buffalo gourd	P	N	F	W
Cyperaceae (Sedge Family)					
Carex emoryi	Emory's sedge	P	N	G	C
Carex hystericina	Bottlebrush sedge	P	N	G	C
Carex occidentalis	Western sedge	P	N	G	C
Carex pensylvanica, ssp. *heliophila*	Sun sedge	P	N	G	C
Carex stenophylla, ssp. *eleocharis*	Needleleaf sedge	P	N	G	C
Eleocharis palustris	Common spikerush	P	N	G	C
Mariscus fendlerianus	Fendlers flatsedge	P	N	G	W
Schoenoplectus lacustris, ssp. *acutis*	Tule bulrush	P	N	G	C
Schoenoplectus lacustris, ssp. *creber*	Hardstem bulrush	P	N	G	C
Schoenoplectus pungens	Bulrush	P	N	G	W
Scirpus pallidus	Cloaked bulrush				
Dipsacaceae (Teasel Family)					
Dipsacus fullonum	Fuller's teasel	B	I	F	W
Elaeagnaceae (Oleaster Family)					
Elaeagnus angustifolia	Russian olive	P	I	T	C
Ericaceae (Heath Family)					
Arctostaphylos uva-ursi	Bearberry	P	N	S	W
Euphorbiaceae (Spurge Family)					
Agaloma marginata	Snow-on-the-mountain	A	N	F	C
Chamaesyce fendleri	Sandmat	P	N	F	C
Chamaesyce glyptosperma	Small, Ribseed sandmat	A	N	F	C
Chamaesyce missurica	Prairie sandmat	A	N	F	W
Chamaesyce serpyllifolia	Thymeleaf sandmat	A	N	F	W
Chamaesyce stictospora	Slimseed sandmat	A	N	F	W
Poinsettia dentata	Toothed spurge	A	N	F	C
Tragia ramosa	Noseburn	P	N	F	C
Fabaceae (Pea Family)					
Amorpha fruticosa, var. *angustifolia*	False indigo	P	N	S	C
Astragalus adsurgens, var. *robustior*	Prairie milk-vetch	P	N	F	W
Astragalus bisulcatus	Two-grooved vetch	P	N	F	W
Astragalus drummondii	Drummond's milk-vetch	P	N	F	C
Astragalus missouriensis	Missouri milk-vetch	P	N	F	C

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Astragalus racemosus	Alkali milk-vetch	P	N	F	C
Astragalus tenellus	Looseflower milk-vetch	P	N	F	C
Caragana arborescens	Siberian pea-shrub	P	I	S	C
Dalea aurea	Silktop dalea	P	N	F	W
Dalea candida, var. *oligophylla*	White prairie clover	P	N	F	C
Dalea jamesii	James dalea	P	N	F	C
Dalea purpurea	Purple prairie clover	P	N	F	C
Glycyrrhiza lepidota	American licorice	P	N	F	C
Hoffmanseggia drepanocarpa	Sicklepod rushpea	P	N	F	C
Lathyrus eucosmus	Bush peavine	P	N	F	C
Lathrus latifolius	Perenial sweetpea	P	I	F	C
Medicago lupulina	Black medic	P	I	F	C
Medicago sativa	Alfalfa	P	I	F	C
Melilotus albus	White sweet clover	P	I	F	C
Melilotus officinalis	Yellow sweet clover	P	I	F	C
Oxytropis lambertii	Lambert crazyweed	P	N	F	C
Psoralidium tenuiflorum	Slimflower scurfpea	P	N	F	C
Robina neomexicana	New Mexico locust	P	N	T	C
Thermopsis divaricarpa	Golden banner	P	N	F	C
Trifolium pratense	Red clover	P	I	F	C
Vexibia nuttalliana	White loco	P	N	F	C
Vicia Americana, ssp. *americana*	American vetch	P	N	F	C
Fagaceae (Oak Family)					
Quercus gambelii	Gambel's oak	P	N	S	C
Quercus turbinella	Shrub live oak	P	N	S	C
Quercus undulata	Wavyleaf oak	P	N	S	C
Frankeniaceae (Frankenia Family)					
Frankenia jamesii	James frankenia	P	N	F	C
Geraniaceae (Geranium Family)					
Erodium cicutarium	Filaree	A	I	F	C
Geranium caespitosum, ssp. *caespitosum*	Parry geranium	P	N	F	C
Geranium richardsonii	Richardson's cranebill	P	N	F	C
Grossulariaceae (Currant or Gooseberry Family)					
Ribes aurem	Golden currant	P	N	S	C
Ribes cereum	Wax currant	P	N	S	C
Ribes leptanthum	Trumpet gooseberry	P	N	S	C
Helleboraceae (Hellebore Family)					
Delphinium carolinianum, ssp. *virescens*	Prairie larkspur	P	N	F	C
Delphinium nuttallianum	Nuttals’s larkspur	P	N	F	C
Hypericaceae (St. Johnswort Family)					
Hypericum perforatum	St. John’s wort	P	I	F	W

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Iridaceae (Iris Family)					
Iris missouriensis	Rocky Mountain iris	P	N	G	C
Sisyrinchium montanum	Blue-eyed grass	P	N	G	C
Juncaceae (Rush Family)					
Juncus arcticus, ssp. *ater*	Arctic rush	P	N	G	C
Juncus dudleyi	Path rush	P	N	G	C
Juncus gerardii	Inland rush	P	N	G	W
Juncus interior	Inland rush	P	N	G	C
Juncus nodosus	Jointed rush	P	N	G	W
Juncus torreyi	Torrey's rush	P	N	G	W
Juncaginaceae (Arrowgrass Family)					
Triglochin maritima	Seaside arrowgrass	P	I	G	C
Lamiaceae (Mint Family)					
Hedeoma drummondii	Drummond's false pennyroyal	P	N	F	C
Lycopus americanus	American bugleweed	P	N	F	W
Marrubium vulgare	Horehound	P	I	F	C
Mentha arvensis	Field mint	P	N	F	W
Nepeta cataria	Catnip	P	I	F	W
Prunella vulgaris	Common self-heal	P	N	F	W
Salvia reflexa	Lanceleaf sage	A	N	F	W
Teucrium laciniatum	Cutleaf germander	P	N	F	C
Lemnaceae (Duckweed Family)					
Lemna minor	Duckweed	A	N	F	W
Linaceae (Flax Family)					
Adenolinum lewisii	Wild blue flax	P	N	F	C
Mesynium puberulum	Plains flax	A	N	F	C
Loasaceae (Loasa Family)					
* *Nuttallia chrysantha*	Golden blazing star	P	N	F	C
Nuttallia multiflora	Manyflowered mentzelia	P	N	F	C
Malvaceae (Mallow Family)					
Sphaeralcea angustifolia, var. *cuspidata*	Narrowleaf globemallow	P	N	F	C
Sphaeralcea coccinea	Scarlet globemallow	P	N	F	C
Nyctaginaceae (Four-O'clock Family)					
Mirabilis multiflora	Colorado four-o'clock	P	N	F	C
Mirabilis oxybaphoides	Spreading four-o'clock	P	N	F	W
Oxybaphus linearis	Narrowleaf umbrellawort	P	N	F	C
Oxybaphus nyctagineus	Wild four-o'clock	P	N	F	C
**Oxybaphus rotundifolius*	Roundleaf four-o'clock	P	N	F	C

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Oleaceae (Olive Family)					
Fraxinus pensylvanica, var. *lanceolata*	Sargent, Green ash	P	N	T	C
Menodora scabra	Rough menodora	P	N	F	C
Onagraceae (Evening-Primrose Family)					
Calylophus lavandulifolius	Lavenderleaf evening primrose	P	N	F	C
Calylophus serrulatus	Plains yellow primrose	P	N	F	C
Epilobium ciliatum	Hairy willowherb	P	N	F	W
Gaura coccinea	Scarlet gaura	P	N	F	C
Gaura mollis	Smallflower gaura	P	N	F	C
Oenothera albicaulis	Prairie evening primrose	A	N	F	C
Oenothera coronopifolia	Crownleaf evening primrose	P	N	F	C
**Oenothera harringtonii*	Arkansas valley primrose	P	N	F	C
Oenothera villosa	Common evening primrose	P	N	F	W
Orobanchaceae (Broom-Rape Family)					
Aphyllon fasciculatum	Broomrape	P	N	T	W
Papaveraceae (Poppy Family)					
Argemone hispida	Hedgehog pricklypoppy	P	N	F	W
Plantaginaceae (Plantain Family)					
Plantago lanceolata	Narrowleaf plantain	P	N	F	C
Plantago major	Common plantain	P	N	F	C
Plantago patagonica	Woolly plantain	A	N	F	C
Poaceae (Grass Family)					
Achnatherum hymenoides	Indian ricegrass	P	N	G	C
Achnatherum robustum	Sleepygrass	P	N	G	C
Achnatherum scribneri	Scribner's needlegrass	P	N	G	C
Agropyron cristatum, ssp. *Cristatum*	Crested wheatgrass	P	I	G	W
Agropyron cristatum, ssp. *desertorum*	Crested wheatgrass	P	N	G	W
Agrostis stolonifera	Redtop bentgrass	P	I	G	W
Alopecurus aequalis	Short-awn foxtail	P	N	G	W
Andropogon gerardii	Big bluestem	P	N	G	W
Anisantha tectorum	Cheatgrass	A	I	G	C
Aristida divaricata	Poverty threeawn	P	N	G	W
Aristida purpurea	Purple threeawn	P	N	G	W
Avena fatua	Wild oat	A	I	G	C
Beckmannia syzigache, ssp. *baicalensis*	Sloughgrass	P	I	G	W
Bothriochloa bladhii	Australian bluestem	P	I	G	W
Bothriochloa laguroides, ssp. *torriana*	Silver bluestem	P	N	G	W
Bouteloua curtipendula	Sideoats grama	P	N	G	W
Bromopsis inermis	Smooth brome	P	I	G	C
Bromus japonicus	Japanese brome	A	I	G	C
Buchloe dactyloides	Buffalograss	P	N	G	W
Calamovilfa longifolia	Prairie sandreed	P	N	G	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Cenchrus longispinus	Sandbur	P	I	G	W
Chloris verticillata	Windmill grass	P	N	G	C
Chondrosum gracile	Blue grama	P	N	G	W
Chondrosum hirsutum	Hairy grama	P	N	G	W
Chondrosum prostratum	Mat grama	A	N	G	W
Critesion jubatum	Foxtail barley	P	N	G	W
Critesion pusillum	Little barley	A	N	G	C
Dactylis glomerata	Orchardgrass	P	I	G	C
Diplachne fascicularis	Sprangletop	P	N	G	W
Distichlis stricta	Inland saltgrass	P	N	G	W
Echinochloa crus-galli	Barnyardgrass	A	I	G	W
Elymus canadensis	Canada wildrye	P	N	G	W
Elymus elymoides	Bottlebrush squirreltail	P	N	G	C
Elymus lanceolatus	Streambank wheatgrass	P	N	G	W
Elymus trachycaulus	Slender wheatgrass	P	N	G	W
Eragrostis cilianensis	Stinkgrass	A	N	G	W
Eragrostis pilosa	Carolina lovegrass	A	N	G	W
Erioneuron pilosum	Hairy false tridens	P	N	G	C
Festuca arundinacea	Tall fescue	P	I	G	C
Festuca pratensis	Meadow fescue	P	I	G	C
Hesperostipa comata	Needle and thread	P	N	G	C
Hesperostipa neomexicana	New Mexico feathergrass	P	N	G	C
Hilaria jamesii	Galleta	P	N	G	C
Koeleria macrantha	Junegrass	P	N	G	C
Leymus ambiguus	Colorado wild rye	P	N	G	C
Leymus cinereus	Basin wild rye	P	N	G	C
Lycurus setosus	Common wolftail	P	N	G	W
Monroa squarrosa	False buffalograss	A	N	G	W
Muhlenbergia arenacea	Ear muhly	P	N	G	W
Muhlenbergia arenicola	Sand muhly	P	N	G	W
Muhlenbergia asperifolia	Alkali muhly	P	N	G	W
Muhlenbergia capillaris	Hairgrass	P	N	G	W
Muhlenbergia cuspidata	Plains muhly	P	N	G	W
Muhlenbergia montana	Mountain muhly	P	N	G	W
Muhlenbergia racemosa	Green muhly	P	N	G	W
Muhlenbergia torreyi	Ring muhly	P	N	G	W
Muhlenbergia wrightii	Wright's muhly	P	N	G	W
Nassella viridula	Green needlegrass	P	N	G	C
Oryzopsis pungens	Mountain ricegrass	P	N	G	C
Panicum capillare	Common witchgrass	A	N	G	W
Panicum obtusum	Vine mesquite	P	N	G	C
Panicum virgatum	Switchgrass	P	N	G	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Pascopyrum smithii	Western wheatgrass	P	N	G	C
Phleum pratense	Timothy	P	I	G	C
Phragmites australis	Common reed	P	N	G	W
Piptatherum micranthum	Littleseed ricegrass	P	N	G	W
Poa compressa	Canada bluegrass	P	N	G	W
Poa fendleriana	Muttongrass	P	N	G	C
Poa juncifolia	Alkali bluegrass	P	N	G	C
Poa palustris	Fowl bluegrass	P	I	G	W
Poa pratensis	Kentucky bluegrass	P	I	G	C
Polypogon monspeliensis	Rabbitfoot grass	A	I	G	C
Psathyrostachys juncea	Russian wild rye	A	I	G	C
Schedonnardus paniculatus	Tumblegrass	P	N	G	C
Schizachyrium scoparium	Little bluestem	P	N	G	W
Scleropogon brevifolius	Burro grass	P	N	G	W
Setaria viridis	Green foxtail	A	I	G	W
Sorgastrum avenaceum	Indian grass	P	N	G	W
Spartina gracilis	Alkali cordgrass	P	N	G	W
Spartina pectinata	Prairie cordgrass	P	N	G	W
Sphenopholus obtusata	Wedgegrass	P	N	G	C
Sporobolus airoides	Alkali sacaton	P	N	G	W
Sporobolus asper	Rough dropseed	P	N	G	W
Sporobolus cryptandrus	Sand dropseed	P	N	G	W
Thinopyrum intermedium	Intermediate wheatgrass	P	N	G	W
Tridens muticus, var. *elongatus*	Green tridens	P	N	G	W
Triticum aestivum	Wheat	A	I	G	C
Vulpia octoflora	Sixweeks fescue	A	N	G	C
Polemoniaceae (Phlox Family)					
Ipomopsis laxiflora	Iron skyrocket	P	N	F	C
Ipomopsis longiflora	Flaxflowered gilia	A	N	F	C
Ipomopsis spicata	Spike gilia	P	N	F	C
Leptodactylon pungens	Granite prickly gilia	P	N	F	C
Polygonaceae (Knotweed Family)					
Acetosella vulgaris	Sheep sorrel	P	I	F	C
Eriogonum effusum	Spreading buckwheat	P	N	F	W
Eriogonium fendlerianum	Small, Buckwheat	P	N	F	W
Eriogonum jamesii	James' buckwheat	P	N	F	W
Eriogonum tenellum	Matted wild buckwheat	P	N	F	W
Eriogonum umbellatum	Sulfur eriogonum	P	N	F	W
Persicaria maculata	Lady's thumb	A	I	F	W
Persicaria pennsylvanica	Pinkweed	A	N	F	W
Polygonum ramosissimum	Bushy knotweed	A	N	F	W
Pterogonum alatum	Winged buckwheat	P	N	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Rumex altissimus	Pale dock	P	N	F	C
Rumex crispus	Curly dock	P	I	F	C
Portulacaceae (Purslane Family)					
Portulaca oleracea	Common purslane	A	I	F	C
Potamogetonaceae (Pondweed Family)					
Potamogeton foliosus	Leafy pondweed	P	N	F	W
Potamogeton nodosus	Longleaf pondweed	P	N	F	W
Potomogeton pectinatus	Sago pondweed	P	N	F	W
Ranunculaceae (Buttercup Family)					
Batrachium longirostre	Water crowfoot	P	N	F	C
Clematis ligusticifolia	Western virginsbower	P	N	F	W
Coriflora hirsutissima	Sugarbowls	P	N	F	W
Halerpestes cymbalaria, ssp. *saximontana*	Alkali crowfoot	P	N	F	C
Resedaceae (Mignonette Family)					
Reseda lutea	Wild mignonette	P	I	F	C
Rhamnaceae (Buckthorn Family)					
Ceanothus herbaceus	New Jersey tea	P	N	F	C
Rosaceae (Rose Family)					
Agrimonia striata	Agrimony	P	N	F	W
Cerasus pumila, ssp. *besseyi*	Sand cherry	P	N	T	C
Cercocarpus montanus	Mountain mahogany	P	N	S	C
Crataegus erythropoda	Fleshy hawthorn	P	N	S	C
Crataegus succulenta	Fleshy hawthorn	P	N	S	C
Geum aleppicum	Yellow avens	P	I	F	W
Oreobatus deliciosus	Boulder raspberry	P	N	S	C
Padus virginiana, ssp. *melanocarpa*	Chokecherry	P	N	T	C
Physocarpus monogynus	Mountain ninebark	P	N	S	C
Potentilla pensylvanica	Pennsylvania cinquefoil	P	N	F	C
Potentilla supine, ssp. *paradoxa*	Bushy cinquefoil	P	N	F	W
Prunus americana	American plum	P	N	T	C
Rosa woodsii	Wood's rose	P	N	F	C
Rubus idaeus, var. *melanolasius*	Red raspberry	P	N	F	W
Sanguisorba minor	Small burnet	P	I	F	C
Rubiaceae (Madder Family)					
Galium spp.	Bedstraw	P	N	F	W
Rutaceae (Citrus Family)					
Ptelea trifoliata	Common hoptree	P	N	T	C
Salicaceae (Willow Family)					
Populus angustifolia	Narrowleaf cottonwood	P	N	T	C
Populus deltoids, spp. *monolifera*	Plains cottonwood	P	N	T	C
Populus x acuminata	Lanceleaf cottonwood	P	N	T	C
Salix amygdaloides	Peach-leaved willow	P	N	S	C

ATTACHMENT **F.1.1-1**
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Salix exigua	Coyote willow	P	N	S	C
Salix interior	Sandbar willow	P	N	S	C
Salix irrorata	Bluestem willow	P	N	S	C
Santalaceae (Sandlewood Family)					
Comandra umbellata	Bastard toadflax	P	N	F	C
Scrophulariaceae (Figwort Family)					
Castilleja integra	Indian paintbrush	P	N	F	W
Penstemon angustifolius	Broadbeard beard-tongue	P	N	F	C
Penstemon auriberbis	Colorado beard-tongue	P	N	F	C
Penstemon secundiflorus	Sidebells penstemon	P	N	F	C
Penstemon versicolor	Penstemon	P	N	F	C
Penstemon virens	Front Range beard-tongue	P	N	F	C
Penstemon virgatus, ssp. *asa-grayi*	Beard-tongue	P	N	F	C
Verbascum thapsus	Great mullein	P	I	F	C
Veronica americana	American brooklime	P	N	F	W
Veronica anagallis-aquatica	Water speedwell	P	I	F	W
Veronica catenata	Speedwell	P	I	F	W
Smilacaceae (Simlax Family)					
Smilax lasioneuron	Carrionflower	P	N	F	C
Solanaceae (Nightshade Family)					
Chamaesaracha coronopus	Green false nightshade	P	N	F	C
Physalis hederifolia, var. *cordifolia*	Clammy groundcherry	P	N	F	W
Physalis virginiana	Virginia groundcherry	P	N	F	C
Quincula lobata	Chinese lantern	P	N	F	C
Solanum rostratum	Buffalo bur	A	N	F	C
Tamaricaceae (Tamarisk Family)					
Tamarix ramosissima	Tamarisk	P	I	S	C
Thalictraceae (Meadow Rue Family)					
Thalictrum fendleri	Fendler's meadowrue	P	N	F	C
Typhaceae (Cattail Family)					
Typha angustifolia	Narrow-leaved cattail	P	N	G	C
Typha latifolia	Broad-leaved cattail	P	N	G	C
Ulmaceae (Elm Family)					
Celtis reticulata	Netleaf hackberry	P	N	T	C
Verbenaceae (Vervain Family)					
Glandularia bipinnatifida	Showy vervain	P	N	F	C
Verbena bracteata	Prostrate vervain	P	N	F	C
Verbena hastata	Blue vervain	P	N	F	W
Violaceae (Violet Family)					
Viola nuttallii	Nuttall's violet	P	N	F	C
Viscaceae (Mistletoe Family)					
Arceuthobium spp.	Dwarf mistletoe	P	N	F	W

ATTACHMENT F.1.1-1
Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Vitaceae (Grape Family)					
Parthenocissus vitaceae	Thicket creeper	P	N	F	C
Vitis ripara	Riverbank grapes	P	N	F	C
Zygophyllaceae (Caltrop Family)					
Tribulus terrestris	Puncturevine	P	N	F	W
Gymnosperms ("Naked-Seed" Plants)					
Cupressaceae (Cypress Family)					
Sabina monosperma	One-seed juniper	P	N	T	C
Sabina scopulorum	Rocky Mountain juniper	P	N	T	C
Pinaceae (Pine Family)					
Abies concolor	White fir	P	N	T	C
Picea pungens	Colorado blue spruce	P	N	T	C
Pinus edulis	Pinyon pine	P	N	T	C
Pinus ponderosa, ssp. *scopulorum*	Ponderosa pine	P	N	T	C
Pseudotsuga menziesii	Douglas fir	P	N	T	C
Ferns and Fern Allies					
Equisetaceae (Horsetail Family)					
Hippochaete laevigata	Smooth horsetail	P	N	G	C
Selaginellaceae (Little Club-Moss Family)					
Selaginella densa	Little club moss	P	N	F	C
Selaginella mutica	Little club moss	P	N	F	C
Sinopteridaceae (Lipfern Family)					
Argyrochosma fendleri	Fendler's falsecloak fern				
Cheilanthes eatonii	Eaton's lipfern	P	N	F	C
Cheilanthes fendleri	Fendler's lipfern	P	N	F	C
Woodsiaceae (Woodsia Family)					
Woodsia oregano, ssp. *cathcartiana*	Oregon woodsia	P	N	F	W
Addendum to the Fort Carson Species List					
Horticultural Species					
Aceraceae (Maple Family)					
Acer saccharinum	Silver maple	P	I	T	C
Fabaceae (Pea Family)					
Gleditsia triacanthos	Honey locust	P	I	T	C
Robina pseudoacacia	Black locust	P	I	T	C
Iridaceae (Iris Family)					
Iris spp.	Common iris	P	I	G	W
Juglandaceae (Walnut Family)					
Juglans nigra	Black walnut	P	I	T	W
Oleaceae (Olive Family)					
Syringia vulgaris	Common lilac	P	I	S	C

ATTACHMENT **F.1.1-1**

Plant Species Known to Occur on Fort Carson

Scientific Name	Common Name	Life	Origin	Form	Season
Rosaceae (Rose Family)					
Malus ioensis, var. *ionesis*	Crab apple	P	I	T	C
Malus pumila	Apple	P	I	T	C
Prunus persica, var. *persica*	Peach	P	I	T	W
Pyrus communis	Pear	P	I	T	W
Ulmaceae (Elm Family)					
Ulmus americana	American elm	P	I	T	C
Ulmus pumila	Siberian elm	P	I	T	C

Life Form: A = Annual, B = Biennial, P = Perennial;

Origin: N = Native, I = Introduced

Form: F = Forb, G = Grass, V = Vine, S = Shrub, T = Tree

Season: W = Warm Season, C = Cool Season

Source: DECAM, 2002.

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ATTACHMENT F.1.2

Vertebrate Species Known to Occur at Fort Carson

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ATTACHMENT **F.1.2-1**

Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Campostoma anomalum	Osteichthyes	Stoneroller		
Ctenopharyngodon idella	Osteichthyes	Grass Carp		
Culaea inconstans	Osteichthyes	Brook Stickleback		
Cyprinus carpio	Osteichthyes	Carp		
Etheostoma cragini	Osteichthyes	Arkansas Darter	Candidate	Threatened
Fundulus zebrinus	Osteichthyes	Plains Killifish		
Gambusia affinis	Osteichthyes	Mosquitofish		
Ictalurus punctatus	Osteichthyes	Channel Catfish		
Lepomis cyanellus	Osteichthyes	Green Sunfish		
Lepomis macrochirus	Osteichthyes	Bluegill		
Notemigonus crysoleucas	Osteichthyes	Golden shiner		
Oncorhynchus clarki stomias	Osteichthyes	Greenback Cutthroat Trout	Threatened	Threatened
Phoxinus erythrogaster	Osteichthyes	Southern Redbelly Dace		Endangered
Pimephales promelas	Osteichthyes	Fathead Minnow		
Pomoxis nigromaculatus	Osteichthyes	Black crappie		
Rhinichthys cataractae	Osteichthyes	Longnose Dace		
Salmo clarki	Osteichthyes	Snake River Cutthroat trout		
Salmo gairdneri	Osteichthyes	Rainbow trout		
Salvelinus fontinalis	Osteichthyes	Brook Trout		
Semotilus atromaculatus	Osteichthyes	Creek Chub		
Ambystoma tigrinum	Amphibia	Tiger Salamander		
Spea bombifrons	Amphibia	Plains Spadefoot Toad		
Spea multiplicatus	Amphibia	New Mexico Spadefoot		
Bufo punctatus	Amphibia	Red-spotted Toad		
Bufo woodhousii	Amphibia	Woodhouse's Toad		
Pseudacris triseriata	Amphibia	Western chorus frog		
Rana blairi	Amphibia	Plains Leopard Frog		Special Concern
Rana catesbeiana	Amphibia	Bullfrog		
Rana pipiens	Amphibia	Northern Leopard Frog		Special Concern
Coluber constrictor flaviventris	Reptilia	Racer		
Heterodon nasicus nasicus	Reptilia	Western Hognose Snake		
Lampropeltis triangulum	Reptilia	Milk Snake		
Masticophis flagellum testaceus	Reptilia	Western Coachwhip		
Pituophis melanoleucus sayi	Reptilia	Bullsnake		
Thamnophis elegans	Reptilia	Western Terrestrial Garter Snake		
Chrysemys picta bellii	Reptilia	Painted Turtle		Special Concern
Holbrookia maculata	Reptilia	Lesser Earless Lizard		
Phrynosoma douglassi	Reptilia	Short-horned Lizard		
Sceloporus undulatus erythrocheilus	Reptilia	Orange-lipped Plateau Lizard		
Eumeces multivirgatus	Reptilia	Many-lined Skink		
Cnemidophorus neotesselatus	Reptilia	Triploid Checkered Whiptail		Special Concern
Cnemidophorus sexlineatus viridis	Reptilia	Six-lined Racerunner		
Crotalus viridis	Reptilia	Western Rattlesnake		
Anser albifrons	Aves	Greater White-fronted Goose		
Chen caerulescens	Aves	Snow Goose		
Branta hutchinsii	Aves	Cackling Goose		
Branta canadensis	Aves	Canada Goose		
Cygnus columbianus	Aves	Tundra Swan		
Aix sponsa	Aves	Wood Duck		
Anas strepera	Aves	Gadwall		
Anas americana	Aves	American Wigeon		
Anas platyrhynchos	Aves	Mallard		
Anas discors	Aves	Blue-winged Teal		
Anas cyanoptera	Aves	Cinnamon Teal		
Anas clypeata	Aves	Northern Shoveler		
Anas acuta	Aves	Northern Pintail		
Anas crecca	Aves	Green-winged Teal		
Aythya valisineria	Aves	Canvasback		
Aythya americana	Aves	Redhead		
Aythya collaris	Aves	Ring-necked Duck		

ATTACHMENT **F.1.2-1**

Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Aythya marila	Aves	Greater Scaup		
Aythya affinis	Aves	Lesser Scaup		
Melanitta fusca	Aves	White-winged Scoter		
Bucephala albeola	Aves	Bufflehead		
Bucephala clangula	Aves	Common Goldeneye		
Lophodytes cucullatus	Aves	Hooded Merganser		
Mergus merganser	Aves	Common Merganser		
Mergus serrator	Aves	Red-breasted Merganser		
Oxyura jamaicensis	Aves	Ruddy Duck		
Alectoris chukar	Aves	Chukar		
Phasianus colchicus	Aves	Ring-necked Pheasant		
Meleagris gallopavo	Aves	Wild Turkey		
Colinus virginianus	Aves	Northern Bobwhite		
Callipepla squamata	Aves	Scaled Quail		
Gavia immer	Aves	Common Loon		
Podilymbus podiceps	Aves	Pied-billed Grebe		
Podiceps auritus	Aves	Horned Grebe		
Podiceps nigricollis	Aves	Eared Grebe		
Aechmophorus occidentalis	Aves	Western Grebe		
Aechmophorus clarkii	Aves	Clark's Grebe		
Pelecanus erythrorhynchos	Aves	American White Pelican		
Phalacrocorax auritus	Aves	Double-crested Cormorant		
Botaurus lentiginosus	Aves	American Bittern		
Ardea herodias	Aves	Great Blue Heron		
Ardea alba	Aves	Great Egret		
Egretta thula	Aves	Snowy Egret		
Bubulcus ibis	Aves	Cattle Egret		
Nycticorax nycticorax	Aves	Black-crowned Night-Heron		
Plegadis chihi	Aves	White-faced Ibis		
Cathartes aura	Aves	Turkey Vulture		
Pandion haliaetus	Aves	Osprey		
Ictinia misisippiensis	Aves	Mississippi Kite		
Haliaeetus leucocephalus	Aves	Bald Eagle	Threatened	Threatened
Circus cyaneus	Aves	Northern Harrier		
Accipiter striatus	Aves	Sharp-shinned Hawk		
Accipiter cooperii	Aves	Cooper's Hawk		
Accipiter gentilis	Aves	Northern Goshawk		
Buteo platypterus	Aves	Broad-winged Hawk		
Buteo swainsoni	Aves	Swainson's Hawk		
Buteo jamaicensis	Aves	Red-tailed Hawk		
Buteo regalis	Aves	Ferruginous Hawk		Special Concern
Buteo lagopus	Aves	Rough-legged Hawk		
Aquila chrysaetos	Aves	Golden Eagle		
Falco sparverius	Aves	American Kestrel		
Falco columbarius	Aves	Merlin		
Falco peregrinus	Aves	Peregrine Falcon		Special Concern
Falco mexicanus	Aves	Prairie Falcon		
Laterallus jamaicensis	Aves	Black Rail		
Rallus limicola	Aves	Virginia Rail		
Porzana carolina	Aves	Sora		
Fulica americana	Aves	American Coot		
Grus canadensis	Aves	Sandhill Crane		
Charadrius semipalmatus	Aves	Semipalmated Plover		
Charadrius vociferus	Aves	Killdeer		
Charadrius montanus	Aves	Mountain Plover		Special Concern
Himantopus mexicanus	Aves	Black-necked Stilt		
Recurvirostra americana	Aves	American Avocet		
Actitis macularia	Aves	Spotted Sandpiper		
Tringa solitaria	Aves	Solitary Sandpiper		
Tringa melanoleuca	Aves	Greater Yellowlegs		

ATTACHMENT **F.1.2-1**

Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Catoptrophorus semipalmatus	Aves	Willet		
Tringa flavipes	Aves	Lesser Yellowlegs		
Bartramia longicauda	Aves	Upland Sandpiper		
Numenius americanus	Aves	Long-billed Curlew		Special Concern
Limosa fedoa	Aves	Marbled Godwit		
Calidris alba	Aves	Sanderling		
Calidris pusilla	Aves	Semipalmated Sandpiper		
Calidris mauri	Aves	Western Sandpiper		
Calidris minutilla	Aves	Least Sandpiper		
Calidris bairdii	Aves	Baird's Sandpiper		
Calidris melanotos	Aves	Pectoral Sandpiper		
Calisdris himantopus	Aves	Stilt Sandpiper		
Limnodromus scolopaceus	Aves	Long-billed Dowitcher		
Gallinago delicata	Aves	Wilson's Snipe		
Scolopax minor	Aves	American Woodcock		
Phalaropus tricolor	Aves	Wilson's Phalarope		
Larus pipixcan	Aves	Franklin's Gull		
Larus philadelphia	Aves	Bonaparte's Gull		
Larus delawarensis	Aves	Ring-billed Gull		
Larus californicus	Aves	California Gull		
Larus argentatus	Aves	Herring Gull		
Chilidonias niger	Aves	Black Tern		
Sterna forsteri	Aves	Forster's Tern		
Columba livia	Aves	Rock Pigeon		
Patagioenas fasciata	Aves	Band-tailed Pigeon		
Streptopelia decaocto	Aves	Eurasian Collared-Dove		
Zenaida asiatica	Aves	White-winged Dove		
Zenaidura macroura	Aves	Mourning Dove		
Coccyzus americanus	Aves	Yellow-billed Cuckoo		
Geococcyx californianus	Aves	Greater Roadrunner		
Tyto alba	Aves	Barn Owl		
Megascops kennicottii	Aves	Western Screech-Owl		
Bubo virginianus	Aves	Great Horned Owl		
Glaucidium gnoma	Aves	Northern Pygmy-Owl		
Athene cunicularia	Aves	Burrowing Owl		Threatened
Strix occidentalis	Aves	Spotted Owl		
Strix occidentalis lucida	Aves	Mexican Spotted Owl	Threatened	Threatened
Asio otus	Aves	Long-eared Owl		
Asio flammeus	Aves	Short-eared Owl		
Aegolius acadicus	Aves	Northern Saw-whet Owl		
Chordeiles minor	Aves	Common Nighthawk		
Phalaenoptilus nuttalii	Aves	Common Poorwill		
Cypseloides niger	Aves	Black Swift		
Chaetura pelagica	Aves	Chimney Swift		
Aeronautes saxatalis	Aves	White-throated Swift		
Eugenes fulgens	Aves	Magnificent Hummingbird		
Archilochus colubris	Aves	Ruby-throated Hummingbird		
Archilochus alexandri	Aves	Black-chinned Hummingbird		
Stellula calliope	Aves	Calliope Hummingbird		
Selasphorus platycercus	Aves	Broad-tailed Hummingbird		
Selasphorus rufus	Aves	Rufous Hummingbird		
Ceryle alcyon	Aves	Belted Kingfisher		
Melanerpes lewis	Aves	Lewis's Woodpecker		
Melanerpes erythrocephalus	Aves	Red-headed Woodpecker		
Melanerpes formicivorus	Aves	Acorn Woodpecker		
Sphyrapicus thyroideus	Aves	Williamson's Sapsucker		
Sphyrapicus varius	Aves	Yellow-bellied Sapsucker		
Sphyrapicus nuchalis	Aves	Red-naped Sapsucker		
Picoides scalaris	Aves	Ladder-backed Woodpecker		
Picoides pubescens	Aves	Downy Woodpecker		

ATTACHMENT **F.1.2-1**

Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Picoides villosus	Aves	Hairy Woodpecker		
Colaptes auratus	Aves	Northern Flicker		
Contopus cooperii	Aves	Olive-sided Flycatcher		
Contopus sordidulus	Aves	Western Wood-Pewee		
Empidonax traillii	Aves	Willow Flycatcher		
Empidonax minimus	Aves	Least Flycatcher		
Empidonax hammondii	Aves	Hammond's Flycatcher		
Empidonax wrightii	Aves	Gray Flycatcher		
Empidonax oberholseri	Aves	Dusky Flycatcher		
Empidonax occidentalis	Aves	Cordilleran Flycatcher		
Sayornis phoebe	Aves	Eastern Phoebe		
Sayornis saya	Aves	Say's Phoebe		
Myriarchus cinerascens	Aves	Ash-throated Flycatcher		
Tyrannus vociferans	Aves	Cassin's Kingbird		
Tyrannus verticalis	Aves	Western Kingbird		
Tyrannus tyrannus	Aves	Eastern Kingbird		
Tyrannus forticatus	Aves	Scissor-tailed Flycatcher		
Lanius ludovicianus	Aves	Loggerhead Shrike		
Lanius excubitor	Aves	Northern Shrike		
Vireo griseus	Aves	White-eyed Vireo		
Vireo plumbeus	Aves	Plumbeous Vireo		
Vireo cassinii	Aves	Cassin's Vireo		
Vireo solitarius	Aves	Blue-headed Vireo		
Vireo gilvus	Aves	Warbling Vireo		
Vireo olivaceus	Aves	Red-eyed Vireo		
Cyanocitta stellerii	Aves	Steller's Jay		
Cyanocitta cristata	Aves	Blue Jay		
Aphelocoma californica	Aves	Western Scrub-Jay		
Gymnorhinus cyanocephalus	Aves	Pinyon Jay		
Nucifraga columbiana	Aves	Clark's Nutcracker		
Pica hodsonia	Aves	Black-billed Magpie		
Corvus brachyrhynchos	Aves	American Crow		
Corvus cryptoleucus	Aves	Chihuahuan Raven		
Corvus corax	Aves	Common Raven		
Eremophila alpestris	Aves	Horned Lark		
Tachycineta bicolor	Aves	Tree Swallow		
Tachycineta thalassina	Aves	Violet-green Swallow		
Stelgidopteryx serripennis	Aves	Northern Rough-winged Swallow		
Riparia riparia	Aves	Bank Swallow		
Petrochelidon pyrrhonota	Aves	Cliff Swallow		
Hirundo rustica	Aves	Barn Swallow		
Poecile atricapilla	Aves	Black-capped Chickadee		
Poecile gambeli	Aves	Mountain Chickadee		
Baeolophus ridgwayi	Aves	Juniper Titmouse		
Psaltriparus minimus	Aves	Bushtit		
Sitta canadensis	Aves	Red-breasted Nuthatch		
Sitta carolinensis	Aves	White-breasted Nuthatch		
Sitta pygmaea	Aves	Pygmy Nuthatch		
Certhia americana	Aves	Brown Creeper		
Salpinctes obsoletus	Aves	Rock Wren		
Catherpes mexicanus	Aves	Canyon Wren		
Thyrothorus ludovicianus	Aves	Carolina Wren		
Thyromanes bewickii	Aves	Bewick's Wren		
Troglodytes aedon	Aves	House Wren		
Cistothorus palustris	Aves	Marsh Wren		
Cinclus mexicanus	Aves	American Dipper		
Regulus satrapa	Aves	Golden-crowned Kinglet		
Regulus calendula	Aves	Ruby-crowned Kinglet		
Polioptila caerulea	Aves	Blue-gray Gnatcatcher		
Sialia sialis	Aves	Eastern Bluebird		

ATTACHMENT **F.1.2-1**

Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Sialia mexicana	Aves	Western Bluebird		
Sialia currucoides	Aves	Mountain Bluebird		
Myadestes townsendi	Aves	Townsend's Solitaire		
Catharus fuscescens	Aves	Veery		
Catharus ustulatus	Aves	Swainson's Thrush		
Catharus guttatus	Aves	Hermit Thrush		
Turdus migratorius	Aves	American Robin		
Dumetella carolinensis	Aves	Gray Catbird		
Mimus polyglottos	Aves	Northern Mockingbird		
Oreoscoptes montanus	Aves	Sage Thrasher		
Toxostoma rufum	Aves	Brown Thrasher		
Toxostoma curvirostre	Aves	Curve-billed Thrasher		
Sturnus vulgaris	Aves	European Starling		
Anthus rubescens	Aves	American Pipit		
Bombycilla garralus	Aves	Bohemian Waxwing		
Bombycilla cedrorum	Aves	Cedar Waxwing		
Vermivora pinus	Aves	Blue-winged Warbler		
Vermivora chrysoptera	Aves	Golden-winged Warbler		
Vermivora peregrina	Aves	Tennessee Warbler		
Vermivora celata	Aves	Orange-crowned Warbler		
Vermivora ruficapilla	Aves	Nashville Warbler		
Vermivora virginiae	Aves	Virginia's Warbler		
Parula americana	Aves	Northern Parula		
Dendroica petechia	Aves	Yellow Warbler		
Dendroica pensylvanica	Aves	Chestnut-sided Warbler		
Dendroica coronata	Aves	Yellow-rumped Warbler		
Dendroica nigrescens	Aves	Black-throated Gray Warbler		
Dendroica virens	Aves	Black-throated Green Warbler		
Dendroica townsendi	Aves	Townsend's Warbler		
Dendroica palmarum	Aves	Palm Warbler		
Dendroica striata	Aves	Blackpoll Warbler		
Mniotilta varia	Aves	Black-and-white Warbler		
Setophaga ruticilla	Aves	American Redstart		
Helmitheros vermivorus	Aves	Worm-eating Warbler		
Seiurus aurocapillus	Aves	Ovenbird		
Seiurus noveboracensis	Aves	Northern Waterthrush		
Oporornis tolmiei	Aves	MacGillivray's Warbler		
Geothlypis trichas	Aves	Common Yellowthroat		
Wilsonia citrina	Aves	Hooded Warbler		
Wilsonia pusilla	Aves	Wilson's Warbler		
Icteria virens	Aves	Yellow-breasted Chat		
Piranga flava	Aves	Hepatic Tanager		
Piranga rubra	Aves	Summer Tanager		
Piranga ludoviciana	Aves	Western Tanager		
Pipilo chlorurus	Aves	Green-tailed Towhee		
Pipilo maculatus	Aves	Spotted Towhee		
Pipilo fuscus	Aves	Canyon Towhee		
Aimophila cassini	Aves	Cassin's Sparrow		
Aimophila ruficeps	Aves	Rufous-crowned Sparrow		
Spizella arborea	Aves	American Tree Sparrow		
Spizella passerina	Aves	Chipping Sparrow		
Spizella pallida	Aves	Clay-colored Sparrow		
Spizella breweri	Aves	Brewer's Sparrow		
Spizella pusilla	Aves	Field Sparrow		
Pooecetes gramineus	Aves	Vesper Sparrow		
Chondestes grammacus	Aves	Lark Sparrow		
Amphispiza bilineata	Aves	Black-throated Sparrow		
Calamospiza melanocorys	Aves	Lark Bunting		
Passerculus sandwichensis	Aves	Savannah Sparrow		
Ammodramus savannarum	Aves	Grasshopper Sparrow		

ATTACHMENT F.1.2-1
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Passerella iliaca	Aves	Fox Sparrow		
Melospiza melodia	Aves	Song Sparrow		
Melospiza lincolnii	Aves	Lincoln's Sparrow		
Melospiza georgiana	Aves	Swamp Sparrow		
Zonotrichia albicollis	Aves	White-throated Sparrow		
Zonotrichia querula	Aves	Harris's Sparrow		
Zonotrichia leucophrys	Aves	White-crowned Sparrow		
Junco hyemalis	Aves	Dark-eyed Junco		
Calcarius mccownii	Aves	McCown's Longspur		
Calcarius lapponicus	Aves	Lapland Longspur		
Calcarius ornatus	Aves	Chestnut-collared Longspur		
Pheucticus ludovicianus	Aves	Rose-breasted Grosbeak		
Pheucticus melanocephalus	Aves	Black-headed Grosbeak		
Passerina caerulea	Aves	Blue Grosbeak		
Passerina amoena	Aves	Lazuli Bunting		
Passerina cyanea	Aves	Indigo Bunting		
Spiza americana	Aves	Dickcissel		
Dolichonyx oryzivorus	Aves	Bobolink		
Agelaius phoeniceus	Aves	Red-winged Blackbird		
Sturnella neglecta	Aves	Western Meadowlark		
Xanthocephalus xanthocephalus	Aves	Yellow-headed Blackbird		
Euphagus cyanocephalus	Aves	Brewer's Blackbird		
Quiscalus quiscula	Aves	Common Grackle		
Quiscalus mexicanus	Aves	Great-tailed Grackle		
Molothrus ater	Aves	Brown-headed Cowbird		
Icterus spurius	Aves	Orchard Oriole		
Icterus bullockii	Aves	Bullock's Oriole		
Leucosticte tephrocotia	Aves	Gray-crowned Rosy-Finch		
Leucosticte australis	Aves	Brown-capped Rosy-Finch		
Carpodacus cassinii	Aves	Cassin's Finch		
Carpodacus mexicanus	Aves	House Finch		
Loxia curvirostra	Aves	Red Crossbill		
Coccothraustes vespertinus	Aves	Evening Grosbeak		
Carduelis pinus	Aves	Pine Siskin		
Carduelis psaltria	Aves	Lesser Goldfinch		
Carduelis tristis	Aves	American Goldfinch		
Passer domesticus	Aves	House Sparrow		
Antilocapra americana	Mammalia	Pronghorn		
Ovis canadensis	Mammalia	Bighorn sheep		
Canis latrans	Mammalia	Coyote		
Urocyon cinereoargenteus	Mammalia	Gray fox		
Vulpes vulpes	Mammalia	Red fox		
Castor canadensis	Mammalia	Beaver		
Cervus elaphus	Mammalia	Wapiti (Elk)		
Odocoileus hemionus	Mammalia	Mule Deer		
Odocoileus virginianus	Mammalia	White-tailed deer		
Microtus longicaudus	Mammalia	Long-tailed vole		
Microtus ochrogaster	Mammalia	Prairie vole		
Microtus pennsylvanicus	Mammalia	Meadow vole		
Neotoma cinerea	Mammalia	Bushy-tailed woodrat		
Neotoma floridana	Mammalia	Eastern woodrat		
Neotoma mexicana	Mammalia	Mexican woodrat		
Ondatra zibethicus	Mammalia	Muskrat		
Onychomys leucogaster	Mammalia	Northern grasshopper mouse		
Peromyscus boylii	Mammalia	Brush mouse		
Peromyscus difficilis	Mammalia	Northern Rock Mouse		
Peromyscus leucopus	Mammalia	White-footed mouse		
Peromyscus maniculatus	Mammalia	Deer mouse		
Peromyscus truei	Mammalia	Pinon mouse		
Reithrodontomys megalotis	Mammalia	Western harvest mouse		
Reithrodontomys montanus	Mammalia	Plains harvest mouse		

ATTACHMENT F.1.2-1
Vertebrate Species Known to Occur on Fort Carson

Scientific Name	Class	Common Name	Federal	State
Erethizon dorsatum	Mammalia	Porcupine		
Felis concolor	Mammalia	Mountain lion		
Lynx rufus	Mammalia	Bobcat		
Chaetodipus hispidus	Mammalia	Hispid pocket mouse		
Dipodomys ordii	Mammalia	Ord's kangaroo rat		
Perognathus flavescens	Mammalia	Plains pocket mouse		
Perognathus flavus	Mammalia	Silky pocket mouse		
Lepus californicus	Mammalia	Black-tailed jack rabbit		
Sylvilagus audubonii	Mammalia	Desert cottontail		
Corynorhinus townsendii	Mammalia	Townsend's Big-Eared Bat		Special Concern
Nyctinomops macrotis	Mammalia	Big free-tailed bat		
Pipistrellus subflavus	Mammalia	Eastern Pipistrelle		
Tadarida brasiliensis	Mammalia	Brazilian free-tailed bat		
Mus musculus	Mammalia	House mouse		
Mephitis mephitis	Mammalia	Striped skunk		
Mustela erminea	Mammalia	Ermine		
Mustela frenata	Mammalia	Long-tailed weasel		
Spilogale gracilis	Mammalia	Western Spotted Skunk		
Taxidea taxus	Mammalia	Badger		
Bassariscus astutus	Mammalia	Ringtail		
Procyon lotor	Mammalia	Raccoon		
Cynomys ludovicianus	Mammalia	Black-tailed prairie dog		Special Concern
Sciurus aberti	Mammalia	Abert's squirrel		
Sciurus niger	Mammalia	Fox squirrel		
Spermophilus spilosoma	Mammalia	Spotted ground squirrel		
Spermophilus tridecemlineatus	Mammalia	Thirteen-lined ground squirrel		
Spermophilus variegatus	Mammalia	Rock squirrel		
Spermphilus spilosoma	Mammalia	Spotted ground squirrel		
Tamias minimus	Mammalia	Least chipmunk		
Tamias quadrivittatus	Mammalia	Colorado chipmunk		
Tamiasciurus hudsonicus	Mammalia	Red squirrel		
Ursus americanus	Mammalia	Black bear		
Antrozous pallidus	Mammalia	Pallid bat		
Eptesicus fuscus	Mammalia	Big brown bat		
Lasiurus cinereus	Mammalia	Hoary bat		
Myotis yumanensis	Mammalia	Yuma myotis		

Source: DECAM, 2002a (Updated by DECAM in 2007)

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APPENDIX F.2

PCMS
Biological Resources Supporting Documentation

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ATTACHMENT F.2.1

Plants Known to Occur at the PCMS

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ATTACHMENT **F.2.1-1**
Plants Known to Occur at the PCMS

Scientific Name	Common Name	Life	Origin	Form	Season
Angiosperms (Flowering plants)					
Aceraceae (Maple family)					
Acer glabrum	Mountain maple	P	N	T	C
Agavaceae (Agave family)					
Yucca glauca	Small soapweed	P	N	F	C
Alismataceae (Water-Plantain family)					
Alisma trivale	Northern water plantain	N	P	F	W
Alisma spp. L.	Water plantain	N	P	F	W
Sagittaria spp. L.	Arrowhead	N	P	F	W
Alliaceae (Onion family)					
Allium cernuum	Wild onion	P	N	F	W
Allium textile	Textile onion	P	N	F	C
Alsinaceae (Chickweed family)					
Eremogone hookeri	Hooker sandwort	P	N	F	W
Paronychia sessiliflora	Creeping nailwort	P	N	F	W
Amaranthaceae (Amaranth family)					
Amaranthus blitoides	Mat amaranth	A	I	F	W
Anacardiaceae (Sumac family)					
Rhus aromatica ssp. *tribolata*	Skunkbrush, lemonade bush	P	N	S	C
Rhus aromatica ssp. *pilosissima*	Lemonade bush, skunkbrush	P	N	S	C
Toxicodendron rydbergii	Poison Ivy	P	N	S	W
Apiaceae (Carrot family)					
Conium maculatum L.	Poison hemlock	B	I	F	C
Cymopterus acaulis	Plains spring parsley	P	N	F	C
Cymopterus montanus	Mountain spring parsley	P	N	F	C
Heracleum sphondylium L. ssp. *montanum*	Cow parsnip	P	N	F	C
Lomatium orientale	Northern Idaho biscuitroot	P	N	F	C
Musineon divaricatum	Leafy wild parsley	P	N	F	C
Apocynaceae (Dogbane family)					
Apocynum cannabinum L.	Indian hemp	P	N	F	W
Asclepiadaceae (Milkweed family)					
Asclepias arenaria	Sand milkweed	P	N	F	W
Asclepias asperula	Spider milkweed	P	N	F	C
Asclepias engelmanniana	Englemann's milkweed	P	N	F	W
Asclepias incarnata L.	Swamp milkweed	P	N	F	W
Asclepias macrotis	Plains milkweed	P	N	F	W

Scientific Name	Common Name	Life	Origin	Form	Season
Asclepias speciosa	Showy milkweed	P	N	F	C
Asclepias subverticillata	Poison milkweed	P	N	F	W
**Asclepias uncialis*	Dwarf milkweed	P	N	F	C
Asclepias verticillata	Whorled milkweed	P	N	F	W
Asclepias viridiflora	Green milkweed	P	N	F	W
**Sarcostemma crispum*	Twinevine	P	N	F	W
Asteraceae (Daisy family)					
Acroptilon repens L.	Russian knapweed	P	I	F	W
Ambrosia psilostachya var. *coronopifolia*	Western ragweed	P	N	F	W
Ambrosia trifida L.	Giant ragweed	A	I	F	W
Antennaria howellii	Howell's pussytoes	P	N	F	C
Antennaria parvifolia	Littleleaf pussytoes	P	N	F	C
Arctium minus	Common burdock	P	I	F	W
Artemisia bigelovii	Bigelow's sagebrush	P	N	F	W
Artemisia frigida	Silver sagebrush	P	N	F	W
Artemisia ludoviciana	Louisiana sagebrush	P	N	F	W
Baccharis wrightii	Wright's baccharis	P	N	F	W
Brickellia brachyphylla	Plumed brickellbush	P	N	F	W
Brickellia californica	California brickellbush	P	N	F	W
Chrysothamnus nauseosus	Rabbitbrush	P	N	S	W
Chrysothamnus viscidiflorus	Green rabbitbrush	P	N	S	W
Cirsium undulatum	Wavyleaf thistle	P	N	F	W
Conyza canadensis L.	Canadian horseweed	A	N	F	W
Coreopsis tinctoria	Plains coreopsis	A	N	F	W
Cyclachaena xanthifolia	Marsh-elder	A	N	F	C
Dyssodia aurea	Dogweed	A	N	F	W
Erigeron divergens	Spreading fleabane	P	N	F	W
Erigeron pumilus	Low fleabane	P	N	F	C
Erigeron subtrinervis	Threenerved fleabane	P	N	F	C
Evax prolifera	Bighead pygmy cudweed	A	N	F	C
Gaillardia pinnatifida	Blanket flower	P	N	F	C
Grindelia squarrosa	Curlycup gumweed	P	N	F	W
Gutierrezia sarothrae	Broom snakeweed	P	N	F	W
Helianthus annuus L.	Annual sunflower	A	N	F	W
Helianthus petiolaris	Prairie sunflower	A	N	F	W
Heterotheca villosa	Hairy goldaster	P	N	F	W

Scientific Name	Common Name	Life	Origin	Form	Season
Hymenopappus filifolius	Fineleaf hymenopappus	P	N	F	C
Hymenopappus tenuifolius	Fineleaf hymenopappus	P	N	F	C
Iva axillaris	Poverty weed	P	N	F	W
Lactuca serriola L.	Prickly lettuce	P	I	F	W
Lactuca tatarica L. ssp. *pulchella*	Blue lettuce	P	N	F	W
Leucelene ericoides	Sand aster	P	N	F	C
Liatris punctata	Dotted gayfeather	P	N	F	W
Lygodesmia juncea	Rush skeletonweed	P	N	F	W
Machaeranthera pinnatifida	Lacy tansyaster	P	N	F	C
Machaeranthera tanacetifolia	Tansyleaf aster	A	N	F	W
Melampodium leucanthum	Plains blackfoot daisy	P	N	F	C
Nothocalis cuspidata	False dandelion	P	N	F	C
Oligosporus caudatus	Sagewort wormwood	P	N	F	W
Oligosporus dracunculus L. ssp. *glaucus*	Wild tarragon	P	N	F	W
Oligosporus filifolius	Sand sagebrush	P	N	S	W
Oonopsis foliosa	Fremont goldenweed	P	N	F	W
Packera neomexicana ssp. *mutabilis*	New Mexico groundsel	P	N	F	C
Packera pseudaurea	Falsegold groundsel	P	N	F	C
Packera tridenticulata	Threetooth ragwort	P	N	F	C
Palafoxia rosea var. *macrolepsis*	Rosy palafox	P	N	F	W
Pectis angustifolia	Narrow-leaf pectis	P	N	F	W
Picradeniopsis oppositifolia	Plains bahia	P	N	F	W
Ratibida columnifera	Prairie coneflower	P	N	F	W
Ratibida tagetes	Green prairie coneflower	P	N	F	W
Senecio riddellii	Riddell's ragwort	P	N	F	W
Solidago mollis	Velvety goldenrod	P	N	F	W
Solidago multiradiata	Mountain goldenrod	P	N	F	W
Solidago petiolaris	Downy goldenrod	P	N	F	W
Solidago velutina	Three-nerved goldenrod	P	N	F	W
Stephanomeria pauciflora	Desert wirelettuce	P	N	F	W
Taraxacum officinale	Common dandelion	P	I	F	C
Tetraneuris acaulis	Stemless hymenoxys	P	N	F	C
Thelesperma megapotamicum	Hopi-tea greenthread	P	N	F	C
Thelesperma subnudum	Navajo-tea greenthread	P	N	F	W
Townsendia exscapa	Stemless townsendia	P	N	F	C
Townsendia hookeri	Hooker's townsendia	P	N	F	C

Scientific Name	Common Name	Life	Origin	Form	Season
Tragopogon dubius ssp. *major* (	Western salsify	P	N	F	C
Virgulus ericoides L.	Heath aster	P	I	F	C
Virgulus falcatus	Cluster aster	P	N	F	W
Virgulus fendleri	Fendler's aster	P	N	F	W
Zinnia grandiflora	Rocky Mountain zinnia	P	N	F	C
Boraginaceae (Borage family)					
Cryptantha minima	Little catseye	A	N	F	C
Lappula marginata	Margined stickseed	A	I	F	C
Lappula redowskii (Hornemamm)	Desert stickseed	A	N	F	C
Lithospernum incisum	Narrowleaf gromwell	P	N	F	C
Onosmodium molle var. *occidentale*	Western marbleseed	P	N	F	C
Oreocarya bakeri	Baker's catseye	P	N	F	C
Oreocarya suffruticosa	James' catseye	P	N	F	C
Oreocarya thyrsiflora	Cluster catseye	P	N	F	C
Brassicaceae (Mustard family)					
Arabis hirsuta L.	Rockcress	A	I	F	C
Camelina microcarpa	Littlepod false flax	A	I	F	C
Descurainia incana L.	Mountain tanseymustard	P	N	F	C
Descurania incisa	Tansey muxtard	P	N	F	C
Descurainia pinnata	Western tanseymustard	A	I	F	C
Descurainia sophia L.	Herb sophia	A	I	F	C
Draba reptans	Carolina draba	A	N	F	C
Erysimum asperum	Western wallflower	P	N	F	C
Erysimum inconspicuum	Western wallflower	P	N	F	C
Lesquerella fendleri	Fendler's bladderpod	P	N	F	C
Lesquerella ovalifolia	Bladderpad	P	N	F	C
Stanleya pinnata	Prince's plume	P	N	F	C
Thelypodium wrightii ssp. *oklahomensis*	Oklahoma thelypody	P	N	F	W
Cactaceae (Cactus family)					
Coryphantha vivipara	Nipple cactus	P	N	C	C
Cylindropuntia imbricata	Candelabra cactus	P	N	S	C
Echinocereus reichenbackii var. *perbellus*	Claret cup	P	N	C	C
Echinocereus viridiflorus	Hens-and-chickens	P	N	C	C
Opuntia macrorhiza	Twisted spine prickly pear	P	N	C	C
Opuntia phaeacantha	New Mexican prickly-pear	P	N	C	C

Scientific Name	Common Name	Life	Origin	Form	Season
Opuntia polyacantha	Plains prickly-pear	P	N	C	C
Calochortaceae (Mariposa family)					
Calochortus gunnisonii	Sego lily, mariposa lily	P	N	F	W
Campanulaceae (BellFlower family)					
Lobelia cardinalis L. ssp. *graminea*	Cardinal flower	P	N	F	W
Capparidaceae (Caper family)					
Cleome serrulata	Rocky Mountain beeplant	A	N	F	W
Polanisia dodecandra L.	Roughseed clammyweed	P	N	F	C
Caprifoliaceae (Honeysuckle family)					
Sambucus canadensis L.	Elderberry	P	N	F	C
Symphoricarpos albus L.	White coralberry	P	N	F	C
Symphoricarpos occidentalis	Western snowberry	P	N	F	C
Symphoricarpos oreophilus	Mountain snowberry	P	N	F	C
Chenopodiaceae (Goosefoot family)					
Atriplex argenta	Tumbling saltbush	A	N	F	W
Atriplex canescens	Fourwing saltbush	P	N	S	C
Bassia sieversiana	Ironweed	A	I	F	W
Chenopodium album L.	Lambsquarters	A	I	F	W
Chenopodium desiccatum	Desert goosefoot	A	N	F	W
Chenopodium incanum	Mealy goosefoot	A	N	F	W
Chenopodium leptophyllum	Slimleaf goosefoot	A	N	F	W
Krascheninnikovia lanata	Common winterfat	P	N	H	C
Salsola australis	Russian thistle, tumbleweed	A	I	F	W
Sarcobatus vermiculatus	Black greasewood	P	N	S	C
Commelinaceae (Spiderwort family)					
Tradescantia occidentalis	Prairie spiderwort	P	N	F	C
Convolvulaceae (Morningglory family)					
Convolvulus arvensis L.	Creeping jenny	P	I	F	W
Evolvulus nuttallianus	Arizona evolvulus	P	N	F	C
Ipomoea leptophylla	Bush morningglory	P	N	F	C
Crossosomataceae					
Forsellesia planitierum	Greasebush	P	N	S	C
Cucurbitaceae (Gourd family)					
Cucurbita foetidissima	Buffalo gourd	P	N	V	W
Cyperaceae (Sedge family)					
Carex gravida var. *lunelliana*	Heavy sedge	P	N	G	C

Scientific Name	Common Name	Life	Origin	Form	Season
Carex lanuginosa	Bottlebrush sedge	P	N	G	C
Carex stenophylla ssp. *eleocharis*	Needleleaf sedge	P	N	G	C
Eleocharis palustris L.	Common spikerush	P	N	G	C
Mariscus filiculmis	Fern flatsedge	P	N	G	W
Mariscus schweinitzii	Schweinitz's flatsedge	P	N	G	W
Schoenoplectus lacustris L. ssp. *acutis*	Tule bulrush	P	N	G	C
Schoenoplectus pungens	Bulrush	P	N	G	W
Elaeagnaceae (Oleaster family)					
Elaeagnus angustifolia L.	Russian olive	P	I	T	C
Euphorbiaceae					
Alagloma marginata	Snow-on-the-mountain	A	N	F	W
Chamaesyce fendleri	Fendler's sandmat	P	N	F	C
Chamaesyce glyptosperma	Ribseed sandmat	A	N	F	C
Chamaesyce lata	Hoary sandmat	P	N	F	C
Chamaesyce missurica	Thymeleaf sandmat	A	N	F	W
Chamaesyce stictospora	Slimseed sandmat	A	N	F	W
Croton texensis	Texas croton	A	N	F	W
Poinsettia dentata	Toothed spurge	A	N	F	C
Tithymalus spathulatus	Warty spurge	A	N	F	C
Tragia ramosa	Noseburn	P	N	F	C
Fabaceae (Pea family)					
Amorpha fruticosa L. var. *angustifolia*	False indigo	P	N	S	C
**Amorpha nana*	Dwarf wild indigo	P	N	S	C
Astragalus crassiocarpus	Ground plum	P	N	F	C
Astragalus gracilis	Slender milkvetch	P	N	F	C
Astragalus missouriensis	Slender milkvetch	P	N	F	C
Astragalus nuttallianus var. *micranthiformis*	Turkeypeas	P	N	F	C
Astragalus paryii	Parry's milk-vetch	P	N	F	C
Astragalus puniceus	Trinidad milk-vetch	P	N	F	C
Astragalus racemosus	Alkali poisonvetch	P	N	F	C
Astragalus shortianus	Short's milk-vetch	P	N	F	C
Caesalpinia jamesii	James' holdback	P	N	F	C
Dalea aurea	Golden prarie clover	P	N	F	W
Dalea candida var. *oligophylla*	White prairie clover	P	N	F	C
Dalea enneandra	Nine anther prairie clover	P	N	F	W
Dalea jamesii	James dalea	P	N	F	C

ATTACHMENT **F.2.1-1**
Plants Known to Occur at the PCMS

Scientific Name	Common Name	Life	Origin	Form	Season
Dalea purpurea	Purple prairie clover	P	N	F	C
Glycyrrhiza lepidota	American licorice	P	N	F	C
Hedysarum boreale	Chainpod	P	N	F	W
Hoffmanseggia drepanocarpa	Sicklepod rushpea	P	N	F	C
Lathyrus eucosmus	Bush peavine	P	N	F	C
Lupinus pusillus	Rusty lupine	A/B	N	F	C
Medicago sativa L.	Alfalfa	P	I	F	C
Melilotus albus	White sweet clover	P	I	F	C
Melilotus officinalis L.	Yellow sweet clover	P	I	F	C
Oxytropis deflexa var. *sericea*	Pendulous pod	P	N	F	C
Oxytropis lambertii	Lambert crazyweed	P	N	F	C
Pediomelum hypogaeum	Indian potato	P	N	F	C
Psoralidium tenuiflorum	Slimflower scurfpea	P	N	F	C
Vexibia nuttalliana	White loco	P	N	F	C
Vicia americana ssp. *americana*	American vetch	P	N	F	C
Vicia americana ssp. *minor*	Mat vetch	P	N	F	C
Frankeniaceae (Frankenia family)					
Frankenia jamesii	James frankenia	P	N	S	C
Fumariaceae (Fumitory family)					
Corydalis aurea	Golden smoke	A	N	F	C
Corydalis curvisiliqua ssp*. occidentalis*	Golden smoke	A	N	F	C
Geraniaceae (Geranium family)					
Erodium cicutarium L.	Filaree	A	I	F	C
Grossulariaceae (Currant or Gooseberry family)					
Ribes aureum	Golden currant	P	N	S	C
Ribes cereum	Wax currant	P	N	S	C
Ribes leptanthum	Trumpet gooseberry	P	N	S	C
Helleboraceae (Hellebore family)					
Delphinium carolinianum ssp. *virescens*	Prairie larkspur	P	N	F	C
Delphinium wootonii	Oregon mountain larkspur	P	N	F	C
Hydrangeaceae (Hydrangea family)					
Philadelphus microphyllus	Mock orange	P	N	S	C
Iridaceae (Iris family)					
Sisyrinchium montanum	Blue-eyed grass	P	N	G	C
Juncaceae					

Scientific Name	Common Name	Life	Origin	Form	Season
Juncus arcticus ssp. *ater*	Mountain rush	P	N	G	C
Juncus dudleyi	Rush	P	N	G	C
Juncus interior	Inland rush	P	N	G	C
Juncus torreyi	Torrey's rush	P	N	G	W
Juncaginaceae (Arrowgrass family)					
Triglochin maritima L.	Seaside arrowgrass	P	I	G	C
Lamiaceae					
Hedeoma drummondii	False pennyroyal	P	N	F	C
Marribium vulgare L.	Horehound	P	I	F	C
Monarda pectinata	Beebalm	P	N	F	C
Salvia reflexa	Lanceleaf sage	A	N	F	W
Teucrium laciniatum	Cutleaf germander	P	N	F	C
Liliaceae (Lily family)					
Leucrocrinum montanum	Sand lily	P	N	F	C
Linaceae (Flax family)					
Adenolinum lewisii	Wild blue flax	P	N	F	C
Mesynium puberulum	Plains flax	A	N	F	C
Mesynium rigidum	Yellow flax	A	N	F	C
Loasaceae (Loasa family)					
Acrolasia albicaulis	Whitestem blazingstar	A	N	F	C
Mentzelia oligosperma	Chickenthief	P	N	F	W
Nuttallia nuda	Bractless blazingstar	P	N	F	W
Nuttallia rusbyi	Bractless blazingstar	P	N	F	W
Malvaceae (Mallow family)					
Sphaeralcea angustifolia (Cavanilles) D.Don var. *cuspidata*	Narrowleaf globemallow	P	N	F	C
Sphaeralcea coccinea	Scarlet globemallow	P	N	F	C
Martyniaceae (Unicorn Plant family)					
Proboscidea louisianica	Devil's claw	P	A	F	W
Nyctaginaceae (Four-O'Clock family)					
Ambronia fragrans	Sand verbena	P	N	F	C
Mirabilis multiflora	Colorado four-o'clock	P	N	F	C
Oxybaphus hirsutus	Hairy four-o'clock	P	N	F	C
Oxybaphus linearis	Narrow leaved four-o'clock	P	N	F	C
**Oxybaphus rotundifolius*	Roundleaf four-o'clock	P	N	F	C
Tripterocalyx micranthus	Sand puff	A	N	F	C

ATTACHMENT **F.2.1-1**
Plants Known to Occur at the PCMS

Scientific Name	Common Name	Life	Origin	Form	Season
Onagraceae (Evening-Primrose family)					
Calylophus lavandulifolius	Lavenderleaf evening primrose	P	N	F	C
Gaura coccinea	Scarlet gaura	P	N	F	C
Gaura mollis	Smallflower gaura	P	N	F	C
Oenothera albicaulis	Prairie evening primrose	A	N	F	C
Oenothera caespitosa	Tufted evening primrose	P	N	F	C
**Oenothera harringtonii*	Arkansas valley primrose	P	N	F	C
Orobanchaceae (Broom-Rape family)					
Orobanche multiflora	Broomrape	P	N	F	W
Papaveraceae (Poppy family)					
Argemone hispida	Hedgehog pricklypoppy	P	N	F	W
Plantaginaceae (Plantain family)					
Plantago patagonica	Woolly plantain	A	N	F	C
Poaceae (Grass family)					
Achnatherum hymenoides	Indian ricegrass	P	N	G	C
Achnatherum robustum	Sleepygrass	P	N	G	C
Achnatherum scribneri	Scribner needlegrass	P	N	G	C
Agropyron cristatum L.	Crested wheatgrass	P	I	G	W
Agropyron cristatum L. ssp. *desertorum*	Crested wheatgrass	P	N	G	W
Agrostis stolinifera L.	Redtop bentrgrass	P	I	G	W
Alopecurus aequalis	Short-awn foxtail	P	N	G	W
Aristida purpurea	Purple threeawn	P	N	G	W
Andropogon gerardii	Big bluestem	P	N	G	W
Avena fatua L.	Wild oat	A	I	G	C
Bothriochloa laguroides ssp. *torreyana*	Silver bluestem	P	N	G	W
Bouteloua curtipendula	Sideoats grama	P	N	G	W
Bromopsis inermis	Smooth brome	P	I	G	C
Bromus japonicus	Japanese brome	A	I	G	C
Buchloe dactyloides	Buffalograss	P	N	G	W
Calamagrostis stricta	Reedgrass	P	N	G	W
Chondrosum eriopodum	Black grama	P	N	G	W
Chondrosum gracile	Blue grama	P	N	G	W
Chondrosum hirsutum	Hairy grama	P	N	G	W
Chondrosum prostratum	Mat grama	A	N	G	W
Critesion jubatum L.	Foxtail barley	P	N	G	W

Scientific Name	Common Name	Life	Origin	Form	Season
Critesion pusillum	Little barley	A	N	G	C
Dactylis glomerata L.	Orchardgrass	P	I	G	C
Echinochloa crus-galli L.	Barnyardgrass	A	I	G	W
Elymus canadensis L.	Canada wildrye	P	N	G	W
Elymus elymoides	Bottlebrush squirreltail	P	N	G	C
Elymus lanceolatus	Streambank wheatgrass	P	N	G	W
Erioneuron pilosum	Hairy false tridens	P	N	G	C
Hesperostipa comata	Needle and thread	P	N	G	C
Hilaria jamesii	Galleta	P	N	G	C
Koeleria macrantha	Junegrass	P	N	G	C
Lycurus setosus	Common wolftail	P	N	G	W
Monroa squarrosa	False buffalograss	A	N	G	W
Muhlenbergia arenacea	Ear muhly	P	N	G	W
Muhlenbergia arenicola	Sand muhly	P	N	G	W
Muhlenbergia asperifolia (	Alkali muhly	P	N	G	W
Muhlenbergia torreyi (	Ring muhly	P	N	G	W
Nassella viridula	Green needlegrass	P	N	G	C
Panicum capillare L.	Common witchgrass	P	N	G	C
Panicum obtusum	Vine mesquite	A	N	G	W
Pascopyrum smithii	Western wheatgrass	P	N	G	C
Phragmites australis	Common reed	P	N	G	W
Piptatherum micranthum	Littleseed ricegrass	P	N	G	W
Poa bigelovi	Bigelow's bluegrass	A	N	G	C
Poa pratensis L.	Kentucky bluegrass	P	I	G	C
Poa secunda	Sandberg bluegrass	P	N	G	C
Polypogon monspeliensis L.	Rabbitfoot grass	A	I	G	C
Schedonnardus paniculatus	Tumblegrass	P	N	G	C
Schizachyrium scoparium	Little bluestem	P	N	G	W
Scleropogon brevifolius	Burro grass	P	N	G	W
Sporobolus airoides	Alkali sacaton	P	N	G	W
Sporobolus cryptandrus	Sand dropseed	P	N	G	W
Sphenopholus obtusata	Wedgegrass	P	N	G	C
Tridens muticus var. *elongatus*	Green tridens	P	N	G	W
Vulpia octoflora	Sixweeks fescue	A	N	G	C
Polemoniaceae (Phlox family)					
Gilia opthalmoides	Eyed gilia	A	N	F	C
Giliastrum rigidulum ssp. *acerosum*	Blue bowls	P	N	F	C

Scientific Name	Common Name	Life	Origin	Form	Season
(Bentham) Rydberg					
Ipomopsis laxiflora	Iron skyrocket	P	N	F	C
Ipomopsis pumila	Manybranched gilia	A	N	F	C
Ipomopsis spicata	Spike gilia	P	N	F	C
Phlox longifolia	Longleaf phlox	P	N	F	C
Polygonaceae (Knotweed family)					
Eriogonum annuum	Annual buckwheat	A	N	F	W
Eriogonum effusum	Spreading buckwheat	P	N	F	W
Eriogonium fendlerianum	Buckwheat	P	N	F	W
Eriogonium gordonii	Gordon's buckwheat	A	N	F	W
Eriogonum jamesii	James' buckwheat	P	N	F	W
Eriogonum lachnogynum	Woollycup buckwheat	P	N	F	W
Eriogonum tenellum	Matted wild buckwheat	P	N	F	W
Eriogonum umbellatum	Sulfur eriogonum	P	N	F	W
Rumex crispus L.	Curly dock	P	I	F	C
Rumex stenophyllus	Narrow leaf dock	P	I	F	C
Portulacaceae (Purslane family)					
Portulaca oleracea L.	Common purslane	A	N	F	C
Portulaca halimoides L.	Silkcotton purslane	A	I	F	C
Ranunculaceae					
Clematis ligusticifolia	Western virginsbower	P	N	F	W
Rosaceae (Rose family)					
Amelanchier alnifolia	Saskatoon	P	N	S	C
Amelanchier utahensis	Serviceberry	P	N	S	C
Cerasus pensylvanica L.	Pin cherry	P	N	T	C
Cercocarpus montanus	Mountain mahogany	P	N	S	C
Drymocallis arguta	Sticky cinquefoil	P	N	F	W
Oreobatus deliciosus	Boulder raspberry	P	N	S	C
Padus virginiana L. ssp. *melanocarpa*	Chokecherry	P	N	T	C
Physocarpus monogynus	Mountain ninebark	P	N	S	C
Prunus americana	American plum	P	N	T	C
Rosa woodsii	Wood's rose	P	N	S	C
Rutaceae (Citrus family)					
Ptelea trifoliata L.	Common hoptree	P	N	T	C
Salicaceae (Willow family)					
Populus x acuminata	Lanceleaf cottonwood	P	N	T	C

Scientific Name	Common Name	Life	Origin	Form	Season
Populus angustifolia	Narrowleaf cottonwood	P	N	T	C
Populus deltoides spp. *monolifera*	Plains cottonwood	P	N	T	C
Populus tremuloides	Quacking aspen	P	N	T	C
Salix alba L. var. *vitellina* L. *fragilis* L.	Hybrid Golden osier/crack willow	P	N	S	C
Salix amygdaloides	Peach-leaved willow	P	N	S	C
Salix interior	Sandbar willow	P	N	S	C
Santalaceae (Sandlewood family)					
Comandra umbellata L.	Bastard toadflax	P	N	F	C
Sapindaceae (Soapberry family)					
**Sapindus saponaria* L. var. *drummondii*	Southern soapberry	P	N	S	C
Saxifragaceae					
Heuchera parvifolia	Little leaf alumroot	P	N	F	W
Scrophulariaceae (Figwort family)					
Castilleja integra	Indian paintbrush	P	N	F	W
Castilleja sessiliflora	Largeflowered Indian paintbrush	P	N	F	C
Penstemon angustifolius ssp *caudatus*	Colorado beard-tongue	P	N	F	C
Penstemon auriberbis	Colorado beard-tongue	P	N	F	C
Penstemon barbatus var. *torreyi*	Torrey's penstemon	P	N	F	W
Verbascum thapsus L.	Great mullein	P	I	F	C
Solanaceae (Nightshade family)					
Chamaesaracha conoides	Green false nightshade	P	N	F	C
Chamaesaracha coronopus	Green false nightshade	P	N	F	C
Lycium pallidum Miers	Pale woldberry	P	N	S	C
Physalis hederifolia var. *cordifolia*	Clammy groundcherry	P	N	F	W
Physalis virginiana	Virginia groundcherry	P	N	F	C
Quincula lobata	Chinese lantern	P	N	F	C
Solanum americanum	Black nightshade	A	N	F	C
Solanum elaeagnifolium	Silverleaf nightshade	P	N	F	C
Solanum rostratum	Buffalo bur	A	N	F	C
Solanum triflorum	Cutleaf nightshade	A	N	F	C
Tamaricaceae (Tamarisk family)					
Tamarix ramosissima	Salt cedar	P	I	T	C
Typhaceae (Cattail family)					
Typha angustifolia L.	Narrow-leaved cattail	P	N	G	C

Scientific Name	Common Name	Life	Origin	Form	Season
Typha latifolia L.	Broad-leaved cattail	P	N	G	C
Ulmaceae (Elm family)					
Celtis occidentalis L.	Hackberry	P	N	T	C
Celtis reticulata	Netleaf hackberry	P	N	T	C
Urticaceae (Nettle family)		A	N	F	C
Parietaria pensylvanica	Pennsylvania pellitory				
Verbenaceae (Vervain family)					
Glandularia bipinnatifida	Showy vervain	P	N	F	C
Phyla cuneifolia	Frog fruit	P	N	F	W
Verbena bracteata	Prostrate vervain	P	N	F	C
Violaceae (Violet family)					
Hybanthus verticillatus	Nodding green violet	P	N	F	C
Viola nuttallii	Nuttall's violet	P	N	F	C
Vitaceae (Grape family)					
Parthenocissus vitaceae	Thicket creeper	P	N	F	C
Vitis acerifolia Rafinesque	Long's grape	P	N	F	C
Gymnosperms					
Cupressaceae (Cypress family)					
Sabina monosperma.	One-seeded juniper	P	N	T	C
Sabina scopulorum	Rocky Mountain juniper	P	N	T	C
Pinaceae (Pine family)					
Pinus edulis	Pinyon pine	P	N	T	C
Pinus ponderosa ssp. *scopulorum*	Ponderosa pine	P	N	T	C
Ferns & Fern Allies					
Athyriaceae (Ladyfern family)					
Cystopteris fragilis L.	Brittle fern	P	N	F	C
Aspidaceae (Shieldfern family)					
Dryopteris felix-mas L.	Male fern	P	N	F	C
Equisetaceae (Horsetail family)					
Hippochaete laevigata	Smooth horsetail	P	N	G	C
Hippochaete variegata	Variegated scouring rush	P	N	G	W
Selaginellaceae (Little Club-Moss family)					
Selaginella densa	Little club moss	P	N	F	C
Selaginella mutica	Little club moss	P	N	F	C
Sinopteridaceae (Lipfern family)					

ATTACHMENT **F.2.1-1**
Plants Known to Occur at the PCMS

Scientific Name	Common Name	Life	Origin	Form	Season
Cheilanthes feei	Fee's lipfern	P	N	F	C
Cheilanthes fendleri	Fendler's lipfern	P	N	F	C
Viscaceae (Mistletoe family)					
Arceuthobium spp.	Dwarf mistletoe	P	N	F	W
Woodsiaceae (Woodsia family)					
Woodsia oregano ssp. *cathcartiana*	Oregon woodsia	P	N	F	W

Notes:

Life Form: A = Annual, B = Biennial, P = Perennial

Origin: N = Native, I = Introduced

Form: F = Forb, G = Grass, V = Vine, S = Shrub, T = Tree

Season: W = Warm Season, C = Cool Season

ATTACHMENT F.2.2

Vertebrate Species Known to Occur at the PCMS

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Campostoma	Central stoneroller	Osteichthyes		
Catostomus commersoni	White sucker	Osteichthyes		
Cyprinella lutrensis	Red shiner	Osteichthyes		
Cyprinus carpio	Common carp	Osteichthyes		
Fundulus zebrinus	Plains killifish	Osteichthyes		
Hybopsis gracilis	Flathead chub	Osteichthyes		Special concern
Ictalurus melas	Black bullhead	Osteichthyes		
Ictalurus punctatus	Channel catfish	Osteichthyes		
Lepomis cyanellus	Green sunfish	Osteichthyes		
Notropis stamineus	Sand shiner	Osteichthyes		
Pimephales promelas	Fathead minnow	Osteichthyes		
Rhinichtthys cataractae	Longnose dace	Osteichthyes		
Ambystoma tigrinum	Tiger salamander	Amphibia		
Bufo punctatus	Red-spotted toad	Amphibia		
Bufo woodhousii woodhousei	Woodhouse's toad	Amphibia		
Hyla arenicolor	Canyon treefrog	Amphibia		
Rana blairi	Plains leopard frog	Amphibia		Special concern
Rana catesbeiana	Bullfrog	Amphibia		
Scaphiopus bombifrons	Plains spadefoot	Amphibia		
Scaphiopus multiplicatus	New Mexico spadefoot	Amphibia		
Chelydra serpentina serpentina	Snapping turtle	Reptilia		
Terrapene ornata ornata	Western box turtle	Reptilia		
Cnemidophorus sexlineatus viridis	Six-lined racerunner	Reptilia		
Cnemidophorus tesselatus	Colorado checkered whiptail	Reptilia		Special concern
Crotaphytus collaris collaris	Collared lizard	Reptilia		
Eumeces obsoletus	Great Plains skink	Reptilia		
Holbrookia maculata maculata	Lesser earless lizard	Reptilia		
Phrynosoma cornutum	Texas horned lizard	Reptilia		Special concern
Phrynosoma douglassi	Short-horned lizard	Reptilia		
Sceloporus undulatus erythrocheilus	Eastern fence lizard	Reptilia		
Arizona elegans elegans	Glossy snake	Reptilia		
Coluber constrictor flaviventris	Eastern yellowbelly racer	Reptilia		
Crotalus viridis viridis	Western rattlesnake	Reptilia		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Diadophis punctatus arnyi	Ring-necked snake	Reptilia		
Elaphe guttata emoryi	Corn snake	Reptilia		
Heterodon nasicus nasicus	Western hognose snake	Reptilia		
Hypsiglena torquata jani	Night snake	Reptilia		
Lampropeltis triangulum	Milk snake	Reptilia		
Leptotyphlops dulcis	Texas blind snake	Reptilia		Special concern
Masticophis flagellum testaceus	Coachwhip	Reptilia		
Pituophis melanoleucus sayi	Bullsnake	Reptilia		
Sonora semiannulata	Ground snake	Reptilia		
Tantilla nigriceps nigriceps	Plains blackhead snake	Reptilia		
Thamnophis cyrtopsis cyrtopsis	Blackneck garter snake	Reptilia		
Thamnophis elegans vagrans	Western terrestrial garter snake	Reptilia		
Thamnophis radix haydeni	Plains garter snake	Reptilia		
Podilymbus podiceps	Pied-billed grebe	Aves		
Podiceps nigricollis	Eared grebe	Aves		
Pelecanus erythrorhynchos	American white pelican	Aves		
Phalacrocorax auritus	Double-crested cormorant	Aves		
Botaurus lentiginosus	American bittern	Aves		
Ixobrychus exilis	Least bittern	Aves		
Ardea herodias	Great blue heron	Aves		
Egretta thula	Snowy egret	Aves		
Butorides virescens	Green heron	Aves		
Nycticorax nycticorax	Black-crowned night-heron	Aves		
Plegadis chihi	White-faced Ibis	Aves		
Chen caerulescens	Snow goose	Aves		
Chen rossii	Ross' goose	Aves		
Branta canadensis	Canada goose	Aves		
Aix sponsa	Wood duck	Aves		
Anas crecca	Green-winged teal	Aves		
Anas platyrhynchos	Mallard	Aves		
Anas acuta	Northern pintail	Aves		
Anas discors	Blue-winged teal	Aves		
Anas cyanoptera	Cinnamon teal	Aves		
Anas clypeata	Northern shoveler	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Anas strepera	Gadwall	Aves		
Anas americana	American wigeon	Aves		
Aythya valisineria	Canvasback	Aves		
Aythya americana	Redhead	Aves		
Aythya collaris	Ring-necked duck	Aves		
Aythya affinis	Lesser scaup	Aves		
Melanitta fusca	White-winged scoter	Aves		
Bucephala clangula	Common goldeneye	Aves		
Bucephala albeola	Bufflehead	Aves		
Oxyura jamaicensis	Ruddy duck	Aves		
Cathartes aura	Turkey vulture	Aves		
Pandion haliaetus	Osprey	Aves		
Ictinia mississippiensis	Mississippi kite	Aves		
Haliaeetus leucocephalus	Bald eagle	Aves	Threatened	Threatened
Circus cyaneus	Northern harrier	Aves		
Accipiter striatus	Sharp-shinned hawk	Aves		
Accipiter cooperii	Cooper's hawk	Aves		
Accipiter gentilis	Northern goshawk	Aves		
Buteo platypterus	Broad-winged hawk	Aves		
Buteo swainsoni	Swainson's hawk	Aves		
Buteo jamaicensis	Red-tailed hawk	Aves		
Buteo jamaicensis calurus	Western red-tailed hawk	Aves		
Buteo regalis	Ferruginous hawk	Aves		Special concern
Buteo lagopus	Rough-legged hawk	Aves		
Aquila chrysaetos	Golden eagle	Aves		
Falco sparverius	American kestrel	Aves		
Falco columbarius	Merlin	Aves		
Falco peregrinus	Peregrine falcon	Aves		Special concern
Falco mexicanus	Prairie falcon	Aves		
Meleagris gallopavo	Wild turkey	Aves		
Colinus virginianus	Northern bobwhite	Aves		
Callipepla squamata	Scaled quail	Aves		
Rallus limicola	Virginia rail	Aves		
Porzana carolina	Sora	Aves		
Fulica americana	American coot	Aves		
Grus canadensis	Sandhill crane	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Charadrius semipalmatus	Semipalmated plover	Aves		
Charadrius vociferus	Killdeer	Aves		
Charadrius montanus	Mountain plover	Aves		Special concern
Himantopus mexicanus	Black-necked stilt	Aves		
Recurvirostra americana	American avocet	Aves		
Tringa melanoleuca	Greater yellowlegs	Aves		
Tringa flavipes	Lesser yellowlegs	Aves		
Tringa solitaria	Solitary sandpiper	Aves		
Catoptrophorus semipalmatus	Willet	Aves		
Actitis macularia	Spotted sandpiper	Aves		
Bartramia longicauda	Upland sandpiper	Aves		
Numenius americanus	Long-billed curlew	Aves		Special concern
Calidris alba	Sanderling	Aves		
Calidris pusilla	Semipalmated sandpiper	Aves		
Calidris mauri	Western sandpiper	Aves		
Calidris minutilla	Least sandpiper	Aves		
Calidris bairdii	Baird's sandpiper	Aves		
Calidris melanotos	Pectoral sandpiper	Aves		
Limnodromus scolopaceus	Long-billed dowitcher	Aves		
Gallinago gallinago	Common snipe	Aves		
Phalaropus tricolor	Wilson's phalarope	Aves		
Larus pipixcan	Franklin's gull	Aves		
Larus delawarensis	Ring-billed gull	Aves		
Columba livia	Rock dove	Aves		
Columba fasciata	Band-tailed pigeon	Aves		
Zenaida asiatica	White-winged dove	Aves		
Zenaida macroura	Mourning dove	Aves		
Coccyzus erythropthalmus	Black-billed cuckoo	Aves		
Coccyzus americanus	Yellow-billed cuckoo	Aves		Special concern
Geococcyx californianus	Greater roadrunner	Aves		
Tyto alba	Barn owl	Aves		
Otus kennicottii	Western screech-owl	Aves		
Bubo virginianus	Great horned owl	Aves		
Speotyto cunicularia	Burrowing owl	Aves		Threatened
Asio otus	Long-eared owl	Aves		
Asio flammeus	Short-eared owl	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Chordeiles minor	Common nighthawk	Aves		
Phalaenoptilus nuttallii	Common poorwill	Aves		
Aeronautes saxatalis	White-throated swift	Aves		
Archilochus alexandri	Black-chinned hummingbird	Aves		
Stellula calliope	Calliope hummingbird	Aves		
Selasphorus platycercus	Broad-tailed hummingbird	Aves		
Selasphorus rufus	Rufous hummingbird	Aves		
Ceryle alcyon	Belted kingfisher	Aves		
Melanerpes lewis	Lewis' woodpecker	Aves		
Melanerpes erythrocephalus	Red-headed woodpecker	Aves		
Sphyrapicus nuchalis	Red-naped sapsucker	Aves		
Picoides scalaris	Ladder-backed woodpecker	Aves		
Picoides pubescens	Downy woodpecker	Aves		
Picoides villosus	Hairy woodpecker	Aves		
Colaptes auratus	Northern flicker	Aves		
Colaptes auratus auratus	Yellow-shafted flicker	Aves		
Colaptes auratus x cafer	Red-shafted flicker	Aves		
Contopus borealis	Olive-sided flycatcher	Aves		
Contopus sordidulus	Western wood-pewee	Aves		
Empidonax oberholseri	Dusky flycatcher	Aves		
Empidonax wrightii	Gray flycatcher	Aves		
Empidonax occidentalis	Cordilleran flycatcher	Aves		
Sayornis phoebe	Eastern phoebe	Aves		
Sayornis saya	Say's phoebe	Aves		
Myiarchus cinerascens	Ash-throated flycatcher	Aves		
Tyrannus vociferans	Cassin's kingbird	Aves		
Tyrannus verticalis	Western kingbird	Aves		
Tyrannus tyrannus	Eastern kingbird	Aves		
Tyrannus forficatus	Scissor-tailed flycatcher	Aves		
Eremophila alpestris	Horned lark	Aves		
Tachycineta bicolor	Tree swallow	Aves		
Tachycineta thalassina	Violet-green swallow	Aves		
Stelgidopteryx serripennis	Northern rough-winged swallow	Aves		
Riparia riparia	Bank swallow	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Hirundo pyrrhonota	Cliff swallow	Aves		
Hirundo rustica	Barn swallow	Aves		
Cyanocitta stelleri	Steller's jay	Aves		
Cyanocitta cristata	Blue jay	Aves		
Aphelocoma coerulescens	Western scrub jay	Aves		
Gymnorhinus cyanocephalus	Pinyon jay	Aves		
Nucifraga columbiana	Clark's nutcracker	Aves		
Pica pica	Black-billed magpie	Aves		
Corvus brachyrhynchos	American crow	Aves		
Corvus cryptoleucus	Chihuahuan raven	Aves		
Corvus corax	Common raven	Aves		
Parus gambeli	Mountain chickadee	Aves		
Parus inornatus	Plain titmouse	Aves		
Psaltriparus minimus	Bushtit	Aves		
Sitta canadensis	Red-breasted nuthatch	Aves		
Sitta carolinensis	White-breasted nuthatch	Aves		
Sitta pygmaea	Pygmy nuthatch	Aves		
Certhia americana	Brown creeper	Aves		
Salpinctes obsoletus	Rock wren	Aves		
Catherpes mexicanus	Canyon wren	Aves		
Thryomanes bewickii	Bewick's wren	Aves		
Troglodytes aedon	House wren	Aves		
Cistothorus palustris	Marsh wren	Aves		
Regulus satrapa	Golden-crowned kinglet	Aves		
Regulus calendula	Ruby-crowned kinglet	Aves		
Polioptila caerulea	Blue-gray gnatcatcher	Aves		
Sialia mexicana	Western bluebird	Aves		
Sialia currucoides	Mountain bluebird	Aves		
Myadestes townsendi	Townsend's solitaire	Aves		
Catharus ustulatus	Swainson's thrush	Aves		
Catharus guttatus	Hermit thrush	Aves		
Turdus migratorius	American robin	Aves		
Dumetella carolinensis	Gray catbird	Aves		
Mimus polyglottos	Northern mockingbird	Aves		
Oreoscoptes montanus	Sage thrasher	Aves		
Toxostoma rufum	Brown thrasher	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Toxostoma curvirostre	Curve-billed thrasher	Aves		
Anthus rubescens	American pipit	Aves		
Anthus spragueii	Sprague's pipit	Aves		
Bombycilla garrulus	Bohemian waxwing	Aves		
Bombycilla cedrorum	Cedar waxwing	Aves		
Lanius excubitor	Northern shrike	Aves		
Lanius ludovicianus	Loggerhead shrike	Aves		
Sturnus vulgaris	European starling	Aves		
Vireo vicinior	Gray vireo	Aves		
Vireo plumbeus	Plumbeous vireo	Aves		
Vireo gilvus	Warbling vireo	Aves		
Vireo olivaceus	Red-eyed vireo	Aves		
Vermivora celata	Orange-crowned warbler	Aves		
Vermivora ruficapilla	Nashville warbler	Aves		
Vermivora virginiae	Virginia's warbler	Aves		
Parula americana	Northern parula	Aves		
Dendroica petechia	Yellow warbler	Aves		
Dendroica pensylvanica	Chestnut-sided warbler	Aves		
Dendroica coronata	Yellow-rumped warbler	Aves		
Dendroica coronata coronata	Myrtle warbler	Aves		
Dendroica coronata auduboni	Audubon’s warbler	Aves		
Dendroica nigrescens	Black-throated gray warbler	Aves		
Dendroica townsendi	Townsend's warbler	Aves		
Setophaga ruticilla	American redstart	Aves		
Seiurus aurocapillus	Ovenbird	Aves		
Seiurus noveboracensis	Northern waterthrush	Aves		
Oporornis tolmiei	MacGillivray's warbler	Aves		
Geothlypis trichas	Common yellowthroat	Aves		
Wilsonia pusilla	Wilson's warbler	Aves		
Icteria virens	Yellow-breasted chat	Aves		
Piranga flava	Hepatic tanager	Aves		
Piranga rubra	Summer tanager	Aves		
Piranga ludoviciana	Western tanager	Aves		
Pheucticus ludovicianus	Rose-breasted grosbeak	Aves		
Pheucticus melanocephalus	Black-headed grosbeak	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Guiraca caerulea	Blue grosbeak	Aves		
Passerina amoena	Lazuli bunting	Aves		
Passerina cyanea	Indigo bunting	Aves		
Spiza americana	Dickcissel	Aves		
Pipilo chlorurus	Green-tailed towhee	Aves		
Pipilo	Spotted towhee	Aves		
Pipilo	Canyon towhee	Aves		
Aimophila cassinii	Cassin's sparrow	Aves		
Aimophila ruficeps	Rufous-crowned sparrow	Aves		
Spizella arborea	American tree sparrow	Aves		
Spizella passerina	Chipping sparrow	Aves		
Spizella pallida	Clay-colored sparrow	Aves		
Spizella breweri	Brewer's sparrow	Aves		
Pooecetes gramineus	Vesper sparrow	Aves		
Chondestes grammacus	Lark sparrow	Aves		
Amphispiza bilineata	Black-throated sparrow	Aves		
Calamospiza melanocorys	Lark bunting	Aves		
Passerculus sandwichensis	Savannah sparrow	Aves		
Ammodramus savannarum	Grasshopper sparrow	Aves		
Melospiza melodia	Song sparrow	Aves		
Melospiza lincolnii	Lincoln's sparrow	Aves		
Zonotrichia albicollis	White-throated sparrow	Aves		
Zonotrichia leucophrys	White-crowned sparrow	Aves		
Zonotrichia leucophrys oriantha	Mountain white-crowned sparrow	Aves		
Zonotrichia leucophrys gambelii	Gambel’s white-crowned sparrow	Aves		
Zonotrichia querula	Harris' sparrow	Aves		
Junco hyemalis	Dark-eyed junco	Aves		
Junco hyemalis aikeni	White-winged junco	Aves		
Junco hyemalis hyemalis	Slate-colored junco	Aves		
Junco hyemalis montanus/shufeldt	Oregon junco	Aves		
Junco hyemalis mearnsi	Pink-sided junco	Aves		
Junco hyemalis caniceps	Gray-headed junco	Aves		
Calcarius mccownii	McCown's longspur	Aves		
Calcarius lapponicus	Lapland longspur	Aves		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Calcarius ornatus	Chestnut-collared longspur	Aves		
Dolichonyx oryzivorus	Bobolink	Aves		
Agelaius phoeniceus	Red-winged blackbird	Aves		
Sturnella neglecta	Western meadowlark	Aves		
Xanthocephalus xanthocephalus	Yellow-headed blackbird	Aves		
Euphagus cyanocephalus	Brewer's blackbird	Aves		
Quiscalus mexicanus	Great-tailed grackle	Aves		
Quiscalus quiscula	Common grackle	Aves		
Molothrus ater	Brown-headed cowbird	Aves		
Icterus spurius	Orchard oriole	Aves		
Icterus galbula	Baltimore oriole	Aves		
Icterus bullockii	Bullock's oriole	Aves		
Icterus parisorum	Scott's oriole	Aves		
Carpodacus cassinii	Cassin's finch	Aves		
Carpodacus mexicanus	House finch	Aves		
Loxia curvirostra	Red crossbill	Aves		
Carduelis pinus	Pine siskin	Aves		
Carduelis psaltria	Lesser goldfinch	Aves		
Carduelis tristis	American goldfinch	Aves		
Coccothraustes vespertinus	Evening grosbeak	Aves		
Passer domesticus	House sparrow	Aves		
Antilocapra americana	Pronghorn	Mammalia		
Canis latrans	Coyote	Mammalia		
Urocyon cinereoargenteus	Gray fox	Mammalia		
Vulpes velox	Swift fox	Mammalia		Special concern
Castor canadensis	Beaver	Mammalia		
Cervus elaphus	Wapiti	Mammalia		
Odocoileus hemionus	Mule deer	Mammalia		
Odocoileus virginianus	White-tailed deer	Mammalia		
Erethizon dorsatum	Porcupine	Mammalia		
Felis concolor	Mountain lion	Mammalia		
Lynx rufus	Bobcat	Mammalia		
Pappogeomys castanops	Yellow-faced pocket gopher	Mammalia		
Thomomys bottae	Botta's pocket gopher	Mammalia		
Chaetodipus hispidus	Hispid pocket mouse	Mammalia		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Dipodomys ordii	Ord's kangaroo rat	Mammalia		
Perognathus flavescens	Plains pocket mouse	Mammalia		
Perognathus flavus	Silky pocket mouse	Mammalia		
Lepus californicus	Black-tailed jack rabbit	Mammalia		
Sylvilagus audubonii	Desert cottontail	Mammalia		
Nyctinomops macrotis	Big free-tailed bat	Mammalia		
Tadarida brasiliensis	Brazilian free-tailed bat	Mammalia		
Mus musculus	House mouse	Mammalia		
Neotoma albigula	White-throated woodrat	Mammalia		
Neotoma floridana	Eastern woodrat	Mammalia		
Neotoma mexicana	Mexican woodrat	Mammalia		
Neotoma micropus	Southern plains woodrat	Mammalia		
Ondatra zibethicus	Muskrat	Mammalia		
Onychomys leucogaster	Northern grasshopper mouse	Mammalia		
Peromyscus boylii	Brush mouse	Mammalia		
Peromyscus difficilis	Rock mouse	Mammalia		
Peromyscus leucopus	White-footed mouse	Mammalia		
Peromyscus maniculatus	Deer mouse	Mammalia		
Peromyscus truei	Pinyon mouse	Mammalia		
Reithrodontomys megalotis	Western harvest mouse	Mammalia		
Reithrodontomys montanus	Plains harvest mouse	Mammalia		
Sigmodon hispidus	Hispid cotton rat	Mammalia		
Conepatus mesoleucus	Hog-nosed skunk	Mammalia		
Spilogale gracilis	Western spotted skunk	Mammalia		
Taxidea taxus	Badger	Mammalia		
Mephitis mephitis	Striped skunk	Mammalia		
Bassariscus astutus	Ringtail	Mammalia		
Procyon lotor	Raccoon	Mammalia		
Cynomys ludovicianus	Black-tailed prairie dog	Mammalia		Special concern
Spermophilus tridecemlineatus	Thirteen-lined ground squirrel	Mammalia		
Spermophilus variegatus	Rock squirrel	Mammalia		
Spermphilus spilosoma	Spotted ground squirrel	Mammalia		
Tamias quadrivittatus	Colorado chipmunk	Mammalia		
Notiosorex crawfordi	Desert shrew	Mammalia		
Antrozous pallidus	Pallid bat	Mammalia		

ATTACHMENT **F.2.2-1**
Vertebrates Known to Occur at the PCMS

Scientific Name	Common Name	Class	Federal Status	State Status
Eptesicus fuscus	Big brown bat	Mammalia		
Lasiurus cinereus	Hoary bat	Mammalia		
Myotis yumanensis	Yuma myotis	Mammalia		
Plecotus townsendii	Townsend's big-eared bat	Mammalia		

ATTACHMENT F.3

Management Plan for Wintering Bald Eagles at Fort Carson and the Pinon Canyon Maneuver Site

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Acronyms and Abbreviations

BGEPA	Bald and Golden Eagle Protection Act
CDOW	Colorado Division of Wildlife
DDT	dichlorodiphenyl tricholorethane
DECAM	Directorate of Environmental Compliance and Management
ESA	Endangered Species Act
FR	Federal Regulation
ft	feet
Guidelines	Draft National Bald Eagle Management Guidelines
kg	kilograms
km^2	square kilometers
lbs	pounds
m	meters
MBTA	Migratory Bird Treaty Act
mi^2	square miles
PCMS	Pinon Canyon Maneuver Site
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction

1.1 Purpose

The purpose of this Technical Memorandum is to provide a conservation assessment and conservation goals for wintering bald eagles on Fort Carson and the Pinon Canyon Maneuver Site (PCMS). Elements of the memorandum include threats to bald eagles on Fort Carson and the PCMS, and specific management actions to mitigate negative effects on the bald eagle.

1.2 Project Overview

This plan is organized into four parts.

Section 1.0 **Introduction:** A brief overview of the purpose of this Technical Memorandum.

Section 2.0 **Conservation Assessment:** Current knowledge on bald eagle population status, ecology, and habitat requirements on Fort Carson, the PCMS, and regionally, including known and potential threats to the bald eagle on the installations.

Section 3.0 **Conservation Goal:** Specific management prescriptions for the bald eagle on Fort Carson and the PCMS.

Section 4.0 **References:** References cited in the preparation of the plan.

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2.0 Conservation Assessment

2.1 Species Description

The bald eagle is a diurnal bird of prey. Adult bald eagles are readily identified by their white head and tail, dark brown body, and large yellow bill. Bald eagles weigh 3.6 to 6.4 kilograms (kg) (8 to 14 pounds [lbs]) and have wingspans of 1.7 to 2.4 meters (m) (5.5 to 8 feet [ft]). Northern bald eagles (Alaska and Canada) are significantly larger than their southern relatives, and females are larger than males. Juveniles are mottled brown and white and generally attain adult plumage by 5 years of age (U.S. Fish and Wildlife Service [USFWS], 2006a).

(Pictures from Birds of North America Online)

Juvenile Bald Eagle

Adult Bald Eagle

2.2 Species Distribution

2.2.1 General

The bald eagle is a North American species that has historically occurred throughout the contiguous United States and Alaska (USFWS, 2006a). Bald eagles nest in areas with forested shorelines or cliffs along aquatic habitats, including coastal areas, rivers, lakes, and reservoirs (Buehler, 2000). In winter, bald eagles may also occur in semi-deserts and grasslands, especially near prairie dog towns (Andrews and Righter, 1992).

2.2.2 Regional

Historically, the number of bald eagle pairs nesting in Colorado is unknown, but records indicate several mountain sites and one plains site. Bald eagles now nest across Colorado in large, mature cottonwoods or pines (Kingery et al., 1998). The Colorado population of bald eagles increases during the winter, and the bald eagle is a common local winter resident in western valleys, mountain parks, and on the eastern plains (Andrews and Righter, 1992).

2.2.3 Fort Carson

Most bald eagle records for Fort Carson are from the northern region (Figure F.3-1), most likely due to the presence of prairie dog colonies. Bald eagles do not nest on Fort Carson or within its region of influence, and no bald eagles have been seen on Fort Carson during the breeding season. Most records of bald eagles on Fort Carson are from October to March, with the majority of sightings from November to January (Bunn, 2006). Bald eagle density likely increases during the big game hunting season on Fort Carson as bald eagles scavenge viscera left by hunters (Directorate of Environmental Compliance and Management [DECAM], 2002).

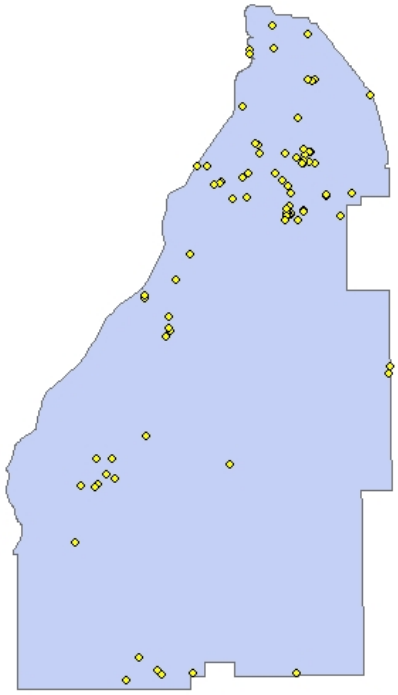

FIGURE F.3-1
Bald Eagle Sightings on Fort Carson

2.2.4 Pinon Canyon Maneuver Site

Bald eagles are winter residents and migrants on the PCMS, especially in the southwestern grassland area (Figure F.3-2). No evidence of active eyries has been found. As is the case at Fort Carson, bald eagle density probably increases during big game hunting season on the PCMS as bald eagles scavenge viscera left by hunters (DECAM, 2002). A bald eagle winter roost exists along County Road 54, off site of the PCMS (Klavetter, 2006).

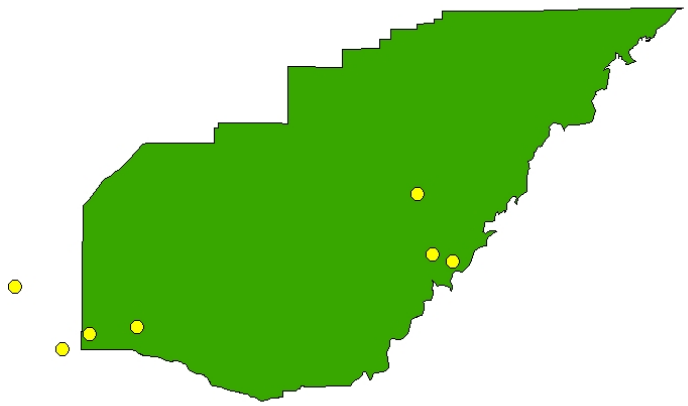

FIGURE F.3-2
Bald Eagle Sightings on the PCMS and Surrounding Area

2.3 Habitat Requirements

2.3.1 General

Bald eagles winter primarily in the temperate zone, generally below 500 m (1,640 ft) elevation. In Colorado, however, wintering areas may reach 2,500 m (8,200 ft) elevation. Bald eagle winter habitat is generally defined by food availability, presence of roost sites that provide protection from inclement weather, and absence of human disturbance. The majority of wintering bald eagles are associated with aquatic areas with some open water for foraging (Buehler, 2000). In some areas, however, bald eagles use habitats in winter with little or no open water if other food sources (e.g., small mammals or carrion) are readily available (NatureServe, 2006). Type of food consumed (avian, mammalian, or fish) and means of availability (live or carrion) vary greatly across wintering range. Winter perching habitat is characterized by the presence of tall trees located less than 50 m (164 ft) from foraging areas (Buehler, 2000).

Bald eagles have shown high site fidelity to wintering grounds (Buehler, 2000). In Colorado, 10 of 36 immatures and adults repeatedly returned to the same area to winter, and one individual wintered in the same area for 10 years (Harmata and Stahlecker, 1993).

Bald eagle winter ranges, especially those of non-breeding birds, can be very large (NatureServe, 2006). An immature bald eagle wintered in Arizona over an area of more than 40,000 square kilometers (km^2) (15,444 square miles [mi^2]) and spent the summer in the Northwest Territories on a summer range of more than 55,000 km^2 (21,235 mi^2) (Grubb et al., 1994). During February to April, the mean minimum winter home range of four immature bald eagles in Arizona averaged 400 km^2 (154 mi^2)(Grubb et al., 1989), and in Montana, adults and immatures had winter ranges from 102 to 3,925 km^2 (39 to 1,515 mi^2) (McClelland et al., 1996). Winter home ranges in Colorado averaged 311 km^2 (120 mi^2); ranges for mated birds were less than for unmated birds (128 km^2 and 546 km^2, respectively) (49 mi^2 and 211 mi^2, respectively) (Harmata, 1984).

2.3.2 Fort Carson and the PCMS

Due to large winter home ranges and various migration routes, wintering and migrating bald eagles may be found throughout Fort Carson and the PCMS. However, bald eagles are generally found near prairie dog towns on both installations. Prairie dogs, other small mammals, and animal remnants left by hunters provide food for bald eagles on Fort Carson and the PCMS.

2.4 Life History

2.4.1 Reproduction and Mortality

Bald eagle nest-building activity and egg-laying timing vary throughout the United States depending on latitude (Buehler, 2000). In the northern United States, including Colorado, bald eagles begin building nests between December and mid-March, and eggs are laid from February through April. Bald eagles lay from one to four eggs, with one or two eggs being most common. Only one egg is laid per day, and eggs are not always laid on successive days. Incubation begins after the first egg is laid, and hatching of young occurs on different days, resulting in chicks of unequal size occupying the same nest. Incubation typically lasts 33 to 35 days but can be as long as 45 days. Egg hatching and young rearing take place from March to June and by mid-May to August, the young are fledging. At 10 to 12 weeks after hatching, eaglets make their first flights, and they fledge within a few days after that first flight. After fledging, young birds usually remain in the vicinity of the nest for several weeks. Young are almost completely dependent on their parents for food until approximately 6 weeks later, when they disperse from the nesting territory. Overall, the national fledging rate is approximately one chick per nest per year (USFWS, 2006a).

Bald eagles exhibit high nest fidelity and nesting territories are often used year after year. Generally, nests are found near coastlines, rivers, lakes, or streams that support an adequate food supply. Nests are located in mature or old-growth trees, snags, cliffs, rock promontories, but rarely on the ground and, with increasing frequency, on human-made structures, including power poles and communication towers (USFWS, 2006a). In suitable forested areas, nest trees are generally the largest trees with accessible limbs capable of holding a nest that can weigh more than 455 kg (1,000 lbs) (USFWS, 2006a; Buehler, 2000). Nests are constructed from large sticks and may be lined with moss, grass, plant stalks, lichen, seaweed, or sod. Bald eagle nests are typically 1.2 to 1.8 m (4 to 6 ft) in diameter and 0.9 m (3 ft) deep (USFWS, 2006a). Nest sites generally include at least one perch with good visibility of the surrounding area (USFWS, 2006a; Buehler, 2000).

Humans represent the single greatest cause of bald eagle mortality, including mortality from direct human actions (shooting, trapping, poisoning) and mortality related to indirect human development activities (power lines and other structures). Environmental contaminants are also a significant source of mortality. These include ingestion of lead from waterfowl, deer, and other game species' carcasses, and secondary poisoning through consumption of prey killed by pesticides or euthanasia (sodium pentobarbital). Bald eagles are also susceptible to motor vehicle-impact injuries while scavenging carcasses off highways (USFWS, 2006a; Buehler, 2000).

2.4.2 Movement and Behavior

Bald eagles have a complex pattern of migration that is dependent on age of the individual (immature or adult), location of breeding site (north versus south, interior versus coastal), severity of climate (especially during winter, but also possibly during summer), and year-round food availability. Adult bald eagles migrate as needed when food becomes unavailable. Bald eagles usually migrate alone but occasionally join other migrants. Concentrations of migrants may be found at communal feeding or roosting sites. Immature bald eagles migrate and move nomadically, presumably because they are not tied to a nest site (Buehler, 2000).

Bald eagles migrate widely over most of North America. Northward migration may be more rapid than the return trip south to wintering grounds because early arrival on breeding grounds provides advantages in competing for nest sites and mates. Migration southward may occur at a slower rate as birds respond to foraging opportunities along the way (Buehler, 2000).

2.4.3 Foraging and Diet

Bald eagles are opportunistic feeders, and fish make up most of their diet. Bald eagles also eat waterfowl, shorebirds/colonial water birds, small mammals, reptiles, amphibians, and carrion (USFWS, 2006a; Buehler, 2000). Bald eagles are visual hunters and usually locate their prey from a conspicuous perch or from soaring flight, then swoop down and strike. Large numbers of bald eagles often congregate in winter to feed on spawning salmon and other fish species or in areas below reservoirs (especially hydropower dams) where fish are abundant. In winter, bald eagles take birds from rafts of ducks on reservoirs and rivers, and congregate on melting ice sheets to scavenge dead fish. Bald eagles also eat roadkill and euthanized animal carcasses at landfills and feedlots. In addition, young eagles will often congregate to feed on easily acquired food such as carrion and fish found in abundance at the mouths of streams and shallow bays, and at landfills (USFWS, 2006a).

2.4.4 Population Status

The bald eagle has been extensively surveyed on breeding and wintering grounds throughout their range. In the 1980s, population estimates were from 70,000 to 80,000 birds, and populations in the 1990s undoubtedly increased (Buehler, 2000). In 1999, the entire bald eagle population was estimated to be around 100,000 individuals with the greatest numbers found in Alaska and British Columbia (Buehler, 2000).

In 1963, it was estimated that the lower 48 states had less than 500 pairs of nesting bald eagles, and USFWS-coordinated surveys in 1973-1974 estimated 1,000 pairs. In 2000, the USFWS recorded more than 6,471 occupied breeding areas. The 2001 estimate for breeding pairs in Colorado was 45 (USFWS, 2006b).

The estimated total wintering population of bald eagles in the continental United States was over 20,000 by 2000 (Buehler, 2000).

2.5 Species Status

The bald eagle was first listed under the Endangered Species Act (ESA) as endangered on March 11, 1967, (32 Federal Regulation [FR] 4001) and was downlisted to threatened in July 1995 (60 FR 35999 36010). Primary agents that contributed to listing the bald eagle are habitat loss and contaminants (USFWS, 2006b).

Due to population rebounds, the USFWS in 1999 proposed to remove the bald eagle from the threatened and endangered species list (64 FR 36454). The public comment period for the proposal to delist the bald eagle closed on June 19, 2006 (71 FR 8238). Banning dichlorodiphenyl tricholorethane (DDT) and other harmful organochlorines from use in the United States and promulgation of the ESA with the subsequent listing of the bald eagle were the two major actions contributing to the recovery of the bald eagle. Impacts from contaminants have also been reduced through elimination of lead shot for waterfowl hunting and restrictions on other harmful pesticides. Vigorous law enforcement efforts also added to the recovery by reducing the shooting of bald eagles (USFWS, 2006b).

Bald eagles are also protected by the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA). Bald eagles are a Colorado state-listed threatened species.

2.6 Conservation Measures

The USFWS has developed and is implementing the Northern States Bald Eagle Recovery Plan, which includes Colorado (USFWS, 1983). The plan includes four basic elements:

- Determine current population and habitat status.
- Determine minimum population and habitat needed to achieve recovery.
- Protect, enhance, and increase bald eagle populations and habitats.
- Establish and implement a coordination system for information and communication.

In the event the bald eagle is removed from the Federal List of Endangered and Threatened Wildlife and Plants and does not have protection under the ESA, Draft National Bald Eagle Management Guidelines (Guidelines) have been established to promote the continued conservation of the bald eagle (USFWS, 2006a). The Guidelines are intended to:

- Publicize the provisions of the BGEPA that continue to protect bald eagles in order to reduce the possibility that people will violate the law.
- Advise landowners, land managers, and the general public of the potential for various human activities to disturb bald eagles.
- Encourage land management practices that benefit bald eagles and their habitat.

2.7 Conservation Issues on Fort Carson and the Pinon Canyon Maneuver Site

This section outlines potential natural and human-related threats to the bald eagle and its habitat on Fort Carson and the PCMS.

2.7.1 Natural Threats

Predators

Bald eagles will defend their nests against other avian species, especially ravens and other raptors. Bald eagle eggs, nestlings, and fledglings are the most vulnerable to predation. Black-billed magpies, gulls, ravens, crows, black bears, and raccoons have been reported to prey on eggs in nests. Black bears, raccoons, hawks, owls, crows, ravens, bobcats, and wolverines have been reported to kill nestlings, although there is little actual documentation. Fledglings on the ground are vulnerable to mammalian predators. Few non-human species are capable of or likely to prey on immature or adult bald eagles. Starving, injured, or diseased immatures and adults may be vulnerable to mammalian predation (Buehler, 2000).

Disease

Of 1,428 bald eagles examined during a 20-year period, only 2 percent died directly from disease. Diseases reported as leading to death included peritonitis, pneumonia, enteritis, septicemia, avian cholera, aspergillosis, hepatic necrosis, and myocardial infarction. Avian pox has been reported in a few cases, including one case involving mortality of two bald eagles (Buehler, 2000).

Parasites

Few data on parasites exist, and no parasites have been reported to cause death of an individual bald eagle. Parasites appear to be common on nestling bald eagles (Buehler, 2000).

Exposure

Although little mortality is attributed to exposure, extreme weather conditions that lead to food shortages may cause death. Bald eagles can tolerate extreme cold, wind, and snow as long as food is available (Buehler, 2000).

Black-Tailed Prairie Dog Plague Outbreaks

Black-tailed prairie dogs are an important food source for wintering bald eagles. If natural prairie dog plague outbreaks cause significant localized loss of prairie dog colonies, bald eagles may not use the area for foraging.

2.7.2 Human Threats

Bald eagles are sensitive to human disturbance, especially during the nesting season. During migration and winter, bald eagles often concentrate in large numbers, from hundreds to thousands of individuals, for feeding and sheltering. Bald eagles rely on established roost

sites because of their proximity to sufficient food sources. Human activities near or within roost sites may prevent bald eagles from feeding or taking shelter, especially if other undisturbed or productive areas are not available. Feeding may be disrupted if there are disturbance activities in the flight path of important foraging areas. Activities that permanently alter bald eagle habitat may altogether eliminate factors essential for foraging bald eagles (USWFS, 2006a).

Military Training

There are no training restrictions or buffer zones at Fort Carson and the PCMS associated with the management of the bald eagle. Military training occurs in many forms throughout areas in which bald eagles have been found on Fort Carson and the PCMS. The most likely military training to affect bald eagles would be training that may cause prairie dog populations to decline on Fort Carson and the PCMS.

Military Training Effects on Prairie Dogs

Military training activities within prairie dog colonies, including mine plows, large-caliber weapon firing, construction of trench obstacles, live small-arms-caliber munitions, equipment drops, and offroad vehicles, would have a direct impact on prairie dogs. Except in the smallest colonies, damage associated with this type of training would not be substantial. These activities would have a short-term adverse effect on prairie dogs and a negligible effect on the long-term viability of a colony.

Non-Military Activities

Infrastructure Construction

Construction of infrastructure, especially on Fort Carson, could have the greatest impact on existing colonies of black-tailed prairie dogs on the installations. Prairie dog burrowing activities near infrastructure may lead to human/wildlife conflicts (i.e., gnawing of electrical wiring causing malfunctions in equipment), and in these cases, prairie dogs may be controlled according to practices outlined in the *Biological Assessment and Management Plan for the Black-Tailed Prairie Dog on Fort Carson and the Pinon Canyon Maneuver Site* (DECAM, 2004). Loss of prairie dog populations could result in bald eagles foraging outside of the installations.

Recreation

Hunting is permitted on both Fort Carson and the PCMS. The Colorado Division of Wildlife (CDOW) sets hunting seasons, but Fort Carson and the PCMS may place additional restrictions if warranted. There is a permanent moratorium on all black-tailed prairie dog hunting on both installations. Bald eagles scavenge animal remains left by hunters, and hunting most likely increases the availability of food for bald eagles on the installations. Therefore, hunting restrictions are not warranted.

Pest Control

The *Biological Assessment and Management Plan for the Black-Tailed Prairie Dog on Fort Carson and the Pinon Canyon Maneuver Site* outlines approved prairie dog population-control methods. Lethal control of prairie dogs occurs on Fort Carson at sites where prairie dogs present a public health threat, threaten the safety of sanctioned Army activities, damage or threaten to damage Army property, or where their presence is incompatible with current land-use practices or management goals. No prairie dogs have ever been poisoned on the

PCMS, but lethal removal of prairie dogs could be employed on the PCMS in the future under the circumstances outlined above for Fort Carson (DECAM, 2004).

Aluminum phosphide (trade name Phostoxin) is the chemical agent used to control prairie dogs. Phostoxin use is restricted to times when soil temperatures are greater than 55 degrees Fahrenheit for 72 hours and acceptable soil moisture is present. Under proper conditions, Phostoxin combines with moisture in the soil to emit carbon dioxide. Phostoxin is lethal to all other wildlife species and is not used on sites where burrowing owls or mountain plovers are present (DECAM, 2004).

Bald eagles are susceptible to secondary poisoning in prairie dog colonies. The prairie dog is an important food source for bald eagles on Fort Carson and the PCMS, especially in winter. The application of any pesticide must consider the risk of secondary poisoning to bald eagles.

Power Lines

Bald eagles are susceptible to electrocution by power lines and power poles, as demonstrated by the electrocution deaths of golden eagles along Route 1 and Route 8 on Fort Carson (DECAM, 2002). Eagle electrocutions on power lines have been documented in several states, especially in the west. Problem lines are those with wires so close together that an eagle is apt to simultaneously touch two wires while attempting to land on a power pole. The problem seems to be most severe in terrestrial habitats where few suitable natural hunting perches are available (USFWS, 1983).

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3.0 Conservation Goal

3.1 Goal

The goal of bald eagle management on Fort Carson and the PCMS is to protect and enhance bald eagle populations in accordance with the ESA, BGEPA, and MBTA. The primary conservation objective is to protect wintering bald eagles while on Fort Carson and the PCMS. Described below are specific management recommendations to protect bald eagles on Fort Carson and the PCMS.

3.1.1 Manage for Sustainable Black-Tailed Prairie Dog Populations

Restrict aboveground poisoning of black-tailed prairie dogs, especially in winter. Restricted use of pesticides would reduce the potential for ingestion of contaminated prey that could result in the death of bald eagles. By coordination, exclusion devices, and use of pesticides that are not poisonous or available to raptors, ensure that pest management programs do not inadvertently affect bald eagles on Fort Carson and the PCMS (DECAM, 2002). Black-tailed prairie dog recreational shooting is banned on Fort Carson and the PCMS, which may reduce the added risk of lead poisoning to eagles from scavenging prairie dog carcasses from hunters.

3.1.2 Implement Measures to Prevent Bald Eagles from Being Electrocuted on Towers, Poles, and Power Lines

Reduce accidental power line electrocution of bald eagles through identification of lines currently causing electrocution, modification of existing problem lines, and construction of new lines in accordance with recommended standards (USFWS, 1983). Recommendations for reducing impacts of power lines on raptors can be found in *Suggested Practices for Raptor Protection on Power Lines: the State of the Art in 1996*, by Edison Electric Institute and Raptor Research Foundation.

Power lines will be inventoried to identify existing problem lines that should be modified. The DECAM will continue to monitor incidental take by electrocutions and will provide recommendations to the Directorate of Public Works regarding power lines that are known to kill raptors. Implementation of this objective includes gathering data on raptor electrocutions on the installations to identify raptor-killing lines and investigating methods to reduce the number of electrocutions on the installations (DECAM, 2002). The DECAM will provide technical assistance to ensure that wire/pole modifications to power lines do not accidentally electrocute bald eagles (or other large raptors). The DECAM will also notify the USFWS in the event of any bald eagle electrocution on Fort Carson or the PCMS.

In 2002, an independent survey by San Isabel Electric Company (Beth Dillion) was conducted for the potential for electrocution sites on all power lines within the PCMS. No locations were found on site that did not meet current guidelines/standards to avoid raptor electrocution (Klavetter, 2006).

3.1.3 Follow Applicable USFWS Guidelines for Protecting Bald Eagles

The USFWS describes management practices that land owners and planners can use to benefit bald eagles. Many of the recommendations are designed to protect bald eagle habitat and ensure against illegal take under the BGEPA (USFWS, 2006a). These recommendations include:

- Protect and preserve communal roost sites, potential nest sites, and important foraging areas. Retain mature trees and old-growth stands wherever possible, particularly within one-half mile of water.
- Avoid potentially disruptive activities and development in the eagles' direct flight path between their nest sites, roost sites, and important foraging areas.
- Locate long-term and permanent water-dependent facilities away from important eagle foraging areas.
- Avoid recreational and commercial boating and fishing near eagle foraging areas during peak feeding times (usually early to mid-morning and late afternoon), except where eagles have demonstrated tolerance to such activity.
- Do not use explosives within one-half mile (or within 1 mile in open areas) of communal roosts when eagles are congregating, without prior coordination with the USFWS and CDOW.
- Locate aircraft corridors no closer than 1,000 feet vertical or horizontal distance from communal roost sites.
- Only use pesticides, herbicides, fertilizers, and other chemicals in accordance with federal and state laws and labeled instructions for their use.
- Identify and monitor contaminants associated with hazardous waste sites (legal or illegal) and permitted releases, especially within watersheds where eagles have shown poor reproduction or where bio-accumulating contaminants have been documented. These factors present a risk of contamination to eagles and their food sources.
- Where feasible, site wind turbines, communication towers, and high-voltage transmission power lines away from bald eagle communal roost sites to avoid collisions. Bury utility lines along forested shorelines and roadways in new development projects.
- Employ industry-accepted measures to prevent birds from being electrocuted on towers and poles.
- Immediately cover carcasses of euthanized animals at landfills to protect eagles from being poisoned.
- Do not intentionally feed bald eagles. Artificially feeding bald eagles can disrupt their essential behavioral patterns and put them at increased risk from power lines, collisions with windows and cars, and other mortality factors.
- Avoid excessive groundwater pumping and river diversion that can lead to destruction of nest trees, roosts, and foraging areas.

- Use an approved non-toxic shot when hunting waterfowl. Eagles can be poisoned by elevated levels of lead after feeding on fish and waterfowl that have ingested lead shot or carrion killed with lead shot.

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Provided by

Fort Carson Directorate of
Environmental Compliance and Management,
Cultural Resources Program

ATTACHMENT G.1

Prehistoric and Historic Cultural Sequences at Fort Carson

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PREHISTORIC AND HISTORIC CULTURAL SEQUENCES FOR FORT CARSON

Prehistoric Cultural Sequence

Three general stages of prehistory have been delineated for southeastern Colorado: the Paleoindian, Archaic, and Late Prehistoric. An earlier stage, the Pre-Clovis, has been proposed, but direct evidence of this stage in the region is lacking. The Paleoindian, Archaic, and Late Prehistoric stages in southeastern Colorado are each subdivided into three periods. These periods represent specific changes or innovations in the material culture of prehistoric peoples that suggest broader changes in environmental conditions and/or political and socio-economic structure. These periods span from approximately 11,500 B.P. to 225 B.P.

The following description of the prehistoric cultural chronology is taken from the cultural synthesis for Fort Carson provided in Zier et al. (1997), and the southeastern Colorado overviews found in Piper et al. (2006) and Zier and Kalasz (1999).

Pre-Clovis

The most noteworthy and generally widely accepted Pre-Clovis site is Monte Verde (Dillehay 1989; Meltzer et al. 1997) in southern Chile. In North America, a Pre-Clovis stage has been proposed by some archeologists based on the early radiocarbon dates found at sites like Cactus Hill site in southeastern Virginia (Adovasio 2002), Topper site in South Carolina (Goodyear 2002), and Meadowcroft rockshelter in Pennsylvania (Adovasio and Carlisle 1988).

Some sites in Colorado have Pre-Clovis age materials; however, radiocarbon dates at these locations have yet to be definitively associated with actual human activity (Zier and Kalasz 1999:75). Two northeastern Colorado sites, Dutton and Selby, produced bones of extinct megafauna that exhibit spiral fracturing and flake scars suggesting human modification. At the Lamb Spring site southwest of Denver, a possible Pre-Clovis component contained the remains of 23 mammoths, some of which appeared to have been left in piles, and bone flakes possibly resulting from the production of bone tools. Dates from the Dutton, Selby, and Lamb Spring sites range from 13,140 B.P. to 11,710 B.P.

Paleoindian 11,500-7,800 B.P.

The Paleoindian (11,500-7,800 B.P.) represents the earliest stage of cultural evolution in the archeological record of southeastern Colorado. This stage in southeastern Colorado is commonly divided into three periods based on diagnostic projectile points.

Clovis Period (11,500-10,950 B.P.)

The Clovis Period (11,500-10,950 B.P.), the earliest Paleoindian manifestation, has been delineated based on findings of large, fluted lanceolate spear points and prismatic blades, blade cores, and blade tools (Collins and Kay 1999:45-71). The latter were most likely used as knives, scrapers, and core/choppers. These characteristic artifacts have been found in association with the remains of mammoth, horse, and other Pleistocene fauna suggesting economies were

hunting-focused. Clovis sites in eastern Colorado include the Dent, Dutton, and Lamb Spring sites. The Drake cache in northeastern Colorado contained 13 large Clovis points and may represent a human interment (Frison 1991).

Other Clovis sites within the region include the Domebo site in southwestern Oklahoma and the Blackwater Draw site in east-central New Mexico. The Hahn site represents the only site of this age in southeastern Colorado (McDonald 1992), though surface Clovis points have been reported near Aguilar (Bair 1975:8), in Black Mesa State Park in the northwestern Oklahoma panhandle, and at several locations in western Kansas (Anderson 1990). Campbell (1969:360) identified a Clovis point in northern Las Animas County.

Folsom Period (10,950-10,250 B.P.)

The Folsom Period (10,950-10,250 B.P.) has been delineated based on fluted points found in association with extinct *Bison bison antiquitus*, as well as pronghorn, hare, wolf, fox, coyote, and turtle. The period coincided with early Holocene warming that saw the extinction of many large Pleistocene mammals. Besides fluted points, other Folsom period tools included knives, gravers, spokeshaves, scrapers, cores, drills, burin-like implements, choppers, abrading stones, awls, beads, and needles (Zier and Kalasz 1999:86-87). There is some evidence for the processing of vegetal products and for the grinding of pigments (Anderson 1990). Folsom sites in the region include the "type" site in northeastern New Mexico (35 miles south of the PCMS), the Lindenmeier, Fowler-Parrish, Powars, and Johnson sites in north-central Colorado (Zier and Kalasz 1999:85), and the Stewart's Cattle Guard, Zapata, and Linger sites in the San Luis Valley (Dawson and Stanford 1975; Jodry and Stanford 1992).

Though no Folsom sites have been reported in southeastern Colorado, surface projectile points have been reported in the Canon City area, Red Top Ranch, the Flank Field Storage Area, the Cimarron River basin (Zier and Kalasz 1999:87), near Fowler (Lotrich 1938), and on the Chaquaqua Plateau (Anderson 1975). Three Folsom point fragments have been recovered from PCMS sites, but two appear to have been brought there by later occupants. The other is of a local material and was broken during the fluting process (Owens and Loendorf 2005:581).

Plano Period (10,250-7,800 B.P.)

The Plano Period (10,250-7,800 B.P.) comprises several complexes characterized by different flake styles of lanceolate projectile points. Complexes include Midland, Agate Basin, Hell Gap, Alberta, Cody, Frederick, and Lusk (Gunnerson 1987; Wiesend and Frison (1998); Zier and Kalasz 1999:91-92). These complexes are thought to reflect a cultural continuum with adaptive modifications resulting in tool variability. An increasingly complex lifestyle is indicated by the presence of more varied tool kits, including a variety of stone and bone tools (Knell 1999). The presence of milling stones indicates a greater emphasis on processing plants. A great variety of kill, processing, and camp sites also occur, some with evidence suggestive of religious practices (Anderson 1990).

Evidence of Plano occupation in southeastern Colorado is plentiful; recorded sites of note include Olsen-Chubbock (Wheat 1972) and Runberg (Black 1986). On Fort Carson, two Cody complex projectile points and two unidentified Plano projectile points fragments have been recorded as surface finds. On the PCMS, Hell Gap points are quite common and have been

found on eight sites and as isolates twice. Recently, PCMS archaeologists (Owens and Swan 2006) identified an Agate Basin site with four diagnostic projectile points and highly patinated debitage and chipped-stone tools.

Archaic 7,800-1,850 B.P.

The beginning of the Archaic Stage (7,800-1,850 B.P.) marks another turning point in the natural environment with the onset of the Altithermal climatic episode, a prolonged early Holocene period of general warming and drying in western North America (Benedict 1979). The Archaic Stage represents a shift from economies geared toward big game hunting to more generalized hunting and gathering. More importance was placed on wild plant foods like *Chenoams*, and the procurement of game became more diversified, with large and small mammals like rabbits and gophers represented (Piper et al. 1996). Ground stone implements became common and are the predominant artifact class at many Archaic sites. Lithic tool assemblages exhibit more variability, and many artifacts reflect specialized local adaptation (Zier and Kalasz 1999).

Based on changes in projectile point morphology, the Archaic stage has been divided into Early, Middle, and Late periods. Archaic projectile points are nearly all stemmed and are not as delicately flaked as those of the earlier Paleoindian stage. Generally, Archaic complexes in the region have been poorly defined (Anderson 1990; Zier and Kalasz 1999:100).

Early Archaic Period (7,800-5,000 B.P.)

The Early Archaic Period (7,800-5,000 B.P.) reflects human adaptations to a hotter and drier climate. In response to this drastic climate change, southeastern Colorado may have become partially depopulated (Owens and Loendorf 2005:661), with some groups possibly relocating to the relatively cooler and wetter foothill and mountain regions (Benedict 1979; Brunswig 1992; Feiler 1994:16).

Early Archaic projectile points in eastern Colorado tend to be large, with either corner-notching or shallow side-notching (Zier and Kalasz 1999:105). Tool kits have not been thoroughly described, though Cassels (1997:95) indicates that expedient ground stone first appears regularly at this time.

In southeastern Colorado, Early Archaic projectile points have been reported from nine sites in the Apishapa highlands and from one site in the John Martin Reservoir area (Zier and Kalasz 1999:102-104). On Fort Carson, a component of the Gooseberry Shelter site has been radiocarbon-dated to the Early Archaic (Kalasz et al. 1993). No Early Archaic archeological sites have been found at Pinon Canyon and only a few projectile point isolates have been identified (Owens and Loendorf 2005). The lack of Early Archaic remains results from either a cultural hiatus, brought on by drought, or poor site preservation resulting from natural geologic processes (Zier et al 1989:15).

Middle Archaic Period (5,000-3,000 B.P.)

The Middle Archaic Period (5,000-3,000 B.P.) witnessed a widespread reversion to more mesic climatic conditions following the Altithermal event. Middle Archaic sites indicate broad-spectrum adaptations by hunter-gatherers to plains, basin/valley, foothills, and montane

environments (Gunnerson 1987:31-36). Sites display evidence of diverse resource procurement. Remains of large and small mammals, birds, reptiles, and shellfish occur, as do seeds of numerous wild plants (Zier and Kalasz 1999:121). Hearths are common and spaced-stone circles also appear. Characteristic projectile points of this period include large, basally concave or indented points such as McKean, Duncan, Hanna, and Mallory types (Gunnerson 1987:31-32). Other artifacts include formalized manos and grinding slabs, bifaces, scrapers, drills, spokeshaves, bone awls, and hammerstones (Anderson 1990).

In southeastern Colorado, one Middle Archaic site, Draper Cave in Custer County, has been excavated revealing mixed levels of Duncan, McKean, and Hanna projectile points. On Fort Carson, components of the Recon John Shelter site, the Gooseberry Shelter, and the Two Deer Shelter have been radiocarbon-dated to the Middle Archaic (Zier and Kalsaz 1999:115). Though isolated Middle archaic projectile points are quite common, only one PCMS site can be attributed to the McKean Complex (Piper et al. 2006:3-4). Middle Archaic age rock art, in the form of Pecked Curvilinear and Pecked Rectilinear elements, is quite common on the PCMS.

Late Archaic Period (3,000-1,850 B.P.)

The Late Archaic Period (3,500-1,800 B.P.) saw the continued specialization in subsistence practices, and maize probably first spread into the region at this time (Zier and Kalasz 1999:137). Evidence of communal bison procurement is abundant for this period and suggests the development of complex intergroup cooperation in conjunction with population growth (Piper et al. 2006:3-6). In southeastern Colorado, Late Archaic sites are much more common than Middle Archaic sites. Diagnostic projectile points of the period include basal corner-notched types like Ellis, Garza, Marcos, Shumla, Williams, Palmillas, Ensor, Edgewood, and Yarbrough (Anderson 1990).

On Fort Carson, Late Archaic components have been discovered at many locations, including a number with Middle Archaic components, such as the Recon John Shelter, the Gooseberry Shelter , and the Two Deer Shelter (Zier and Kalasz 1999:128-129). Pinon Canyon contains many surface sites of this time period; those excavated indicate that communal plant collecting and processing were dominant activities (Piper et al. 2006:3-6 – 3-7). In the area around Pinon Canyon, Late Archaic remains are plentiful, especially in the canyons (Campbell 1969; Hand and Jepson 1996; Reed and Horn 1995).

Late Prehistoric 1,850-225 B.P.

The Late Prehistoric Stage (1,850-225 BP) observed important changes in subsistence patterns, artifact complexes, and demographics on the southern Plains. The beginning of the stage coincides with innovations like the bow and arrow, ceramics, and permanent or semi-permanent houses (Piper et al. 2006:3-7). The use of cultigens reached a significant level during this time, though few pollen or macrobotanical samples attest to this change in southeastern Colorado. Recently, however, excavations along the Purgatoire River have produced significant maize pollen (Scott-Cummings and Varney 2002) at the Developmental Period/Diversification Period boundary.

The final centuries of the Late Prehistoric Stage reflect the effects of European incursions, including both direct intrusions by Europeans and diffusion and spread of material goods of European origin by indigenous groups (Secoy 1953; Zier and Kalasz 1999).

Developmental Period (1,850-900 B.P.)

The Developmental Period (1,850-900 B.P.) corresponds with what has traditionally been referred to by archeologists as the Plains Woodland Period (Winter 1988) or the Early Ceramic Period (Eighmy 1984). At this time, cordmarked and plain pottery, small corner-notched arrow points (Scallorn, Reed, Bonham, Alba, Washita, Fresno, Chaquaqua types), circular slab masonry architecture and some agriculture first appeared.

Ground stone tools are more common than chipped stone in this period. This suggests that vegetal materials, possibly including maize, and other cultigens probably constituted larger portions of the human diet (Piper et al. 2006:3-8). Faunal remains from excavated sites indicate that animals like deer and antelope were exploited, as well as small animals like cottontail rabbits and prairie dogs (Zier and Kalasz 1999:178). Aquatic species like fish, frogs, and fresh water mussels were also consumed (Sanders 1983; Zier and Kalasz 1999:178).

Developmental Period sites are much more numerous in the region than those of earlier periods. It has been noted that this increase in the number of recorded sites could be the result of improved site visibility due to the presence of architectural features (Zier et al. 1997). Observed site types include circular masonry architecture, rock shelters, brush and hide shelters with circular rock foundations, and open camps (Zier and Kalasz 1999:174-175)

Diversification Period (900-500 B.P.)

The Diversification Period (900-500 B.P.), also termed the Middle Ceramic (Eighmy 1984), marks the local variant of the Plains Village tradition. It is subdivided into the Sopris (900 to 750 B.P.) and Apishapa Phases (900 to 500 B.P.) in southeastern Colorado. The Sopris occurs in the area around Trinidad, Colorado, and relates to the Pueblo Indian occupation of New Mexico. Sites of this phase have never been found at the PCMS or Fort Carson and will receive little discussion here.

Based on the appearance of “fortified” sites on areas of high terrain, and massive architectural features, Withers (1954) proposed the concept of the Apishapa focus. More recently, Lintz (1984) proposed the concept of the Upper Canark regional variant for cultures of Plains Village age that occur along the western margin of the southern and central Plains. Within the Upper Canark regional variant, he recognized the Antelope Creek Phase of the Texas and Oklahoma Panhandles and northeastern New Mexico, and the Apishapa Phase of southeastern Colorado. Lintz’s dates for the Upper Carnark regional variant were approximately 900-500 B.P. (Zier et al. 1997).

There is little doubt that subsistence practices during the Diversification Period were geared more toward horticulture than those of the Developmental Period. However, floral and faunal evidence from Diversification sites still indicates that hunting and gathering predominated and that horticulture was supplemental. The degree to which architectural developments are reflective of permanent habitation is also uncertain. Where surface architecture is common

(particularly along the canyons of the upper Arkansas River drainage basin), it is difficult to envision permanent habitation and a horticultural subsistence base, due to the marked absence of substantial middens (Zier et al. 1997).

Cultigens have been recovered from excavations on Diversification Period sites. Maize has been recovered from many rockshelters in the region including Medina Rockshelter, Pyeatt Rockshelter, Upper Plum Canyon Rockshelter, Gimmie Shelter, and Trinchera Cave (Zier and Kalasz 1999:217). Maize pollen has been recovered from open architectural sites along the major rivers of southeast Colorado (Gardner 2005; Gunnerson 1989). At Umbart Cave in the upper Arkansas River drainage basin, Campbell (1969:180) recovered beans in subsurface context. The presence of cultigens in the drainage basins of the Arkansas River indicates that horticulture was being practiced, or that these peoples were actively trading with the horticulturists of the Antelope Creek Phase.

Deer and antelope remains are common on Apishapa Phase sites, but bison bones are rarely encountered. Communal hunting of ungulates is portrayed in rock art of this time period with human figures portrayed herding or chasing quadrupeds (Piper et al. 2006:3-10).

Technologically, the most distinctive lithic characteristic of the period is the small triangular projectile point, either unnotched Fresno or side-notched Washita. Ceramics are also varied, but generally consist of cord-marked, globular, or conoidal jars. Bone artifacts are common and include awls, fleshers, wrenches, and beads. Ground stone includes manos, metates, and shaft abraders (Zier et al. 1997).

Many Diversification Period sites are found on the Army controlled lands in Colorado. The canyon settings of the PCMS exhibit defensive sites on every isolated high ridge point surrounded by a steep slope. At the Sorenson Site or Jason's Pillar, for example, Apishapa village sites were found on isolated canyon edges where their occupants could monitor the movement of adversaries during what was likely a raid or siege warfare event.

Protohistoric Period (500-225 B.P.)

The Protohistoric Period (500-225 B.P) extends from roughly 1450 A.D. to 1725 A.D. The earliest European incursions into the region occurred during the first half of the sixteenth century, and the material cultures of indigenous populations were altered significantly over the course of the ensuing three centuries. Three principal indigenous groups entered southeastern Colorado during this period. In chronological order of appearance, they are the Apache, Comanche, and Cheyenne-Arapaho (Zier et al. 1997). In addition, southeastern Colorado was on the margin of Ute territory throughout protohistoric times.

The Protohistoric Period marks the start of the Plains Nomad Tradition (Gunnerson 1969, 1984). Material remains include metal artifacts, micaceous pottery, Pueblo pottery, chipped glass artifacts, and side-notched points. Most sites from this period are tipi encampments found along canyon heads though some earth ovens have been found (Winter 1988:77-78). Spanish expeditions onto the southern Plains reported groups of nomadic bison hunters that also subsisted on corn, other large and small game, native plant seeds, greens and tubers, mussels and fish.

In eastern Colorado, the Dismal River Aspect has been proposed for the remains recovered for the time period between A.D. 1675 and A.D. 1725. The Dismal River Aspect has been associated with Plains Apachean peoples (Anderson 1990; Gunnerson 1960) based on the previously mentioned Spanish accounts. Recently, Gulley (2000:7) has called into question the validity of these accounts and has determined that sites attributed to Dismal River actually represent a local manifestation of a Plains life way, rather than a definitive Apachean presence.

Tipi rings sites are common throughout the southern Plains, but only a few of them can be attributed to the Protohistoric. Sites on the Carrizo Ranches near the Colorado/New Mexico border have tipi rings and diagnostic pottery (Kingsbury and Gabel 1983). Protohistoric ceramics have also been found at two sites on the PCMS (Loendorf and Kuehn 1991).

Historic Cultural Sequence

Within southern Colorado, the initial European contact occurred mid 16th century. The Late Prehistoric aboriginal way of life probably changed little until the Spanish began settling in the region. Following Zier and Kalasz (1999), the transition between the Protohistoric to the Historic begins around A.D. 1725. Though there is a paucity of ethnographic and historical data for the region, records document aboriginal/European contact beginning with Fray Marcos DeNiza's expedition of 1539.

Archaeologically, the recognition of Historic Indian sites in the region has been rare (Church 2002; Stoffle et al. 1984). Because of this, only the European cultural history will be discussed. The following description of the historic cultural chronology is largely taken from Clark (2003), Mehls and Carter (1984), Jones et al. (1998), Zier and Kalasz (1999), and Zier et al. (1997), though other, less known sources are also consulted.

Spanish Period (A.D. 1540 – A.D. 1822)

Initial European exploration into southeastern Colorado was associated with Spanish colonialism. In 1539, Viceroy Medoza sent Fray Marcos DeNiza to investigate the "Seven Cities of Cibola" described by Cabeza DeVaca (Carson 1998:5). In 1540, Francisco Coronado led another large expedition in search of the Seven Cities as far north as south-central Kansas. Though neither of these expeditions actually crossed into Colorado, the entire region became part of the territory claimed by Spain in the New World (Mehls and Carter II-1; Zier et al.. 1997).

Through the late 16th century, there were other Spanish expeditions into the southern Plains. In 1598, Don Juan Onate sent Vincente de Zaldivar into southern Colorado and the Juan de Archuleta made the first documented trip into Colorado around 1664 when retrieving Taos Indians from El Cuartelejo (Freidman 1988; Mehls and Carter II-1-3). The Purgatoire River is said to have received its name because Spanish soldiers had died here and did not receive last rites. Perhaps members of the Bonilla and Humana expedition of 1594 (Taylor 1963) were the servicemen mentioned in this account. The river's Spanish name, "Rio de las Animas", means river of souls, to which was later added "Perdidas en Purgatorio," or lost in Purgatory. Records indicate that Gutierez de Humana killed Captain Fransisco Leyva de Bonilla along the Arkansas River in Kansas, however, while retuning to Pecos Pueblo the rest of the group was attacked by Indians and most of the Spanish Soldiers were killed (Murray 1979). The majority of scholars

(Friedman 1989; Thomas 1924) confirm that the Humana expedition went into Kansas and not Colorado, but a skeleton in Spanish armor found in a canyon near La Junta (Jeancon 1925) and chain mail found in the area (Church and Cowen 2003) collaborate nicely with the legend.

The migration of the Utes and Comanches was part of a broader pattern of rapidly shifting tribal territories, a pattern which had begun before the Spaniards reached the region and continued into the late-nineteenth century (Kenner 1969). The Uto-Aztecan speaking Ute Indians may have been the first historic tribe to enter Colorado when they migrated southeastward from the Great Basin (Zier et al. 1997). Following herds of bison, and because of ameliorating climatic conditions, Apaches entered the area from the north by the beginning of the 16th century (Piper et al. 2006). Other Athabaskans, Navajos, migrated to extreme southern Colorado and northern New Mexico at this time (Zier et al.. 1997). The Navajos and Apaches conducted both trade and warfare with the older pueblo groups further to the south. By the 1660s, the Apaches had become a mounted military threat to the Pueblos and the Spanish in what Secoy (1953) calls the Post-Horse-Pre-gun pattern. The Utes also had horses in the 1700s and they too began to raid New Mexico villages.

The first documentation of mounted Indians with armor occurred around the time of the 1680 Pueblo Revolt (Secoy 1953). The revolt had little direct impact north of New Mexico, though Spanish exploration into the area ceased as both soldiers and settlers retreated into Mexico (Mehls and Carter 1984). Within a few years, the Spanish regained control of the Rio Grande area and exploration into territories to the north resumed.

In the 1700s, French traders operating on the northern Plains and along the Mississippi River began to trade goods and arms to the various Indian groups including members of the Pawnee family and the Comanche (Secoy 1953). These enemies of the Apache pushed back across the southern Plains, and along with the Ute's who had guns at this time, established military dominance. This is because the semi-sedentary Apache were tied to crops on a seasonal basis and their more mobile, and better equipped, adversaries could pattern their locations and dominate calvary warfare.

In 1704, the Comanches began to raid Spanish settlements in New Mexico and used the Purgatoire River area as a staging point for their trips (Stoffle et al. 1984). Competition between Comanches and Utes for the upper Arkansas River basin eventually led to general warfare between those former allies, with the remaining Apaches allied with the Utes (Zier et al. 1997).

The Spanish military pattern at this time was one of infantry and calvary and expeditions into the southern Plains a show of force. To control the Indians of the southern Plains, and to assess French influence in the area, Spanish leaders dispatched a party lead by Antonio de Valverde in 1717 and Pedro de Villasur in 1729 (Mehls and Carter 1984; Murray 1979). On the Platte River of Nebraska, Villasur's party was attacked by the Pawnee and was the last Spanish expedition across eastern Colorado until 1779.

The French Canadian brothers, Paul and Peter Mallet, are credited with the first expedition up the Arkansas and Purgatory River valleys while traveling to Santa Fe in 1739 to establish a trade route (Taylor 1959). On the journey, they apparently found stones bearing Spanish inscriptions

on the banks of the Arkansas River (Folmer 1939). Although their exact route is not known, they may have followed the prehistoric Indian trade route, which would later become known as the Santa Fe Trail (Church and Cowen 2003).

In the 1770s, Comanche and Apache raiding parties terrorized the edge of the Spanish frontier. To combat these attacks, Governor Juan Bautista de Anza led an army of 600 solders, militiamen, and Indian allies against the Comanche (Murray 1979). They ambushed a large Comanche camp on the north side of the Wet Mountains in south central Colorado, then traveled south to near the present town of Rye where routed another Comanche force led by Cuerno Verde (Stoffle et al. 1984).

This Spanish victory initiated lasting peace with the Comanche in 1786. This new alliance led not only to the demise of the Apache on the Plains, but began the *Comanchero* period (1786 to 1860) where the Spanish, New Mexicans, and Comanche came together for trading on the southern plains (Kenner 1969). At the same time, New Mexican buffalo hunters known as *ciboleros,* hunted throughout the region (Carrillo 1990).

The French threat to the Spanish in the southern Plains disappeared in 1763. Napoleon, in the early 1800s, needed money to support the French Empire elsewhere, and came to an agreement with Spain to return the former French colony of Louisiana to France (Murray 1979). In 1803, in one of the greatest land deals of its time, France sold the recently secured Louisiana to the United States (Ubbelohde et al. 2001). The boundaries of the Louisiana, largely disputed by Spain, but claimed by the United States included the land extending west from the Mississippi River to the Rocky Mountains and the Rio Grande. It was not until 1819 that the Adams-Onis Treaty would established the Arkansas River as the northern boundary of Spanish New Mexico (Stout 2002; Zier et al. 1997).

President Jefferson did not waste any time in procuring federal funding for scientific expeditions to explore the natural resources, and to gain knowledge of the Indians, and the transportation routes of this uncharted territory. One of the first explorations, the renowned Lewis and Clark Expedition (1803-1806), explored the area along the Missouri River and the Northwest region. Two later expeditions that followed are directly associated with the Fort Carson area. The expedition of Captain Zebulon Pike (1806) explored the geography, natural history, and topography of the lands in the southwest portion of the newly acquired territory, leading Pike up the Arkansas River Valley into Colorado. The entourage of twenty-two men split into two groups, one to seek the headwaters of the Red River, and the other along the Arkansas River. During this expedition Pike would observe the mountain peak that bears his name today. Pike and three other men continued northwest in an attempt to climb the peak looming on the horizon, an attempt that proved unsuccessful. This venture possibly led him to the area of Little Fountain Creek, and on his return journey to the mouth of Fountain Creek the group possibly went by way of Turkey Creek. A winter camp described by Pike believed to have been located east of Colorado Highway 115 between Turkey Creek and Little Turkey Creek within the Fort Carson area has not been archaeologically verified (Zier et al. 1997).

After the official boundaries of Louisiana were established, Long's expedition (1820) would explore the western mountains in search of the source of the Platte River, returning by way of the

Arkansas and Red Rivers. Three of the men in Long's expedition would be the first Americans to climb what Long referred to as James' Peak, but would forever be referred to by the public as Pike's Peak (Ubbelohde et al. 2001). Long's expedition skirted the eastern boundary of Fort Carson (Stout 2002; Zier et al. 1997).

Fur trappers and traders were among the first Euro-Americans to venture forth in this unknown land, exploring the region in the process of economic enterprise. Trading and trapping networks had been in place by the early 19th century, and while private parties of New Mexico traders were encouraged by Spanish authorities to travel north and east to trade with the Indians, American traders were not always welcomed to trade in Santa Fe. When American traders did venture to Santa Fe, the Spaniards confiscated their goods and detained them, some for as long as a decade. James Purcell explained to the captured Pike in 1807 that after coming from Missouri and traveling up the South Platte to South Park he and two French-American traders turned southward to trade their furs in Santa Fe. Upon arriving there, Spanish authorities appropriated their goods, and did not allow them to leave (Stout 2002; Zier et al. 1997).

The Missouri Fur Company, in 1809-1812, did not intend to have its trappers detained in New Mexico and sent parties of trappers into the Rocky Mountains. Jean Baptiste Champlain led one party up the South Platte River bringing news back to St. Louis of a thriving beaver population and Arapaho Indians eager to trade. He returned to the South Platte area in 1811, and his party of trappers dispersed into different areas where they learned of the hostilities of the northern Plains Indians towards Americans resulting from British incitement during the War of 1812 (Weber 1971). In 1821, the Mexicans overthrew the Spanish during the Mexican Revolution.

Mexican Period (A.D. 1822 – A.D. 1848)

The Mexican Period coincides with much of the early American presence in the Colorado territory. In the spring of 1821, Spain granted Mexico independence as addressed in General Agustin de Iturbide's publication of the *Plan of Iguala*. While the news of independence spreads quickly through Mexico, it was not until September that Santa Fe learned of freedom from Spanish rule. New Mexico officials quickly endorsed independence, with no show of opposition. After the long imposed monopoly on the price of merchandise shipped to New Mexico by Chihuahua merchants, Santa Fe was eager to reverse Spanish policy against transactions with foreign merchants. Aware of the advantages that trading with the United States could bring, New Mexico eagerly sought the business of American traders from the northern frontier (Weber 1971).

Upon learning of the new opportunities in Mexico, William Becknell, who had set out in 1821 from Missouri to trade with the Comanches, traveled on to Santa Fe. His route across the plains and over Raton Pass became the Mountain Branch of the Santa Fe Trail (Taylor 1971). The Santa Fe Trail provided a trade route that linked Independence, Missouri with Santa Fe, New Mexico (Stout 2002; Zier et al. 1997). The Mountain Branch of the Santa Fe Trail more or less runs along State Highway 350 and the Timpas Creek drainage on the south side of Pinon Canyon. Shortly thereafter, many other traders made their way to sell merchandise to the New Mexico market. Establishment of a viable fur trade in the region brought about exploration of previous sections of unknown territory, thus expanding geographical knowledge of the mountain west (Alexander et al. 1982).

As the door opened for trade in New Mexico, the price of furs was rising in the United States, which brought with it a renewed interest in the fur trade. American fur traders ventured into New Mexico to hunt the plentiful beaver found in the streams of the Pecos and Rio Grande Rivers. In 1823, Mexican soldiers warned trappers of Baird and Company working the drainage of the Colorado River Basin that there were laws against foreigners trapping beavers in Mexican waters. When officials in Mexico City learned in 1824 that an American trapping network had developed in New Mexico, they ordered the government to prevent trapping of furs by foreigners in Mexican territory. American trappers, however, continued to trap New Mexico's waters by obtaining licenses granted to them in the names of Mexican citizens by Governors Baca and Narbona, provided a group of Mexicans joins the trappers to learn the fur trade. Due to pressures from Mexico City in 1826, Narbona revoked licenses and confiscated furs. American trappers did not easily give up the rich trapping areas in New Mexico, and many found ways around the law like smuggling furs by alternative routes, or by obtaining Mexican citizenship. Many American trappers, however, moved on, as early as 1827, into the Rocky Mountains to work the mountain streams for beaver. The "golden era of beaver trapping" dates between 1828 and 1833. The demand for beaver fur fell from favor in the early 1830s, replaced by the demand for the hide of the American bison, which lasted close to three decades (Weber 1971).

The success of the fur trade brought about the construction of many trading posts inside the United States territory north of New Mexico. Entrepreneurs such as William and Charles Bent and John Gantt established trading posts along the Upper Arkansas River between 1821 and 1835 (Lecompte 1964; Alexander et al. 1982). The most successful trading post, and strongest competitor of Taos, was Bent's Fort, established in the early 1830s by the Bent, St. Vrain and Company on the north side of the Arkansas River (Weber 1971). The location of the fort increased usage of the Mountain Branch of the Santa Fe Trail, and encouraged initial attempts of the first permanent settlements in the region (Stout 2002; Zier et al. 1997).

As the fur trade waned in the late 1830s, many trading posts continued to serve as supply stops along established trails and trade routes (Alexander et al. 1982). Agricultural settlement of the region coincided in conjunction with fur trading activities. Small farming communities settled at Pueblo and other locations along the Arkansas River and its north-flowing tributaries in the 1830s and 1840s. Corn and other produce of these farms found a ready market at the fur trading posts, and most farms were located close to at least one of the various segments of the Santa Fe and Taos Trails (Zier et al. 1997). As the fur trade became less lucrative many fur traders gave up their roaming lives and some with Spanish or Indian wives settled down to farm (Hafen and Hafen 1943). Food demands of Bent's Fort encouraged Mexican traders (*comancheros*) in 1839 to establish the first Mexican settlement, Fort El Pueblo, five miles upstream of Bent's Fort (Carrillo 1990; Stout 2002; Zier et al. 1997), where they raised grain, vegetables, horses and mules (Hafen and Hafen 1943). Around 1842, trappers and mountaineers started a settlement at the site of present day Pueblo where they farmed and traded with the Indians. A similar settlement started about the same time near the mouth of Hardscrabble Creek, near present day Florence (Hafen and Hafen 1943).

Sites associated with the fur trade are lacking within the boundaries of Fort Carson Military Reservation. The absence of well-traveled waterways or an overland route necessary for the

existence of a fur trading post indicates little promise that anything other than ephemeral interactions with the area existed. Archival evidence does not indicate the existence of fur trading posts in the area. One site, 5PE64, was erroneously identified as an 1820s-1830s "Bent's Stockade" by amateur historian C. W. Hurd in 1960. Archival, architectural and archaeological evidence indicated the site is the remains of a small ranch established in the late 1860s or early 1870s (Hurd 1960; Socha and Posner 1975:45-52; Zier and Kalasz 1985: 42-45, 74-48; Zier 1987; Zier et al. 1997). Review of archival sources or physical contexts fail to indicate establishment of a fur trading post near the location of site 5PE64 or anywhere else within Fort Carson. A number of streams run through the Fort Carson area to include, Fountain Creek, Little Fountain Creek, Little Turkey Creek, Red Creek, Sand Creek, and Turkey Creek (Zier et al. 1987). While trappers probably worked the streams throughout Fort Carson, their temporary campsites most likely have been lost through natural processes or latter human interaction with the land (Stout 2002; Zier et al. 1997).

The Arkansas River was the international boundary of the Louisiana Territory from 1819 to 1848. To promote settlement in Mexico's northern frontier, the Mexican government issued a series of land grants between 1833 and 1843 to individuals for the development of towns and natural resources (Hafen and Hafen 1943; Abbott et al. 1982). Mexico established three large land grants in 1843. The Sangre de Cristo Grant, a million acre tract in present Costilla County extended into New Mexico. The Nolan Grant encompassed an area south of Pueblo, and the Virgil and St. Vrain Grant, extended east of Pueblo to the Purgatory River and south of Trinidad. Prior to 1843, individuals received from Mexico the Maxwell Grant, south of Trinidad into New Mexico, and the Tierra Amarilla Grant, southwest of the San Juan Mountains (Hafen and Hafen 1943).

Before the establishment of any permanent Mexican settlements, the land grants transferred to the United States in 1848 after the war with Mexico. The treaty between the United States and Mexico honored the land and property rights of the individuals who held the Sangre de Cristo, Maxwell, and Tierra Amarilla grants. Congress reduced the size of the Nolan, and the Virgil and St. Vrain Grants, and did not ratify the Conejos Grant. The Navajo and Ute thwarted earlier attempts (1833 and early 1840s) to settle the Conejos Grant (Abbott et al. 1982). Hispanic *pobladores* migrated from northern New Mexico to develop towns within the Sange de Cristo Grant along the Costilla River (1849), and San Luis (1851), San Pedro (1852), and San Acacio (1853) and the Culebra River. Humble farmers raised families, tilled the soil with crude wooden plows, dug irrigation ditches, and raised crops of wheat, corn, and beans (Hafen and Hafen 1943). These small Hispanic communities were the first permanent agricultural settlements in Colorado (Hafen and Hafen 1943; Carrillo 1990; Stout 2002; Zier et al. 1997). By 1860, more than 2,000 emigrants had settled in the area establishing at least forty irrigation ditches (Abbott et al. 1982).

American Frontier (A.D. 1849 - A.D. 1858)

The Mexican War officially ended in 1848, with the Treaty of Guadalupe Hidalgo. The United States annexed the Mexico territory from Texas to the Pacific Ocean, from the Rio Grande to the forty-second parallel, the present American Southwest, including the area of Colorado south of the Arkansas River (Ubbelohde et al. 2001). The postwar period brought several significant changes resulting in permanent occupation of the region. American population in Colorado

increased as a direct result of gold and silver mining and emigrants seeking fortunes through mineral prospecting in California, or settling on farms or ranches in Utah and Oregon (Stout 2002; Zier et al. 1997). While wagon wheels continued to furrow deeply along the Santa Fe Trail, the flow of emigrants heading to Oregon, California, and Utah (1840 – 1850), the rush to gold fields and cattle drive routes contributed to the emergence of formal communication and transportation systems, linking frontier posts and villages. Frontier building increased hostilities between emigrants and the indigenous tribes eventually resulting in systematic removal of the Indians as early as the 1860s (Stout 2002; Zier et al. 1997).

Enthusiastic reports brought back by Lewis and Clark in 1806 of the fertile valleys of Oregon, and the Fremont expeditions (1842, 1843 and 1844) returning with maps of the major trails over the mountains to Oregon and California territories, encouraged many emigrants to head west. The Fremont expedition of 1842 employed the seasoned frontiersman Kit Carson as their guide to survey the area between the Missouri River and South Pass for passable routes and sites for the development of military posts (Ubbelohde et al. 2001). Bent's Fort established in the 1830s continue to serve as a portal from which many expeditions and emigrants began their journey into the western frontier.

Originally, emigrants made the journey west in search of land to establish farms and ranches. The discovery of gold in 1848 on a ranch belonging to John Sutter in California altered the purpose and demographics of those traveling west changed. By 1849, the gold rush brought many seekers of fortune over the Great American Desert and the Rocky Mountains (Ubbelohde et al. 2001). In 1846, Mormons in search of a heavenly fortune sought a "homeland" to practice their beliefs began their trek west establishing their haven in the Great Salt Lake Basin of Utah. In 1846, near Pueblo, a temporary settlement was set up for sick and disabled soldiers of the "Mormon Battalion" who had enlisted in the United States army during the war with Mexico to spend the winter. They left their log cabins and church in the spring of 1847 and traveled northward to the Oregon Trail with their final destination Salt Lake City, Utah (Stout 2002; Zier et al. 1997).

While Fort Carson is not located along the most frequently traveled Oregon Trail that took emigrants through central Wyoming, or the Overland Trail through northeastern Colorado and southern Wyoming, important "feeder" trails of the Oregon Trail did traverse through the immediate Fort Carson area (Zier et al. 1997). A number of exploration parties traveled along the Fountain Creek route: George Ruxton (1847), the Sumner Kansas Territory Survey (1857) and the Hayden Geological Survey (1873). The Cherokee Trail may have originated as early as 1849 with the Evans party of 124 gold prospectors, including 15 Cherokee Indians, on their way to the gold fields north of Denver. The trail followed along Fountain and Jimmy Camp Creeks to the headwaters of the South Platte drainage, then north to Denver. The trail became a frequently used thoroughfare after 1858, as news spread quickly through the Kansas and Missouri frontiers of the discovery of gold in the Pikes Peak area. Following the path of the gold prospectors, came freight wagons with needed supplies to outfit and feed those seeking their fortunes (Stout 2002; Zier et al. 1997).

Eastern Colorado, from 1854-1855, was part of the Kansas and Nebraska Territories, a region largely unsettled by Euro-Americans, with no established civil government (Sprague 1976;

Alexander et al. 1982). Scattered Euroamerican settlements emerged in the Arkansas Valley during the early 1850s. Early settlers included “Uncle Dick” Wooten, Joseph Doyle, and Charles Autobees. Communication between the United States and its new territories was a necessity; thus in1850 the U.S. government established the first mail contract between Independence, Missouri and Santa Fe, New Mexico. Settlement, along with the appearance of smallpox, increased tensions between Native Americans and emigrants (Stout 2002; Zier et al. 1997). Indian hostilities often caused abandonment of early settlements and ranches before the decade of the 1850s closed, and prior to the 1858 Colorado gold rush (Hafen and Hafen 1943).

Indian populations adapted to the limited presence of American traders and fur trappers along the South Platte and Arkansas River drainages, but became more agitated as Americans began to extensively travel through and settle in the Colorado Territory. The Treaty of Fort Laramie established in 1851 between the United States government and nine Plains tribes allowed Americans the right to build forts and roads within the tribal territories. The tribal territories agreed upon in the treaty set aside eastern Colorado from the Arkansas River to the North Platte River in Wyoming for the Cheyenne and Arapahoe. The central Rockies and the western slope was the land of the Ute, who resisted the gradual emigration of Hispanic American groups from New Mexico into the San Luis Valley. The U.S. Army erected Fort Massachusetts in 1852 to protect the settlers from Indian hostilities (Sprague 1976; Alexander et al. 1982). On Christmas Day in 1854, the Muache Ute and their Jicarilla Apache allies attacked the trading post at Pueblo, killing most of the residents (Carrillo 1990).

Increased traffic along the Santa Fe Trail and the establishment of the cattle drive routes in the new territory created further problems with Native American populations. In June 1860, the War Department ordered construction of a military fort at Big Timbers (known as Fort Lyon after the Civil War). Nevertheless, the situation between settlers and Native Americans continued to degenerate. In 1861, under pressure from the U.S. Government and white settlers, the Cheyenne and Arapahoe surrendered in the Treaty of Fort Wise the bulk of their land, which included the heart of their hunting lands at the base of the mountains. While most of the Cheyenne peace chiefs, lead by White Antelope and Black Kettle, supported the agreement, many of the young men and members of the warrior society claimed they had not agreed to the cessation of their land. The amount of game necessary to support the tribes was not plentiful enough on the fraction of the land north of the Arkansas allotted to the tribes. Stealing livestock from farms and ranches became a way to supplement the lack of game (Abbott et al. 1982).

In the spring of 1864, Cheyenne and Arapahoe Indians began raiding isolated ranches, running off horses, and antagonizing detachments of cavalry primed for action after a long winter (Abbott et al. 1982). A Cheyenne party attacked and burned the Iron Spring stage station along the Santa Fe Trail, and, in June, the brutally murdered the Hungate family on their ranch thirty miles from Denver. Reprisals by the military led to a series of events that culminated in the Sand Creek Massacre on 29 November1864. Cheyenne came to Sand Creek to witness the aftermath of the massacre. Incited by what they saw, the Cheyenne joined by Arapaho and Sioux gathered a force of thousands in early 1865, and initiated two attacks on the freight station of Julesburg killing forty whites, and blockading Denver (Abbott et al. 1982). William Bent associated through marriage with a Cheyenne woman and his trade relationship with the Cheyenne from the 1830s – 1840s, helped open negotiations for a new treaty in late 1865. However, intensive

raiding of settlers continued into 1867. A major military campaign occurred in the winter of 1868-1869, resulting in the Treaty of Medicine Lodge, where most of the Southern Cheyenne and Arapaho agreed to relocate to a reservation in Oklahoma (Abbott et al. 1982; Carrillo 1990; Stout 2002; Zier et al. 1997).

Colorado Territory

The formation of the Colorado Territory coincided with the onset of the Civil War in 1861. Geographically the newly established territory included portions of western Kansas and Nebraska, eastern Utah, and northern New Mexico (Alexander et al. 1982). However, due to political infighting, the prospect of attaining actual statehood was less and less attractive to many Coloradans. From 1868 to the approach of the presidential election of 1876, Colorado statehood was a dead issue. Then, with the national elections fast approaching, President Grant promised Colorado statehood in return for three Republican electoral votes. The proclamation was issued on August 1, 1876, and that fall Hayes defeated Tilden by a one-vote margin (Cowen, personal communication).

By 1860, the population of Colorado had expanded to almost 35,000, with 82.4% of the working force employed in mineral extraction (Arrington 1963; Schulze 1977; Alexander et al. 1982). The first detailed census (1860) for the Fort Carson vicinity reported 737 individuals living within the area of Canon City, down the north side of Fountain Creek, and up Fountain Creek to Colorado City. Demographics of this population consist of 614 men, 122 females, and one Negro (Alexander et al. 1982). The Colorado Territory gold rush was short lived with the primary gold deposits in the Leadville district depleted by 1863, and the mining industry entered a depressed phase lasting through the 1860s. By the 1870s, the work force employed in the mining industry had dropped to 12.5%, a dramatic change from the 82.4% indicated in the 1860s census (Arrington 1963; Alexander et al. 1982). Most prospectors eventually left, some turned to agriculture, and some stayed on to bolster new communities such as Boulder, Central City, and Fort Collins (Stout 2002; Zier et al. 1997). With new mining discoveries in the 1870s and development of railroad transportation Denver effectively doubled its size by 1872; by 1874 Denver's population reached 20,000 (Carrillo 1990; Stout 2002; Zier et al. 1997).

Settlement and Development of the Fort Carson Area

Fort Carson does not include locations of known outstanding events in the history of the region or the nation, but areas within and adjacent to the military reservation are directly associated with important historical themes and eras. Principal historical themes are homestead/ranch settlement and hardrock mining, but the area has also seen Spanish military and trading expeditions, placer gold prospecting, exploration expedition, overland emigration, United States military expeditions of the Mexican, Civil, and Indian wars, open range ranching and trail herding, railroad construction, and stagecoach communications. The following overview is intended to be a general background statement about the themes, events and eras of the Fort Carson region, with specific references to threshold events of themes and eras and to events within or adjacent to Fort Carson associated with the themes. Of no less importance is the direct association of Fort Carson Military Reservation itself with the United States' role in World War II as well as its association with the Korean and Vietnam wars (Zier et al. 1997).

The overview necessarily addresses a broad regional context, as well as the more particular context of the present Fort Carson Military Reservation. The regional context is part of southeastern Colorado bounded on the south by the Arkansas River, on the east by the Kansas-Colorado border, on the north by the headwaters of the Platte River system, and on the west by the Front Range of the Rocky Mountains.

Historic sites predating the 1860s have not been located within Fort Carson proper (Zier and Kalasz 1985). The climate in the Fort Carson area is semiarid to arid and unsuitable for settlement on the subsistence scale. Settlement within the present boundaries of Fort Carson was sparse due to the lack of water and the difficulty of travel. The area surrounding Fort Carson would greatly expand as a result of gold rush of 1859, bringing with it population and economic fluctuations, and as readily assessable minerals were depleted, resulted in a substantial decline in settlement of the area. The demand for fresh meat in mining camps played a role in the development of the Colorado cattle industry. The cattle industry developed gradually in the Fort Carson area beginning in 1860. The Civil War, depletion of readily accessible minerals, the difficulty in transportation and the transportation of goods, and growing conflicts between settlers and native tribes tempered growth between the mid-to late-1860s. With the cessation of Indian hostilities in 1868, development of better transportation alternatives and communication mechanisms, settlement gradually increased within the region surrounding Fort Carson and within its boundaries. Resurgence in population and community development resulted from the mining industry in Leadville in the 1870s and discovery of large gold deposits in Cripple Creek in the 1890s.

The discovery of gold in 1858 in the mountains near present day Denver and in Leadville (1859) would bring approximately 100,000 gold-seekers to Colorado in 1859, where they spread like wild fire up the South Platte into the upper reaches of the Arkansas River drainage to pan for gold. Not all emigrants came to seek fortune by panning for gold, but rather they took advantage of the needs of those who did. Thousands of would-be miners eventually stayed and became ranchers and farmers (Zier et al. 1997). Towns and villages emerged out of the wilderness in the late 1850s. A few communities developed to serve as supply points and agricultural centers near the present boundaries of Fort Carson: Fountain City (Pueblo), Canon City, El Dorado, and Colorado City. Canon City and Colorado City were located along the foot of the mountains on trails that lead to the gold mines in South Park and along the Blue River. Attributes of these two cities—the scenery, fresh mountain air, and fertile soil near streams—made settling in the area favorable. Regional farms could supply fresher food for mining towns then supply trains departing from the Missouri River. Thus, farms sprung up along the branches of the Arkansas, especially in Huerfano and Fountain Creek, offering fresh radishes, lettuce, onions, and peas for sale in the Denver market (Hafen and Hafen 1943).

Colorado City received its name because it was located along the natural gateway leading to upper branches of the Colorado River. By 1860, the population of Colorado City had reached 1,000; many were merchants and forwarders (Griswold 1958). In a marketing campaign in May 1860, Colorado City advertised free access to the South Park Mines, abundant agricultural resources, medicinal springs, and inspiring views of the Garden of the Gods. From 1861 to 1862, Colorado City briefly held the distinction as capitol of the Colorado Territory. The first publication of the Canon City newspaper on September 8, 1860, included references to an

operating shingle mill and steam saw mill, discovery of an oil spring, and announced that subscriptions were being taken up to begin a new church. By November, the population was 800, with forty businesses established (Hafen and Hafen 1943). The growth of Colorado City and Canon City would go through a period of decline as the mining industry entered a depressed phase in 1863. By the end of the decade, Colorado City was virtually deserted (Hafen and Hafen 1943; Griswold 1958; Alexander et al. 1982).

The cattle industry in Colorado Territory developed as a direct result of the 1859 gold rush. Prior to the gold rush, ranches were located at widely scattered locations in the Arkansas River Valley, most close to the Santa Fe Trail. Former New Mexico citizens who trailed cattle herds northward in search of grassy pastures along major rivers operated many of the ranches. Cattle were brought in from Missouri or Kansas, rather than from Texas or New Mexico (Zier et al. 1997). In 1860, the cattle industry found its official beginnings in Colorado when the Lovell and Reed Cattle Company brought Texas longhorn cattle to the lower Turkey Creek area near Pueblo. Over the summer, cattle grazed, until sold in small packs to resident ranchers or for butchering. Many small ranches, established as early as1860, continued to grow, and their success encouraged the establishment of others between 1869 and 1872. The home ranch or ranch headquarters often was located on a stream with at least semi-permanent water, and the cattle would graze the adjacent public domain land (Stout 2002; Zier et al. 1997).

True to the old pattern, most ranches continued to be located close to established trails. Settlement near present day Fort Carson began in 1860. The first settlement along Fountain Creek started when J.P. Robinson, Johnson Sanders, and Oliver Locks brought their families to the area and established small ranches. Several families, along with J.B. Bates, settled along Monument Creek, northeast of present day Fort Carson. Lewis Conley operated a gristmill on lower Beaver Creek, southwest of Fort Carson. William T. Holt established a cattle and sheep ranch on Horse Creek, east of Fort Carson, where he eventually ran 1,200 cattle, 1,000 horses, and 125,000 sheep. D. M. Holden settled with his family in the Bijou Basin east of present-day Colorado Springs. By 1878, the Holden ranch was running 2,700 sheep and 1,500 cattle. Sparseness of water and lack of transportation routes would delay settlement within the Fort Carson area until the late 1860s (Sandoz 1958; Whittemore 1967; Zier et al. 1997).

Agricultural settlement in the area between Fountain Creek and Beaver Creek was limited almost entirely to raising stock because of the rough and arid landscape and the lack of surface water. The term "settlement" does not accurately apply to occupation and use of the area until at least 1880. Scattered and usually isolated ranches were established throughout the Fort Carson area in the early 1870s, but most of the southern and eastern portions of the area were hinterland ranges for ranches headquartered along Fountain, Beaver, Red and lower Turkey Creeks. Virtually all of the territory remained unfenced range, and therefore used as common range by the ranchers (Zier et al. 1997).

Just outside the boundaries of Fort Carson, J.L. White and H.S. Clark secured CE patents in 1868. C.B. Wells (1867), P.D. Miller (1868), and J.W. Love (1869) held land patents located within the first terrace of the Fountain Creek flood plain (Schweigert 1997). By 1872, ranches were located along the length of Turkey Creek (Bullen 1939; *Canon City Daily Record* 5/8/1962; Whittemore 1967). In the 1870s, sheep were a dominant livestock in the area. One of the earliest

and most successful sheep ranchers within the Fort Carson area was David Degraff who settled near Fountain Creek in 1871. Reported to have run about 6,000 sheep at one time, Degraff switched to raising shorthorn cattle in 1887. The Skinner and Tabor Ranch started a sheep operation in 1878, with its headquarters at the Skinner railroad siding just northeast of Fort Carson (Osgood 1970; Zier et al. 1997). W.A. Cuthell operated a large sheep ranch in 1878 near Cheyenne Valley, located in the original Fort Carson cantonment area. W.D. Corley purchased the ranch and operated as a Hereford cattle ranch until purchased by the Army (Alexander et al. 1982; Zier et al. 1997).

The Charter Oak Ranch/Brown Ranch operated in the general vicinity of the present Fort Carson Rod and Gun Club. Charter Oak ranch was founded prior to 1886 with the original name of Brown Ranch (Alexander et al. 1982). C.S. Haynes, owner of the Haynes Cattle Company, changed the name to Charter Oak. Haynes filed a land entry in Sec. 10, T16S/R66W in 1885, later canceled. The Mary Helen Ranch, named by owner Charles Carson in the 1930s, was from part of the Old Charter Oak property (Alexander et al. 1982). Latter the Engle Land and Cattle Company owned the ranch. Both ranches produced Hereford Cattle (Whittemore 1967; Zier et al. 1997).

In 1866, Charles Goodnight and Oliver Loving established the Goodnight-Loving Trail, to bring cheap Texas beef to the mining camps of the Front Range. The trail extended from the Pecos River in Texas to Trinidad, Pueblo, Colorado City, and Denver. Goodnight and Loving brought 2,000 Texas longhorns into Colorado in 1867, and started a ranch on Apishapa Creek. Colorado's cattle industry was growing, with an estimated 147,000 cattle in 1867. As early as 1868, El Paso County stockgrowers held meetings to discuss concerns that Texas cattle traveling through the region could transport tick fever and other diseases that would endanger Colorado herds, and possibly affect the efforts of selective breeding to improve range stock (Stout 2002; Zier et al. 1997). Petitions passed against the importation of Texas cattle, and armed men soon turned back Texas herds entering the Colorado Range, causing the search for ranges and slaughterhouses further north that welcomed Texas longhorns (Osgood 1970; Stout 2002; Zier et al. 1997).

The route of trail drives probably changed somewhat depending upon the time of year and condition of the grass and streams. Some Texas herds possibly trailed through Fountain Creek on a trail reportedly used in the 1870s and 1880s until fencing and railroad construction made the overland cattle drive unprofitable and unnecessary. After the Union Pacific Railroad was built through Wyoming in 1868-1869 a vast opportunity for ranching opened up on the Central and Northern Plains, and primary cattle drives moved eastward away from the Fort Carson area (Zier et al. 1997).

Attack by Indians was not the only violence settlers and ranchers faced in eking out a living on the frontier. The Arkansas Valley Claim Club was organized by ranchers in 1860 "to protect life and property", and to arbitrate range rights. In April 1863, a band of horse rustlers disturbing the peace in the southeastern section of the newly formed Colorado territory, were stopped by a shoot-out near an outcrop called "Crows Roost" on Squirrel Creek, east of Fort Carson. That same year, the Espinosa brothers, Vivian and Filipe, committed a series of robberies and murders in a rampage leading from Hardscrabble Creek to South Park, then southward to the Fort Garland

area. Near upper Beaver Creek, the brothers killed Henry Harkings on March 19, 1863. Harkings was buried in Deadman Canyon, outside the present northwest boundary of Fort Carson (Little 1996; Whittaker 1917; Whittemore 1976; Zier et al. 1997).

In the spring of 1876 most of the cattlemen on Turkey Creek, Red Creek, and Little Fountain Creek formed the Turkey Creek Stock Association in order to handle their stock more effectively and economically. The constitution of the Association required ranchers to contribute one herder for each six hundred head of cattle on the range and to pay assessments for the cost of roundup proportional to the number of cattle. During the first summer, the Association herders spent about five months on a roundup that apparently extended from the Arkansas River northward to the Arkansas-South Platte divide. The *Pueblo Chieftain* (November 7, 1877) reported completion of the annual roundup. The principal beef sellers were J.W. Booth, Mrs. A.D. Hamlin, John Palmer, Rich Toof (whose home ranch was near the mouth of Beaver Creek), Ed Van Erder, Frank Price, Mr. Barnardsdale, Mr. Redman, and Jeff and Mass Steel. By 1878, the Turkey Creek Stock Association had 35 members whom cumulatively owned about 8,000 head of cattle. The roundup of that year consisted of fourteen herders under the direction of ranch foreman, John Palmer. Organized at the Steel Ranch on Fountain Creek the roundup took place on May 18 (*Pueblo Chieftain* 4/8/1877, 5/5/1878, 5/14/1878; Zier et al. 1997).

In the fall of 1877, field cattle buyers began to visit the ranches of the study region to buy stock directly from the ranchers. Individual ranchers responded by rounding up their market-ready steers. The *Pueblo Chieftain* (11/25/1877) reported that several ranchers were having a tough time extracting their stock from Wild Mountain, a densely wooded mountain between Beaver Creek and Red Creek. The newspaper reported in the same article that J.W. Booth, John Allen, Charles Hobson, and the Myers brothers sold steers to one of the buyers (Zier et al. 1997).

With the arrival of railroad service, ranchers shipped most of their stock by rail from Colorado Springs, Fountain, or Pueblo. However, the high cost of shipping led several members of the association to drive herds of cattle overland to Kansas City. The last trail drive from the Fort Carson area probably occurred in the early 1880s (Osgood 1970; Stout 2002; Zier et al. 1997).

Stagecoach lines were one of the first modes of transportation to provide passenger and mail service to supply stations and gold camps. The Leavenworth and Pike's Peak Express Company, already operating under a federal contract to deliver supplies to army units in Utah Territory, provided daily passenger service between Kansas and the Cherry Creek settlements for a fare per person of $100 to $125 one way. In 1860, after reorganization, the name changed to the Central Overland, California and Pike's Peak Express Company (COC&PP), and besides running passenger service, the COC&PP also ran the Pony Express across western America until 1861. Ben Holladay's Overland Mail and Express Company took over the COC&PP in 1861, and the Wells, Fargo & Company took over the line five years later. Stagecoach and mail service between Denver and Santa Fe in the 1860s was irregular. The line apparently ran "…from Denver…through Russellville, Jimmy's Camp, the Fountaine and Jenk's Ranch; then" left "over the hill to the Arkansas near the mouth of the Huerfano…"(Burnett and Burnett 1965; Zier et al. 1997).

Several stage stations were located near the eastern boundary of Fort Carson. The Widefield Stage Station was about two miles south of the present junction of Colorado Highway 83 and U.S. 85. The Fountain Stage Station was on the southern edge of the present city limits of Fountain, on the north bank of Jimmy Camp Creek. The Little Buttes Stage Station was in Section 33, T16S/R65W, at a ranch operated by Mr. Lincoln and Mathias Lock. A "Map of the Colorado Territory Embracing the Central Gold Region" (1886) shows a community/stage station (?) of El Paso, perhaps three miles north of the Pueblo-El Paso County boundary. The map locates Wood Valley about four miles south of the boundary. Piñon possibly had a stage station on the west bank of Fountain Creek in Section 31, T18S/R65W, and east of the southeast corner of Fort Carson (Bullen 1939; Ebert 1866; Long 1947; Township Map of El Paso County 1913; Whittemore 1967; Zier et al.1997).

Congress appropriated $1 million to subsidize daily transcontinental mail service, either by main line or extension routes in 1861. Denver was interested in establishing a direct east-west route, but after investigation development of a pass over the mountains proved too difficult to maneuver. Daily service to the gold camps came by way of a tri-weekly branch from Julesburg, off the Oregon Trail (Ubbelohde et al. 2001). Weibling received a mail contract in 1862 to provide regular mail service from Denver to Pueblo. Jacobs took over the mail contract and extended the service to Trinidad. The Barlow, Sanderson and Company established a stage line in 1861 from Independence, Missouri to Santa Fe, and took over the Jacobs' line, known as the Denver & Santa Fe Stage Line in 1869. A branch telegraph line extended from Julesburg to Denver in 1863. By 1868, the telegraph line ran from Denver to Santa Fe by way of Colorado City, Pueblo, and Trinidad (Burnett and Burnett 1965; Clausen 1963; Hafen 1948; Ubbelohde et al. 2001, Zier et al. 1997). Colorado Territory would not gain transportation service by rail until 1870.

In the 1870s, sporadic new gold and silver strikes were discovered in the mountains west of the region nearest the Fort Carson area. The Union Pacific Railroad completed its mainline through Cheyenne, Wyoming in 1868, and the transcontinental link by 1869. When Coloradans learned the Union Pacific would not be extending a line to Denver, citizens with financial backing built the Denver Pacific Railroad in 1870, with a line extending from Denver to Cheyenne, where it connected with the transcontinental line of the Union Pacific. The Kansas Pacific Railroad completed its line from St. Louis to Denver that same year. As these two railroad lines reached completion, W.A.H. Loveland began building the Colorado Central Railroad, which extended out of Denver to Golden and on to the mines on Clear Creek. By 1871, the Denver and Rio Grande Railroad (DRG), directed by General William Palmer, began building a line southward, reaching Colorado Springs on October 21, 1871. The DRG extended its line south, east of Fountain Creek reaching Pueblo on June 15, 1872, eliminating the stage line along that route. The Canon City Railroad, a line financed by the DRG to gain access to the coal fields, extended up the Arkansas River to Coal Creek, several miles east of Canon City.

The growing industry at Cañon City, the failure of railroads to reach Cañon City until 1877, and the settlement along Beaver Creek resulted in a demand for overland passenger and freight service between Colorado Springs and Cañon City. When the railroad did not provide service to Canon City in the early 1870s, Bob Spotswood and William McClelland constructed a wagon road in

1873 from Beaver Creek northward to Colorado Springs, over much of the route later known as Lytle Road. The Granite-Colorado City Stage began carrying passengers and freight over the road. One source reported that at least one hundred people used this route per day. The exact route of the stageline/wagon road is not known, but it probably conformed in large measure to a road or trail shown on an 1862 map of Colorado territory (Campbell 1972:59; Case 1862; Zier et al. 1997). As in many other cases, the stage service was probably preceded for some time by mounted mail service on the route. Two sub-post offices were set up along the route. Sun View, the home of Bob Womack on the Little Fountain served as one sub-post office, and the other at the John Lytle homestead on Turkey Creek. Thus the area took on another title of recognition as "the Lytle" area (*Cañon City Daily Record* 5/8/1962; Zier et al. 1997).

Other archival sources identify two stage stations farther to the southwest on Beaver Creek. The little community of Hatten, also called Upper Beaver Creek, was served at an unknown date and for an unknown period. Hatten area settlers grew vegetables and fruit for the mining camps and began providing cheaper imported foodstuffs. Farther south, near the confluence of Red Creek and Beaver Creek, the community of Glendale was established about 1873 as a station on the stage line. John McClure, a merchant in Cañon City, built a large hotel "of pale stone from near-by quarries" on the east bank of Beaver Creek, above the junction with Red Creek, called the McClure House. Large barns and corrals that held a thousand mules and horses for exchange teams were located below the hotel where the road forded the creek. During the years when mining along the Upper Arkansas brought an enormous amount of traffic through the area, D. S. Coffman, then proprietor of the hotel served more than a hundred passengers a day. In addition, "the spacious, well-furnished rooms made it a popular spot for local weddings, dances, and occasional gospel meetings. It was frequented by Indians and Cowhands as well as more cultured ladies" (Fremont County historian Rosemae Campbell 1972). Campbell may have exaggerated the importance and the business of the stage stop to a considerable extent.

Glendale remained a bustling stage station and settlement center until railroads reached Leadville and removed both the need for transportation to the Upper Arkansas from Colorado Springs and some of the market for agricultural products grown around Glendale. The stagecoach was discontinued in the late 1870s; archival sources give the date of demise of the community as 1896 and 1909 (Alexander et al. 1982). A flood on June 5, 1921 destroyed everything at Glendale except the stone hotel (Campbell 1972). Glendale was apparently located in Section 35, T18S/R68W, about a half-mile to the west of the Fort Carson Military Reservation. Hatten was well outside the reservation boundary (Zier et al. 1997).

In 1876, the Atchison, Topeka, and Santa Fe Railroad (ATSF) completed a line up the Arkansas River to Pueblo eliminating the need for the Southern Overland Stage. In response to the ATSF, the Denver and Rio Grande Western Railroad (D&RGW) extended its track from Pueblo south to the Purgatoire River. By 1878, the two companies were in competition for access to Raton Pass. "Uncle Dick" Wooten disliked the D&RGW, which worked favorably for the ATSF to received access in 1878 to Raton Pass via Wooten's former toll route. The ATSF reached Trinidad on September 1, 1878. The Pueblo and Arkansas Valley Railroad, a subsidiary of ATSF, built a track between Granada and Pueblo in 1877, and continued construction to Cañon City and the Royal Gorge, and the 1873 the Granite-Colorado City Stage route was abandoned shortly thereafter (Stout 2002; Zier et al. 1997). Additional rail access to the Fort Carson area was

established when the Denver and New Orleans Railroad (know later as the Denver, Texas and Fort Worth Railroad, a subsidiary of the Chicago, Burlington, and Quincy) built a line from Denver to Trinidad in 1881. The Missouri Pacific reached Pueblo from the east in 1887. That same year the ATSF built a line from Pueblo to Denver by way of Colorado Springs. The last major rail link to the region occurred in 1888 when the Chicago, Rock Island, and Pacific Railroad reached Colorado Springs via Limon (Ormes 1976; Sprague 1980; Zier et al. 1997).

During the late nineteenth century Euroamerican interests came to control and dominate southeast Colorado. Several factors contributed to the intensive settlement of the plains in the area by the early twentieth century, including the passage of the Enlarged Homestead Act of 1909 and the Stock Raising Act of 1916. Methods of dryland farming also improved, and new wheat strains better adapted to arid environments were introduced. World War I was a major factor in the spread of dryland agriculture in the region, as the United States became an important exporter of wheat and corn to Europe. This period resulted in significant changes for southeastern Colorado, rivaling the gold rush era in terms of demographic effects (Carrillo 1990; Stout 2002).

Rail connections, coal, oil, and available water greatly influenced the growth of Pueblo and Florence. The discovery of oil, sometime in 1859 or 1860, became the lifeblood of Florence and Canon City where several small extraction and refining enterprises operated. Florence Well Field, established in 1881 with the development of the first deep well, holds the distinction as the second oldest oil field in the United States. In 1885, Florence opened a refinery with the capacity to refine 100 barrels daily, and other refineries were built. The Florence Well Field reached a peak in crude oil production in 1892, with 824,000 barrels extracted. By1892 there were 75 producing wells, but gradually production declined and new exploration was halted by 1923 (Little and McFall 1972; *Pueblo Star-Journal and Sunday Chieftain*, 8/31/1975; Riches 1978; Scamehorn 1978; Zier et al. 1997).

Major ore milling and smelting industries developed in Pueblo and Florence. Pueblo built the first smelting industry in 1878 and was devoted to extracting gold and silver. Large deposits of iron ore discovered at Orient and Calument in 1880-1881, and ore hauled from many sources in Colorado, resulted in the founding of the Colorado Coal and Iron Company in Pueblo. Six smelting furnaces, each with the capacity of 40 tons were operating by 1881. Meyer Gugenheim and his sons built the Philadelphia Smelter in Pueblo in 1888, one of the smelting bases that would contribute to the eventual world domination of the smelting industry by the Gugenheims (Bullen 1939; *Pueblo Star-Journal and Sunday Chieftain*, 4/5/1959; Zier et al. 1997). Three railroads built from the plains into the mountains included lines from Colorado Springs to Florence. The Florence and Cripple Creek Railroad built in 1894 brought low-grade ores directly to the reduction mills, causing Florence to develop into a milling and smelting center in its own right. When in 1901 the Colorado Springs and Cripple Creek District Railroad, the “short line”, reached the mines, Florence gradually declined as a reduction center. The last mill closed in 1910 (Scamehorn 1978; Zier et al. 1997).

The railroad stimulated the growth in the Pike’s Peak Region and in areas on the Front Range. The mining industry in the 1870s also significantly affected the area surrounding Fort Carson, resulting in the establishment of several towns and rural railroad stations. Colorado Springs,

originally Fountain Colony, established by General William Jackson Palmer in 1871 near the nearly abandoned town of Colorado City, was located on the new Denver and Rio Grande Western route from Denver to Pueblo. By 1879, the population of Colorado Springs had grown to about 5,000 people, and included members of Fountain Colony, a Quaker agricultural colony within the environs of the township (Lavender 1968). Recreation and tourism greatly influenced the early development of Colorado Springs, however the 1890 gold strikes in Cripple Creek expanded economic and societal development as it became an important ore-smelting center (Zier et al. 1997).

When the Denver and Rio Grande Railroad built its mainline south of Colorado Springs through the mouth of Jimmy Camp Creek in 1872, the town/siding of Fountain was probably established. Various sources seem to confuse the Fountain community with Fountain City, a precursor to Pueblo established in 1859, and Fountain Colony at Colorado Springs. Early settlement around Fountain relied on irrigation, and the community became a farming and stock shipping center. In 1888, the town had a population of around 200 persons, but in that year a runaway train struck rail cars filled with naphtha and blasting powder in the Fountain switchyard destroying most of the town. The town was rebuilt and remains a small farming center (Fountain, Colorado Historical Survey Report n.d.). Other towns established along the railroad included Kelker, Wideland, and Wigwam (Carrillo 1990; Stout 2002; Zier et al. 1997).

Robert Womack's famous gold strike in 1890 resulted in a second Pikes Peak gold rush. By 1900, more than 450 mines developed yielding an estimated $125,000,000 in gold extracted. The Cripple Creek Mining District is listed on the National Register (Scamehorn 1978; Zier et al. 1997). Gold strikes at Cripple Creek encouraged prospectors to examine streams of the Fort Carson area. During the 1890s, local farmers and ranchers joined prospectors mining for gold in Beaver Creek. Placer workings on Red Creek and Turkey Creek were extensive enough to encourage William A. Williamson to plat the town of Red Creek, near the head of Red Creek in 1893. The first day of the sale, June 22, 1893, fifteen lots sold, with arrangements to construct a two-story hotel made a week later. Settlement at Red Creek, directly west of the present Camp Red Devil, appears to have been temporary at best. Several claims established between 1916 and 1919 were located about a mile from Turkey Creek, west of Fort Carson. Occasional prospecting on Turkey Creek may have continued until Fort Carson was established (Stout 2002; Zier et al. 1997).

Beginning in the late 1860s, as manufacturing, commercial and governmental structures established in developing towns, so did the desire for substantial buildings to house these enterprises. Stone and brick, to face prominent buildings, came into demand (Carrillo et al. 1991; Van Hook 1933; Zier et al. 1997). In the early 1870s, the Denver and Rio Grande Railroad extended a line from Pueblo to the mountains, offering a way to ship stone from quarries established between Pueblo and Beaver Creek to Denver. Pueblo developed into an ore-smelting center in the late 1870s, leading to the successful development of the iron and the steel industry. By 1874, Denver and Pueblo were vying for the distinction of being the state capital, with Denver winning the title in 1881. In 1881, the firm of Mather and Geist built eight new calcine furnaces and four new blast furnaces in Pueblo. The Standard Fire and Brick Company of Pueblo organized in 1890, and by 1901 occupied a 21-acre track of land west of Fountain Creek. The plant employed 650 workers, and in a 24-hour day production capabilities numbered nearly one-quarter of a million bricks, consisting of 75,000 firebricks, 75,000 paving bricks, and 50,000 pressed bricks. By the turn of the century, Pueblo was

reducing ore from areas outside Colorado, to include Arizona, New Mexico, Mexico, Montana, and Utah and shipping products to St. Louis, Chicago, and Pittsburg. The steel industry employed 3,000 workers, and produced steel for markets ranging from California to Missouri (Van Hook 1933; Carrillo et al. 1991).

Large-scale, sustained quarrying and other extraction developed in 1898 when the Colorado Portland Cement Company began mining and manufacturing cement, 23 miles west of Pueblo on the Arkansas River. The towns of Portland and Cement developed. By 1908, the Colorado Portland Cement Company joined operations with an affiliated firm, the Portland Company. After 1910, the Ideal Cement Company built a ten-million-dollar cement plant at Portland. From 1915 to 1927, the Ideal Cement Company ran a small railroad from Portland about twenty miles northeastward to a limestone quarry on Beaver Creek (Campbell 1972; Ormes 1976; Zier et al. 1997).

In the early 1900s, Robert K. Potter, owner of a lumber business in Cripple Creek in the 1890s, became interested in quarrying building stone deposits in the Turkey Creek region of Booth Gulch. His ranch was located just south of the area that developed into the small stone quarrying and clay mining town of Stone City (1912) eventually purchased by Fort Carson in the 1960s. Porter established quarries in Booth Gulch in 1908. Clay mining had already begun in Booth Gulch in 1906, when J. Wands, owner of the Pueblo Clay Products Company, developed three clay mines to extract exposed Red Creek anticline clay deposits. Nevertheless, Potter was instrumental in establishing a railroad line into the area. Prior to the development of the rail line, wagons hauled stone to Pueblo.

Development of stone and clay industries at Booth Gulch remained limited by distance and difficulty of transporting materials to Pueblo. In 1908, the Kansas-Colorado Railway planned to build an electric railway line from Cañon City to Dodge City, Kansas, with a 25-mile extension from northwest Pueblo to the Turkey Creek region. R. K. Potter, owner of the Turkey Creek Stone Company, and a principle supporter of the plan, held groundbreaking ceremonies on his Turkey Creek Ranch on July 31, 1908 (*Pueblo Chieftain*, July 31, 1908). Management problems and financial setbacks prevented construction of the line, until the company reorganized in 1910, and constructed 21 miles of railroad grade from Pueblo to Booth Gulch. An ambitious plan was to extend the railroad a few miles east of Turkey Creek following Lytle Road to the north, eventually ending in Cripple Creek. Only limited grading had begun on this segment and discontinued in favor of a route that afforded better grades and a more adequate water supply for the locomotives (McKenzie 1972; Ormes 1975; Zier et al. 1987). Additional financial difficulties sent the railroad into receivership until reorganization in April 1911 as the Colorado Kansas Railway. Construction of the Pueblo/Booth Gulch railroad resumed with 14.8 miles of rail completed by the end of the year. By late May/early June 1912, with the addition of eight miles of rail following the west bank of Turkey Creek, the goal to provide rail service to the Booth Gulch quarries had been reached (Carrillo et al. 1991; McKenzie 1972; Ormes 1975; Wilkins 1974; Zier et al. 1987). The Booth Gulch line was 22.2 miles long and had 1.8 miles of sidings. An estimated five hundred Pueblo residents boarded inaugural excursion trains on June 12, 1912, to travel to the mining area (Carrillo et al. 1991; McKenzie 1972; Ormes 1976:17; *Pueblo Chieftain* 6/13/1912).

Several large quarries opened after the railroad reached the area. A quarry about three miles from the nominal rail terminus at Stone City produced a fine white sandstone which was used to build the

massive Pueblo County courthouse in 1918 (McKenzie 1972; see also Carrillo 1991: Figures 14, 15). Adjacent to the quarry was a large stone working yard with a railroad track running through it. A large overhead crane was used to move blocks of stone to a finishing plant and then to flatbed railroad cars for shipment (Carrillo et al. 1991: Figures 16, 17). McKenzie's description, confirmed by archaeological survey, indicates that this quarry complex was to the southeast of Stone City, and portions of a spur rail grade are visible, which served various quarries in that area (Carrillo et al. 1991). Builders began switching to reinforced concrete as a major building material after World War I, to the detriment of the natural stone industry. The Turkey Creek Stone, Clay & Gypsum Company ceased quarrying sandstone at its large pit in 1930, but the company maintained an office in Stone City and probably continued to mine other products through 1934 (Carrillo et al. 1991; *Colorado State Business Directory* 1922-1935; McKenzie 1972).

The Colorado Kansas Railway consistently operated at a loss; in 1930, it went into receivership. The line sold under foreclosure in 1932 and a corporation called the Colorado Railroad purchased it in 1938. Throughout its existence, the line operated with second-hand equipment; in 1917, the rolling stock consisted of one 30-year-old locomotive, one passenger car, ten flatcars, and one service car (Carrillo et al. 1991: Figure 9). When the original locomotive was no longer operable in 1938, a locomotive leased from the Denver and Rio Grande Western Railroad replaced it. The leased locomotive proved too heavy for the deteriorated condition of the grade and track, and in 1940, replaced with a gasoline-electric locomotive (Carrillo et al. 1991: Figure 10). The line continued to operate, usually at a loss, until 1957 when a flash flood washed out several bridges on the line. The management of the Colorado Railroad then determined that the haulage potential of the line was not sufficient to justify repair of the bridges and grade, and the tracks removed in 1958 (Carrillo et al. 1991; McKenzie 1972; Wilkins 1974:265).

Clay mining proved to be a much more durable industry at Booth Gulch than was quarrying of building stone. The primary means of mining clay was driving drift tunnels into the slopes and excavating the clay seams found between solid sandstone and limestone roofs and floors. In later years, the mining of clay evolved in Stone City with the quarrying of limestone and sandstone as seams of clay were exposed. Accounts of pre-1912 mining are lacking, but it is likely wagons carried the clay to Pueblo for processing and firing. The *Pueblo Chieftain* reported in June 1912 that a large brick plant would be installed to kiln the eight kinds of clay being mined. This brick plant was probably built; a brick manufacturer, J. E. McCusker, was listed as a resident of the town in 1913 and 1914. However, a brickyard also was operated in Pueblo in association with the Booth Gulch mines, and no archaeological evidence of a brick plant at Stone City has been found. The Booth Gulch clay deposits were first mined by Wands' Colorado Clay Company and the Turkey Creek Stone, Clay & Gypsum Company. Other companies that also mined these deposits in were the Pueblo Quarries Incorporated, the Standard Fire Brick Company, and the Diamond Fire Brick Company (*Colorado State Business Directory* 1913, 1914; Carrillo et al. 1991; McKenzie 1972; *Pueblo Chieftain* 6/3/1912; Vanderbilt 1947).

Archival sources do not indicate that clay mining was done anywhere other than at Stone City. A number of materials mined in Stone City were gannister (a pure form of silica), limestone, flint fire clay, sandstone, plastic clay, calcite, roof tile clay, vitrifying clay, gypsum, glass sand, and gypsite (McKenzie 1972). Calcine kilns, which heated raw materials to make them friable and pure of unwanted organic material, operated at Stone City at least from 1924 to 1930, with H.R. Colby

serving as superintendent. Pueblo Clay Products Company built and operated the calcine kilns, and possibly promoted Colby to general manager of the firm's Stone City complex. In 1930 or 1931, Colby became manager of the Pueblo Clay Products Company, presumably in Pueblo, and thereafter the manager of the calcine kilns no longer appears in the business directories (Carrillo et al. 1991; *Colorado State Business Directory* 1924-1931). Very limited, part-year mining of clay in the area, by the Colorado Clay Company, continues to the present day. Clay is now hauled by truck (Carrillo et al. 1991; McKenzie 1972; Wilkins 1974).

Mining is represented at Fort Carson by one recorded site, Stone City (5PE793), located within and at the extreme southern end of the reservation in the vicinity of lower Booth Gulch and the southernmost reaches of Booth Mountain. The site was heavily impacted by intentional demolition by the Army and impacted further during training exercises. In 1988 and 1989 the site of Stone City and associated industrial complex was extensively documented using a combination of aerial photography and photogrammetric mapping, surface inventory and recording, and archival research (Carrillo et al. 1991). In addition to Stone City, the study area encompassed two previously recorded sites (5PE319 and 5PE230) and one newly recorded site (5PE1126). Ultimately, 123 features were recorded and include quarries and related features, mines and related features, railroad grade and associated features, residences, and miscellaneous features. Two of the features, a calcine kiln and culvert, were assessed as NRHP-eligible. Feature 1 at site 5PE319 is a largely intact calcine kiln that dates to the earlier years of quarrying in the Stone City area. Feature 19 at site 5PE793 is one of nine culverts associated with the Colorado-Kansas Railroad bed or related rail spurs. Spanning an ephemeral drainage above Stone City proper, it exhibits a vaulted configuration and is constructed of mortared sandstone blocks.

The vitality of the small community of Stone City was entirely tied to the fortunes of the nearby mines. The Turkey Creek Stone, Clay & Gypsum Company (Figure 5) filed the official plat of Stone City on December 24, 1912. The town was located in the W1/2 of the E1/2 of the SW1/4, Section 26, T18S/R67W. It consisted of five blocks of 34 lots each and one block containing 17 lots; each lot was 25 by 120 feet. The original plat indicated that portions of four blocks would be included in the right-of-way of the Colorado-Kansas Railway. Four of the five avenues and one of the two streets on the plat were named after officials of the Turkey Creek Stone, Clay & Gypsum Company: McCorkle, Potter, Crews, Harvey, and Candow. West Street and Hillside Avenue were geographical truths. An addition to the plat, of unknown date, indicates a "Water Main" extending along the east edge of the north half of the town and ending in a "City Water Supply."

As may be expected, the commercial focus of the town was the railroad depot, which was a small wood frame structure with a gabled roof and a simple board platform facing the tracks to the north. The depot also housed the general merchandise store operated by J. W. Heath from 1912 to 1915. The depot building eventually moved to Penrose presently stands at the corner of Broadway and Grand (Carrillo et al. 1991: Figures 12, 13). C. M. Jasper and Mrs. E. V. Jasper operated a general merchandise store from 1916 to 1921, followed by Roscoe E. Sutton in 1923, J. O. Southwell in 1924, and L. B. Keigley from 1925 to 1937. By 1939, Clyde Wands sold groceries in association with his auto service station. In 1950, James W. Mayfield operated the Stone City Grocery. The locations of the grocery/general stores are not known; the store may have remained in the depot for sometime after 1915 (Carrillo et al. 1991).

The post office, established at Stone City in 1912, was usually associated with the grocery or general stores. In 1920 through 1921, Mrs. William Candow ran a large hotel, built in 1920, followed by Dumbeck & Dodge in 1922. After 1922, the hotel listing disappears from the business directories. One source indicated the building was dismantled and the stone was used in construction of a building in Pueblo (Staton 1959). For varying lengths of time, the town also had resident blacksmiths, an automobile stage to Pueblo, a chiropractor, a constable and justice of the peace, and two ranch owners. A resident principal served a combined grade and high school at least as early as 1922. The school building burned in December of 1939 and was replaced with a two-room school built as a Works Progress Administration project in the summer of 1940 (Carrillo et al. 1991; *Pueblo Chieftain* 4/4/1940, 4/25/1940).

The population of Stone City appears to have been rather static; an estimated 100 persons lived there in 1912, 100 in 1914, 150 in 1917, 175 in 1929, 125 in 1935, and 100 in 1950 (*Colorado State Business Directory*; *Pueblo Chieftain* 6/13/1912). The post office was closed on June 30, 1957, serving only seven families with mailboxes at Stone City, and some boxes serving ranch families who did not live in the town (*Pueblo Star-Journal* and *Sunday Chieftain* 6/12/1957). Photographs taken at an unknown date show small one-and-a-half story wood frame cottages surrounded by lawns and trees. Some persons may have continued to live in Stone City until the U. S. Army purchased the area in 1965 when the Fort Carson Military Reservation expanded. The Army subsequently bulldozed the Stone City structures and only the trees, foundation remnants of structures, and widely scattered refuse are now visible (Carrillo et al. 1991; Zier et al. 1997).

Other smaller stone quarries and clay mines are known to exist inside the Fort Carson Military Reservation. Records of mineral entries on public lands indicate that several claims were filed in the period 1915-1919 in areas removed from stream courses, which probably means the claims were filed to reserve mining rights to stone or clay. The historical and engineering significance of the small mines and prospects is probably much less than that of the Stone City complex (Zier et al. 1997).

Unlike other areas of the Plains, the Fort Carson area did not have distinct homestead settlement periods. Sizable ranches prior to the 1940s involved a combination of purchasing land claims and filing claims on available land. Generally, later homesteaders, often limited to marginal land, characteristically claimed land under laws requiring a period of residence and improvement. Between 1865 and 1965, 1,735 land entries were filed in the immediate Fort Carson area. The number of entries rose dramatically from the 1860s to the end of the 1880s. After a quieter decade of the 1890s, land entries jumped to a peak during 1900-1909. Homesteading remained strong in the 1910s and 1920s, with a large drop off in the 1930s (Stout 2002; Zier et al. 1997).

Sixty percent of all land entries occurred between 1900 and 1929. This corresponds with the prime homestead period on the Plains when the government encouraged the establishment of family farms and dryland agriculture. Laws that encouraged dryland farming and the system's inappropriateness are demonstrated in the number of failing land entries. Of land claims filed in the 1870s, only 11 percent failed. Thereafter percentages rose with 15 percent in the 1880s, 25 percent in the 1890s, 42 percent in the 1900s, 68 percent in the 1910s, 40 percent in the 1920s, and 91 percent in the 1930s (Stout 2002; Zier et al. 1997).

The period 1900 to 1920 was the prime homestead period for the dryland areas of the High Plains, and therefore a high number of land entries for the Fort Carson area are not surprising. The high volume of land entries in the 1920s, when climate and the economy of the region made any agricultural existence difficult, may be attributable to inertia from the preceding decades and/or attempts by previous claimants to obtain sufficient land to make a living. Despite the facts that the land was open for settlement in the 1860s and railroads penetrated the area in the 1870s, 60% of all land entries in the area were made between 1900 and 1929 (Zier et al. 1997).

The inappropriateness of dryland farming and the laws, which encourage it, are demonstrated in the ratios of the number of land entries to the number of entries that failed to reach patent. Of land claims filed in the decade of the 1880s, 27% (3 of 11) failed to reach patent because the claims were canceled or relinquished. The number is not statistically reliable because of the small universe and because the actions of a single settler could determine the entire ratio. During the 1870s only 11% of land claims failed. Thereafter the ration of failures rose steadily: 15% in the 1880s, 24% in the 1890s, 42% in the 1900s, 68% in the 1910s, a mere 40% in the 1920s, and 91% in the 1930s (Zier et al. 1997).

Availability of water was a key factor in success of settlement. The first known irrigation system in the area was in place in 1863. A General Land Office survey plat (1863) shows "Murray, Cooper, Miller and Stubbs Ditch" east of Fountain Creek in T15S/R66W. About the same date Lincoln and Lock filed water right claims and began irrigating hay meadows near Fountain, and several settlers began irrigating fields on Beaver Creek near what later became Glendale (Little 1966; Whittemore 1967). A number of applications were made for rights-of-way for irrigation ditches and reservoirs within the Fort Carson area in the period 1865 to 1965 (Centennial Archaeology, Inc. 1997). Only one filing for a ditch appears in the Federal land records; it was entered in 1911 and relinquished in 1924. The ditch was planned to run through 23 legal sections in townships T17S/R66W, T18S/R66W, T18S/R67W, T18S/R68W, and T?S/R67W. Considering the long period the rights were in force, this ditch undoubtedly served a number of settlers. One other ditch was filed with Pueblo County officials, rather than with the General Land Office. Oscar P. Harpel filed a plat for the Harpel Turkey Creek Ditch on December 26, 1895. Other small ditches may also have been filed with county officials (Zier et al. 1997).

Harpel filed rights to a reservoir location in Section 19, T18S/R66W in 1903, but this entry was canceled in 1910. Applications were also filed for reservoir sites in Section 3, T17S/R66W in 1906; Section 34, T17S/R66W in 1913 (proof of construction filed 1923); and Sections 29 and 32, T18S/R67W in 1909 (relinquished 1929). The largest reservoir project was the construction of a dam on Turkey Creek, which resulted in the present Teller Reservoir in Section 30 and 31, T18S/R66W. The General Land Office reserved the general site as a potential reservoir area in 1891, and in 1894 R. K. Potter and Red Rock Reservoir, Inc. filed an application for rights to build a reservoir in Sections 19, 20, 29, 30, and 31 of this township. That claim was canceled in 1915 (Zier et al. 1997).

In the meantime, much of the land came to private patent, which would not necessarily negate the rights of other persons to build and maintain a reservoir there. R. K. Potter and associated companies obtained special warranty deeds and other deeds for some of the property beginning in 1910. The progression of companies interested in the project appears to have been Turkey

Creek Reservoir Company (1910), Turkey Creek Irrigation Company (1914), Meadow Investment Company (1921), Pueblo Meadow Land Company (1923), and Red Rock Reservoir, Inc. (1923). In 1924 Frederick J. Muench of Stone City filed a plat with the Pueblo County Clerk for the Hood Rock Reservoir in Section 30, T18S/R66W. Muench's plan included two dams, one 90 feet high and one 20 feet high on Turkey Creek, and a diversion ditch below the second and lower dam. The development would also be known as the Turkey Creek Dam (Pueblo County Clerk and Recorder, Plat of Hood Rock Reservoir). Muench's project appears to have been slightly south of the Red Rock Reservoir project. The present dam was apparently built shortly thereafter (Zier et al. 1997).

The ribbon of settlement on Beaver Creek began to expand onto the mesa to the west about 1900. In 1907 Florence merchant J. Q. MacDonald convinced Spencer Penrose and other Colorado Springs investors to develop large-scale fruit growing businesses on the mesa. The Beaver Creek Land and Irrigation Company bought out settlers on Beaver Creek to obtain water rights, and they build an extensive series of irrigation ditches to the west of Beaver Creek. The company platted Beaver Park agricultural subdivision on November 1, 1907, and in June of 1908 the Fremont Townsite Company superimposed the townsite of Penrose over parts of Beaver Park. To provide access and transportation to the 18,000-acre development, Penrose and other investors built the Beaver, Penrose and Northern Railroad in 1909. The line ran from Penrose Townsite to Beaver Station on the Denver and Rio Grande Railroad at the mouth of the Beaver Creek. The Beaver, Penrose and Northern ran only until 1919; in its last years it operated with a Cadillac flange-wheeled auto car as its locomotive power (Campbell 1972; *Cañon City Daily Record* 5/8/1962; Zier et al. 1997).

The introduction of refrigerated railroad cars after World War I caused a decline in the demand for Beaver Creek fruits. Heavy rains in the spring of 1921 caused the Shaeffer Dam on Beaver Creek to collapse; a wall of water sped down Beaver Creek and eventually down the Arkansas River to devastate the valley and a large area of Pueblo. The Shaeffer Dam was a chief source of irrigation water for Beaver Park, and in the following years the farmers turned to other kinds of produce. The Shaeffer Dam was rebuilt and other reservoirs were constructed, but the drought and economic difficulties of the Great Depression brought a general decline to the community. The Penrose Canning Factory and an alcohol distillery each lasted only two years in Penrose (Campbell 1972; Zier et al. 1997).

Very little information has been found about the architecture of the settlements in the Fort Carson area. The area had abundant sources of building stone and most foundations and retaining walls found in the area to date were constructed of mortared and dry-laid sandstone. Timber suitable for building purposes, particularly for cribbed log construction, generally did not exist in the area but was available to the west and north. Some of the larger structures built in the 1860s and 1870s probably were built of imported logs, and many of the smaller structures were undoubtedly built of native piñon pine and juniper logs. Remains of a log structure have been found in site 5FN496 in the southwestern part of the reservation. William Ninehouse, a settler on Beaver Creek, constructed his dwelling, barns, and granary by anchoring cedar poles in a vertical rock face, placing cedar poles as rafters, and then covering the roof with a poured concrete slab (Campbell 1972). Similar construction is indicated in the physical remains of a settlement site (5EP150) recorded in Fort Carson (Zier et al. 1997).

Piñon and juniper poles were also sunk vertically into the ground in close order to form corrals. The pole enclosures offered increased shelter to livestock, were cheap to build and did not cause injury to livestock as pole-and-wire fences often did. This kind of corral was particularly appropriate for horses and mules, which were prone to wire-related injuries. One such corral was built and used by a grading crew during construction of the railroad from Pueblo to Stone City in 1910 (Carrillo et al. 1991: Figure 7). The "stockade" at the supposed Bent trading post on Turkey Creek (site 5PE64) may simply be a corral built after 1873 (Zier 1987; Zier and Kalasz 1985; Zier et al. 1997).

By the early 1870s sawmills were producing milled lumber on upper Beaver Creek and in the area called "The Pinery" near Colorado Springs. Milled lumber could also be obtained at the railroad sidings along Fountain Creek on the east edge of the Fort Carson area. Most settlement structures were probably simple wood frame buildings, but some true sod, adobe brick, and mortared stone masonry buildings are known to have been constructed in the region in the early settlement period (Alexander et al. 1982; Freed and Barber 1977; Whittemore 1967). Mounding of clay material around some foundations in the Fort Carson Military Reservation indicates either that superstructures were partially composed of earthen materials (or insulated with stacked sod) or, more likely, the roofs were covered with earth or sod (Zier et al. 1997).

Ethnic reflections in settlement architecture are apparently rare in the region, other than the ephemeral association of adobe with Mexican Americans. Regional urban stylistic preferences during the period 1865 to 1920 tended toward "Western Victorian" forms and decorations, but rural structures in the region were characteristically utilitarian in design with little if any ornamentation (Freed and Barber 1977; Naeve 1972). A notable exception to this pattern was Spencer Penrose's Turkey Creek Farm. Shortly after Penrose bought the farm in 1912, he hired the Colorado Springs firm of MacLaren & Thomas, Architects to design a showcase house, garage, stable, hay shed, and large cow barn to be built on the site. Several buildings already existed on the site at that time, and the new structures eclipsed the old buildings in size. The house was designed in Spanish Revival Style, as was Penrose's sprawling mansion called El Pomar in Colorado Springs. The house featured curved Baroque gables, round-arched windows and doors, columns, balustrades, and wrought iron railings. Like the mansion in town, the house looked out on wide lawns and fine shrubbery. The house still stands today (Zier et al. 1997).

The most famous ranch located within Fort Carson (SW Section 34, T16S/R67W), is the Turkey Creek Ranch. The ranch is eligible for inclusion as a historic district in the National Register of Historic Places's, because of its association with Spencer Penrose and the development of ranching in the area. Supposedly established in the late 19th century by Frank Cross (Alexander et al. 1982; Socha and Posner 1972), it seems as though Cross never owned the property. H.H. Jacobs started the ranch in 1883, followed by 10 other owners before Spencer Penrose bought the ranch in 1912. Penrose reregistered the property in 1916 as the Turkey Creek Farm. The ranch saw much development under Penrose with many structures that contribute to the historic district because of architectural significance. The U.S. Army purchased the ranch in 1965, and its use has changed over the years. Today it is the Turkey Creek Recreation Area (Zier et al. 1997).

Nearly all of the historic period sites recorded to date in the Fort Carson Military Reservation are related to the settlement theme. Most of the sites consist of remains of stone or concrete

foundations, depressions, and scatters of domestic and agricultural artifacts. The only known intact standing structures related to settlement remaining in Fort Carson include Turkey Creek Ranch, one building in the Fort Carson cantonment area, and possibly several buildings at the Fort Carson Rod and Gun Club and at Camp Red Devil (Schweigert 1987; Barnes 1991). Site 5FN290 contains portions of buildings probably moved from within Fort Carson to just west of the reservation boundary. All but a very few of the recorded settlement sites appear to have had stock raising as the primary economic base; the remainder appear to have had a partial fruit-raising economic base. Other features associated with settlement within the reservation are occasional graves, windmills, dams, irrigation ditches, stock watering tanks, artifact scatters, and rock faces with historic graffiti (Zier et al. 1997).

Historic Development of Fort Carson

The modern history of the Fort Carson region began in 1940 when a group of Colorado Springs business and community leaders started lobbying for a military installation near their city in hopes of reviving a sagging economy (Barnes 1992; Jepson 1990; McCarthy and McCullough 2003; Zier 1987). The Pikes Peak region possessed many features suited to military training, including miles of prairie for large-scale training maneuvers and a mild climate permitting year-round training (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; Jepson 1990; Stout 2002).

World War II, 1942-1945

Construction of Camp Carson

The U.S. Army announced plans in January 1942 to establish a military installation on approximately 60,000 acres of rangeland between Colorado Springs and Pueblo. The installation received the name Camp Carson after Army Brigadier General Christopher "Kit" Carson, famed nineteenth century frontiersman and Indian agent. The installation would encompass 5,533 acres donated by the city of Colorado Springs, 29,676 acres purchased from private owners, 262 acres acquired from the Department of the Interior, and 24,577 acres leased from the State of Colorado (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; Stout 2002; Zier 2004).

In mid-January of 1942, specifications for construction of the camp were completed and the bidding process opened. Colorado Springs Constructors, Incorporated, "The Big Five", a team of five construction firms, won the contract with the bid of $30,054,390; signed February 1942 (Public Affairs Office undated). Companies organized under the "Big Five" included Edward H. Honnen Construction Company, Colorado Springs; Peter Kiewit, Omaha, Nebraska; Condon-Cunningham Construction Company, Omaha; Thomas Bate and Sons, Denver, Colorado, and the C.F. Lytle Company, Sioux City, Iowa. The concept of a group of contractors organized together under one large company to reduce liability risks was not entirely new; the first successful implementation was during construction of Boulder Dam. Within the framework of the package contract, each company was responsible for only the percentage it agreed to perform. Honnen, a native of Colorado, became the contractor/sponsor of the project. His experience included work on Army installations at Cheyenne, Wyoming, Rock Island Arsenal in Illinois, and Peterson Field east of Colorado Springs (Connor et al. 1999; Stout 2002; Zier 2004).
Thousands of men and women, laboring around the clock, participated in construction. A force of contractors and skilled laborers were initially coordinated through union rosters nationwide.

At the peak of construction, when the unions could not provide enough skilled labor, recruitment of additional laborers from the general work force was necessary. During peak construction, the project employed close to 11,500 workers. Construction of the camp proceeded quickly. In less than a month's time after the January announcement of the establishment of Camp Carson, the first building was completed. Crews finished a large segment in a two-week period, causing the need for a Kiewit representative from the firm's home office to visit the construction site to verify the achievement.

The design layout of Camp Carson conformed to the contour of the land, thus avoiding unnecessary grading, and accounts for the banana shape of the post. Series 800 building plans, first introduced in 1941, was the architectural type used for most of the buildings constructed on Camp Carson. Dissatisfaction of design and amount of materials necessary to construct this type of architecture led to its discontinuation in October 1942. Assembly-line construction, making the headlines around the United States, was the method used at Camp Carson, as well as elsewhere. The first-floor level of a building and its foundation was staked by a transit crew, followed by a foundation crew, who drilled holes with an auger (6-minutes for each) to set in wood or concrete support piers. Framing crews consisted of two crews; construction of floors done by one crew, while the other erected walls. Prefabrication methods helped to speed construction, and as building sites were leveled pre-cut lumber arrived. A sawmill located near the railroad cut lumber planks to size, which were then shipped to Camp Carson on a specially constructed railroad spur. The D&RGW laid a spur connecting the warehouse district with Kelker, Colorado. When ever possible, procurement of construction materials was local, and when necessary shipped in from out-of-state. Plumbing and electrical crews were subcontracted, and quickly became drawn in with the assembly-line concept of construction. As the tempo of construction increased, the Mountain States Telephone and Telegraph Company joined in the activity, hurrying to keep pace with the demand for communication (Barnes 1992; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; Stout 2002; Zier 2004).

Completed six weeks before the deadline, the Army took possession of the first segment of two-story, wood-frame buildings on June 2, 1942. When the installation's facilities were complete, they provided for 35,173 enlisted men, 1,818 officers, and 592 nurses. Most buildings were of mobilization type construction, *i.e.* buildings assembled as a component in the effort to place human and material resources in a state of readiness for war. Shortly before the contract expired, the Army negotiated additional construction of a prisoner of war internment camp, barns for 3,310 horses and mules, and 374 additional buildings to house 5,000 more enlisted men and 200 officers, raising the total cost of construction to approximately $41 million. The extended date for completion was November 4; the skill and expertise brought to the project by the five companies working under Colorado Springs Construction enabled completion by the deadline. In doing so, the government received a refund of nearly $2.5 million in accordance with the "renegotiation" clause of the contract (Barnes 1991; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

Training and Mobilization

During World War II, four infantry divisions prepared for combat at Camp Carson. The camp's peak troop strength occurred in late 1943 with approximately 43,000 military personnel. In June 1942, the 89th Infantry Division, from Jefferson Barracks, Missouri, reactivated at Fort Carson on

July 14, and deployed in 1944. Following deployment to the European theater in January 1945, the division gained the nickname "Rolling W" while making assault crossings of the Moselle and Rhine rivers and advancing 350 miles into Germany. Created by the War Department in 1943, the 71st Infantry Division met the need for a small strike force capable of fighting in rough terrain. Activated at Camp Carson as the 71st Light Division in July 1943, the unit was designated the 71st Infantry Division on May 26, 1944, and transferred to Europe in February 1945. The 104th Infantry Division, activated in August 1943 at Camp Adair, Oregon, transferred to Camp Carson on March 11, 1944. The "Timberwolves" deployed to France in September 1944 and fought through Northern Europe from Antwerp to the Rhine River (Barnes 1991; Conner and Schneck 1996; Connor et al. 1999; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

Mountain and Cold Weather Training at Camp Hale

In 1942, Camp Hale constructed west of Pikes Peak near Leadville, Colorado, operated as a sub-installation of Camp Carson during the war. The Mountain Training Command, activated at Camp Carson on September 2, 1942, moved to Camp Hale in November. An increased need for troops trained in the art of mountain warfare led to the formation of the 10th Mountain Division. Activated at Camp Hale, Colorado, in July 1943, the 10th Mountain was the Army's only specifically trained mountain division. Trained by Norwegian General Dagfin Dahl, the 10th Mountain Division deployed to the mountains of Northern Italy and proved instrumental in defeating the Axis powers in the Italian campaigns (Barnes 1992; Connor and Schneck 1996; Friedman 1986; Jepson 1990; McCarthy and McCullough 2003; Stout 2002).

Prisoner-of-War Camp

In 1942, the U.S. War Department established a prisoner-of-war (POW) camp on Camp Carson, one of 511 installations throughout the United States to detain Axis prisoners of war. Colorado was the location of more than 30 POW camps, and many served as small temporary branch camps under the jurisdiction of Camp Carson. The location of Fort Carson, not in close proximity of any crucial war industries afforded maximum security; the temperate climate of the area ensured construction costs and maintenance would be minimal (Connor et al. 1999; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004) .

Fort Carson's prisoner-of-war (POW) camp opened on January 1, 1943. Original camp facilities were minimal, and meant to accommodate 3,000 enlisted men and 32 officer POWs.
In January 1943, a wildfire hit Camp Carson, and swept through the POW camp destroying twenty-three buildings. In all, the fire caused over $1 million in damage (Barnes 1992; Jepson 1990; Connor and Schneck 1996; Connor et al. 1999; Stout 2002).

The initial group of 368 Italian prisoners arrived at Camp Carson in May 1943, and soon moved to another camp outside Colorado. During their short internment, the Italian POWs built a camp theater for their production of "Romeo and Juliet." Shortly after the Italian POWs moved, German POWs arrived. Camp Carson POWs participated in athletic events, musical performances and plays. A POW library was established, a wide variety of educational classes organized, and religious services held. A POW post exchange was set-up, and prisoners published a weekly German-language newspaper. The demands of war caused a work force shortage in Colorado, which POWs help to alleviate by doing general farm work and aiding in

logging operations. Prisoners earned $0.80 a day, but the wages could range from $0.60 to $1.20 throughout the period of internment.

One of the largest prisoner repositories in the U.S., Camp Carson housed nearly 10,000 German prisoners, during one period from 1943 – 1946 (Connor et al. 1999; Jepson 1990; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

During the war, Fort Carson incarcerated nearly 9,000 German, Italian, and some Japanese prisoners of war. In 1945, near the end of the war, Fort Carson housed an additional 5,000 prisoners in barracks located east of Pershing Field. Repatriation of all POWs to their respective homelands occurred by July 21, 1946.

Archival research (1990) and archaeological investigations of 1989 and 1990 determined that there was little intact evidence of the Camp Carson Prisoner-of-War camp. Archaeological testing (1995) determined that there were no subsurface remains (Barnes 1992; Jepson 1990; Connor and Schneck 1996; Connor et al. 1999; Stout 2002).

Carson Hospital Center/Old Hospital Complex

In 1942, the Carson Hospital Center, the largest of nine medical centers built in the nation during World War II, opened to provide immediate medical care for Camp Carson's soldiers. The Center had a 2,000-bed capacity with 11 square miles of floor space. The combined general and convalescent hospitals cared for more than 30,000 patients over the course of the war. The staff consisted of three Women's Army Corps (WAC) hospital companies, 2,000 civilians, and hundreds of doctors, nurses, and medical corpsmen. The Carson Hospital Center was also a major training center for nurses. The Army Nurse Training Center trained more than 3,000 nurses between October 1943 and the end of the war. When the war ended the Carson Hospital Center was inactivated, and a temporary separation center was established. The 400-bed center continued treating patients scheduled for release before May 31, 1946. About 9,000 soldiers from installations in a four-state area processed for discharge through the center (Barnes 1992; Connor and Schneck 1996; McCarthy and McCullough 2003; Stout 2002).

The Old Hospital Complex at Fort Carson was determined as an eligible property for inclusion in the National Register in 1991. The complex, constructed of semi-permanent buildings, followed the Department of the Army's Series 800 plans. A 1991 Memorandum of Agreement (MOA) and a 2002 amended MOA with the Colorado State Historic Preservation Office, allowed for disposal of all complex buildings except Buildings #6237 and #6236. In 1995, a Historic Architectural Building Survey was completed on 59 buildings in the complex and Colorado site forms completed, with both the interior and exterior of buildings inventoried and evaluated. Literature research and review of the Directorate of Public Works real property forms were completed and an historic context written. The 2002 MOA provides for adaptive reuse of Building #6237 and Building #6236. The exterior of Building #6236 has been restored to historic standards, and the Directorate of Environmental Compliance and Management currently occupies the building. Plans for Building #6237 involve restoring its interior and exterior to historic standards to accommodate additional office space for Fort Carson personnel. Management includes establishing a buffer zone around Buildings #6237 and #6236 to maintain existing line-of-sight features (Napier and McCarthy 2000; Clapper 2000; Stout 2002).

Cold War, 1946-1989

By 1946, with activities greatly reduced, it appeared that Camp Carson would close. The military strength at the camp had dropped to around 600, not including 320 patients at the hospital. In April, an announcement made by the War Department verified that the camp would remain open. In late April and May, troop strength increased when the 38th Regimental Combat Team and the 611th Field Artillery Battalion transferred to Camp Carson. To facilitate the families of enlisted men, the Army converted a large block of two-story barracks into NCO apartments for families of enlisted men.

A fire that started in the Broadmoor area on January 17, 1950, and driven by 50 mile-per-hour winds soon spread over the post. It would be the worst fire to strike the post in its history. In an attempt to stop the fire, post engineer bulldozers cut a firebreak across the northern part of the post. The unceasing winds blew the fire where there were no men and equipment available to extinguish or control its velocity, causing the destruction of more than 33 buildings. Civilian volunteers and fire fighting equipment from the surrounding town was not able to come to the camp's aid until mid-morning. Families evacuated from the NCO housing area went to Pueblo. By noon, when the fire still blazed, it appeared total destruction was the fate of the entire camp. Wind velocity dropped by dusk, allowing firefighters finally to extinguish the fire by midnight. Six people lost their lives in the fire, and 92 buildings destroyed resulting in $3 million in damage (Barnes 1992; Stout 2002).

In 1950, at the onset of the Korean War, activities at Camp Carson increased. Many Reserve and National Guard units called into active duty began to arrive. The 196th Regiment Combat Team from the South Dakota National Guard, the largest unit, arrived in September. The camp also served as duty station for more than 20 engineer and artillery battalions and several miscellaneous companies and detachments. To process returning veterans, Activated in July 1951, the Camp Carson Separation Center prepared to process returning Korean War veterans. More than 100,000 soldiers were processed by the end of 1953 (Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002).

As the nation emerged from war to peace in the early 1950s, Camp Carson continued to serve as duty station for approximately 25,000 troops. The future of the camp was uncertain, and the lack of approval for new construction did not indicate positive prospects. Colorado Springs was just beginning to recover from an economic recession, when an announcement indicated that Camp Carson would become a fort. The designation of the post as Fort Cason officially occurred on August 27, 1954. This distinction from camp to fort did not necessarily ensure a secure future for the post. Congress approved approximately $3.5 million for the construction of new barracks and officer quarters. Fort Carson was authorized $13 million for construction of 1,000 sets of family quarters, and a NCO mess hall. By the mid-1950s, cuts made to the Department of Defense's budget affected Fort Carson. Units of the 9th Infantry Division, stationed on Fort Carson, were inactivated. Efficiency experts argued that Fort Carson was too remote from main transportation arteries and population centers to be economically viable as an Army post. By 1960, the 2nd United States Army Missile Command (Medium) was the only major unit stationed at Fort Carson (Barnes 1992; Connor and Schneck 1996; Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002; Zier 2004).

In response to the Berlin Crisis of 1961 and the Cuban Missile Crisis of 1962, two more divisions activated at Fort Carson. The 5th Infantry Division (Mechanized), formally reactivated at Fort Carson on February 19, 1962, was the first division to be organized under the "ROAD" (Reorganization Objectives Army Division) concept. Training a mechanized division triggered the need for more land. In 1965, Fort Carson acquired 24,577 acres of state land by trading it for federal land located at the Lowry Bombing Range east of Denver. In 1965 and 1966, the Army acquired a total of 78,741 acres of land south of Fort Carson's original reservation at a cost of approximately $3.5 million. These additions brought Fort Carson to its current size of 138,523 acres (Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002).

Fort Carson opened Camp Red Devil, the first year-round training area for soldiers in a field environment on March 7, 1966 (Barnes 1992). Training for Southeast Asia was also a priority at Fort Carson. By the end of 1966, Fort Carson deployed 9,000 soldiers to Vietnam, with another 9,000 deployed in 1967, and 6,000 in 1968. Activities at Fort Carson had risen to a higher level near the end of 1968 than at any time since World War II. In October 1965, the military strength was 9,658 and by March 1967 had more than doubled with 24,735 troops. In March 1965, civilian strength was 1,337 and had increased to 2,445 in July 1967. The economic impact of Fort Carson on the Colorado Springs region rose from approximately $55 million in 1964 to $100 million in 1967. By January 1973, the economic impact was over $340 million (McCarthy and McCullough 2003; Stout 2002).

Force reductions in Vietnam, 1 November 1970, deployed the 4th Infantry Division back to the United States and to Fort Carson, replacing the 5th Infantry Division. In its new western home, the 4th Infantry Division was reorganized as a mechanized infantry division (Stout 2002). Fort Carson would become an initial test site for The Modern Volunteer Army concept in January 1971. The 18-month field test aimed to create an environment conducive for an all-volunteer Army, with plans to incorporate the best field test experiences in future Army budgets (McCarthy and McCullough 2003; Stout 2002).

The need for additional land for Army training received considerable emphasis during 1974. The Army was considering the Pinon Canyon area southeast of Pueblo, Colorado, for land acquisition by the late 1970s. Purchase of 245,000 acres in the Pinon Canyon area, 100 air miles southeast of Fort Carson, was made in September 1983 at an approximate cost of $26 million. Relocation of eleven landowners and school bond relief cost an additional $2 million. The Pinon Canyon Maneuver Site opened for training in the summer of 1985 (Connor and Schneck 1996; Connor et al. 1999; McCarthy and McCullough 2003; Stout 2002). In 1986, the Evans Army Community Hospital was dedicated continuing Fort Carson's long tradition of providing medical care to U.S. citizens and soldiers (McCarthy and McCullough 2003).

Post Cold War, 1990-Present

Changes in troop units assigned to Fort Carson in the 1990s reflect the evolving role of defending the United States. The 43rd Corps Support Group, supported the 4th Division and III Corps and was deployed to Saudi Arabia in October 1990 and served in Operations Desert Shield and Desert Storm until April 1991. The 43rd sent units to Somalia in December 1992 for Operation Restore Hope, and redesigned as Area Support Group. In 1992, the 10th Special

Forces Group (Airborne) arrived at Fort Carson. In 1995, a number of brigades and troop units were inactivated, reassigned or re-flagged. The 4th Infantry Division headquarters, one maneuver brigade (1st Brigade), and support units at Fort Carson were inactivated. One brigade of the 3rd Brigade Combat Team was reassigned to the 2nd Armored Division, Fort Hood, Texas, but remained at Fort Carson. The 2nd Armored Division at Fort Hood was re-flagged as the 4th Infantry Division, and the 3rd Armored Cavalry Regiment was relocated to Fort Carson from Fort Bliss, Texas. The latest major unit change is the formation of the 7th Infantry Division at Fort Carson in 1999 (Stout 2002; McCarthy and McCullough 2003; Zier 2004).

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Individuals Contacted

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Jeffrey Dean, Laboratory of Tree-Ring Research, University of Arizona, Tucson, Arizona.

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Janet Lecompte, Colorado Springs, Colorado

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Provided by

Fort Carson Directorate of
Environmental Compliance and Management,
Cultural Resources Program

ATTACHMENT G.2

1980 Memorandum of Agreement Regarding Fort Carson Military Reservation

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1980 MEMORANDUM OF AGREEMENT REGARDING FORT CARSON MILITARY RESERVATION

Advisory
Council On
Historic
Preservation

1522 K Street, NW
Washington, DC 20005

MEMORANDUM OF AGREEMENT

WHEREAS, the Department of the Army, Headquarters Fort Carson and Headquarters 4th Infantry Division (Army), propose to continue training at the Fort Carson (Installation); and,

WHEREAS, the Army proposes to acquire additional training land within Southeastern Colorado (for the purposes of this Agreement the term "Fort Carson" includes the existing installation as well as any additional lands that may be acquired); and,

WHEREAS, the Army, in consultation with the Colorado State Historic Preservation Officer (SHPO), has determined that these undertakings as proposed may have an adverse effect upon cultural properties included in or eligible for the National Register of Historic Places; and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended, 90 Stat. 1320), Section 2(b) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment," the Army has requested the comments of the Advisory Council on Historic Preservation (Council) in accordance with the Council's regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800); and,

WHEREAS, representatives of the Council, the Army and the Colorado SHPO have consulted and reviewed the undertakings as proposed; and,

NOW, THEREFORE, it is mutually agreed that the implementation of the undertakings, in accordance with the following stipulations, will avoid, minimize, or mitigate adverse effects on cultural properties.

Stipulations

The Army will ensure that the following stipulations are carried out at Fort Carson (Installation).

I. All survey, evaluations, data recovery, monitoring of land disturbing activities, or rehabilitation work performed in accordance with this Agreement will be conducted under the direct supervision of a person who meets at a minimum the appropriate professional qualifications set forth in 36 CFR Part 1210, Appendix C and who has professional experience relevant to Southeastern Colorado.

II. The Army will ensure compliance with the Archeological Resources Protection Act of 1979 and will advise all contract and Army personnel

and resident dependents against illegal collection of cultural materials and of the penalties for such collection imposed by the Act.

III. Copies of all scopes of work, reports, plans, or other products generated under this Agreement will be provided to the Colorado SHPO for review and comment.

IV. Copies of any final technical reports will be furnished to the Council and to Interagency Archeological Services (Heritage Conservation and Recreation Service, Department of the Interior, Washington, D.C. 20243), for possible submission to the National Technical Information Service (NTIS). Any precise locational data should appear in a separate appendix and may be withheld from NTIS publication pursuant to Section 11 of the General Authorities Act of 1970, as amended (P. L. 94-458).

V. An Historic Preservation Program for the Installation will be developed and implemented in consultation with the Colorado SHPO and, as appropriate, historical architects, archeologists, or other historic preservation specialists. The Historic Preservation Program will be included as an element of the Installation Master Plan and will be used to guide installation and training exercise planning. In order to promote consistency in the treatment of cultural properties on the Installation, the Historic Preservation Program will be responsive to Army Technical Manuals TM5-801-1, TM5-801-2, and Technical Note No. 78-17, dated September 15, 1978, until it is superceded by Army Technical Manual TM5-801-3 (presently in draft form).

A. The Historic Preservation Program must include, but need not be limited to, the following elements:

1. A cultural property overview and archeological research design (or designs) that identifies the types of cutural properties that are expected to be found on the installation; that sets forth the research topics to be addressed; and that establishes survey and other investigation strategies for the identification and evaluation of such properties.

2. A strategy for completing the cultural property survey required by Section 2(a) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment." This strategy will include:

a. assignment of all installation land into land-use categories based on intensity of military use or land disturbing activities, such as planned construction and new training areas;

b. survey priorities based on the land-use categories;

c. time table for completion of the survey; and,

d. staffing and funding programs.

3. An Installation procedure to be followed in determining historic and cultural properties eligible for inclusion in the National Register of Historic Places, which is consistent with 36 CFR 1204.

4. An Installation procedure for reviewing actions to determine effects (36 CFR Sec. 800.3) on National Register or eligible properties.

5. An Installation procedure for the preservation of affected National Register or eligible properties. This procedure will include, but need not be limited to, the following:

a. an assessment of alternatives that would avoid project effects by project design, relocation or physical means such as signing, fencing or patrolling,

b. an assessment of alternatives designed to mitigate any adverse effects, where it is not prudent and feasible to avoid effects.

c. a process for selecting an appropriate alternative course of action (avoidance or mitigation) that includes consultation with the Colorado SHPO. The Council will be afforded an opportunity to comment where agreement cannot be reached with the Colorado SHPO and the Army, the affected property is of national significance (recognized as a National Landmark, National Historic Site, National Historic Monument, or National Historic Trail), or beyond its historic or scientific value is known to have historic or cultural significance to a community, ethnic, or social group that would be impaired by its disturbance.

d. standards and guidelines for archeological data recovery that take into account 36 CFR Part 1210 and the Council's "Recommendations for Archeological Data Recovery" (Part III of Guidelines-attached).

e. a procedure to be followed, if after meeting all the responsibilities for identification of National Register or eligible properties, the Army finds or is notified after the undertaking has begun that the undertaking will affect a previously unidentified National Register or eligible property. This procedure should permit delay of the undertaking, consultation with the Colorado SHPO and compliance with Section 800.7 of the Council's regulations.

6. Provision for curation of all specimens, field notes, photographs, negatives, and processed data in a manner that makes them available for future study at an appropriately equipped institution that meets the standards set forth in 36 CFR Sec. 1210.4 and that makes these data available to other parties for research or other appropriate purposes. Specimens may be disposed-of permanently only with the written concurrence of the Secretary of the Interior and the Colorado SHPO.

7. Provision for routine maintenance of all National Register or eligible properties consistent with Army Technical Manual TM5-801-1.

8. Provision for periodic review and refinement of the Historic Preservation Program in consultation with the Colorado SHPO.

B. After the Historic Preservation Program has been developed, it will be submitted to the Council and the Colorado SHPO for review. If, after 30 days, neither has provided written objections, the program may be implemented. Once approved, should the Historic Preservation Program be modified, the Council and the Colorado SHPO will be afforded an opportunity to provide written objections within 30 days of receipt of the modified program. Should the Council or the Colorado SHPO object to the proposed Historic Preservation Program, or any modifications thereof, the Army, Colorado SHPO, and the Council will consult to resolve the objections.

VI. Within 180 days after ratification of this Agreement, the Army will submit a draft of the Historic Preservation Program to the Council and the Colorado SHPO..

VII. Until the Historic Preservation Program is implemented and during any period in which objections between the Army and SHPO remains unresolved, the Army will follow the procedure set forth in 36 CFR Part 800.

VIII. If any of the signatories to this Agreement determine that the terms of the Agreement cannot be met or believes a change is necessary, that signatory shall immediately request the consulting parties to consider an amendment or addendum to the Agreement. Such an amendment or addendum shall be executed in the same manner as the original Agreement.

Robert Barrey NOV. 17 1980

Executive Director (date)
Advisory Council on Historic Preservation

26 Nov 8
BERNARD D. FRIEND
Colonel, MPC
Deputy Post Commander
Fort Carson, U.S. Army
(date)

12.9.80
Colorado State Historic
Preservation Officer
(date)

12-15-80
Chairman
Advisory Council on Historic Preservation
(date)

CULTURAL RESOURCES LAWS, REGULATIONS, AND EXECUTIVE ORDERS

The Cultural Resources Management Program at the US Army Environmental Center offers a variety of resources to help support military readiness and quality of life for our soldiers.

An archeological project is not complete simply because the artifacts are out of the ground and a final report has been submitted. The materials recovered from archeological inventories, evaluations and data recovery projects must be appropriately curated for the benefit of future scientists, educators, and museum specialists.

Statutes:

- Abandoned Shipwreck Act of 1987 (43 USC 2101-2106)
- Archeological Resources Protection Act of 1979 (16 USC 470aa-470mm)
- American Indian Religious Freedom Act of 1978, as amended (42 USC 1996-1996a)
- Archeological and Historic Preservation Act of 1974 (16 USC 469-469c)
- National Environmental Policy Act of 1969 (42 USC 4321-4370c)
- National Historic Preservation Act of 1966, as amended (16 USC 470-470w)
- Historic Sites, Buildings and Antiquities Act of 1935 (16 USC 461-467)
- Antiquities Act of 1906 (16 USC 431-433; 34 Stat 225)
- Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001-3013)

Federal Regulations and Guidelines:

- Advisory Council on Historic Preservation: Protection of Historic Properties (36 CFR 800)
- Council on Environmental Quality: Regulations Implementing the National Environmental Policy Act (40 CFR 1500-1508)
- Department of Defense: American Indian and Alaska Native Policy
- Department of Defense Guidelines for the Curation of Archeological Soil Samples
- Protection of Archeological Resources (32 CFR 229)
- Department of the Interior: Native American Graves Protection and Repatriation Act Regulations (43 CFR 10)
- Department of the Interior: Curation of Federally-owned and Administered Archeological Collections (36 CFR 79)
- Department of the Interior: Determinations of Eligibility for Inclusion in the National Register of Historic Places (36 CFR 63)
- Department of the Interior: National Historic Landmarks Program (36 CFR 65)
- Department of the Interior: National Register of Historic Places (36 CFR 60)
- Department of the Interior: Preservation of American Antiquities (43 CFR 3)
- Department of the Interior: Protection of Archeological Resources (43 CFR 7)
- Secretary of the Interior's Standards and Guidelines for Federal Agency Historic Preservation Programs Pursuant to the National Historic Preservation Act
- Secretary of the Interior's Professional Qualification Standards (48 FR 22716, 1983)

- Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation
- Secretary of the Interior's Standards for Architectural and Engineering Documentation: HABS/HAER Standards
- Secretary of the Interior's Standards for Rehabilitation
- Secretary of the Interior's Illustrated Guidelines for Rehabilitating Historic Buildings
- Secretary of the Interior's Standards for the Treatment of Historic Properties (36 CFR 68)

Executive Orders:

- EO 11593 Protection and Enhancement of the Cultural Environment
- EO 13006 Locating Federal Facilities in Historic Properties in our Nation's Central Cities
- EO 13007 Indian Sacred Sites
- EO 13175 Consultion and Coordination with Indian Tribal Governments
- EO 13287 Preserve America

DoD and Army Regulations and Policy:

- Army Regulation 200-4: Cultural Resources Management
- DA Pamphlet 200-4: Cultural Resources Management
- Environmental Assessment for AR 200-4 —83.5kb DOC
- Department of Defense: American Indian and Alaska Native Policy
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Zier, Christian J.	Stephen M. Kalasz, Anne H. Peebles, Margaret A. Van Ness, Elaine Anderson	*Archeological Excavation of the Avery Ranch Site (5EP56) on the Fort Carson Military Reservation, Colorado.*	Report	1988
Zier, Christian J.		*Archaeological Excavation of Recon John Shelter (5EP648) on the Fort Carson Military Reservation, Colorado.*	Report	1989
Zier, Christian J.	Richard F. Carrillo	*Archaeological Survey of Live Firing Lanes in Range 111, Fort Carson, Colorado.*	Report	1989
Butler, William B.		*Cultural Resource Survey of Ten Soil Conservation Structures and the Gale Irrigation Ditch, Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado.*	Report	1990
Jepson, Daniel A.		*Historical and Archaeological Perspectives on the World War II Prisoner of War Camp at Fort Carson, Colorado.*	Report	1990
Kalasz, Stephen M.		*Archaeological Survey and Test Excavation in the Turkey Canyon Area, Fort Carson Military Reservation, Pueblo and El Paso Counties, Colorado (Appendix A).*	Report	1990

Van Ness, Margaret A.	Stephen M. Kalasz, Christian J. Zier, Daniel A. Jepson, Mollie S. Toll, Richard F. Madole, Richard F. Carrillo	*Archaeological Survey and Test Excavation in the Turkey Canyon Area, Fort Carson Military Reservation, Pueblo and El Paso Counties, Colorado.*	Report	1990
Zier, Christian J.	Stephen M. Kalasz, Anne H. Peebles, Margaret A. Van Ness, Elaine Anderson	*The Avery Ranch Site Revisited.*	Article	1990
Andrefsky, William Jr.		*Inferring Trends in Prehistoric Settlement Behavior from Lithic Production Technology in the Southern Plains.*	Article	1991
Barnes, Andrea M.		*An Archival and Photographic Study of World War II Temporary Wooden Buildings, Fort Carson Military Reservation, Colorado*	Report	1991
Butler, William B.		*Reconnaissance Survey of a Proposed Fiber-Optic Line, Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado.*	Report	1991
Carrillo, Richard M.	Christian J. Zier, Andrea M. Barnes	*The Documentation of Stone City (5PE793): Historical Archaeology on the Fort Carson Military Reservation, Colorado.*	Report	1991
Jepson, Daniel A.		*Camp Carson, Colorado: European Prisoners of War in the American West During World War II.*	Article	1991

Zier, Christian J.	Stephen M. Kalasz	*Recon John Shelter and the Archaic-Woodland Transition in Southeastern Colorado.*	Article	1991
Chomko, Stephen A.	Lucy Annis Gange, Ted Roesgen	*Our Past, Our Future: Cultural Resources of the Pinon Canyon Maneuver Site.*	Video	1992
Barnes, Andrea M.	Christian J. Zier	*Documentation and National Register Assessment of the Old Hospital Complex and Red Creek Ranch, Fort Carson Military Reservation, Colorado.*	Report	1992
Butler, William B.		*Cultural Resource Investigations of Several Small Scale Projects on the Fort Carson Military Reservation, Colorado.*	Report	1992
Jepson, Daniel A.	Christian J. Zier, Stephen M. Kalasz, Andrea M. Barnes	*Archaeological Survey of High Priority Parcels and Other Miscellaneous Areas on the Fort Carson Military Reservation, Colorado.*	Report	1992
Kalasz, Stephen M.		*Archaeological Survey of High Priority Parcels and Other Miscellaneous Areas on the Fort Carson Military Reservation, El Paso, Pueblo and Fremont Counties, Colorado (Appendices A & B).*	Report	1992
Barnes, Andrea M.	Christian J. Zier	*Documentation and Evaluation of Certain Historic Sites on the Fort Carson Military Reservation, Colorado.*	Report	1993

Chomko, Stephen A.	J. Michael Hoffman	*The East Fork Burial.*	Manuscript	1993
Garner, John S.		*World War II Temporary Military Buildings: A Brief History of the Architecture and Planning of Cantonments and Training Stations in the United States.*	Report	1993
Kalasz, Stephen M.	Daniel A. Jepson, Christian J. Zier, Margaret A. Van Ness	*Text Excavations of Seven Prehistoric Sites on the Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado.*	Report	1993
Spath, Carl		*City of Colorado Springs, Department of Wastewater Proposed Test Wells on Fort Carson Military Reservation Township 16 South, Range 66 West, Section 36, El Paso County: Class III Cultural Resource Inventory.*	Report	1993
Zier, Christian J.	Kurt P. Schweigert, Mary W. Painter, Marilynn A. Mueller, Kenneth R. Weber	*Archaeological Excavation of the Avery Ranch Site (5PE56) on the Fort Carson Military Reservation, Colorado.*	Report	1993
Andrefsky, William Jr.		*Raw Material Availability and the Organization of Technology.*	Article	1994
Hartman Associates Inc.		*Report of Control Survey Fort Carson Colorado Springs, Colorado.*	Report	1994

Mueller, Marilynn A.	Sherryl A. McBride	*Fort Carson Curation Notebook and Artifact Database Documentation.*	Manual	1994
Schneck, James		*HABS Documentation: Surgery and X-Ray Building No. S6233, Fort Carson, Colorado.* (Old Hospital Complex)	Report	1994
Connor, Melissa A.	James Schneck	*Old Hospital Complex (5EP1778), Fort Carson, Colorado.*	Report	1995
Conner, Melissa		*Fort Carson and Pinon Canyon Archeology Forms, Revised 1995.*	Forms	1995
Zier, Christian J.	Stephen M. Kalasz, Margaret A. Van Ness, R. Johnson, F. Madole, J. L. Anderson, Elaine Anderson, L. Grantham, L. S. Cummings	*Archeological Excavation of Recon John Shelter (5PE548) on the Fort Carson Military Reservation, Colorado.*	Report	1995
Evanoff, Emmett	Benjamin Burger, Melissa Burke, M. Erik Dorsett, Kari Wright	*Preliminary Mapping and Report on Physiography, Geophysical Data, Surficial Geology, and Paleotologic Resources of the Fort Carson Military Reservation, Colorado.*	Report	1996
Korgel, Randy		*Test Excavations at Building 10001, Turkey Creek National Register District, Fort Carson Military Reservation, Colorado.*	Report	1996

Korgel, Randy		*Test Excavations at Mountain Post Sports Complex, Fort Carson, Colorado.*	Report	1996
Schneck, Jim	Julie Field, Karin Roberts, Christine Voight	*HABS Level II Documentation: Turkey Creek Ranch, Fort Carson, Colorado.*	Report	1996
Schneck, James		*Management and Maintenance Manual: The Old Hospital Complex (5EP1778).*	Manual	1996
Schneck, James		*HABS Level II Documentation: Fort Carson Hospital (Old Hospital Complex) State No. 5EP1778.*	Report	1996
Zier, Christian J.	Stephen M. Kalasz, Daniel A. Jepson, Stephen A. Brown, Mary W. Painter, Kathryn Puseman	*Archaeological Survey, Site Documentation, and Test Excavation Conducted During the 1991 and 1993 Field Seasons on the Fort Carson Military Reservation, Colorado.*	Report	1996
Zier, Christian J.	Kurt P. Schweigert, Mary W. Painter, Marilynn A. Mueller, Kenneth R. Weber	*Archaeological Survey, 1991-1993 Field Session.*	Report	1996
Charles, Mona	P. Duke and R. Nathan	*A Cultural Resource Inventory of Portions of Booth Mountain, Fort Carson, Colorado.*	Report	1997
Chomko, Stephen A.		*Fort Carson Cultural Resource Reports Requirements.*	Manual	1997

Connor, Melissa A.	James Schneck	*Fort Carson in World War II - The Old Hospital Complex, Fort Carson, Colorado.*	Report	1997
DCA/DPW		*Overview of Use Plan, Turkey Creek Recreation Area Developmental Concept: Turkey Creek Ranch Recreation Area Historic District.*	Report	1997
National Park Service		*Historic American Engineering Record: Waste Water Treatment Plant & Incinerator Complex, Fort Carson, Colorado.*	Report	1997
National Park Service		*Turkey Creek Ranch, HABS Level II Documentation, Fort Carson, Colorado.*	Report	1997
National Park Service		*Waste Water Treatment Plant and Incinerator Complex, HABS Level II Documentation, Fort Carson, Colorado.*	Report	1997
Schweigert, Kurt P.		*Catalog of Historic Land Entries for the Fort Carson Military Reservation, Colorado.*	Catalog	1997
U.S. Army Engineer District, St. Lewis		*Results of the NAGPRA Investigation of the Archaeological Collections from Fort Carson and Pinon Canyon Maneuver Site.*	Report	1997
Zier, Christian J.		*The Archaeology and History of the Fort Carson Military Reservation, Colorado.*	Report	1997

Zier, Christian J.	Kurt P. Schweigert, Mary W. Painter, Marilynn A. Mueller, Kenneth R. Weber	*Cultural Resource Management Plan for Fort Carson Military Reservation, Colorado.* Volume I - Management.	Plan	1997
Zier, Christian J.	Kurt P. Schweigert, Mary W. Painter, Marilynn A. Mueller, Kenneth R. Weber	*Cultural Resource Management Plan for Fort Carson Military Reservation, Colorado.* Volume II - Supporting Data.	Plan	1997
Zier, Christian J.	Mary W. Painter, Kurt P. Schweigert	NRHP Multiple Property Documentation Forms, Cultural Resources of the Fort Carson Military Reservation, El Paso, Fremont and Pueblo Counties, Colorado.	Forms	1997
Baker, Karen J.		*History Project Helps Army Protect Cultural Resources.*	Article	1998
Conner, Melissa	Dawn Bringelsohn	*Dean Manual Revisions.*	Manual	1998
Jones, Donald G.	Martha Williams, Kathy Stemmler, Michael H. McGrath, Elizabeth C. Winstead	*Ethnohistoric and Ethnographic Information Related to the Fort Carson Military Reservation and Pinon Canyon Maneuver Site in Colorado.*	Report	1998
Korgel, Randy	Stephen A. Chomko	*A Cultural Resource Inventory of Prescribed Burned Areas, Multi-Purpose Range Complex, Fort Carson, Colorado.*	Report	1998

Korgel, Randy		*Backhoe Trenching of a Proposed Erosion Control site, Red Creek Vicinity, Fort Carson, Colorado.*	Report	1998
Kuehn, David D.		*Results of a Reconnaissance-Level Geomorphic and Geoarchaeological Inventory of Red Creek, Fort Carson, Colorado.*	Report	1998
Raynolds, Robert	Douglas Nelson, Frederick Olsen	*Results of the Field Study of the Paleontological Resources on the Fort Carson Military Reservation, Colorado.*	Report	1998
Roberts, Karin	James Schneck	*Turkey Creek Ranch (5EP836), Fort Carson, Colorado.*	Report	1998
Schneck, James	Karin M. Roberts	*Waste and Water Treatment Plant and Incinerator Complex (5EP2447 and 5EP2446), Fort Carson, Colorado.*	Report	1998
Taylor, Melissa A.	Hoefer III, Ted	*Cultural Resources Survey of the Poncha-Midway Transmission Line Access Roads and Tower Locations Chaffee, Fremont, Pueblo, and El Paso Counties, Colorado. Volume I Text, Appendices A-F.*	Report	1998

Taylor, Melissa A.	Hoefer III, Ted	*Cultural Resources Survey of the Poncha-Midway Transmission Line Access Roads and Tower Locations Chaffee, Fremont, Pueblo, and El Paso Counties, Colorado. Volume II.*	Report	1998
Charles, Mona	Randy Nathan, Phillip Duke, Nikki Salazar, Sean Larmore	*Results of a Cultural Resource Inventory of Portions of Fort Carson Military Reservation and Test Excavation of Site 5EP2524, El Paso County, Colorado, 1996.*	Report	1999
Charles, Mona	Randy Nathan, Phillip Duke, Nikki Salazar, Sean Larmore	*Results of the 1997 Cultural Resource Re-evaluation Project; Fort Carson Military Reservation: El Paso, Fremont, and Pueblo Counties, Colorado.*	Report	1999
Connor, Melissa A.	Julie Field, Karin Roberts	*Archeological Testing of the World War II Prisoner-of-War Camp (5EP1221) at Fort Carson, Colorado.*	Report	1999
Krause, Richard		*An Inventory and Analysis of Ceramics from Sites on the Fort Carson Military Base.*	Report	1999
McCarthy, Sheila A.	Patrick Nowlan, Jamie Clapper	*Determination of Eligibility: Building 1919, Fort Carson, Colorado.*	Report	1999
Napier, T. R.	Sheila A. McCarthy	*Condition Assessment of Building 6237, Old Hospital Complex, May 1999.*	Report	1999

Paleonotological Investigations		*Paleontological Sites of the Fort Carson Military Reservation, Colorado (Revised Site Forms). CONFIDENTIAL*	Forms	1999
Raynolds, Robert	Douglas Nelson, Frederick Olsen	*Results of the Field Study of the Paleontological Resources of the Fort Carson Military Reservation, Colorado.*	Report	1999
Center for Ecological Management of Military Lands (CEMML)		*World War II Era Facilities Mitigation, Draft HABS II Documentation.*	Report	2000
Charles, Mona	Phillip Duke, Randy Nathan, Sujan Bryan, Christine Markussen	*A Cultural Resources Inventory of High and Medium Site Sensitivity Areas, Fort Carson Military Reservation: El Paso, Fremont, and Pueblo Counties, Colorado, 1998.*	Report	2000
Chomko, Stephen A.	Vincent Schiavitti	*A Cultural Resources Inventory of the Range 155 Upgrades and Erosion Control Structures, Fort Carson, Colorado.*	Report	2000
Clapper, Jamie L.	Sheila A. McCarthy	*Turkey Creek Ranch Historic District Design Guidelines, November 2000.*	Report	2000
Clapper, Jamie L.		*A Study for the Adaptive Re-use of Old Hospital Complex Building 6237, Fort Carson, Colorado, Architecture 491 --Preservation Thesis.*	Thesis	2000

Grashof, Bethanie C.		*Evaluation of Proposed Historic District: Warehouse and Utility Area, Fort Carson, Colorado.*	Report	2000
Griffin, Marcus		*Protecting Mission Activities and Cultural Resources at Fort Carson and Pinon Canyon Maneuver Site through Consultation with Native American Tribes.*	Draft	2000
McCarthy, Sheila A.		*Turkey Creek Recreation Area Immediate Concerns to Historic Properties.*	Report	2000
Napier, T. R.	Sheila A. McCarthy	*Condition Assessment of Building 6237, Old Hospital Complex, August 2000.*	Report	2000
Charles, Mona	P. Duke, R. Nathan, S. Bryan,, C. Markussen	*Evaluative Testing of 13 Sites on the Fort Carson Military Reservation, El Paso and Pueblo Counties, Colorado.*	Report	2001
Clapper, Jamie L.	Scott Riley, Karen Zimnicki, and Sheila McCarthy, Principal Investigator	*Turkey Creek Recreation Area Maintenance Manual.*	Manual	2001
Cowen, Pamela	DECAM	Cultural Resources Action Plan, 2002-2006.	Plan	2002
Flowers, Michael	Randy Korgel	*A Cultural Resource Inventory of the Fort Carson Military Reservation Cantonment Area.*	Report	2002

Krause, Richard		*An Inventory and Analysis of Ceramics from Sites on the Fort Carson Military Base and the Pinon Canyon Maneuver Site.*	Draft	2002
Stout, Gene	Jeff Blythe	Integrated Cultural Resources Management Plan and Environmental Assessment 2002-2006.	Plan	2002
Swan, Thaddeus	DECAM	Range 127 Survey and Mitigation.	Report Pending	2002-2004
Zeidler, James	Michael O'Donnell	*Fort Carson Predictive Archaeological Model.*	Model	2002
McCarthy, Sheila	Roy L. McCullough	*The Cold War and Fort Carson: A Historic Context.*	Report	2003
Swan, T.		*forthcoming: 2002 DECAM Range 127 Surveys.*	Pending	2003
De Vore, Steven L.		*Geophysical Baseline Survey of site 5PE623 for Site Burial Project on Fort Carson Military Reservation Pueblo County, Colorado.*	Report	2004
Kennerly, Dan L.		*You Have Come a Long Way to Die: A 10th Mountain Division Diary of War in Italy.*	Booklet	2004

Wiley, Spc. Jon		*"Giving a Helping Hand" RE: Turkey Creek Ranch Penrose House, Fort Carson, Colorado.*	Newspaper article	2004
Blythe, Jeffrey		*Our Footprints are There: Report of Native American Consultation to Identify Traditional Cultural Properties and Sacred Sites on Lands Administered by Fort Carson, Colorado.*	Draft	2005
Chidley, Mike	DECAM	Range 155 Survey and Mitigation.	Report Pending	2005
Moody, Terry	Pamela Cowen	Restoration Plan for Building 6237, Old Hospital Complex Historic District, Fort Carson, Colorado.	Plan	2007
Anderson, Cody		*Gilligan's Island Site 5FN1592: An Archaic to Late Prehistoric Stage Site on FCMR, Fremont County, Colorado.*	Thesis	2008

Provided by

Fort Carson Directorate of
Environmental Compliance and Management,
Cultural Resources Program

ATTACHMENT G.4

Comprehensive Agreement

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COMPREHENSIVE AGREEMENT

Regarding Tribal Access, Privacy and Information Sharing, and Inadvertent Discovery and Intentional Excavation of Native American Human Remains and Cultural Items Culturally Affiliated with the Following Indian Tribes:

Apache Tribe of Oklahoma
Cheyenne and Arapaho Tribes of Oklahoma
Comanche Nation of Oklahoma
Kiowa Tribe of Oklahoma
Northern Arapaho Tribe
Northern Cheyenne Tribe
Oglala Sioux Tribe of the Pine Ridge Reservation
Shoshone Tribe (Eastern Band)
Southern Ute Indian Tribe
Ute Mountain Ute Tribe

Within Federal Lands Owned or Controlled by Fort Carson, Colorado

Whereas, Fort Carson has need to engage in ongoing activities that may result in the inadvertent discovery or intentional excavation of human remains and/or cultural items culturally affiliated with the aforementioned Federally Recognized Tribes (Tribes); and

Whereas, Fort Carson, in consultation with the Federally Recognized Tribes, is responsible for identification, protection, and disposition of human remains and cultural items on lands it administers pursuant to the Native American Graves Protection and Repatriation Act of 1990 [25 U.S.C. 3001-3013] (NAGPRA) and 43 CFR 10; and

Whereas, appropriate treatment of Native American human remains and cultural items that may be affiliated with the Tribes requires respect for the cultural traditions of tribal members; and

Whereas, the Tribes represented by the signatories hereto were aboriginal occupants of lands now administered by Fort Carson and, based on cultural and/or aboriginal affiliation, do hereby claim and assert the right of possession and control of human remains and associated funerary objects on these lands in accordance with Section 3a(2)(B) of NAGPRA; and

Whereas, Section 11 of NAGPRA and 43 CFR 10.5(f) specifically encourage the development of comprehensive agreements between federal agencies and federally recognized tribal governments to ensure the appropriate treatment of Native American human remains and cultural items;

NOW, THEREFORE, Fort Carson and the identified Tribes agree that the following procedures will be followed for tribal notification and consultation and for the treatment and disposition of all Native American human remains and cultural items that are inadvertently discovered or excavated on lands administered by Fort Carson.

Definitions

For the purposes of this agreement, the following definitions apply:

- *Cultural affiliation* means "that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian Tribe or Native Hawaiian organization and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence, based on geographical, kinship, biological, archeological linguistic, folklore, oral tradition, historical evidence, or other information or expert opinion, reasonably leads to such a conclusion" [43 C.F.R. 10.2(e)].
- *Cultural items* means, collectively, human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony [25 U.S.C. 3001].
- *Federally recognized tribe* means any tribe, band, nation, or other organized Indian group or community of Indians which is recognized as eligible for special programs and services provided by the United States to Indians because of their status as Indians. Such acknowledged or *federally recognized* Indian tribes exist as unique political entities in a government-to-government relationship with the United States.
- *Funerary objects* mean "items that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains." [43 C.F.R. 10.2(d)(2)]. *Associated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are also in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(i)]. *Unassociated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are nor in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(ii)].
- *Human remains* means the "physical remains of a human body, including but not limited to bones, teeth, hair, ashes, or mummified or otherwise preserved soft tissues, of a person of Native American ancestry. For the purposes of determining cultural affiliation, human remains incorporated into a funerary object, sacred object, or object of cultural patrimony, as defined below, must be considered as part of that item" [43 CFR 10.2(d)(1)].
- *Inadvertent discovery* means "the unanticipated encounter or detection of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(d)" of NAGPRA [43 C.F.R. 10.2(g)(4)].
- *Intentional excavation* means "the planned archeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(c)" of NAGPRA [43 C.F.R. 10.2(g)(3)].
- *NAGPRA SOP* is the *Fort Carson NAGPRA Standard Operating Procedures*, appended to this agreement.
- *Objects of cultural patrimony* means "items having ongoing historical, traditional, or cultural importance central to the Indian Tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member. Such objects must have been considered inalienable by the culturally affiliated Indian Tribe or Native Hawaiian organization at the time the object was separated from the group" [43 C.F.R. 10.2(d)(4)].
- *Sacred objects* means "items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents. While many items, from ancient pottery sherds to arrowheads, might be imbued with sacredness in the eyes of an individual, these regulations are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony" [43 C.F.R. 10.2(d)(3)].

Article I: Inadvertent Discovery of Human Remains

A. In the event of an inadvertent discovery of human remains or cultural items on lands administered by Fort Carson, Fort Carson will follow the procedures outlined in the NAGPRA Standard Operating Procedures (SOP - Appendix A).

B. All inadvertently discovered human remains that are not associated with a crime scene shall be analyzed *in situ* by means of non-destructive analysis to potentially determine cultural affiliation. Non-destructive analysis shall consist of direct physical measurement of the material, preceded, if necessary, by cleaning with a non-corrosive solution that does not damage or alter the material or object. Fragments or samples of the material shall not be taken. A qualified professional physical anthropologist or archeologist shall conduct such analysis. Other methods of analysis shall be conducted only upon consultation with the Tribes.

C. All inadvertently discovered cultural items associated with human remains shall be analyzed *in situ* and shall not be removed from their context. Other methods of analysis shall be conducted only upon consultation with the Tribes.

D. In the event that lineal descendants and cultural affiliation cannot be determined based on preliminary analysis, the signatory Tribes to this agreement, based on aboriginal occupation and use of Fort Carson lands, shall hereby claim joint ownership of the human remains and/or cultural items. Other notified Tribes not party to this agreement will have sixty (60) days within which to claim ownership.

E. The Tribes claiming ownership shall, among themselves, determine which Tribe will act as the lead in the disposition of the human remains and/or cultural items depending upon the particular circumstances of the case. If a lead cannot be determined, Fort Carson will follow the dispute resolution procedures outlined in the NAGPRA SOP (Section 6.0), and the matter may be put before the NAGPRA Review Committee.

Article II: Archeological or Other Investigation That May Result in the Discovery of Human Remains or Cultural Items

A. If Fort Carson proposes to undertake an archeological investigation or other activity that has a high probability to result in the discovery of Native American human remains, NAGPRA points-of-contact for the consulting Tribes shall be notified. Fort Carson shall consult with the Tribes (allowing for a thirty (30)-day period for response from the Tribes) to ensure that the scope of work for the investigation or activity addresses the concerns of the Tribes.

B. High probability for the discovery of Native American human remains or burial items will be determined by the Fort Carson Cultural Resources Manager based on whether the scope of work for the planned investigation or activity indicates that excavation is proposed in areas in which Native American cultural resources are likely to occur.

C. In the event of the discovery of human remains or cultural items during a planned investigation, all activity within a 30 meter radius of the remains shall stop, and the Fort Carson CRM will follow the procedures for consultation outlined in the NAGPRA SOP.

D. Analysis to determine cultural affiliation will be conducted *in situ* as stipulated in Article I of this agreement.

E. In the event that lineal descendants and cultural affiliation cannot be determined based on preliminary analysis, the signatory Tribes to this agreement, based on aboriginal occupation and use of Fort Carson lands, shall hereby claim joint ownership of the human remains and/or cultural items. Other notified Tribes not party to this agreement will have sixty (60) days within which to claim ownership.

F. The Tribes claiming ownership shall, among themselves, determine which Tribe will act as the lead in the

disposition of the human remains and/or cultural items depending upon the particular circumstances of the case. If a lead cannot be determined, Fort Carson will follow the dispute resolution procedures outlined in the NAGPRA SOP (Section 6.0), and the matter may be put before the NAGPRA Review Committee.

Article III: Access

A. In accordance with the American Indian Religious Freedom act of 1978, as amended, it is the policy of Fort Carson to accommodate requests by the Tribes for access to Fort Carson and the Pinon Canyon Maneuver Site to carry out their traditional and accustomed beliefs and practices when such access will not interfere with the military mission.

B. Tribes interested in visiting for ceremonial or other purposes shall submit a written request to the CRM at least forty-five (45) days in advance of their visit. Requests may be made via mail or e-mail. The CRM may be contacted at:

Department of Army
Directorate of Environmental Compliance and Management
ATTN: Pamela Cowen, Cultural Resources Manager
1638 Elwell St. – Bldg. 6236
Fort Carson, CO 80913-4356
pamela.cowen@carson.army.mil

C. Requests must come from the federally recognized tribal government, either via the tribal chairperson, a NAGPRA representative, or an authorized cultural or spiritual representative.

D. Depending on the circumstances, visitors may need to be escorted on site by Fort Carson personnel.

E. Tribal use of plants or other natural resources under the stewardship of Fort Carson for ceremonial or traditional purposes must be coordinated with the CRM and approved by the Director, DECAM.

Article IV: Privacy and Information Sharing

A. Fort Carson shall not provide details of any discovered human remains or cultural items to any media, agency, organization or individual, public or private, with the exception of other federally recognized tribes that may express interest. If it is determined that other parties need to be informed, information may be released upon the approval of all consulting parties.

B. Fort Carson shall not provide details of traditional cultural properties, sacred sites, or other resources of cultural significance to the Tribes to any outside media, agency, organization or individual, public or private, with the exception of Colorado State Historic Preservation Office (SHPO) and the Advisory Council on Historic Preservation (ACHP). If it is determined that other parties need to be informed, information may be released upon the approval of all consulting parties.

C. Both the Tribes and Fort Carson shall comply with the confidentiality provisions of the Archeological Resources Protection Act (ARPA) in 16 U.S.C. 470hh.

D. The Tribes may contact the Fort Carson CRM at any time to request information on cultural resources management activities.

E. Per Section 106 of the National Historic Preservation Act of 1966, as amended, the Tribes will be included in review of Fort Carson undertakings with potential to affect historic properties of cultural significance to the Tribes.

F. Subject to any applicable laws to the contrary, the Tribes may obtain copies of any Fort Carson cultural resources reports of investigations upon request, provided that requests do not exceed the photocopying capacity of the program.

Article V: Terms of the Agreement

A. This agreement shall become binding upon a party when it is signed by an authorized representative of that party. Each party warrants that it has the requisite authority to execute, deliver, and consummate the stipulations this agreement.

B. Any party may terminate its participation in this agreement by providing thirty (30) days written notice to the other parties.

C. This agreement shall remain in effect so long as Fort Carson and at least one Tribe remain as participants under it.

D. Any party to this agreement may propose in writing that it be amended, whereupon the parties will consult to consider such an amendment.

Anti-Deficiency Act Statement

All commitments made under this agreement are subject to the availability of funds. Nothing in this agreement will be construed as limiting or affecting the legal authorities of the U.S. Army or the Tribes as binding upon the parties to assume or expend funds in excess of available appropriations.

Signatures:

_____ _____ THOMAS L. WARREN Date Director Environmental Compliance and Management Fort Carson, Colorado	_____ _____ MICHAEL RESTY JR. Date COL, CM Garrison Commander Fort Carson, Colorado
_____ _____ ALONZO CHALEPAH Date Chairman Apache Tribe of Oklahoma	_____ _____ GILBERT BRADY Date NAGPRA Representative Northern Cheyenne Tribe
_____ _____ JOE BIG MEDICINE Date Southern Cheyenne NAGPRA Representative Cheyenne and Arapaho Tribes of Oklahoma	_____ _____ JOHN YELLOW BIRD STEELE Date President Oglala Sioux Tribe of the Pine Ridge Reservation
_____ _____ WILLIAM LEE PEDRO Date Southern Arapaho NAGPRA Representative Cheyenne and Arapaho Tribes of Oklahoma	_____ _____ DELPHINE CLAIR Date NAGPRA Representative Shoshone Tribe (Eastern Band)
_____ _____ WALLACE COFFEY Date Chairman Comanche Nation of Oklahoma	_____ _____ NEIL BUCK CLOUD Date NAGPRA Coordinator Southern Ute Indian Tribe
_____ _____ BILLY EVANS HORSE Date Chairman Kiowa Tribe of Oklahoma	_____ _____ TERRY KNIGHT SR. Date NAGPRA Representative Ute Mountain Ute Tribe
_____ _____ ROBERT J. GOGGLES Date NAGPRA Representative Northern Arapaho Tribe	

FORT CARSON

NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT (NAGPRA) STANDARD OPERATING PROCEDURES (SOP)

1.0 INTRODUCTION

a. Fort Carson is engaged in continuing archeological survey and evaluation of cultural resources on Fort Carson and the Pinon Canyon Maneuver Site (PCMS).

1) Approximately 55% of installation lands have been surveyed (as of October 2002).
2) A total of 5,616 archeological sites have been identified on Fort Carson and the PCMS.
3) A total of 861 sites have been determined eligible for inclusion in the National Register of Historic Places.
4) Prehistoric sites number 4,258; historic sites number 890. A total of 468 are multi-component, *i.e.* have both prehistoric and historic components.

b. Models of site location probability indicate that the lands remaining to be surveyed are likely to contain additional sites and National Register eligible properties. The studies conducted to date indicate that human burials are rare but do occur on Fort Carson administered lands.

c. This SOP is an integral feature of the Fort Carson *Integrated Cultural Resources Management Plan, 2002-2006* (ICRMP), an internal planning document guiding cultural resources management on Fort Carson and the PCMS. This SOP supercedes the interim NAGPRA SOP in Section 6.4 of the ICRMP.

d. Appended to these procedures are:

1) Appendix A: a list of applicable legislation, executive orders, and Presidential memoranda.
2) Appendix B: a template for notification of the Garrison Commander and Indian Tribes.
3) Appendix C: a list of official tribal contacts.

2.0 DEFINITIONS: Reference: Native American Graves Protection and Repatriation Act 25 U.S.C. 3001, Sec. 2, unless indicated otherwise.

- *Burial site* means "any natural or prepared physical location, whether originally below, on, or above the surface of the earth, into which as a part of the death rite or ceremony of a culture, individual human remains are deposited, and includes rock cairns or pyres which do not fall within the ordinary definition of grave site" [43 C.F.R. 10.2(d)(2)].
- *Cultural affiliation* means "that there is a relationship of shared group identity which can reasonably be traced historically or prehistorically between members of a present-day Indian Tribe or Native Hawaiian organization and an identifiable earlier group. Cultural affiliation is established when the preponderance of the evidence, based on geographical, kinship, biological, archeological linguistic, folklore, oral tradition, historical evidence, or other information or expert opinion, reasonably leads to such a conclusion" [43 C.F.R. 10.2(e)].
- *Cultural objects* specifically refers to associated funerary objects, sacred objects, and objects of cultural patrimony.
- *Funerary objects* means "items that, as a part of the death rite or ceremony of a culture, are reasonably believed to have been placed intentionally at the time of death or later with or near individual human remains." [43 C.F.R. 10.2(d)(2)]. *Associated funerary objects* are "those funerary objects for which the human remains with which they were placed intentionally are also in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(i)]. *Unassociated funerary objects* are "those funerary objects for which the human remains

with which they were placed intentionally are nor in the possession or control of a museum or federal agency" [43 C.F.R. 10.2(d)(2)(ii)].

- *Human remains* means the "physical remains of a human body, including but not limited to bones, teeth, hair, ashes, or mummified or otherwise preserved soft tissues, of a person of Native American ancestry. For the purposes of determining cultural affiliation, human remains incorporated into a funerary object, sacred object, or object of cultural patrimony, as defined below, must be considered as part of that item" [43 CFR 10.2(d)(1)].
- *Inadvertent discovery* means "the unanticipated encounter or detection of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(d)" of NAGPRA [43 C.F.R. 10.2(g)(4)].
- *Indian Tribe* means "any tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village or corporation as defined in or established by the Alaska Native Claims Settlement Act [43 U.S.C. 1601 et seq.], which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians" [43 C.F.R. 10.2(b)(2)].
- *Intentional excavation* means "the planned archeological removal of human remains, funerary objects, sacred objects, or objects of cultural patrimony found under or on the surface of Federal or tribal lands pursuant to section 3(c)" of NAGPRA [43 C.F.R. 10.2(g)(3)].
- *Objects of cultural patrimony* means "items having ongoing historical, traditional, or cultural importance central to the Indian Tribe or Native Hawaiian organization itself, rather than property owned by an individual tribal or organization member. These objects are of such central importance that they may not be alienated, appropriated, or conveyed by any individual tribal or organization member. Such objects must have been considered inalienable by the culturally affiliated Indian Tribe or Native Hawaiian organization at the time the object was separated from the group" [43 C.F.R. 10.2(d)(4)].
- *Sacred objects* means "items that are specific ceremonial objects needed by traditional Native American religious leaders for the practice of traditional Native American religions by their present day adherents. While many items, from ancient pottery sherds to arrowheads, might be imbued with sacredness in the eyes of an individual, these regulations are specifically limited to objects that were devoted to a traditional Native American religious ceremony or ritual and which have religious significance or function in the continued observance or renewal of such ceremony" [43 C.F.R. 10.2(d)(3)].
- *Tribal contacts* means the Indian Tribes listed in Appendix C.

3.0 POLICY

a. The Garrison Commander will ensure compliance with the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) [25 U.S.C. 3001-3013, 43 C.F.R. 10]. The Garrison Commander-appointed Cultural Resources Manager (CRM) (Directorate of Environmental Compliance and Management, DECAM) will coordinate with the Staff Judge Advocate (SJA), Criminal Investigation Division (CID), Provost Marshal's Office (PMO), Directorate of Planning, Training and Mobilization (DPTM), and Master Planning (Directorate of Public Works, DPW) to ensure that the CRM is:

1) incorporated in the planning of training and construction in order to assess the potential for the discovery of Native American burials and archeological sites, and
2) identified as the point-of-contact to be notified immediately if a Native American burial or archeological site is inadvertently discovered on installation property.

4.0 PROCEDURES: Reference: NAGPRA 25 U.S.C. 3002 Sec. 3(d), 43 C.F.R. 10.

4.1 Contingency 1: Inadvertent Discovery of Native American Human Remains and Associated Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony
4.1.1. Discovery, Preliminary Assessment, Protection, and Verification

a. Upon discovery of known or suspected human remains or cultural objects on Fort Carson administered lands, all activity within a 30 meter radius of the remains shall stop, no material shall be moved or removed, the area shall be secured, and the Director DECAM ((719) 526-2022) and the CRM ((719) 526-3806) shall be notified immediately. Dig permits and contracts for archeological investigations or construction on installation lands include the requirement to notify the CRM immediately upon discovery of human remains or cultural objects.

b. When notified of the possible discovery of human remains or cultural objects, the CRM will visit the site within twenty-four (24) hours of the notification of discovery. The CRM will make an initial determination whether the remains or objects meet the criteria defined in NAGPRA.

c. If upon examination the remains appear to be human and associated with a crime scene, the CRM will ensure that the Provost Marshal's Office (PMO) and the Criminal Investigation Division (CID) are notified. The CID will assume custody of the area.

d. If upon examination the remains are identified as non-human, the CRM will determine if archeological contexts are present that need to be evaluated pursuant to Section 106 of the National Historic Preservation Act [16 U.S.C. 470-470w].

e. If the remains are determined to be non-Native American (e.g. Caucasian, African American, or Asian American) and not associated with a crime, then NAGPRA will not apply and requirements of this SOP will be complete.

f. If the remains are determined to be Native American and not associated with a crime, the CRM will prepare a preliminary report outlining the circumstances of the discovery, description of the site and/or context of the remains, a description of the remains and objects, and an evaluation of their antiquity and significance.

1) The human remains and cultural objects will be evaluated *in situ* and only descriptive analysis will be permitted at this time.
2) The CRM may consult with a qualified physical or forensic anthropologist if necessary.
3) The site will be protected by temporary fencing and signing as “Off Limits.” Stabilization or covering may be employed if necessary.

g. If preliminary assessment is inconclusive, the CRM will assume Native American affiliation and proceed as described below.

4.1.2 Notification of the Responsible Federal Agency Official (Garrison Commander) [43 C.F.R. 10.4]

a. Upon confirmation of the discovery of Native American human remains and cultural objects, the CRM will immediately notify the Garrison Commander or his/her official designee by the most expeditious means. This notification will be followed within 48 hours by a Memorandum of Notification, a written notification that summarizes the results of the field evaluation and a plan to deal with the consultation tasks and disposition of the discovered objects. A template for the Memorandum of Notification is provided as Appendix B.

b. No later than 48 hours after receipt of the Memorandum of Notification from the CRM, the Garrison Commander or his/her official designee will forward to the CRM confirmation that he/she has received the notification.

4.1.3 Notification of Native American Tribes

a. Within three (3) working days after receipt of confirmation from the Garrison Commander of receipt of the Memorandum of Notification, the CRM shall notify culturally affiliated Indian Tribes of the discovery. Notification will be by telephone and by forwarding a notification packet by certified mail. The notification packet will include:

1) the Memorandum of Notification, this time signed by the Garrison Commander;
2) the report of the preliminary analysis of cultural affiliation; and
3) a proposed time and place for consultation and which other Indian Tribes are being notified.

b. The notification packet shall be sent to the tribal chairpersons and a copy furnished to the designated tribal NAGPRA coordinators.

c. Decisions on which Indian Tribes to notify will be based on information in the Native American contacts list appended to this SOP [Appendix C].

4.1.4 Native American Consultation

a. After the notification packet has been sent to the Tribes or review, the CRM will continue to consult with the Tribes. Representatives of Indian Tribes may decide to visit the site.

b. The Garrison Commander will notify the Installation Management Agency Northwest Region (IMA NWR), POC Rick Sharp, regarding the details of the case.

Determining Custody

c. An Indian Tribe that wishes to make a claim of ownership of human remains or cultural objects must be able to demonstrate an affiliation by a preponderance of evidence according to the criteria for the priority of custody specified in 25 U.S.C. 3002, Sec.3(a) and 43 C.F.R. 10.6.

d. Priority of ownership or control of Native American human remains and cultural objects is: [For details, see 25 U.S.C. 3002, Sec. 3(a)(1)-(2), 43 C.F.R. 10.6]

1) Lineal descendants, as determined pursuant to 43 C.F.R. 10.14(b).
2) Indian Tribe land owner.
3) Culturally affiliated Indian Tribe, as determined pursuant to 43 C.F.R. 10.14.
4) Indian Tribe recognized as the aboriginal owners of the land by a final judgment of the Indian Claims Commission or the United States Court of Claims.
5) Indian Tribe aboriginally occupying the land.
6) Indian Tribe with the strongest demonstrated cultural relationship.
7) Unclaimed.

e. If a single, legitimate claimant cannot be identified, signatories to the NAGPRA Comprehensive Agreements will claim custody of the human remains or cultural objects as allowed for in the agreements. Consultation will continue to consider treatment and disposition.

Plan of Action

f. Consultation must result in a written plan of action in accordance with 43 C.F.R. 10.5(e) between the appropriate Indian Tribes and the Garrison Commander.

1) Development, review, and signature of the plan of action will follow Army protocol specified in AR 200-4 (paragraph 3-3).
2) The CRM may prepare the written plan of action.
3) The Garrison Commander or his/her official designee will approve and sign the plan of action.
4) Copies of the written plan of action will be provided to the consulting Indian Tribes.

g. Information to be gained during the consultation that should be included in the plan of action include the following.

1) Kinds of material to be considered as cultural objects pursuant to 43 C.F.R. 10.2(b).
2) Specific information used to determine custody pursuant to 43 C.F. R. 10.6.
3) Treatment, care, and handling of human remains and cultural objects.
4) Archeological recording of the human remains and cultural objects.
5) Kinds of analysis for identification of human remains and cultural objects.
6) Kind(s) of traditional treatment(s) to be afforded the human remains or cultural objects.
7) Nature of the reports to be prepared.
8) Disposition of human remains and cultural objects in accordance with 43 C.F.R. 10.6.
9) Steps to be followed to contact Indian Tribe officials if there is a future inadvertent discovery or before any intentional excavation of human remains or cultural objects.

h. If no agreement can be reached, refer to dispute resolution in Section 6.0 of this SOP.

1) Unclaimed Native American human remains and cultural objects shall be treated in accordance with the regulations developed by the NAGPRA Review Committee.

4.1.5 Treatment and Disposition of Native American Human Remains, Associated Funerary Objects, Sacred Objects, and Objects of Cultural Patrimony

a. The treatment and disposition of Native American human remains and cultural objects recovered from Fort Carson administered lands will follow the plan of action developed through consultation with Indian Tribes (see above).

b. If the human remains or cultural objects have been removed from their context, they will be maintained in a safe and secure manner agreeable to the consulting parties as required by 43 C.F.R. 10.6(c) and 10.15 until the plan of action is implemented.

Publishing Notice

c. Following 43 C.F.R. 10.6(c), prior to the disposition of human remains and cultural objects to the lineal descendants or the apparent most closely affiliated Indian Tribe/s, the Garrison Commander or his/her official designee must publish notices of the proposed disposition in a newspaper of general circulation in the area in which the human remains and cultural objects were discovered and in which the lineal descendants or affiliated Indian Tribe/s currently reside.

1) The notice must provide information as to the nature and affiliation of the human remains, funerary objects, sacred objects, or objects of cultural patrimony and solicit further claims to custody.
2) The consulting Indian Tribes may review the content of the notice before its publication.
3) Privileged information should not be included in the notice.
4) The notices must be published twice, at least a week apart. A copy of the notice and information on when and in what newspaper/s the notice was published must be sent to the Departmental Consulting Archeologist, Department of the Interior.

Disposition

d. Per 43 C.F.R. 10.6(c), the disposition of human remains and cultural objects must not take place until at least thirty days after the publication of the second notice to allow time for any additional claimants to come forward.

e. If, during the period of publication, additional claimants come forward and the Garrison Commander or his/her designee is unable to determine which claimant is entitled to custody, proceed to Section 6.0, *Dispute Resolution*, of this SOP.

f. Fort Carson will provide an opportunity for appropriate tribal religious ceremony or ceremonies pursuant to the American Indian Religious Freedom Act (AIRFA) [42 U.S.C. 1996-1996a] and E.O. 13007 for burial site restoration and/or re-internment.

4.1.6 Resumption of Activity [43 C.F.R. 10.4(d)(2)]

a. The activity that resulted in the inadvertent discovery of Native American human remains or cultural objects may resume thirty (30) days after certification by the Commanding of the receipt of the Memorandum of Notification, if otherwise lawful.

b. Activity may resume before that time if there is a written plan of action approved by consulting parties that outlines steps for stabilization and protection of the site with no removal of human remains and cultural objects, excavation or removal of the human remains or cultural objects in accordance with 43 C.F.R. 10.3, or their disposition to lineal descendants or Indian Tribe/s with priority of custody as defined in 25 U.S.C. 3002, Sec. 3(a) and 43 C.F.R. 10.6.

4.2 Contingency 2: Intentional Archeological Excavation That May Result in the Discovery of Native American Human Remains, Associated Funerary Objects, Sacred Objects, and Objects of Cultural Patrimony

a. Archeological excavations or other investigations that have a high potential to result in the discovery or removal of Native American human remains, associated funerary objects, sacred objects, or objects of cultural patrimony are permitted only after:

1) Issuance of a permit pursuant to the Archaeological Resources Protection Act [16 U.S.C. 470aa-470ll], if applicable, and
2) Consultation with potential culturally affiliated Indian Tribes to establish provisions for the identification, treatment, and disposition of Native American human remains and cultural objects and meet the requirements of 43 C.F.R. 10.5., and
3) For sites determined eligible for the National Register of Historic Places, compliance with Section 106 of the National Historic Preservation Act [16 U.S.C. 470-470w].

b. Before issuing any approvals or permits for excavations that may result in the discovery of Native American human remains or cultural objects, the CRM must provide written notification signed by the Garrison Commander or his designee to the Indian Tribes listed in Appendix C.

c. The notice to the Indian Tribes of planned excavations must describe the planned activity, its general location, the basis for the determination that human remains and cultural objects may be encountered during excavation, and the basis for the determination of likely custody pursuant to 43 C.F.R. 10.6.

d. If no response is received in fifteen (15) days from a written notification, a follow-up telephone call will be made

by the CRM.

e. The CRM will then consult with the Tribes to ensure that the scope of work for the investigation or activity addresses the concerns of the Tribes.

f. In the event of the discovery of human remains or cultural items during the excavation, the CRM will follow the procedures set forth in Section 4.1 of this SOP.

5.0 TIME CONFLICTS

On those occasions when Fort Carson or the Indian Tribe(s) are unable to meet their commitments pertaining to time schedules for any activity specified herein, the party that is unable to meet the schedule will notify the other party as soon as physically possible to reschedule the activities to the mutual satisfaction of both parties. Emergency actions will be coordinated by telephone or FAX.

6.0 DISPUTE RESOLUTION

a. All disputes regarding the cultural affiliation of discovered human remains and/or cultural objects shall be resolved in accordance with Sections 3 and 7(e) of NAGPRA and the implementing regulations 43 C.F.R. 10.

b. Should any interested Indian Tribe make a conflicting claim of cultural affiliation or dispute the methods of treatment or disposition of human remains and/or cultural objects as delineated herein, the Garrison Commander will notify the Installation Management Agency Northwest Region, POC Rick Sharp, and the Army Environmental Center (AEC).

c. Fort Carson will continue consultation with the disputing parties, suggest that the disputing parties seek resolution among themselves, and, if the disputing parties concur, go before the NAGPRA Review Committee which is given the authority under 25 U.S.C 3006, Sec. 8(c)(4) and 43 C.F.R. 10.16 and 10.17 to make recommendations on the resolution of disputes.

d. If, upon receipt of the recommendations of the Review Committee, the most appropriate claimant still cannot be determined, Fort Carson shall retain the disputed remains or cultural objects until the question of custody is resolved, as stated in 43 C.F.R. 10.15(a)(2).

7.0 ADDITIONAL PARTIES

a. Interested Indian Tribes claiming lineal descent or cultural affiliation may join these procedures at any time should they express a desire to do so.

b. In accordance with 43 C.F.R. 10.15 (a)(1), if an interested party fails to make a written claim prior to the time human remains and cultural objects are duly repatriated or disposed of to a claimant in accordance with 43 C.F.R. 10, the interested party is deemed to have irrevocably waived any right to claim such items pursuant to these regulations.

APPENDIX A to NAGPRA SOP

MANDATES

FEDERAL STATUTES

American Indian Religious Freedom Act of 1978, as amended, 42 U.S.C. 1996-1996a
Archaeological Resources Protection Act of 1979, 16 U.S.C. 470aa-470ll
Native American Graves Protection and Repatriation Act of 1990, 25 U.S.C. 3001-3013
National Environmental Policy Act of 1969, as amended, 42 U.S.C. 4321-4370c
National Historic Preservation Act of 1966, as amended, 16 U.S.C. 470-470w

FEDERAL REGULATIONS

32 C.F.R. 229	Protection of Archeological Resources
36 C.F.R. 60	National Register of Historic Places
36 C.F.R. 63	Determinations of Eligibility for Inclusion in the National Register of Historic Places
36 C.F.R. 78	Waiver of Federal Agency Responsibility under Section 110 of the National Historic Preservation Act
36 C.F.R. 800	Protection of Historic Properties
40 C.F.R. 1500-1508	Regulations Implementing the National Environmental Policy Act
43 C.F.R. 7	Protection of Archaeological Resources
43 C.F.R. 10	Native American Graves Protection and Repatriation Act Regulations

EXECUTIVE ORDERS

E.O. 11593	Protection and Enhancement of the Cultural Environment
E.O. 13007	Indian Sacred Sites
E.O. 13175	Consultation and Coordination with Indian Tribal Governments, November 6, 2000

ARMY REGULATIONS

Army Regulation (AR) 200-4, Cultural Resources Management, 1 October 1998
Army Pamphlet 200-4, Cultural Resources Management, 1 October 1998

APPENDIX B to NAGPRA SOP

TEMPLATE FOR
MEMORANDUM OF NOTIFICATION OF THE GARRISON COMMANDER

1. PURPOSE:

a. To notify the Garrison Commander that Native American human remains and/or cultural objects have been inadvertently discovered on Fort Carson or the PCMS.

b. Recommend an action plan that implements requirements of the Native American Graves Protection and Repatriation Act (NAGPRA) [25 U.S.C. 3001-3013, 43 C.F.R. 10], outlined in the NAGPRA Standard Operating Procedures.

c. Request certification of this notification by the Garrison Commander to be forwarded directly to the CRM.

2. SITUATION:

a. Describe circumstances of discovery: by whom, where, and how were Native American human remains and/or cultural objects discovered on the installation.

b. Describe discovered items: condition and contents of the burial, including any grave goods; the primary and secondary context of the remains and any artifacts, including site location described according to standard Fort Carson archeological practice; probable antiquity and significance of the remains and/or cultural objects.

3. ACTION PLAN

a. Continue to protect the site.

b. Mention that the CRM must receive confirmation of receipt of the Memorandum of Notification within forty-eight (48) hours.

c. Notify the Indian Tribes listed in Appendix C of the discovery by telephone and written report within three working days after receipt of confirmation from the Garrison Commander.

d. Inform each notified Indian Tribe of the names of the other Indian Tribes being consulted.

e. Consult with the Indian Tribes regarding the cultural affiliation, treatment, and disposition of the remains and/or objects.

f. Document the decisions made as a result of consultation in a written plan of action or as specified in Section 4.1 of this SOP.

g. Carry out treatment and disposition of remains and/or objects as agreed upon in consultations according to the process outlined in Section 4.1 of this SOP.

APPENDIX C to NAGPRA SOP

TRIBAL CONTACTS

Apache Tribe of Oklahoma
Mr. Alonzo Chalepah, Chairman
Apache Tribe of Oklahoma
P.O. Box 1220
Anadarko, OK 73005
(405) 247-9493 fax-2686

Cheyenne and Arapaho Tribes of Oklahoma
Mr. Robert Tabor, Chairman
Cheyenne and Arapaho Tribes of Oklahoma
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Concho, OK 73022
(405) 262-0345 fax - 422-1184

Mr. Joe Big Medicine, Southern Cheyenne NAGPRA Representative
620 South Wengle Ave.
Watonga, OK 73772
(580) 623-5052

Mr. Lee Pedro, Southern Arapaho NAGPRA Representative
P.O. Box 41
Concho, OK 73022
(405) 422-1725

Mr. Alonzo Sankey, Southern Arapaho NAGPRA Representative
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Canton, OK 73724
(580) 886-2984

Mr. Gordon L. Yellowman, Sr., Southern Cheyenne NAGPRA Representative
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Comanche Nation of Oklahoma
Mr. Wallace Coffey, Chairman
Comanche Nation of Oklahoma
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Office of Environmental Programs
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Kiowa Tribe of Oklahoma
Mr. Billy Evans Horse, Chairman
Kiowa Tribe of Oklahoma
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(Rev.) George Daingkau, NAGPRA Representative
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Northern Arapaho Tribe
Mr. Anthony A. Addison, Sr., Chairman
Northern Arapaho Business Council
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Northern Arapaho NAGPRA Coordinator
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fax – (307) 857 - 5932
home – (307) 332-9175

Northern Cheyenne Tribe
Ms. Geri Small, President
Northern Cheyenne Tribe
P.O. Box 128
Lame Deer, MT 59043
(406) 477-6284 fax - 6210

Gilbert Brady, NAGPRA Representative (Northern Cheyenne Culture Commission)
(406) 477-6035

Oglala Sioux Tribe of the Pine Ridge Reservation
Mr. John Yellow Bird Steele, President
Oglala Sioux Tribe of the Pine Ridge Reservation
P.O. Box H
Pine Ridge, SD 57770
(605) 867-5821 fax - 1788

Vance Blacksmith, NAGPRA Coordinator

Shoshone Tribe (Eastern Band)
Mr. Ivan Posey, Chairman
Shoshone Business Council
P.O. Box 538
Fort Washakie, WY 82514

Mr. Delpine Clair and Mr. Haman Wise, NAGRPA Representatives
Shoshone Tribe
P.O. Box 538
Fort Washakie, WY 82514
(307) 332-5832 fax – 2074

Southern Ute Indian Tribe
Mr. Howard Richards, Sr., Chairperson
Southern Ute Indian Tribe
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Mr. Neil Cloud, NAGPRA Coordinator
Southern Ute Indian Tribe
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Ute Mountain Ute
Mr. Harold Cuthair, Acting Chair
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APPENDIX H

SOCIOECONOMICS ECONOMIC IMPACT FORECAST SYSTEM

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H. Analysis of Socioeconomic Effects For Grow the Army (GTA) at Fort Carson

H.1. Introduction

The socioeconomic analysis requirements of NEPA have been established over the years through successful early NEPA litigation ("McDowell vs Schlesinger", US District Court, Western District of Missouri, Western Division, No. 75-CV-234-W-4 [June 19, 1975] and "Breckinridge vs Schlesinger", US District Court, Eastern District of Kentucky, No. 75-100 [October 31,1975]), as well as the practical need for communication and collaboration with affected communities. The social and economic effects of Base Realignment and Closure (BRAC) actions are especially relevant and important, as these issues are often the source of community concerns and subsequent controversies.

H.2. The Economic Impact Forecast System (EIFS) and the Hierarchical Approach.

H.2.1. The Model

The Economic Impact Forecast System (EIFS) (Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.) has been a mainstay of Army NEPA practice since its initial development and implementation in the mid-70s. EIFS provides a mechanism to estimate impacts, and ascertain the "significance" of projected impacts, using the Rational Threshold Value (RTV) technique. This analysis and determination can be readily documented, and if significance thresholds are not exceeded, the analysis can be completed. EIFS was designed to address NEPA applications, providing a "two-tier" approach to the process; (1) a simple and quick aggregate model (sufficient to ascertain the overall magnitude of impacts) and (2) a more detailed, sophisticated input-output (I-O) model to further analyze impacts that appear significant, in NEPA terms, and worthy of additional expenditures and analyses. This "two-tier" approach is consistent with the two common levels of NEPA analysis, the Environmental Assessment (EA) and the Environmental Impact Statement (EIS). EIFS has facilitated efficient and effective completion of such analyses for approximately 3 decades.

Complete documentation of the model, its development, and applicable theoretical underpinnings is available in numerous publications:

- Huppertz, Claire E.; Bloomquist, Kim M.; Barbehenn, Jacinda M.; EIFS 5.0 Economic Impact Forecast System, User's Reference Manual; USACERL Technical Report TA-94/03; July 1994.
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- U.S. Army, Army Regulation 5-20, "Commercial Activities"
- U.S. Army, Department of the Army, DA Pamphlet 200-2, "Economic Impact Forecast System-User Instructions", 1980

- Webster, R.D.and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978.
- Webster, R.D., Hamilton, J.W., and Robinson, D.P., "The Two-Tier Concept for Economic Analysis: Introduction and User Instructions", USACERL Technical Report N-127/ADA118855.

These efforts reflect development of a tool for specific NEPA application, following the successful NEPA litigation referenced in the Introduction. As EIFS has been used for Army NEPA analyses, the results of EIFS analyses have been reviewed by stakeholder (affected community) representatives, and, as a result of BRAC application, twice reviewed by the Government Accounting Office (GAO). During such reviews, the analyses and resultant decisions were upheld, and EIFS was lauded as a uniform (non-arbitrary and non-capricious) approach to such requirements. Drawing from a national, uniform database, and using a common, systematic approach, EIFS allowing the improved comparison of project alternatives (the heart of NEPA analysis), and provides comparable analyses across the U.S.

H.2.2. NEPA Process Improvement

Since NEPA was implemented, it has been commonly criticized as expensive and time-consuming. While these criticisms have been often justified, the President's Council on Environmental Quality (CEQ) has actively promoted NEPA process improvements; first in the publication of the CEQ NEPA regulations (CEQ, Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Reprint, 40 CFR Parts 1500-1508, Executive Office of the President, Council on Environmental Quality, 1992.), and, more recently, through a NEPA anniversary introspective (CEQ, The National Environmental Policy Act: A Study of its Effectiveness After Twenty-five Years, Executive Office of the President, Council on Environmental Quality, January, 1997.) and the formal CEQ NEPA Task Force (CEQ, The NEPA Task Force Report to the Council on Environmental Quality: Modernizing NEPA Implementation; September, 2003.). All three CEQ initiatives call for more "focus" on NEPA documents, eliminating the analyses of minor or unimportant issues, and focusing, instead, on those issues that should be part of an informed agency decision. The use of EIFS, and the "two-tier" approach is consistent with these CEQ recommendations.

H.2.3. Determining Significance

While EIFS was being developed, communities began to question the rationale for determining the significance of socioeconomic impacts. USACERL was directed to develop a defensible procedure for

such a determination, resulting in the Rational Threshold Value (RTV) technique (Webster, R.D.; and Shannon, E.; The Rational Threshold Value (RTV) Technique for the Evaluation of Regional Economic Impacts; USACERL Technical Report TR N-49/ADA055561; 1978). This technique relies on the yearly Bureau of Economic Analysis (BEA) time series data on employment, income, and population to evaluate historical trends with in a subject community (region); and uses those trends to measure the "resilience" of the local community to change, or its ability to accommodate such change. This approach has worked well when communicating with affected communities. The combined use of RTV with the EIFS model meet the two pronged approach for significance determinations, intensity and context (CEQ, 1992)

The initial EIFS implementation (USACERL, 1975) included the analysis of numerous variables: business volume, personal income, employment, government revenues and expenditures, income and employment distribution, local housing impacts, regional economic stability, school system impacts, government bond obligations, population, welfare and dependency, social control, and aesthetic considerations. These selection of these variables was based on the predictive capability of forecasting techniques and data availability. Over some 30 years of practice, pragmatism and sufficiency led to the use of sales volume, employment, personal income, and population as indicators of impacts (as a "first tier" approximation of effects). These effects can also be readily evaluated (and significance determined) using the BEA time series data. Population, important in its own right, is also a valuable indicator of other factors (e.g., impact on local government revenues and expenditures, housing, local school systems, and the change in welfare and dependency), as impacts on such variables are driven, to a large extent, by a population change.

Using BEA time series data is used to analyze the four variables for the ROI, the RTV model produces thresholds for assessing the magnitude of impacts. The RTV technique is simple, starting with a straight line between the first year of record and the last year of record for that variable, establishing the average rate of change over time. Then, each yearly deviation from that growth rate is calculated and converted to a percentage. The largest historical changes (both increase and decrease) are used to define significance thresholds. The following figure illustrates the RTV concept:

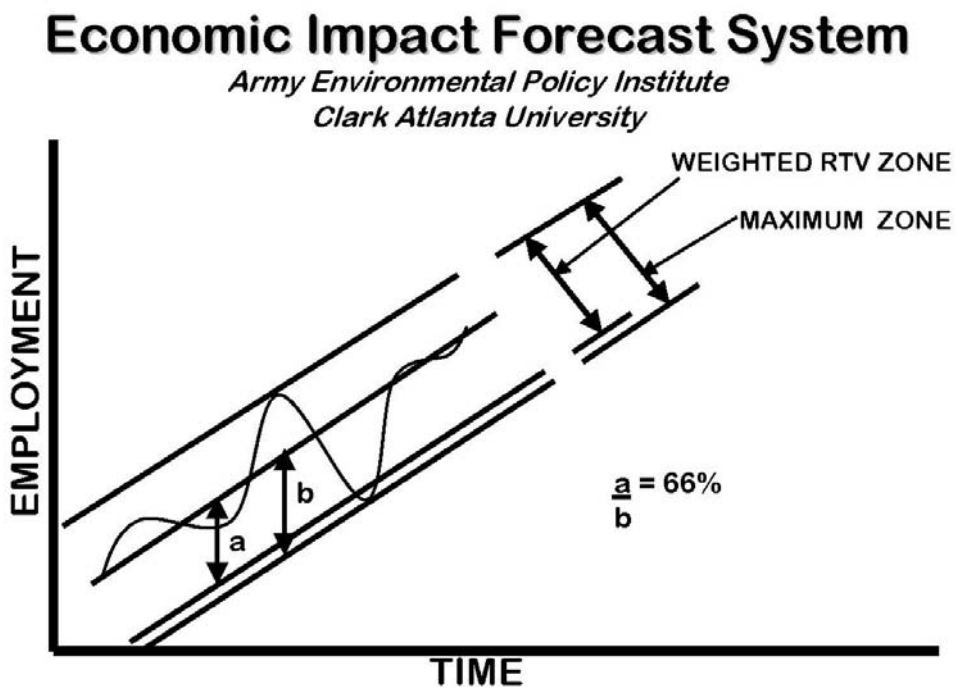


Figure H-1 Visual Depiction of the RTV Technique

A "factor of safety" is applied to negative thresholds, as shown in the figure, to produce a conservative analysis; while 100% of the maximum positive thresholds is used; as indicated in Table H-1.

	Increase	Decrease
Total sales volume	100 percent	75 percent
Total employment	100 percent	66 percent
Personal income	100 percent	66 percent
Total population	100 percent	50 percent

The maximum positive historical fluctuation is used because of the positive connotations generally associated with economic growth. While economic growth can produce unacceptable impacts and the "smart growth" concept is increasingly favored, the effects of reductions and closures are usually much more controversial. These adjustments, while arbitrary, are sensible. The negative sales volume threshold is adjusted by 75%, as sales volume impacts can be absorbed by such factors as the manipulation of inventory, new equipment, etc; and the impacts on individual workers or proprietors is indirect, if at all. Changes in employment and income, however, are impacts that immediately affect individuals; thus they are adjusted by 66%. Population is extremely important, as an indicator of other social issues, and is thus adjusted by 50%.

To adjust dollar amounts for inflation (to create "constant dollars" prior to calculations), the Consumer Price Index (CPI) is used for appropriate years, and all dollar values are adjusted to 1987 equivalents.

The main strength of the RTV approach stems from its reliance on data for each individual ROI. This approach addressed previous criticism of more simple approaches that applied arbitrary criteria to all communities. This approach establishes unique criteria, representative of local community patterns, and, while a community may not completely agree, a common frame of reference is established. Critics of the RTV technique have questioned the arbitrary selection of the maximum allowable deviations to indicate impact significance, but the process has proven workable over the years.

H.2.4. The Application of EIFS to the Proposed Action

To effect these analyses, the inputs to the EIFS model must be estimated. The normal EIFS inputs include:

- Number of affected (moving) civilians and their salaries
- Number of affected (moving) military employees and their salaries
- Percentage of affected military employees living on-post
- Changes in local procurement, contracting, and purchases
- Definition of the multi-county region of influence (ROI)

In the case of the proposed GTA actions at Fort Carson, the EIFS analyses are completed for (1) the Proposed Alternative (the ORCA site) or Alternative 2 (Tent City) and (2) Alternative 1 (TA Bravo). These analyses (two scenarios) are completed for each fiscal year (FY09-FY12). These socioeconomic effects are estimated using a Region of Influence (ROI) consisting of El Paso, Fremont, and Pueblo counties in Colorado. Only minor civilian changes are anticipated, but are included in the EIFS analyses. The estimated military salary ($37,000) is determined from a detailed analysis of IBCT grade structure, using the same salary for the CAB component. Civilian salaries are estimated at 50,000. Construction estimates are combined for MCA and range construction program plans, allocating expenditures (by FY) over the estimated periods of construction.

These input values were as follows:

Prop Alt 1 and Alt 2	**FY09**	**FY10**	**FY11**	**FY12**
Increase in military		161	3621	191
Increase in civilians			16	
Construction expenditures	$107.4M	$269.3M	$128.8M	$19.7M
Alt 1				
Increase in military		161	3621	191

Increase in civilians			16	
Construction expenditures	$83.5M	$199.5M	$102.9M	$19.7M

The estimated inputs were used to produce EIFS reports (model results) for changes in total business volume, employment, income, and population. These are best shown as percentages (of the activity in the total ROI), and can be compared to the RTVs for that variable in that ROI. The following EIFS documentation is provided for both scenarios for each fiscal year (The detailed RTV analyses are shown in the first EIFS output); detailing the inputs, documenting projected changes, and evaluating the potential significance of the predicted change, based on the RTV technique:

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 09

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$107,400,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$57,189,530	
Sales Volume - Induced	$101,225,500	
Sales Volume - Total	$158,415,000	0.62%
Income - Direct	$11,922,920	
Income - Induced	$21,103,570	
Income - Total	$33,026,480	0.22%
Employment - Direct	380	
Employment - Induced	672	
Employment - Total	1052	0.27%
Local Population	0	

Local Off-base Population	0	0%

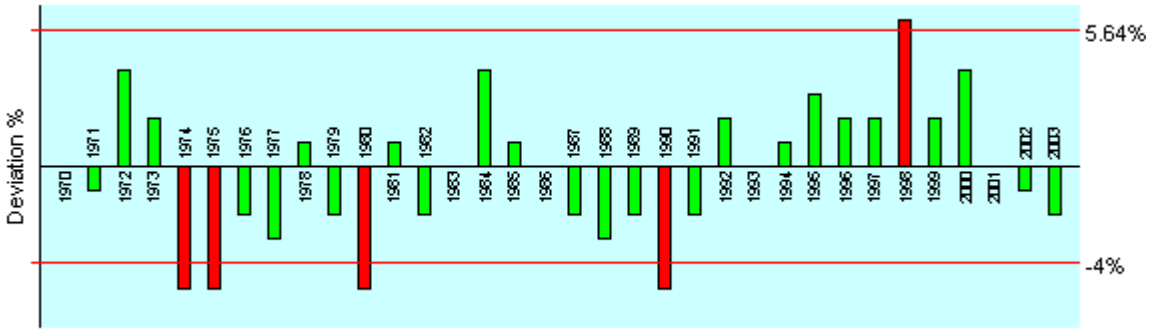
RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

RTV DETAILED

SALES VOLUME

TOTAL BUSINESS VOLUME

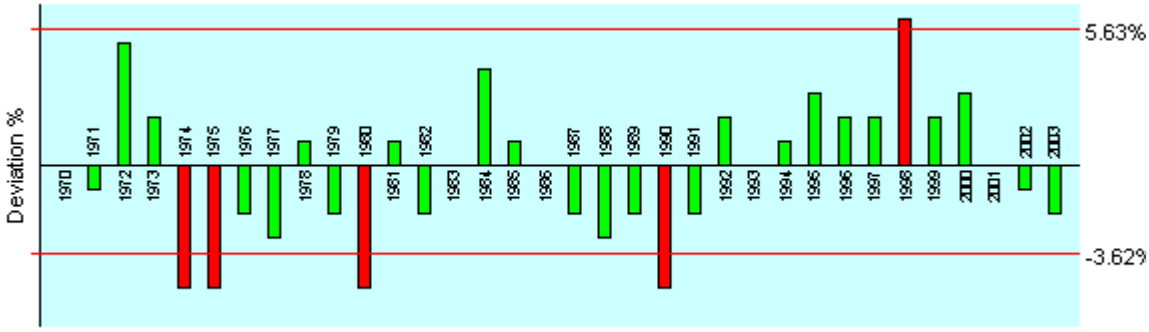


Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	2363070	12429748	0	-934960	0
1970	2685242	13372505	942757	7797	0.06
1971	2976060	14195806	823301	-111659	-0.79
1972	3426442	15830162	1634356	699396	4.42
1973	3943390	17153746	1323584	388624	2.27
1974	4397648	17194804	41057	-893903	-5.2
1975	4794118	17210884	16080	-918880	-5.34
1976	5238588	17811199	600316	-334644	-1.88
1977	5708070	18208743	397544	-537416	-2.95
1978	6509472	19268037	1059294	124334	0.65
1979	7474228	19881446	613409	-321551	-1.62
1980	8482164	19848264	-33183	-968143	-4.88
1981	9846214	20972436	1124172	189212	0.9
1982	10702396	21404792	432356	-502604	-2.35
1983	11520376	22349529	944737	9777	0.04
1984	13092704	24352429	2002900	1067940	4.39
1985	14256596	25661873	1309443	374483	1.46
1986	15126812	26623189	961316	26356	0.1
1987	15915066	27055612	432423	-502537	-1.86
1988	16746320	27296502	240889	-694071	-2.54
1989	17769370	27720217	423716	-511244	-1.84
1990	18333156	27316402	-403815	-1338775	-4.9
1991	19419060	27575065	258663	-676297	-2.45
1992	20993114	28970497	1395432	460472	1.59
1993	22216856	29770587	800090	-134870	-0.45
1994	23959042	31146755	1376168	441208	1.42

1995	26135008	33191460	2044706	1109746	3.34
1996	28182416	34664372	1472912	537952	1.55
1997	30137754	36165305	1500933	565973	1.56
1998	33039476	39316976	3151672	2216712	5.64
1999	35557594	41246809	1929833	994873	2.41
2000	39031928	43715759	2468950	1533990	3.51
2001	40904790	44586221	870462	-64498	-0.14
2002	41977940	44916396	330175	-604785	-1.35
2003	43003188	45153347	236952	-698008	-1.55

INCOME

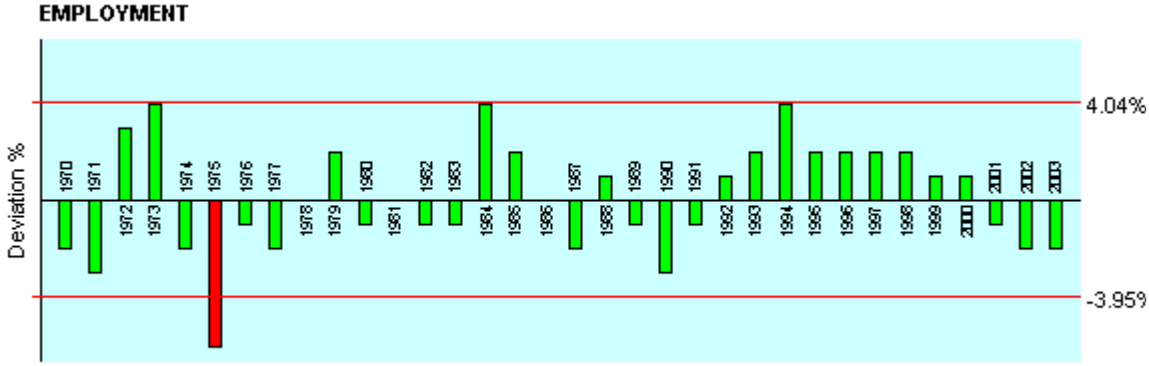
PERSONAL INCOME



Year	Value	Adj_Value	Change	Deviation	%Deviation
1969	1188908	6253656	0	-465948	0
1970	1348723	6716641	462984	-2964	-0.04
1971	1493302	7123051	406410	-59538	-0.84
1972	1720810	7950142	827092	361144	4.54
1973	1983142	8626668	676525	210577	2.44
1974	2206155	8626066	-602	-466550	-5.41
1975	2407721	8643718	17652	-448296	-5.19
1976	2631543	8947246	303528	-162420	-1.82
1977	2863802	9135528	188282	-277666	-3.04
1978	3262735	9657696	522167	56219	0.58
1979	3742079	9953930	296235	-169713	-1.7
1980	4248027	9940383	-13547	-479495	-4.82
1981	4930629	10502240	561857	95909	0.91
1982	5357920	10715840	213600	-252348	-2.35
1983	5768372	11190642	474802	8854	0.08
1984	6553819	12190103	999462	533514	4.38
1985	7132834	12839101	648998	183050	1.43
1986	7568997	13321435	482334	16386	0.12
1987	7968124	13545811	224376	-241572	-1.78
1988	8382614	13663661	117850	-348098	-2.55
1989	8892960	13873018	209357	-256591	-1.85
1990	9176789	13673416	-199602	-665550	-4.87
1991	9714439	13794503	121088	-344860	-2.5
1992	10504802	14496627	702123	236175	1.63
1993	11116836	14896560	399933	-66015	-0.44

1994	11977634	15570924	674364	208416	1.34
1995	13061771	16588449	1017525	551577	3.33
1996	14085368	17325003	736553	270605	1.56
1997	15064877	18077852	752850	286902	1.59
1998	16513456	19651013	1573160	1107212	5.63
1999	17772765	20616407	965395	499447	2.42
2000	19502458	21842753	1226346	760398	3.48
2001	20443716	22283650	440897	-25051	-0.11
2002	20969505	22437370	153720	-312228	-1.39
2003	21487457	22561830	124460	-341488	-1.51

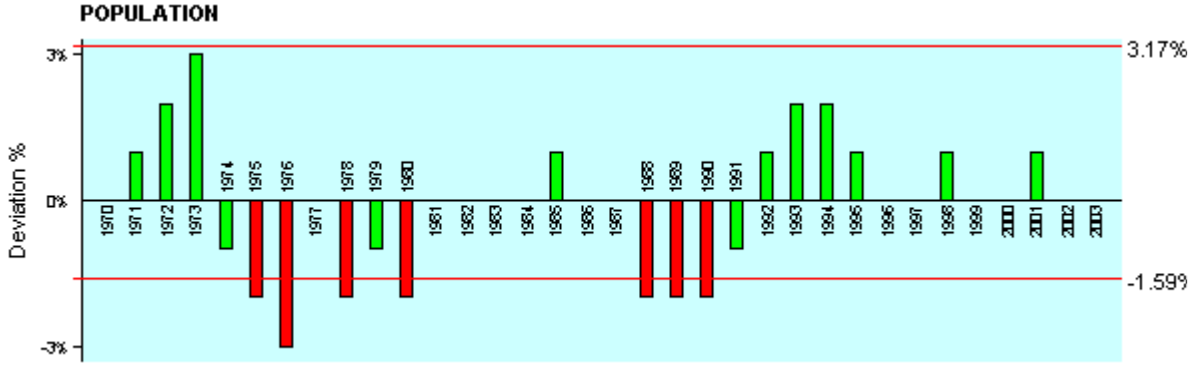
EMPLOYMENT



Year	Value	Change	Deviation	%Deviation
1969	164237	0	-7582	0
1970	168720	4483	-3099	-1.84
1971	170442	1722	-5860	-3.44
1972	183927	13485	5903	3.21
1973	199140	15213	7631	3.83
1974	201795	2655	-4927	-2.44
1975	197713	-4082	-11664	-5.9
1976	202334	4621	-2961	-1.46
1977	206628	4294	-3288	-1.59
1978	214876	8248	666	0.31
1979	226848	11972	4390	1.94
1980	231333	4485	-3097	-1.34
1981	238611	7278	-304	-0.13
1982	242897	4286	-3296	-1.36
1983	248214	5317	-2265	-0.91
1984	266565	18351	10769	4.04
1985	279060	12495	4913	1.76
1986	285229	6169	-1413	-0.5
1987	288096	2867	-4715	-1.64
1988	297442	9346	1764	0.59

1989	301542	4100	-3482	-1.15
1990	300957	-585	-8167	-2.71
1991	306396	5439	-2143	-0.7
1992	315867	9471	1889	0.6
1993	328471	12604	5022	1.53
1994	348621	20150	12568	3.61
1995	361817	13196	5614	1.55
1996	377479	15662	8080	2.14
1997	392208	14729	7147	1.82
1998	406666	14458	6876	1.69
1999	417138	10472	2890	0.69
2000	428918	11780	4198	0.98
2001	431583	2665	-4917	-1.14
2002	429395	-2188	-9770	-2.28
2003	429608	213	-7369	-1.72

POPULATION



Year	Value	Change	Deviation	%Deviation
1969	367959	0	-10757	0
1970	378845	10886	129	0.03
1971	393892	15047	4290	1.09
1972	414727	20835	10078	2.43
1973	439424	24697	13940	3.17
1974	444616	5192	-5565	-1.25
1975	447054	2438	-8319	-1.86
1976	443715	-3339	-14096	-3.18
1977	452406	8691	-2066	-0.46
1978	456115	3709	-7048	-1.55
1979	463710	7595	-3162	-0.68
1980	466859	3149	-7608	-1.63
1981	476858	9999	-758	-0.16
1982	487475	10617	-140	-0.03

1983	500324	12849	2092	0.42
1984	509889	9565	-1192	-0.23
1985	525817	15928	5171	0.98
1986	538814	12997	2240	0.42
1987	551940	13126	2369	0.43
1988	552476	536	-10221	-1.85
1989	553642	1166	-9591	-1.73
1990	552879	-763	-11520	-2.08
1991	560222	7343	-3414	-0.61
1992	579579	19357	8600	1.48
1993	599848	20269	9512	1.59
1994	624880	25032	14275	2.28
1995	641861	16981	6224	0.97
1996	653738	11877	1120	0.17
1997	665551	11813	1056	0.16
1998	680778	15227	4470	0.66
1999	694883	14105	3348	0.48
2000	707505	12622	1865	0.26
2001	725482	17977	7220	1
2002	736745	11263	506	0.07
2003	744453	7708	-3049	-0.41

1

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 10

STUDY AREA

08041 El Paso, CO
08043 Fremont, CO
08101 Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$269,340,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	161
Average Income of Affected Military	$37,000

Percent of Military Living On-post	50	

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$145,319,900	
Sales Volume - Induced	$257,216,200	
Sales Volume - Total	$402,536,200	1.57%
Income - Direct	$35,857,550	
Income - Induced	$53,624,650	
Income - Total	$89,482,190	0.59%
Employment - Direct	1126	
Employment - Induced	1708	
Employment - Total	2834	0.72%
Local Population	401	
Local Off-base Population	200	0.06%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

1

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternative 2 for FY 11

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$128,870,000
Change In Civilian Employment	16
Average Income of Affected Civilian	$50,000
Percent Expected to Relocate	100
Change In Military Employment	3621
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$111,863,300	

Sales Volume - Induced	$197,998,000	
Sales Volume - Total	$309,861,300	1.21%
Income - Direct	$149,083,400	
Income - Induced	$41,278,780	
Income - Total	$190,362,200	1.26%
Employment - Direct	4380	
Employment - Induced	1315	
Employment - Total	5695	1.45%
Local Population	9056	
Local Off-base Population	4548	1.36%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

1
2

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Proposed Alternative and Alternatives 1&2 for FY 12

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$19,700,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	191
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$12,742,680	
Sales Volume - Induced	$22,554,540	
Sales Volume - Total	$35,297,220	0.14%
Income - Direct	$9,253,979	
Income - Induced	$4,702,188	
Income - Total	$13,956,170	0.09%

Employment - Direct	276	
Employment - Induced	150	
Employment - Total	425	0.11%
Local Population	476	
Local Off-base Population	238	0.07%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

1

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 09

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$83,500,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	0
Average Income of Affected Military	$0
Percent of Military Living On-post	0

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$44,463,000	
Sales Volume - Induced	$78,699,500	
Sales Volume - Total	$123,162,500	0.48%
Income - Direct	$9,269,681	
Income - Induced	$16,407,340	
Income - Total	$25,677,020	0.17%
Employment - Direct	295	
Employment - Induced	523	
Employment - Total	818	0.21%
Local Population	0	
Local Off-base Population	0	0%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

1

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 10

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$199,540,000
Change In Civilian Employment	0
Average Income of Affected Civilian	$0
Percent Expected to Relocate	0
Change In Military Employment	161
Average Income of Affected Military	$37,000
Percent of Military Living On-post	50

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$108,152,000	
Sales Volume - Induced	$191,429,100	
Sales Volume - Total	$299,581,200	1.17%
Income - Direct	$28,108,760	
Income - Induced	$39,909,290	
Income - Total	$68,018,060	0.45%
Employment - Direct	879	
Employment - Induced	1271	
Employment - Total	2150	0.55%
Local Population	401	
Local Off-base Population	200	0.06%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

2

Economic Impact Forecast System

EIFS REPORT

PROJECT NAME

Alternative 1 for FY 11

STUDY AREA

08041	El Paso, CO
08043	Fremont, CO
08101	Pueblo, CO

FORECAST INPUT

Change In Local Expenditures	$102,870,000	
Change In Civilian Employment	16	
Average Income of Affected Civilian	$50,000	
Percent Expected to Relocate	100	
Change In Military Employment	3621	
Average Income of Affected Military	$37,000	
Percent of Military Living On-post	50	

FORECAST OUTPUT

Multiplier	2.77	
Sales Volume - Direct	$98,018,510	
Sales Volume - Induced	$173,492,800	
Sales Volume - Total	$271,511,300	1.06%
Income - Direct	$146,197,000	
Income - Induced	$36,169,910	
Income - Total	$182,366,900	1.21%
Employment - Direct	4288	
Employment - Induced	1152	
Employment - Total	5440	1.39%
Local Population	9056	
Local Off-base Population	4548	1.36%

RTV SUMMARY

	Sales Volume	Income	Employment	Population
Positive RTV	5.64 %	5.63 %	4.04 %	3.17 %
Negative RTV	-4 %	-3.62 %	-3.95 %	-1.59 %

H.2.5. Summary of Results

The EIFS analyses indicated that the proposed action will produce no major socioeconomic effects in the ROI (community). The projected changes compare the appropriate RTVs as follows:

Proposed Alt/Alt 2	FY09	FY10	FY11	FY12	RTV
Business volume	0.62%	1.57%	1.21%	0.14%	5.64%
Income	0.22%	0.59%	1.26%	0.09%	5.63%
Employment	0.27%	0.72%	1.45%	0.11%	4.04%
Population	0.0%	0.06%	1.36%	0.07%	3.17%

Alt 1	FY09	FY10	FY11	FY12	RTV
Business volume	0.48%	1.17%	1.06%	0.14%	5.64%
Income	0.17%	0.45%	1.21%	0.09%	5.63%
Employment	0.21%	0.55%	1.39%	0.11%	4.04%
Population	0.0%	0.06%	1.36%	0.07%	3.17%

This significance determination is "conservative"--well within any errors produced through assumed EIFS input values. While these inputs could be refined, the results of the analysis (final determination) will certainly remain unchanged.

The potential stationing of a CAB at Fort Carson cannot be currently analyzed as the amount and timing of construction expenditures and employee relocations cannot currently be defined.