4.0 ENVIRONMENTAL CONSEQUENCES

This chapter presents an assessment of the potential environmental consequences of implementing the proposed Powder River Training Complex (PRTC).

The analysis presented in this chapter is based on overlaying the alternatives described in Chapter 2.0 upon the baseline or existing conditions presented in Chapter 3.0. Each of the environmental resources described in Chapter 3.0 is affected to a different degree and has a different method of analysis. Each resource section presented below defines the resource, includes the methodology for conducting the impact analysis, presents the issues and concerns that focused the analysis, and describes the potential direct and indirect consequences of implementing a PRTC alternative.

Cumulative effects of an alternative with other past, present, and reasonably foreseeable future actions within the region of influence (ROI) are presented in Chapter 5.0. Irreversible, irretrievable, short-term, and long-term effects are also discussed in Chapter 5.0.

4.1 Airspace/Air Traffic

The proposed PRTC would modify and add to the existing Powder River airspace to establish the PRTC in order to meet the defined need for improved training opportunities. The proposed PRTC would provide airspace to conduct local realistic training for Ellsworth and Minot Air Force Base's (AFBs). The Proposed PRTC would restructure and reconfigure the existing Powder River Military Operations Areas (MOAs) and associated Air Traffic Control Assigned Airspaces (ATCAAs), establish up to three additional MOA/ATCAA combinations, and include Gap MOAs and ATCAAs for Large Force Exercises (LFEs) which could be scheduled by Notice to Airmen (NOTAM) typically 1 to 3 days per quarter for an estimated 10 days per year. The linked up MOA/ATCAA airspaces would create a versatile, realistic training complex for LFEs. LFEs would permit approximately 20 bomber, fighter, and support aircraft to train with the tactics and skills the comprehensive team must have in combat.

The current Letter of Agreement between Ellsworth AFB and FAA has Powder River ATCAA defined as Flight Level (FL)180 to FL260 inclusive and the Crossbow ATCAA as FL270 to FL450 inclusive. Although this appears to create a 1,000 foot break, the FAA manages the airspace to not produce a gap between the ATCAAs. For the purpose of this EIS, and to make clear that the airspaces are continuous, this EIS describes the airspace as Low ATCAA FL180 to FL260, Medium ATCAA above FL260 to FL370, and High ATCAA above FL370 to FL600.

Proposed changes to the airspace would permit increased training flights dispersed throughout the MOAs and ATCAAs. PRTC would allow for almost a full range of required combat training missions such as dissimilar aircraft training and LFEs. The Proposed PRTC would also support use of defensive countermeasures and, during LFEs, supersonic flight above 20,000 feet above mean sea level (MSL) for B-1s and 10,000 feet above ground level (AGL) for fighter aircraft. Fighter aircraft capable of training at supersonic speeds would train with the bombers during LFEs.

4.1.1 Methodology for Analysis

Modifications to existing MOA airspace and establishment of new MOA airspace would require non-rulemaking action by the Federal Aviation Administration (FAA) (FAA 2004). Responsibilities, procedures for aircraft operations, air traffic control operations, and utilization of ATCAAs for the existing Powder River airspace are documented in Letters of Agreement between the scheduling military agency (28th Bomb Wing [28 BW] Ellsworth AFB) and the applicable Air Route Traffic Control Center (ARTCC). These Letters of Agreement are supplemental to the procedures in FAA Orders 7110.65 (Air Traffic Control) and 7610.4 (Special Military Operations). Appendix L presents the current Letter of Agreement for

Powder River airspace operations. No Letters of Agreement have been established for the proposed PRTC. These Letters of Agreement would be developed as part of the United States Air Force (Air Force) aeronautical proposal for the proposed PRTC airspace.

The potential environmental effects of implementing the proposed PRTC were assessed by considering the changes in airspace, airspace operations, and airspace use that could occur and relating those changes to current documented and estimated civil and military flight operations in the proposed airspace. The assessments considered compliance with Air Force Instruction (AFI) 13-201 (*Air Force Airspace Management)* and supplements thereto, as well as FAA evaluation of the proposed PRTC as it relates to the ROI and the National Airspace System.

FAA commercial and other civil aircraft traffic data, local airport reported data, and military usage were collected for each of the proposed MOA and ATCAA airspace units as presented in Section 3.1. Day-to-day training would occur in proposed MOA/ATCAA segments. Specific Air Force authorization would be required for supersonic flight (AFI 13-201).

Projected flight operations for each aircraft type within the proposed PRTC airspaces from Sections 2.4 through 2.9 are overlaid on airspace and air traffic baseline conditions described in Section 3.1. Each alternative is addressed in terms of the agency and public issues and concerns. Where agreed-to mitigations have been identified, those are described. The environmental consequences resulting from proposed training under each alternative are explained. All three action alternatives share several features. The proposed Gap MOAs and Gap ATCAAs boundaries would avoid civil aviation Victor Airways by a minimum of 5 nautical miles (NM). All other Victor airways adjacent to the airspace are avoided by a minimum of 4 NM. The remaining proposed MOA boundaries would avoid Victor Airway intersections by 20 NM or more.

In response to FAA and public concerns about Instrument Flight Rule (IFR) flights, the Powder River 1A (PR-1A), Powder River 3 (PR-3), Powder River 4 (PR-4), and all Gap MOAs are now proposed to have Low and High MOAs to facilitate IFR transit in the ROI. PRTC would include Low, Medium, and High ATCAAs above all MOAs. The following airspace may be activated for LFEs only: Gap MOAs and Gap ATCAAs; PR-1A, Powder River 1B (PR-1B) and Powder River 2 (PR-2), Medium and High ATCAAs above FL260, over PR-3 and PR-4; High ATCAAs above FL370 over Gateway West High, and Gateway East ATCAAs (see Table 2-16). The ATCAAs would be activated by the FAA and scheduled to avoid high use periods by civil aviation to the extent possible. Tables 2-10 and 2-11 describe the MOAs and ATCAAs, their altitudes, and time of use. Table 4.1-1 summarizes the PRTC airspaces and alternatives from Tables 2-10 and 2-11. In general, the proposed PR-1A, PR-1B, PR-2, PR-3, and PR-4 MOAs would be scheduled from Monday through Thursday from 7:30 a.m. to 12 noon local time and again from 6 p.m. to 11:30 p.m. The schedule on Friday would be from 7:30 a.m. to 12 noon. The airspaces could be scheduled other times by NOTAM. Although the airspace would be scheduled a total of 10 hours Monday through Thursday and four and one half hours on Friday, the actual MOA expected usage would typically be 3 hours per day except in the PR-2 MOA where usage would typically be 6 hours per day. Air Traffic Control (ATC) would be notified when training aircraft completed their missions in the respective MOAs.

Table 4.1-1 Proposed PRTC Airspace Designation and Use

Airspace			*Alternative*				*Proposed Use*	
	MOA	**ATCAA**	**A**	**B**	**C**	**No Action**	**Day-to-Day and LFE[2]**	**LFE Only[3]**
PR-1A Low MOA	X		X		X		X	
PR-1A High MOA	X		X		X		X	
PR-1B MOA	X		X		X		X	
PR-2 MOA	X		X	X	X	X[1]	X	
PR-3 Low MOA	X		X	X	X		X	
PR-3 High MOA	X		X	X	X		X	
PR-4 Low MOA	X		X	X			X	
PR-4 High MOA	X		X	X			X	
Gap A Low MOA	X		X		X			X
Gap A High MOA	X		X		X			X
Gap B Low MOA	X		X	X	X			X
Gap B High MOA	X		X	X	X			X
Gap C Low MOA	X		X	X				X
Gap C High MOA	X		X	X				X
PR-1A Low ATCAA		X	X	X	X		X	
PR-1A Medium ATCAA		X	X	X	X		X	
PR-1A High ATCAA		X	X	X	X			X
PR-1B Low ATCAA		X	X	X	X		X	
PR-1B Medium ATCAA		X	X	X	X		X	
PR-1B High ATCAA		X	X	X	X			X
PR-2 Low ATCAA		X	X	X	X	X[1]	X	
PR-2 Medium ATCAA		X	X	X	X	X[1]	X	
PR-2 High ATCAA		X	X	X	X	X[1]		X
PR-3 Low ATCAA		X	X	X	X		X	
PR-3 Medium ATCAA		X	X	X	X			X
PR-3 High ATCAA		X	X	X	X			X
PR-4 Low ATCAA		X	X	X	X		X	
PR-4 Medium ATCAA		X	X	X	X			X
PR-4 High ATCAA		X	X	X	X			X
Gateway West Low ATCAA		X	X	X	X	X[1]	X	
Gateway West Medium ATCAA		X	X	X	X	X[1]	X	
Gateway West High ATCAA		X	X	X	X			X
Gateway East Low ATCAA		X	X	X	X			X
Gateway East Medium ATCAA		X	X	X	X			X
Gateway East High ATCAA		X	X	X	X			X
Gap A Low ATCAA		X	X	X	X			X
Gap A Medium ATCAA		X	X	X	X			X
Gap A High ATCAA		X	X	X	X			X
Gap B Low ATCAA		X	X	X	X			X
Gap B Medium ATCAA		X	X	X	X			X
Gap B High ATCAA		X	X	X	X			X
Gap C Low ATCAA		X	X	X	X			X
Gap C Medium ATCAA		X	X	X	X			X
Gap C High ATCAA		X	X	X	X			X

Notes: 1. These airspaces extend over much of the same area currently within the Powder River airspace.
2. Normal use: Monday through Thursday, 7:30 a.m. to 12:00 noon and 6:00 p.m. to 11:30 p.m.; Friday, 7:30 a.m. to 12:00 noon; other times by NOTAM.
3. Large Force Exercise: 20 aircraft of various types training together from 1-3 days per quarter for a total of 10 days per year.

4.1.2 Issues and Concerns

The type, size, and configuration of individual airspace elements in a region are based upon, and are intended to satisfy, competing aviation requirements. Potential impacts could occur if air traffic in the region and/or the ARTCC were encumbered by changed flight activities associated with the PRTC proposal.

4.1.2.1 Summary of Public Concerns

Table 2-27 summarizes public and agency concerns expressed during scoping. Airspace or air traffic concerns expressed by the public during scoping meetings include 1) potential impacts on civil aviation in the proposed airspace, 2) radar and radio coverage in the proposed airspace; 3) the accuracy or availability of information regarding active MOAs; 4) agricultural applications and other commercial activity; 5) arrivals and departures from airfields and airports under, or on the periphery of, the proposed airspace; 6) identification of low-altitude avoidance areas and not flying low-level over livestock, people, or buildings; and 7) training aircraft staying within MOA boundaries. Specific concerns were expressed for weather modification programs, emergency flights, biological or water resource monitoring, ranch monitoring, and recreational activities such as gliders and skydiving in the airspace.

4.1.2.2 FAA Review and Other Times by NOTAM

When any significant change is planned, such as new or revised defense-related activities within an airspace area or a change in the complexity or density of aircraft movements, the FAA reassesses the airspace configuration. The FAA seeks to determine if such changes could adversely affect 1) ARTCC and/or facilities; 2) movement of other air traffic in the area; or 3) airspace already designated and used for other purposes supporting military, commercial, or general aviation.

The Air Force aeronautical proposal includes scheduled airspace other times by NOTAM. The FAA recognizes that the provision of other times by NOTAM permits access to a MOA 24 hours per day. The extent of civil airspace impacts would depend upon the specific hours during a 24-hour day in which one or more MOA segments would be active. Using the number of civil flights in Figure 3.1-10 permits an estimate of the civil aircraft operations during a 24-hour period. A comparison of the proportional recorded FAA MOA activity by 2-hour block from Figures 3.1-7, 3.1-8, and 3.1-9 with Table 3.1-10 permits an estimate of the civilian aircraft activity during the unscheduled MOA periods. Other times by NOTAM has the potential to impact additional flights during the 12 noon to 6 p.m. time period weekdays and during daylight hours on weekends. The estimated civilian operations impacted within the proposed MOAs during a typical week day ranges from 15 civil operations in PR-2 to 50 civil operations in PR-4 (see Table 4.9-2).

4.1.3 Environmental Consequences

Potential airspace and air traffic environmental consequences for each alternative are presented in this section. Alternative A represents the Proposed Action and provides the greatest amount of training airspace with the establishment of three new combinations, PR-1A/PR-1B, PR-3, and PR-4 MOAs and ATCAAs, associated Gap MOAs and ATCAAs, and Gateway ATCAAs, and the modification/expansion of the existing Powder River A/B MOAs into PR-2. Alternatives B and C would retain similarities with Alternative A. Each would include two new MOA combinations, and associated Gap MOAs rather than the three MOA and Gap MOA combinations of Alternative A. The Alternative A and Alternative C MOAs would provide for improved low-altitude terrain following training as compared with Alternative B. Proposed ATCAAs are the same for each alternative.

For all proposed MOA/ATCAA airspaces, one consistent impact would be the need for increased communication among all parties involved. The Air Force would schedule the MOAs, inform ATC that they have entered an activated MOA, and notify ATC when training was completed in the MOA. An IFR transiting civil aircraft pilot seeking to learn the status of the MOA would need to check the schedule, review any NOTAMs, contact ATC to learn if the MOA were activated, request the MOA altitude segment where the training was occurring, and either request an IFR routing below or above the activated MOA or proceed Visual Flight Rules (VFR) in the activated MOA. This additional communication requirement could result in annoyance and some climbing, descending, or re-routing for IFR traffic and similar avoidance for VFR pilots of an active MOA should a VFR civil pilot choose not to traverse an active MOA using see-and-avoid.

Civil aircraft flight schedules, efficient altitudes, and altitude selection to avoid turbulence could be impacted by an activated airspace. This section addresses environmental consequences, including emergency and special conditions associated with each PRTC alternative.

4.1.3.1 Alternative A: Proposed Action

MOAs AND ATCAAs

The average annual baseline training hours estimated to be conducted primarily by B-1 and B-52 and transient military aircraft within the Powder River A and B MOAs and associated ATCAAs totaled 1,199 hours (Table 2-32). The Powder River A and B MOAs constitute most of the proposed PR-2 MOA/ATCAA. Under the Proposed Action, Alternative A, a total of 3,387 day-to-day and LFE training hours would be conducted annually in the proposed PRTC airspace (Table 2-17). The mission profiles in the MOAs/ATCAAs would be low-level to mid-altitude combat maneuvering and high-altitude staging for battlefield operations. The total hours of training represent 78 percent day-to-day training, primarily by B-1 and B-52 aircraft and 22 percent LFE training which would include a variety of aircraft types to replicate real world warfighting conditions. The proposal to allow supersonic flight by bombers during LFEs to 20,000 feet MSL and fighters to 10,000 feet AGL throughout the reconfigured airspace would require specific approval by the Air Force (AFI 13-201).

The 28 BW and 5th Bomb Wing (5 BW) propose to use training chaff and flares in the MOA/ATCAA airspace. These defensive countermeasures would be employed in accordance with current Air Force, Air Combat Command (ACC), and Ellsworth and Minot AFB regulations. The minimum release altitude for flares would be 2,000 feet AGL except during periods of extreme fire danger in a MOA when flare release would be discontinued. Projected annual deployed chaff bundles within the MOA/ATCAA airspace is 33,000 and approximately 3,300 flares are projected to be deployed (refer to Table 2-9). Any and all military training aircraft using PRTC would be briefed on all altitude and fire danger restrictions applying to defensive countermeasures if they intend to employ chaff or flares.

Coordination between the 28 BW, 5 BW, and FAA would let the ARTCC know that military aircraft were training with chaff and flares in the airspace. Specific operating procedures and constraints on the use of chaff and flares have proven effective and have not significantly impacted ATC systems. The Air Force would implement standing instructions to brief pilots training in the proposed PRTC airspace that only RR-188, RR-112, RR-179 chaff or MJU-23, M206, MJU-7, and MJU-10 flares would be permitted (with limitations) for training use within the PRTC MOAs and ATCAAs. Appendices C and D describe these defensive countermeasures.

Flares do not present any issues involving the management or use of airspace. The chaff used by 28 BW and 5 BW pilots does not adversely affect FAA radars when ARTCC is informed of chaff use. No significant airspace impacts would be expected to result from this proposed use of chaff and flares. Further information on impacts of chaff and flares is discussed in Section 4.3, *Safety*. Section 4.3 also

addresses comments from scoping meeting participants about emergency and firefighting aircraft operations flight deconfliction.

4.1.3.1.1 AIRSPACE CATEGORIES

The Proposed Action would result in changes within specific airspace. The proposed PRTC ATCAA segments would be within Class A airspace. The ATCAAs would be identified within the airspace and, when activated, the ATCAA segment would be airspace within which high-speed military aircraft could be expected to perform rapid maneuvers. Commercial traffic would not be routed through an active ATCAA by ARTCC. A non-activated ATCAA would be transited by commercial and other aviation under ARTCC routing as with any Class A airspace.

Class E airspace includes Victor Airways. Civil aircraft cannot fly IFR on a Victor Airway through an active MOA. There would be no changes in airspace categories, but when MOA altitude segments were activated for LFEs, the Victor Airway at these altitudes would be unavailable for IFR traffic. This means that when a Gap MOA was activated an estimated 10 times per year, the associated Victor Airway (example: Gap A MOA and V-254), would not be available for IFR traffic.

Some Class E Controlled and Class G Uncontrolled airspace within the ROI would become MOAs under the proposed PRTC. This would add the MOA airspace designation to aeronautical charts. IFR transit could occur above or below an activated MOA with direction from the applicable ATC. An active MOA is joint-use airspace and can be entered and traversed by VFR traffic using see-and-avoid while high-speed military aircraft are concurrently operating in the activated MOA.

The FAA non rule-making action to establish and chart the MOAs and establish the ATCAAs would create joint use airspace. When a MOA is activated, the usage of the airspace would allow civil aircraft operating under VFR only. When the MOAs or ATCAAs are not activated, the airspace would be treated as normal Class E, G, or A airspace.

4.1.3.1.2 MILITARY TRAINING AIRSPACE

There would be no change to existing military training routes (MTRs). MTRs would continue to be available for high-speed military aircraft low-altitude navigation training. The MTRs are currently used infrequently for low-level navigation. That use is not expected to change with the proposed PRTC. The MTRs which lie partially beneath the proposed PRTC MOA airspace (IR-473, IR-485/492) were historically used for low-level penetration missions and are infrequently used in conjunction with current Powder River MOA activities. The use of these MTRs would likely continue at the present low rate because the training activities associated with these MTRs are independent from the proposed use of the PRTC airspace. Commentors at scoping meetings mentioned MTR low-level overflights outside of the Powder River airspace and referred to such overflights as “buzzing” over livestock, people, and buildings. MTR use, although infrequent, would continue for specific mission training. Alternative A would not impact the use of the MTRs.

Any location under a MOA would be expected to experience a low-level overflight at 2,000 feet AGL or below within one-quarter of a mile of the flight path approximately 6 to 9 times per year (see Section 4.9.3.1.5). B-1 random flight patterns are seen as the loops and circles on, for example, Figures 3.1-14, 3.1-15, and 3.1-16. These training patterns suggest that locations toward the center of an airspace could be overflown more and locations on the edges less than the annual average of 6 to 9 times. Usage of the current Powder River MOAs and ATCAAs would be expected to change with Alternative A. Alternative A would have an estimated 11,956 sortie operations conducted annually within the proposed MOAs and ATCAAs. Table 2-15 presents the projected Alternative A day-to-day airspace use and Table 2-32 presents baseline use. The availability of the Gap MOAs and ATCAAs and the ability to

activate them as part of the overall PRTC creates new training opportunities and an expanded airspace for LFE training.

4.1.3.1.3 Civil Airspace Usage

Section 3.1 explains civil airspace usage throughout the ROI. This section addresses potential civil airspace impacts to Victor Airways, jet routes, and airports and airfields within the ROI.

The flexibility of being able to schedule multiple MOAs/ATCAAs would spread day-to-day training impacts over the proposed airspace. The current Powder River airspace is activated by NOTAM. The proposed PRTC schedule for days and hours of operation is included in Chapter 2.0 (Tables 2-10 and 2-11). This means that small airports and both commercial and general aviation operations would be able to review the schedule and any NOTAMs and plan for when a MOA would be scheduled for activation as described in Section 4.1.1. IFR traffic could not occur in an activated MOA segment. VFR traffic, permitted using see-and-avoid, was mentioned by scoping participants as being unsafe if low-level B-1 training aircraft could be encountered at any time within a MOA, especially at altitudes of 2,000 feet AGL or below. The Air Force would notify ATC when the B-1 was training in the MOA and would notify ATC when training was completed. This would permit ATC to use the MOA airspace for IFR civil aircraft use. Pilots could fly VFR in a MOA at any time using see-and-avoid procedures. The Air Force believes coordination of the airspace with FAA and Low and High MOAs in the PR-1A, PR-3, and PR-4 MOAs would accommodate civil aviation IFR operations where communication is not limited.

Victor Airways

During scoping, the public and agencies noted that much of the low-altitude traffic does not fly Victor Airways, but instead flies direct routing using Global Positioning System (GPS). Figures 3.1-14, 3.1-18, and 3.1-16 show considerable winter traffic below FL180 on V-254 and V-491. Figures 3.1-20, 3.1-21, and 3.1-22 show more summer traffic below FL180 flying direct, especially east-west, and through Billings. Low-altitude direct routing often has no radar and radio coverage to provide IFR vector route service in much of the area. Table 3.1-10 suggests that, based on reported public and private airport operations, the FAA data represents between 6 and 32 percent of the estimated traffic in the proposed MOAs below Class A airspace.

The Gap MOAs are designed to coincide with Victor Airways below FL180. As a result of scoping input, the Air Force proposed revised Gap MOA corridors to allow for the expanded route width generated by the great distances between navigational aids under the airspace. Based on FAA flight paths and reported local usage, the Gap MOA corridors cannot sufficiently mitigate the impact to the local aviation community because these corridors have limited communication and do not allow for direct routing. The public noted that the use of the Gap MOA/Victor Airway corridors would be severely limited by the minimum en route altitudes created by limited navigational aids. The minimum en route altitude requirements limit the options for traffic conflict resolution.

PRTC altitude requirements, combined with the en route altitude requirements for civil aviation, dictated by the distances between navigational aids, has the potential to add an estimated 2-hour ground delay and/or re-routing impact upon civil aviation not willing to fly VFR in an activated MOA or add an estimated 2 to 4 hour delay to fly IFR until a MOA was deactivated. The 2 to 4 hour delay estimate is based on the scheduled MOA times and takes into consideration that training aircraft would be expected to occupy the scheduled airspace not more than 3 hours per day during the scheduled hours.

The impact of requiring day-to-day IFR traffic to fly on Victor Airways could concentrate civil aircraft traffic in areas of limited or nonexistent radar coverage. The FAA has noted that radar coverage along

V-120 between Dupree, South Dakota (SD), and Miles City, Montana (MT), is nonexistent below 13,000 feet MSL (see Figure 3.1-5). Radar coverage south of V-120 along and west of V-491 does not exist below 16,000 feet MSL. In addition to limited radar coverage, the lack of radio frequency coverage restricts the ability to communicate with civil aviation flying within the PRTC proposed airspace. Radio frequency coverage is nonexistent below 18,000 feet MSL in a 50-NM area between Dupree, SD, and Miles City, MT. Inability to communicate with civil aircraft would force traffic volumes to be re-routed to the north or south of the airspaces. This re-routing would concentrate traffic and cause congestion over Dickinson, North Dakota (ND), and Rapid City, SD. The airspace consequences resulting from the absence of navigable routes and limited radar and radio frequency coverage could significantly impact civil aviation when PRTC MOA segments were activated for day-to-day training and would have greater impacts during LFEs when all the Victor Airways traversing the airspace would be unavailable for IFR flights.

Review of Scoping and FAA Inputs

The FAA and Air Force met following receipt of scoping comments to address how to reduce potential impacts to civil aviation. The FAA reviewed the Air Force's original aeronautical proposal and made the following observations:

1) there was no alternative in the original airspace proposal to provide for airspace below 10,000 feet MSL which could potentially be used by IFR traffic;

2) there were no specifics in the original airspace proposal about limiting the times and altitude for training;

3) there are existing communication inadequacies for civil aircraft traffic on Victor Airways below FL180, civil aircraft traffic en route, or civil aircraft seeking to traverse an activated PRTC.

The FAA reviewed the four Victor Airways that transect the proposed PRTC ATCAAs (refer to Figure 3.1-5). The FAA determined that the original Air Force proposal would have potential for adverse impacts on civil aviation airspace use for the following reasons:

1) MOA boundaries were planned to avoid impacts to civil aviation Victor Airways. A small segment of V-247 transects the southwest corner of the proposed the PR-1 MOA;

2) The other three PRTC MOAs avoid federal "Victor" airways by 5 NM internal and 4 external NM and avoid any major Victor Airway intersections by 20 NM. The Gap A, B, and C MOAs each mirror a portion of a Victor Airway. These Gap MOAs are designed to adjoin abutting MOA airspace for large force exercises, planned for, at most, once per quarter, for a total of 1 to 3 days. The Gap MOAs would not be activated on a daily basis. The limited radar and radio communication in much of the proposed airspace results in civil aviation "widening out" the Victor corridors or flying GPS or an IFR direct routing. This reduces the likelihood of a number of aircraft being concentrated in a narrow corridor. The Gap MOAs without communication and radar enhancements would result in a concentration of civil aircraft during day-to-day MOA activation; and

3) The Gap MOAs are designed to be activated for LFEs to avoid impacting traffic into the larger airports in the area (i.e., Billings and Miles City, MT; Sheridan and Gillette, Wyoming [WY]; Dupree and Rapid City, SD; and Bismarck and Dickinson, ND). The Gap MOAs do not include provision for the communication and radar coverages when activated for LFEs. An LFE effectively shuts down all IFR aircraft traffic in a large area of MT, ND, SD, and WY during 4 hours an estimated 1 to 3 LFE days per quarter (or a total of 10 LFE days per year).

In response to the FAA and scoping concerns, the Air Force revised the Proposed Action Alternative A, Alternative B, and Alternative C to reduce potential impacts upon civil aviation. The revised proposal elements specifically address the concerns:

1) The Air Force's aeronautical proposal provides for Low and High PR-1A, PR-3, PR-4, and all Gap MOAs. This is specifically designed to permit activation and de-activation of a MOA in support of civil aviation flying IFR.

2) The Air Force proposal was revised to present specific days and times per day when the proposed MOAs would be scheduled. In addition, the Air Force proposal presents the expected daily use of 3 hours per day for all MOAs except for 6 hours per day for PR-2. If the Proposed Action, Alternative A, airspace were activated the entire time period scheduled from Monday through Thursday and Friday mornings, the number of civilian operations projected to be impacted using data from Table 3.1-10 and from Figures 3.1-8 through 3.1-10, is estimated to be 0.60*[53+25+52+83] = 128 civil operations per day.

3) The Air Force recognizes that there is limited communication and radar coverage in much of the area proposed for PRTC. The addition of Low and High MOAs and communication when training aircraft leave the airspace can reduce the impacts from lack of communication and radar coverage. The Air Force recognizes that communication will need to be improved to provide for military training in the PR-3 and PR-4 MOAs.

4) The southwest corner of the proposed PR-1B was adjusted to avoid V-247.

5) Each Gap MOA was reviewed for radar coverage and the width of the Gap MOAs was "widened out" to reduce the likelihood of a number of aircraft being concentrated in a narrow corridor. The proposed distances from major airports such as Billings, Bismarck, Gillette, Dickinson, and Miles City to the MOAs were increased to support airport traffic.

6) The proposed LFE would activate the entire airspace for a limited number of hours each LFE day. The LFE schedule would be issued in advance by NOTAM. IFR aircraft would be unable to transit the airspace. Since the aeronautical proposal presents the daily duration of an LFE as 4 hours, the actual number of IFR flights impacted in the entire proposed PRTC airspace by an LFE day, based upon FAA data, reported public airport operations, and estimated private airfield operations would average 76 civilian operations per day (from Table 4.9-2). These 76 civilian operations would consist of flights unable to fly IFR and unable or unwilling to fly VFR in the active MOAs. The civilian flights could incur an estimated 2 to 4 hour delay while the entire PRTC airspace was activated.

Jet Routes

As described in Sections 3.1.3.3.2 and 3.1.3.5, there is extensive commercial overflight above FL260 and especially above FL300. This includes daily east-west en route traffic as well as traffic on Canadian (CAN) routes. Hundreds of commercial air carrier flights traverse the proposed PRTC airspace on a daily basis, primarily above FL260. The proposed PRTC ATCAAs cover a large area along the heavily-traveled transcontinental routes between the nation's Midwest and eastern population centers and the Pacific Northwest. International traffic between Vancouver or Calgary and the eastern and southern U.S. also traverses this area. As noted in Section 3.1.3.3.2, several hundred commercial air carrier flights use the proposed PRTC airspace on a daily basis on several published jet routes including J-16, J-34, J-90, J-151, and J-204 which traverse the PRTC proposed airspace (see Figure 3.1-5).

In addition to existing Jet Routes, severe weather avoidance routes between the San Francisco Bay area and airports in the northeast traverse the proposed PRTC airspace. Weather avoidance routes include

CAN 1, 2, 3, 5, and 7, and the BAE 1 national playbook re-routes. These routes are the most common off-load routes used to mitigate thunderstorms in the Great Plains and the Ohio Valley. These severe weather avoidance routes are typically used between 80 and 100 days per year with peak traffic in excess of 400 flights per day, nearly all above FL300. Inability to access these routes for severe weather avoidance would have a detrimental impact upon New York traffic flow and would also significantly impact Mid-West hub operations at Minneapolis, Chicago O'Hare, and Detroit metro airports.

As presented in Table 2-13, 99 percent of the training operation of B-1 aircraft would be below FL260. This would be expected to result in little to no impact to traffic on jet routes, CAN routes, or other high-altitude routes. A comparison of Figures 3.1-10, 3.1-11, and 3.1-12 shows that the preponderance of commercial flight is above FL260. Table 2-13 demonstrates that B-52 training would be above FL260 approximately 500 annual hours of training time.

Nearly all B-1 training could occur below an ARTCC-capped ATCAA at FL260, but B-52 training would need to occupy airspace above FL260. Military aircraft are not normally fitted with collision avoidance systems. In existing Powder River ATCAAs, the ARTCC designates a 2,000 foot block above and below a B-52 training in a 2,000 foot block to ensure safety. A 6,000 foot ATCAA airspace block within the flight paths depicted on Figures 3.1-17, 3.1-18, 3.1-19, and 3.1-20 would have the potential to impact high altitude commercial traffic. Proposed PRTC ATCAAs are stacked to permit avoidance of high-altitude commercial flights. The Air Force proposes activation of High ATCAAs above FL370 during 10 days per year of LFEs. Medium ATCAAs above FL260 to, but not including, FL370 for PR-3, PR-4, and Gateway East are also proposed during 10 days of LFEs per year. B-1 training would have minimal impact upon ATCAA altitudes above FL260 although B-52 and LFE training has the potential for substantial impact.

FAA has determined that, without access to PRTC airspace above FL300, re-routed high-altitude aircraft would be placed into sectors already busy with normal traffic flow. Traffic Management Initiatives would need to be implemented to mitigate the impacts of concentrating re-routed aircraft to avoid an activated PRTC airspace. Traffic management initiatives include capping aircraft at specific altitudes and providing miles-in-trail restrictions, which would result in backlogs of aircraft waiting to depart.

During LFE training, estimated to be up to 4 hours per day, 10 days per year, there would be B-1, B-52, tanker, and transient fighters using the airspace above FL260. The Air Force would work with FAA to identify times when fewer commercial aircraft would be scheduled to use the airspace above FL260. Scheduling the airspace for LFE exercises to the extent possible around commercial schedules would reduce potential for a significant impact to airspace users.

Table 3.1-11 demonstrates the average daily traffic traversing the proposed ATCAAs. The traffic in the Low ATCAA is typically 10 to 20 percent of the traffic in the Medium plus High ATCAAs. A consideration of Figures 3.1-11 and 3.1-12 demonstrate that average daily traffic counts per hour above FL260 are substantially lower from 4 a.m. through 12 noon than for the remainder of the day and evening. FAA data show that an LFE during the 4-hour period from 6 a.m. to 10 a.m. on a representative day, counting the PR-1A, PR-1B, PR-2, PR-3, PR-4, and Gateway ATCAAs, could be expected to affect an average of 43 civil aircraft flights in segments in the ATCAAs above FL260. This represents the total number of airspace segments traversed and includes single flights traversing multiple proposed PRTC airspaces. In contrast, a 4-hour period from 2 p.m. to 6 p.m. could affect an average of 244 civil flights in airspace segments above FL260. Airspace of the scope that is being proposed by PRTC has the potential to impact the national airspace with the potential to affect locations which include, but are not limited to, Seattle, Oakland, Kansas City, Chicago, Cleveland, Washington, D.C., and New York City. The FAA data suggest that LFE impacts to commercial and other civil aircraft would be perceived as significant to the impacted carriers, although impacts could be kept to a minimum through airspace scheduling.

FAA Denver ARTCC has a Letter of Agreement (LOA) with Ellsworth AFB regarding the existing Crossbow ATCAA activation schedule. This LOA allows for use of the Crossbow ATCAA below FL270 and limits use above FL270. Although not explicitly included in the Proposed Action (Chapter 2.0), Letters of Agreement would need to be executed with all affected ARTCCs to address what would otherwise be significant impacts to commercial aircraft operations and the ARTCC would mitigate impacts to commercial and general aviation.

Airports and Airfields

Public airports under or near the proposed PRTC airspaces are presented on Figure 3.1-6. These airports are depicted on aeronautical charts. The aeronautical charts identify a 3 NM airport perimeter by 1500 feet AGL avoidance area over the Belle Creek and Broadus public airports.

During scoping meetings, the public and agencies expressed concerns that the PRTC would significantly impact public airports and private airfields under the proposed airspace and civil aircraft traffic within the proposed airspace. These concerns included the inability for radar to track aircraft and the limited radio frequency coverage in rural areas. Concerns included the inability to know in advance the hours of airspace activation and the low-level training of the B-1 aircraft, which could occur anywhere throughout the airspace at any time the airspace was activated. An activated MOA would render airports under an active MOA inaccessible to IFR traffic. When a MOA was activated, IFR flight could not occur and VFR access would be by see-and-avoid. The FAA has noted that some airports not under the airspace could face access limitations. For example, Dickinson, ND, is daily served by 10 to 12 commercial flights from Denver, Colorado, as well as cargo operations to and from Bismarck and Minot, ND. The original Air Force proposal conflicted with ILS32, GPS14, GPS32, and very high frequency omni-directional radio range (VOR), an instrument approach proceedings into Dickinson. When the PR-4 Low MOA is activated, IFR traffic would not be able to access Hettinger, Lemmon, Mott, or Bison. Table 4.1-1 provides estimated impacts at airports under or on the periphery of the proposed PRTC for Alternative A, B, and C and describes adjustments in the Air Force revised Proposed Action to reduce potential impacts.

The Colstrip airport under the proposed PR-1A supports mining operations and the community of Colstrip.

Colstrip, MT, supports large scale open pit mining operations and has civil aviation activity in support of mining operations. Under the original proposed action, if the PR-1 MOA was activated, the Colstrip airport would have been inaccessible to IFR traffic. FAA reviewers noted that Colstrip traffic flow potentially impacted includes GPS RWY 6, GPS RWY 24, CISPU 1 departure, and CONUK 1 departure. The Air Force's revised aeronautical proposal has Low and High PR-1A MOAs to support IFR traffic into Colstrip. Sheridan, WY, flights potentially affected include GPS RWY 14, VOR RWY 14, ILS RWY 32, and RNAV (GPS) RWY 32. The Sheridan, WY avoidance area in PR-1B has been expanded in the Air Force revised aeronautical proposal to support access to the airport. The Forsythe MT, GPS RWY 26 and NDB RWY 26 have the potential to be impacted by the proposed airspace. A 20 NM distance measuring equipment (DME) arc is incorporated into the Air Force revised aeronautical proposal to provide for the VOR/DME RWY 16 holding pattern at Gillette, WY. A 35 NM DME arc was established to the east of Billings to provide for airport access.

The initially proposed PR-4 MOA/ATCAA was noted by FAA as encroaching upon the southwest quadrant of the Bismarck, ND Municipal Airport approach control and conflicted with a series of instrument approach procedures into Bismarck. Bismarck instrument approach conflicts would include ILS 13, ILS 31, GPS 3, and GPS 21. The PRTC Proposed Action was revised by the Air Force to move the proposed

airspace away from Bismarck and Low and High PR-4 MOAs and Low, Medium, and High ATCAAs were included in the revised aeronautical proposal to support Bismarck access.

All or portions of, five small airfields (Belle Fourche, Black Hills, Upton, Sturgis, and Hulett) lie under the proposed PRTC Gateway ATCAA (Figure 3.1-6). These airports, some of which are under the existing Gateway ATCAA, would be unaffected by ATCAA operations which occur at 18,000 feet MSL or higher. Table 4.1-2 includes public airports under or near the PRTC alternatives. The relative location of each airport is described and the potential consequences identified. A comparison of Table 4.1-2 and Table 3.1-3 shows the relative location of public airports. Private airfields under the proposed MOAs are listed by MOA on Table 3.1-4. Private airfields under a MOA would have comparable impacts to those of public airports. During the typical day when a Low MOA was activated, aircraft could launch, land, or transit the MOA VFR using see-and-avoid. IFR traffic could not be supported when a Low MOA was activated.

Table 4.1-2. Public Airport Consequences Summary (Page 1 of 6)

Airport	*Designation*	*Estimated Annual Operations*[1]	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Baker, MT	BHK	7,000	Under PR-3 MOA	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active
Beach, ND	20U	1,170	North of PR-3 MOA	Within area with limited radio/ radar; potential secondary effects from increased traffic	Within area with limited radio/ radar; potential secondary effects from increased traffic	Within area with limited radio/ radar; potential secondary effects from increased traffic
Belle Creek, MT	3V7	550	Under existing Powder River MOAs and proposed PR-2 MOA	No expected change from existing conditions	No expected change from existing conditions	No expected change from existing conditions
Belle Fourche, SD	EFC	12,112	Under Gateway ATCAA	No impact on traffic up to FL180	No impact on traffic up to FL180	No impact on traffic up to FL180
Billings, MT	BIL	92,319	West of PR-1A and PR-1B	PR-1A MOA/ ATCAAs adjusted to avoid traffic pattern	PR-1A ATCAAs adjusted to avoid traffic pattern	PR-1A MOA/ ATCAAs adjusted to avoid traffic pattern
Bismarck, ND	BIS	46,472	Northeast of PR-4 MOA	PR-4 MOAs adjusted to avoid traffic pattern	PR-4 MOAs adjusted to avoid traffic pattern	PR-4 ATCAAs above FL180 not expected to impact approach control
Bison, SD	6V5	5,500	Under PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180
Black Hills, SD	SPF	192,320	Under Gateway ATCAA	No impact on traffic up to FL180	No impact on traffic up to FL180	No impact on traffic up to FL180

Table 4.1-2. Public Airport Consequences Summary (Page 2 of 6)

Airport	*Designation*	*Estimated Annual Operations*	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Bowman, ND	BPP	4,140	Under PR-3 MOA	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active
Bowman, ND	BPP	4,140	Under PR-3 MOA	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active	Under PR-3 MOA; no IFR when Low MOA active
Broadus, MT	00F	5,350	Under existing Powder River MOAs and proposed PR-2 MOA	No expected change from existing conditions	No expected change from existing conditions	No expected change from existing conditions
Colstrip, MT	M46	5,750	Under PR-1A MOA	No IFR traffic during Low MOA activation	Under PR-1A ATCAA; IFR traffic under FL180 when ATCAA activated	No IFR traffic during Low MOA activation
Dickinson, ND	DIK	8,613	North of intersection between PR-3 and PR-4 MOAs	In an area of low communication; some crowding could occur on northern routes during PRTC activation; IFR traffic to south limited to V-491; se-and-avoid cross-country GPS traffic in PRTC area when Low MOAs activated; V-491 to south not accessible to IFR during LFE	In an area of low communication; some crowding could occur on northern routes during PRTC activation; IFR traffic to south limited to V-491; see-and-avoid cross-country GPS traffic in PRTC area when Low MOAs activated; V-491 to south not accessible to IFR during LFE	In an area of low communication; some crowding could occur on northern routes during PRTC activation; IFR traffic to south on V-491 or southeast below FL180 not impacted; no cross-country GPS traffic in PRTC area when Low MOAs activated
Ekalaka, MT	97M	2,028	Under Gap B MOA	LFE activation of Gap MOA impacts IFR and through traffic on V-120	LFE activation of Gap MOA impacts IFR and through traffic on V-120	LFE activation of Gap MOA impacts IFR and through traffic on V-120
Elgin, ND	Y71	160	Under PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when LOW MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180

Table 4.1-2. Public Airport Consequences Summary (Page 3 of 6)

Airport	*Designation*	*Estimated Annual Operations*	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Faith, SD	D07	2,700	East side of Gateway ATCAA south of PR-4 MOA	Outside of direct impact area; IFR traffic to west on V-120; IFR north could not occur in activated PR-4 Low MOA; traffic to north could re-route through Bismarck or V-491; traffic to southwest under Gateway ATCAA could occur below FL180; all other traffic as under normal conditions	Outside of direct impact area; IFR traffic to west on V-120; traffic to north under FL180 with activated PR-4 ATCAA; traffic to southwest under Gateway ATCAA could occur below FL180; all other traffic as under normal conditions	Outside of direct impact area; IFR traffic to west on V-120; IFR north could not occur in activated PR-4 Low MOA; traffic to north could re-route through Bismarck or V-491; traffic to southwest under Gateway ATCAA could occur below FL180; all other traffic as under normal conditions
Fort Smith, MT	5U7	3,100		Outside airspace; PR-1B MOA affects traffic to northeast	PR-1 ATCAA not expected to impact traffic	Outside airspace; PR-1B MOA affects traffic to northeast
Gillette, WY	GCC	22,218	South of PR 2 MOA/ATCAA	Traffic to north on V-254 traverses Gap A MOA/ ATCAA; traffic impacted during LFE; traffic to other areas to north could not traverse active MOAs	Traffic to north and northwest could fly under PR-1A/1B ATCAA below FL180	Traffic to north on V-254 traverses Gap A MOA/ATCAA; traffic impacted during LFE; traffic to other areas to north could not traverse active MOAs
Glen Ullin, ND	D57	860		Outside airspace; PR-4 MOA affects traffic to south	Outside airspace; PR-4 MOA affects traffic to south	PR-4 ATCAA not expected to impact traffic
Hardin, MT	F02	6,600	Under PR 1 MOA/ATCAA	No IFR traffic during Low MOA activation	Under PR-1 ATCAA; IFR traffic under FL180 when ATCAA activated	No IFR traffic during Low MOA activation
Harding (Buffalo), SD	9D2	2,300	Under Gap B MOA/ATCAA	LFE activation of Gap MOA impacts IFR and through traffic on V-120	LFE activation of Gap MOA impacts IFR and through traffic on V-120	LFE activation of Gap MOA impacts IFR and through traffic on V-120

Table 4.1-2. Public Airport Consequences Summary (Page 4 of 6)

Airport	*Designation*	*Estimated Annual Operations*	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Hettinger, ND	HEI	4,450	Under west side of PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180
Hulett, WY	W43	400	Under Gateway ATCAA	No impact on traffic up to FL180	No impact on traffic up to FL180	No impact on traffic up to FL180
Lemmon, SD	LEM	12,500	Under PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180
Mandan, ND	Y19	24,740		Outside airspace; PR-4 MOA encroaches on southwest approach	Outside airspace; PR-4 MOA encroaches on southwest approach	PR-4 ATCAA not expected to impact approach
McIntosh, SD	8D6	70	East edge of PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180
Miles City, MT	MLS	11,200	Intersection of V-2/V-465, V-120, and V-254 northwest of PR-2 MOA/ATCAA	No direct impact; IFR traffic limited to Victor Airways to south and southeast when Low MOAs activated; potential increased traffic as civil aircraft avoid activated MOAs; see-and-avoid cross-country GPS to south when Low MOAs activated	GPS and IFR traffic to south and southwest under FL180 when PR-1 ATCAA activated; see-and-avoid traffic to south or southeast during LFE	No direct impact; IFR traffic limited to Victor Airways to south and southeast when Low MOAs activated; potential increased traffic as civil aircraft avoid activated MOAs; see-and-avoid cross-country GPS to south when Low MOAs activated
Mott, ND	3P3	1,690	Under PR-4 MOA	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 MOA; no IFR when Low MOA active	Under PR-4 ATCAA; no local impacts to traffic below FL180

Table 4.1-2. Public Airport Consequences Summary (Page 5 of 6)

Airport	*Designation*	*Estimated Annual Operations*	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Newcastle, WY	ECS	4,500	South of Gateway ATCAA	Outside of direct impact area; traffic to north under activated ATCAA could occur below FL180; all other traffic as under normal conditions	Outside of direct impact area; traffic to north under activated ATCAA could occur below FL180; all other traffic as under normal conditions	Outside of direct impact area; traffic to north under activated ATCAA could occur below FL180; all other traffic as under normal conditions
Rapid City, SD	RAP	40,896	Southeast of Gateway ATCAA	Outside of direct impact area; traffic to north to remain below FL180 when Gateway ATCAA activated; IFR traffic on V-491 could not traverse Gap C MOA/ATCAA during LFE	Outside of direct impact area; traffic to north to remain below FL180 when Gateway ATCAA activated; IFR traffic on V-491 could not traverse Gap C MOA/ATCAA during LFE	Outside of direct impact area; traffic to north to remain below FL180 when Gap C ATCAA or PR-4 ATCAA activated; IFR traffic on V-491 could not traverse Gap C MOA/ATCAA during LFE
Sheridan, WY	SHR	41,832	South of PR-1B MOA/ATCAA	V-247 not usable when PR-1 MOA activated; no IFR traffic to north when Low MOA activated; PR-1B MOA adjusted so that traffic to northwest and southeast skirts PR-1B MOA	Traffic to north and northwest could fly under PR-1A/1B ATCAA below FL180	V-247 not usable when PR-1 MOA activated; no IFR traffic to north when Low MOA activated; PR-1B MOA adjusted so that traffic to northwest and southeast skirts PR-1B MOA
Sturgis, SD	49B	23,000	Under southeast edge of Gateway ATCAA	No impact on traffic up to FL180	No impact on traffic up to FL180	No impact on traffic up to FL180

Table 4.1-2. Public Airport Consequences Summary (Page 6 of 6)

Airport	*Designation*	*Estimated Annual Operations*	*Location*	ENVIRONMENTAL CONSEQUENCES		
				Alternative A	*Alternative B*	*Alternative C*
Tillitt (Forsyth), MT	FOR	9,170	North of PR-1 MOA/ATCAA	Outside of direct impact area; no IFR traffic directly south when PR-1A Low MOA activated; some increased congestion as traffic avoids activated MOAs by flying V-2/V-465; all other traffic as under normal conditions	Outside of direct impact area; traffic not affected below FL180 during PR-1A and PR-1B ATCAAs activation	Outside of direct impact area; no IFR traffic directly south when PR-1A Low MOA activated; some increased congestion as traffic avoids activated MOAs by flying V-2/V-465; all other traffic as under normal conditions
Upton, WY	83V	8	Under Gateway ATCAA	No impact on traffic up to FL180	No impact on traffic up to FL180	No impact on traffic up to FL180

Note: 1. From **Table** 3.1-6

4.1.3.1.4 Other Civilian Use

Local public airports and private airfields are used for a variety of civil aircraft activities within the ROI. Agricultural support activities, including aerial applications, ranch and farm oversight and time-sensitive delivery of equipment are typical regional aircraft activities. Aerial applications typically occur below 500 feet AGL, although return flights to base locations can occur at higher altitudes. Aerial applications frequently occur in the morning and/or in the more calm meteorological conditions to ensure appropriate distribution of the materials. Low-level B-1 flights which could occur at any time within an activated MOA were of concern to public commentors and could place significant limitations on the timing of aerial applications. Meteorological conditions and business requirements could require commercial applicators to perform required treatments whether or not a MOA is activated for B-1 training. Although general aviation could fly VFR in an activated MOA, the normal fixed wing and rotary wing aircraft commuting to and from aerial application areas and participating in aerial applications have very limited experience with high-speed military aircraft at altitudes between 500 and 2,000 feet AGL and are usually at or very near gross weight capacity. Scheduling of the respective Low MOAs and reporting when the Low MOA was activated would help agriculture applicators. Agricultural applicators may still perceive a low-level B-1 or other military aircraft as having a potentially significant impact on their operations.

Time-sensitive delivery of equipment parts or personnel can be critical to ensure replacement parts or specialized personnel are available for needed agricultural, mining, or other machinery. Civil aviation IFR transport could be required whether or not a MOA is activated. Public scoping comments included concerns that activated MOAs could interfere with delivery of time-sensitive materials. During the one to three hours on a weekday when a Low MOA was activated, time-sensitive deliveries could be delayed if they required IFR access. ATC could work with the Air Force to deactivate a MOA to route a time-sensitive IFR delivery above or below training military aircraft.

The scheduling of MOAs could help with other civilian use; however, the infrequent, but random appearance of low-level, high-speed large military aircraft could be seen as significantly impacting aerial applications and time-critical deliveries during the time on weekdays when a Low MOA was used for training.

Emergency and Related Services

Public scoping comments included concern that military aircraft training in the PRTC airspace could impact life-flight, firefighting, weather modification aircraft, and other general aviation pilots who considered sharing an active MOA with high-speed military aircraft below 3,000 feet AGL to be unsafe even under "see-and-avoid" conditions. Health care providers based at Bismarck, ND, regularly provide air ambulance and medical doctors to communities for health services. Healthcare providers typically fly IFR at altitudes above 10,000 feet MSL. As is currently the case with the Powder River airspace and would be the case throughout the PRTC, if an emergency, such as a life-flight, were required, the Air Force would immediately shift aircraft or end training in airspace requiring life-flight transport to accommodate the emergency.

In cases of emergency, such as air ambulance, law enforcement, or firefighting, which require ATC clearance, the Air Force would immediately respond to ATC direction and relocate. Should emergency activity require more airspace than a Low MOA, the Air Force would cease training within the MOA and either relocate to an alternate airspace for training or terminate training and return to base. No new MOA could be activated for a relocated training aircraft because an airspace could only be activated with a 2-hour advance notice by NOTAM.

Related aircraft activities which require special conditions could include regional requirements for airspace use. In addition to fire monitoring and related emergency activities, the USFWS and state agencies provide digital aerial photography for wetlands surveys and wildlife monitoring. This photography requires that aircraft be flown at specific altitudes over designated areas under specific visibility conditions at designated times of the year. These activities can occur during specific seasons for one to two week periods. Uncertainty with the Air Force's initial proposal resulted in the concern that access would not be possible and significant impacts to monitoring could occur. The clarified Air Force proposal includes working with monitoring organizations to coordinate B-1 training operations and schedule MOAs to support monitoring activities. Communication, Low and High MOAs, and scheduling would minimize potential impact to monitoring aircraft. The primary impact to civil aircraft involved in emergency and related services and to military training aircraft would be the need for communication and the possible requirement for military aircraft to relocate to another activated MOA in response to emergency conditions.

Commercial Carriers

Adequate communication exists for commercial carriers flying in Class A airspace. The inadequacy of communication within the proposed PRTC MOAs could affect commercial carriers accessing or transiting below Class A airspace. Commercial carriers currently transiting or accessing the airspace provide regular service to Billings, Bismarck, Dickinson, Gillette, Rapid City, and Sheridan. These airports are all outside the proposed PRTC. The inadequate communication throughout much of the PRTC airspace results in commercial carriers using more airspace than might otherwise be anticipated for IFR traffic. This results in aircraft more spread out, especially along the Bismarck-Billings corridor and in the areas around PR-2, PR-3, and the western portions of PR-4. The Gap MOA boundaries and the PRTC proposed airspace distance setbacks have been increased in the revised Air Force proposal from what was originally presented at scoping to support civil aircraft flying in areas with inadequate radio frequency and/or radar coverage.

Other General Aviation

Scoping participants considered low-level flights, which could occur any time a MOA was scheduled, to be a significant impact to civil aviation. Photo courtesy of A.S. Elliott

During public scoping meetings, concern was expressed by general aviation pilots operating especially below 10,000 feet MSL in the proposed MOAs. Pilots who commented during scoping were concerned about limited radar and communication and the inability to be notified when the airspace was activated for training and when the airspace was no longer activated. As noted above under Victor Airways, there is limited radar or radio coverage in much of the area. General aviation which uses altitudes below 10,000 feet MSL includes farm and ranch VFR flight operations, hunting support, and recreational flying. Although pilots can fly VFR in an activated MOA, participants at scoping meetings expressed concern with flying see-and-avoid in an active MOA. Concern was expressed by scoping meeting participants that uncertainty regarding B-1 overflights would impact their flight activities, if they chose not to fly in an active MOA, by a delay of two to four hours or re-routing. In general, these activities occur at altitudes below radar and below radio frequency coverage. The fact that the Air Force would have high-speed military training aircraft which could be anywhere when a MOA is scheduled and the uncertainty of B-1 training flights altitudes which could occur randomly below 2,000 feet AGL were seen by scoping participants as potentially significant impacts upon their general aviation activities throughout the ROI. The Air Force revised aeronautical proposal stratifies most new proposed MOAs in Low and High stacks and specifies weekday hours when the MOAs would be scheduled. This is designed to permit an Air Force training mission to be in a Low MOA for specific training and then to perform continued training in a High MOA or Low ATCAA. The Air Force would inform ATC when training aircraft activated and completed training in the Low MOA so that the Low MOA could be deactivated and used for IFR traffic. This revised proposal is directly designed to respond to public and agency concerns and would be expected to reduce time when a Low MOA was active.

Scoping comments revealed concerns that the large area of the MOAs would deter general aviation pilots from flying through the MOAs, whether they were active or not. The limited radar and radio frequency coverage were cited as problems with the airspace. The combined PRTC is made up of four MOA combinations, which could be activated on a scheduled basis each weekday. General aviation pilots commented at scoping that they considered an active MOA airspace unsafe even under see-and-avoid conditions. If the general aviation pilot chooses not to traverse an active MOA, the pilot could detour around the active MOA. The distances and flight time would suggest that most pilots would choose a ground hold for the period of time the Low MOA was active.

A comparison of actual MOA traffic from FAA on Figures 3.1-14, 3.1-15, 3.1-20, and 3.1-21 shows that much of the MOA traffic flies direct point-to-point. The aircraft tracks do not generally follow the Gap MOA corridors except V-491. This means that civil aircraft seeking to fly IFR would request ATC clearance in an unactivated MOA segment, delay, or divert around airspaces to avoid an active MOA. The revised Air Force proposal with scheduling, stacked MOAs, and real-time ATC information would reduce potential IFR delays. Some general aviation pilots would see the ATC information as inaccessible, the risk of flying VFR too great, and the limited communication for IFR flight to result in a significant impact to general aviation.

Glider and Sky Diving Operations. Gliders and soaring operations in the PRTC proposed MOA areas may be affected. Soaring and sky diving operations occur on an infrequent basis with the majority typically

on the weekends when military training would not normally occur. Gliders tend to operate below 10,000 feet MSL. There is no restriction on a glider operating VFR in these areas; however, a pilot should be alert since military training activities may include low altitudes and abrupt maneuvers. MOAs and their scheduled hours of use are depicted on aeronautical charts. NOTAMS are available to general aviation users when the MOAs are active outside of the published hours of use. The NOTAMs should be checked for activity during glider or sky diving preflight. Aeronautical charts also depict where skydiving and glider operations regularly occur. Military pilots training in the proposed MOAs would be briefed of known glider activity that may occur in the area. See-and-avoid procedures are the responsibilities of all pilots. Any delay or change in airspace which could affect plans for soaring or sky diving would be seen by participants as an annoyance. Furthermore, Ellsworth and Minot AFBs airspace managers would:

- Plan to avoid known glider activities/events.
- Provide a briefing item to aircrews warning of glider/sky diving activity.
- Inform the glider community about procedures and safety in the airspace as requested.

Training aircraft would not normally schedule airspace from Friday afternoon through the weekend. There would be no significant adverse impacts expected to glider or sky diving operations in the regional airspace with participants reviewing military training schedules and military training pilots briefed to avoid areas and times of glider/sky diving activity.

Other Questions. Existing wind generation towers and other flight obstacles are published on aeronautical charts. Should any towers or commercial wind-based energy systems be constructed within the airspace in excess of 200 feet in height they would be subject to FAA tower visibility and lighting requirements. These requirements would be necessary regardless of the existence of a MOA. The MOAs are of sufficient size that training military aircraft would be able to avoid electromagnetic effects from wind generation towers. Additional communication with Ellsworth AFB would be required to support weather modification programs in an active MOA. Military training pilots would be briefed where weather modification activity could occur and would use see-and-avoid techniques to work with weather modification activities.

4.1.3.1.5 FAA Airspace Usage Data

FAA flight paths are presented on Figures 3.1-13 through 3.1-24 for aircraft winter and summer traffic throughout the proposed PRTC airspace. B-1 training aircraft in the Powder River airspace can be seen as the twisting and curving lines within the proposed PR-2 on Figures 3.1-14, 3.1-15, 3.1-16, 3.1-19, 3.1-20, and 3.1-21. General aviation and commercial flight paths are normally straight lines in the Figures. With the proposed PRTC, the twisting and curving lines visible in PR-2 (existing Powder River A and B MOAs) would also be seen in the proposed PR-1A/B, PR-3, and PR-4 MOA/ATCAA airspaces. B-1 aircraft would train for approximately 1.5 to 2 hours within a MOA/ATCAA combination. During this time, a B-1 could be at 2,000 feet AGL or below traveling at speeds of approximately 540 knots for 15 to 20 minutes.

Changes in the Air Force proposal from that presented at scoping are designed to reduce potential impacts on civil aviation. Changes include increasing the distance from the edges of MOAs and ATCAAs from major airports, stacking MOAs and ATCAAs to allow release of a Low or High MOA to support IFR traffic, providing advance schedule of airspace usage, stacking ATCAAs to support high altitude overflight, providing real-time information to ATC when training aircraft have completed activity within an airspace such as a Low MOA, and modifying Gap MOAs to have greater widths and allow for limited communication. These changes in the revised Air Force aeronautical proposal are designed to reduce potential impacts to civil aviation. Table 4.1-3 summarizes the daily number of civilian operations

estimated to be impacted by PRTC Alternatives A. The estimated civilian operations are summarized from Table 3.1-10 and include FAA data for representative days, public airport reported annual operations divided by the number of days in a year, and estimated private airfield operations determined by the reported based aircraft and the number of operations per year for public airports.

Monday through Thursday daily aircraft affected represent the estimated daily civilian operations in the MOAs proportioned to the FAA data. MOA scheduling would impact approximately 60 percent of the daily civil aircraft operations on Monday through Thursday and approximately 20 percent of the daily civil aircraft operations on Friday morning.

Table 4.1-3 Estimated Monday through Thursday MOA Civilian Traffic Affected by PRTC Alternatives

Proposed MOA	*Daily Average Civilian Operations*[2]	*PRTC Alternative*			*No Action*[1,3]
		A[1]	B[1]	C[1]	
PR-1A/1B	53	32		32	
PR-2	25	15	15	15	7
PR-3	52	32	32	32	
PR-4	83	50	50		
Day-to Day Total	213	129	97	79	7

Notes:
1. MOAs scheduled: Monday through Thursday, 7:30 a.m. to 12:00 noon and 6:00 p.m. to 11:30 p.m.; Friday, 7:30 a.m. to 12:00 noon; other times by NOTAM. MOA scheduling would impact approximately 60 percent of the daily civil aircraft operations on Monday through Thursday and approximately 20 percent of the daily civil aircraft operations on Friday morning based on time distribution of flights from Figures 3.1-8, 3.1-9, and 3.1-10.
2. From Table 3.1-10.
3. Represents operations in proposed PR-2.

FAA airspace usage data as summarized on Figures 3.1-7 through 3.1-9 demonstrates the limited communication and radar tracking in much of the airspace below Class A airspace. Many more public airport operations are reported than are tracked by FAA. The FAA data suggest that there is no substantial difference between the numbers of aircraft flying IFR in the proposed PRTC airspace on weekdays or on weekends.

The FAA usage data can be directly used to identify potential impacts to commercial and other aircraft traversing the proposed PRTC. The FAA data demonstrate that average daily commercial flight activity is 4 to 12 flights in the proposed Low ATCAAs below FL260. Above FL260, Table 3.1-11 demonstrates that the average daily traffic can range from 25 to 82 in the proposed Medium ATCAAs and from 26 to 82 in the proposed High ATCAAs. Impacts can be avoided or reduced below FL260, and to avoid significant impacts to commercial high-altitude traffic, the ARTCC is expected to schedule hours for high altitude training to avoid heavy commercial and high civil use hours.

If PRTC is approved by the FAA, the expanded MOA airspace would be well-publicized and documented on aeronautical charts. MOA activation, including Gap MOAs, would be on a scheduled basis or otherwise by NOTAM. The Air Force scheduling and communication efforts with the FAA could provide deconfliction of the PRTC airspace units for military training. Ongoing interaction between Ellsworth AFB and state and federal agencies would help ensure continued compatibility of military and commercial/civil aviation in the affected environment of PRTC airspace. All pilots using aeronautical charts would be aware of the changed configuration of this special use airspace (SUA).

Impacts to civil aircraft are greater above FL260 where over 500 daily flight operations occurred during the FAA data collection period. On a daily training basis, very few B-1, but a substantial number of B-52 training flights could occur above FL260.

4.1.3.1.6 LFE IMPACTS

Impacts to non-military aircraft would be greater on an LFE day than on a normal training day. The LFE encompasses the entire airspace and utilizes more military aircraft. An LFE would propose to activate all or a substantial portion of the PRTC MOAs and ATCAAs, including Gap MOA/ATCAAs for 1 to 3 days a maximum of once per quarter, an estimated 2 to 4 hours daily. These LFEs would include approximately 20 aircraft of various types performing combined training within the airspace as they would in a real-world conflict. The two to four hour daily LFE use of the entire airspace would place restrictions on civil aircraft seeking to fly IFR or seeking to avoid flying VFR through active MOAs as well as commercial overflights in Class A airspace. Avoidance could be accomplished by scheduling civil aircraft flights within the proposed PRTC to avoid the MOA activation times, ground holding, diverting to another airport for a period of two to four hours while LFE training occurred, or diverting around the activated airspace. Local aircraft activities in the region under the airspace would have to fly VFR see-and-avoid or remain on the ground during the hours of LFE training. Section 4.9.3.1.2 calculates that an average of 76 civilian MOA flights would be impacted by re-routing, ground hold, rescheduling, or flying VFR through an active PRTC during each day of Alternative A LFE training.

Table 4.1-4 presents the estimated daily LFE MOA impacts for each alternative. Each day's LFE is estimated to occur within the normally scheduled airspace period. It is anticipated that the airspace would actually be activated for the LFEs for a four-hour period (see Tables 2.10 and 2.11). Figures 3.1-8 through 3.1-10 show that 30 percent of civilian flights occur during a typical four-hour period. The scheduling of the airspace activation for an LFE could be at a time period with lower potential impacts upon commercial traffic, especially above FL260. Figures 3.1-11 and 3.1-12 present the hours when commercial overflights are more and less likely in the proposed ATCAAs.

Table 4.1-4 Estimated LFE Daily MOA plus Gap MOA Civil Operations Affected by PRTC Alternatives

Proposed MOA	*Daily Average Traffic*[2]	*PRTC Alternative*			*No Action*[3]
		A[1]	B[1]	C[1]	
PR-1A/1B (includes Gap A)	61	19		19	
PR-2	25	8	8	8	
PR-3 (includes Gap B)	66	20	20	20	
PR-4 (includes Gap C)	90	27	27		
LFE Total	242	74	55	47	0

Notes: 1. LFEs assumed to be 10 days per year conducted 4 hours per day during normal MOA scheduled times.
2. From Tables 3.1-10 and 3.1-11.
3. LFEs training cannot be adequately performed in the existing Powder River airspace.

ATCAA airspace activation for LFE training could significantly impact en route commercial traffic above FL300. Jet route and related route impacts are described in Section 4.1.4.1.3. PRTC LFE airspace activities could significantly impact regional commercial flight activities through ground delays and have a ripple effect at other commercial airports. A review of FAA airspace data in Figures 3.1-10, 3.1-11, and 3.1-12 suggests that there could be specific hours when ATCAA airspace would be made available for LFE training with some, but not significant, impacts to commercial traffic in Class A airspace. Section 4.1.3.1.3 explains that proper scheduling of a 4-hour period could impact an estimated 43 to 244 commercial or other high-altitude flights through re-routing around the LFE-activated PRTC.

4.1.3.1.7 DECONFLICTION MEASURES

The Air Force would employ the mitigation measures listed in Section 2.12 during regular training and LFEs to aid with deconfliction and address impacts. Section 4.1.3.1.3 summarizes the changes to the Air Force aeronautical proposal designed to reduce impacts upon civil aviation.

4.1.3.2 Alternative B

4.1.3.2.1 AIRSPACE CATEGORIES

Alternative B includes all Alternative A ATCAAs and the PR-2, PR-3, and PR-4 MOAs. Alternative B also includes Gap B MOA/ATCAA, and Gap C MOA/ATCAA. The Gap MOAs/ATCAAs would be activated during LFEs as explained under Alternative A. As with Alternative A, categories for airspace would not be impacted by establishing MOAs and ATCAAs in support of PRTC Alternative B.

4.1.3.2.2 MILITARY TRAINING AIRSPACE

Alternative B would modify the existing Powder River A and Powder River B MOAs to become the PR-2 MOA. There would be no change to PR-2 from what was described for Alternative A. ATCAAs would be the same as described for Alternative A. Alternative B does not include PR-1A or PR-1B MOAs or the Gap A MOAs. The total volume of airspace would be reduced from Alternative A, and the terrain conditions of the PR-1A and PR-1B MOAs would not be available under Alternative B. The PR-3 and PR-4 MOAs would have somewhat reduced airspace impacts when compared with Alternative A. Any location under Alternative B MOA would be expected to be overflown an average of 6 to 9 times per year within one quarter mile of the flight path at an altitude of 2,000 feet AGL or below. A comparison of Table 2-17 with Table 2-23 demonstrates that Alternative B would result in fewer overall sortie operations conducted annually within the airspace when compared with Alternative A. Alternative B would result in an estimated 10,474 sortie operations conducted annually within the proposed MOAs and ATCAAs as compared with 11,956 sortie operations conducted within the MOAs and ATCAAs under Alternative A. Training within the PRTC Alternative B MOAs/ATCAAs would be similar to baseline training in the Powder River A and B MOAs and the consequences would be comparable to those described under Alternative A for the PR-2, PR-3, PR-4, and associated Gap MOAs. Alternative B training would include low-level to high-altitude combat maneuvering and staging for LFEs as described under Alternative A.

4.1.3.2.3 CIVIL AIRSPACE USAGE

Victor Airways

Impacts to Victor Airways would be comparable to Alternative A except that fewer Victor Airways would be impacted. V-120 and V-491 would have the same impacts as under Alternative A (see Figure 3.1-5). Victor Airways V-247 and V-254 below FL180 would not be impacted by Alternative B. V-254 traffic would be parallel to the Alternative B PR-2 MOA with an internal distance of 4 miles from the eastern border of the PR-2 MOA. Civil aircraft would be able to traverse north-south under the proposed PR-1 MOA as depicted on Figures 3.1-13, 3.1-14, 3.1-15, 3.1-19, 3.1-20, and 3.1-21. Impacts to aircraft within the proposed PR-2, PR-3, or PR-4 MOAs not currently using Victor Airways or the aircraft on other Victor Airways would be as described for Alternative A.

If the Alternative B airspace were activated the entire time period scheduled from Monday through Thursday, the total daily number of civilian operations projected to be impacted from Table 4.1-3 is estimated to be 97 civil operations.

Jet Routes

Alternative B would have no change in ATCAA use from those described for Alternative A. Jet route impacts would be as described for Alternative A. This includes potential impacts to commercial traffic above FL300, potential impacts to both jet routes and CAN routes.

Airports and Airfields

Airports and airfields under the PR-2 MOA, PR-3 MOA, or PR-4 MOA would be impacted by military flight training as described for Alternative A. Airports under PR-2 are already under the Powder River A and B MOAs. Airports and airfields under the Gap B MOA and Gap C MOA would be impacted during LFEs as described under Alternative A. Table 4.1-1 summarizes the impacts to airport and airfields for Alternative B.

Airports at Hardin and Colstrip would not have a MOA above them. The ATCAA above those airports would be at FL180. IFR traffic between those airports and Miles City, Gillette, Sheridan, Billings, and airports under the PR-1A and PR-1B ATCAAs would be able to fly IFR below FL180 even during the time when the ATCAA was activated. Communication would be required by pilots at these airports to ascertain the activation status of the PR-1A or PR-1B ATCAAs and to ascertain the activation status of other Alternative B MOAs/ATCAAs if their flight plans took them through the Alternative B airspace. This communication would be the primary impact to the western side of the airspace.

4.1.3.2.4 Other Civilian Use

Commercial Carriers

Commercial carriers or time-sensitive deliveries operating on the western side of the airspace under the PR-1A or PR-1B ATCAAs would be able to fly IFR below FL180 during the time the ATCAAs were activated. This could result in some commercial carriers being required to fly at less efficient altitudes than would otherwise be desired during an activated ATCAA.

Commercial carriers operating on the eastern side of the airspace including service in conjunction with the PR-2, PR-3, and PR-4 MOAs/ATCAAs would face the same consequences as those described under Alternative A. Of particular concern would be the lack of radio frequency communication and radar coverage in the PR-2, PR-3, and western part of the PR-4 MOAs. This lack of coverage could affect corridors between Miles City, Dickinson, Bismarck, and Faith as well as through the Gap B and C MOAs/ATCAAs.

Other General Aviation

Other general aviation throughout the Alternative B PR-2, PR-3, PR-4 and associated Gap MOAs would be impacted as described for Alternative A. This includes the inability to fly IFR within activated MOAs and ground hold or re-routing of civil aviation pilots choosing not to fly VFR in an activated MOA.

All general aviation activities under the PR-1A, PR-1B, and the Gap A ATCAAs (when activated for LFEs) would be able to fly IFR or VFR below FL180 as under existing conditions (see Figures 3.1-14, 3.1-18, 3.1-19, and 3.1-20). General aviation under the PR-2 MOA would face comparable flight conditions as experienced under the existing Powder River A and B MOAs.

General aviation and aerial application impacts under Alternative B within the PR-2 MOA, PR-3 MOA, and PR-4 MOA, would be as described for Alternative A. Alternative B skydiving and glider effects within PR-2, PR-3, and PR-4 MOAs would be as described for Alternative A. There would be no impacts to agricultural operations with Alternative B under the PR-1A or PR-1B ATCAAs or under the Gap A ATCAA.

Skydiving and glider activity, where it occurs under the PR-1A or PR-1B ATCAAs would not be impacted at altitudes below FL180.

Weather modification program effects to the east side of the Alternative B airspace would be as described for Alternative A.

Emergency and Related Services

Emergency services, including life flight, fire support, and other emergency support, would be given priority under Alternative B as described under Alternative A. Such emergencies would require communication with ATC and Ellsworth AFB. Air Force training activities would be adjusted to allow for the emergency uses. The adjustment could include relocating to another airspace or canceling missions and returning to base, depending upon the extent of the emergency. Conditions would be as described for Alternative A.

Related services include natural resource photography and monitoring, which would be conducted during specific times under specific meteorological conditions. As described under Alternative A, the Air Force would work with the appropriate agencies to schedule training activities in support of these ongoing monitoring operations.

4.1.3.2.5 FAA Airspace Usage Data

FAA airspace usage data from Figures 3.1-7 through 3.1-12 were used to project potential air traffic impacts under Alternative B. For Alternative B, FAA data, reported public airport operations, and estimated private airfield operations would average 97 civilian flight operations in MOAs impacted during an average training day (from Table 4.1-3). Air traffic impacts above FL180 would be the same as those described for Alternative A. Potential impacts to commercial traffic above FL300 would be as described for Alternative A. Air traffic below FL180 in the Alternative B PR-2, PR-3, and PR-4 MOAs would be the same as described for Alternative A. Traffic in the Billings-Miles City-Gillette triangle below FL180 would not be impacted by the activation of the PR-1A and PR-1B ATCAAs. This means that ATC would continue to support IFR traffic transiting the airspace below FL180 and the airports at Hardin and Colstrip under the PR-1A and PR-1B ATCAAs.

4.1.3.2.6 LFE Impacts

Table 4.1-4 presents the estimated Alternative B MOA LFE impacts. The LFE ATCAA impacts would be the same as those described for Alternative A. Impacts to civil traffic in MOAs during an LFE day would be comparable to those described for Alternative A in Section 4.1.3.1.6 with the exception that LFE training below FL180 would not occur beneath the PR-1A, PR-1B, and Gap A ATCAAs. An LFE day under Alternative B would impact an estimated 54 civilian flight operations in the MOAs. Impacts would be as described for Alternative A. Civilian MOA flights could be impacted by re-routing, ground holds, rescheduling, or flying VFR through an active MOA.

4.1.3.2.7 Deconfliction Measures

The Air Force would employ the same measures listed in Section 2.12 to aid with deconfliction and address impacts.

4.1.3.3 Alternative C

4.1.3.3.1 Airspace Categories

Alternative C includes all Alternative A ATCAAs. Alternative C MOAs include the PR-1A, PR-1B, PR-2, and PR-3 MOAs, and the Gap A and Gap B MOAs. The Gap MOAs/ATCAAs would be activated during LFEs as explained under Alternative A. PR-4 and Gap C MOAs would not be included in Alternative C.

Categories for airspace would not be impacted by establishing MOAs and ATCAAs in support of PRTC Alternative C.

4.1.3.3.2 Military Training Airspace

The existing Powder River A and Powder River B MOAs would be modified to become the PR-2 MOA under Alternative B as described for Alternative A. ATCAAs would be the same as described for Alternative A. The total volume of airspace would be less for Alternative C than for Alternative A. Terrain conditions for training in the PR-1A and PR-1B MOAs would be available for superior, low-altitude training under Alternative C.

Table 2-29 presents the combined day-to-day and LFE military training activity under Alternative C. Alternative C would result in an estimated 10,478 sortie operations conducted annually within the proposed MOAs and ATCAAs as compared with 11,956 sortie operations conducted within the MOAs and ATCAAs under Alternative A. Training within the PRTC Alternative C MOAs/ATCAAs would be similar to current training in the Powder River airspace and the consequences would be comparable to those described under Alternative A including low-level overflight frequency with the exception of PR-4 MOA and the Gap C MOA. Military training would include all Alternative C MOAs and ATCAAs for low-level to high-altitude combat maneuvering for LFEs a maximum of once per quarter.

4.1.3.3.3 Civil Airspace Usage

Victor Airways

Impacts to Victor Airways on the central and west sides of the proposed PRTC airspace would be comparable to those described for Alternative A. The PR-4 ATCAA would be above FL180 for Alternative C and V-491 traffic would be able to continue IFR below FL180. PR-1A, PR-1B, PR-2, and PR-3 MOA impacts would be as described for Alternative A. Traffic on Victor Airway V-491 would not be expected to be impacted by Alterative C.

If the Alternative C airspace were activated the entire time period scheduled from Monday through Thursday, the total daily number of civilian operations projected to be impacted using Table 4.1-3 is estimated to be 79 civil operations.

Jet Routes

Jet route impacts for Alternative C would be as described for Alternative A. This includes potential impacts to commercial traffic above FL300 and potential impacts to both jet routes and CAN routes.

Airports and Airfields

Alternative C impacts under the PR-1A, PR-1B, PR-2, PR-3, and associated Gap MOAs would be as described for Alternative A. This means that impacts to Hardin and Colstrip airports would be as described under Alternative A. During Low MOA activation, IFR traffic could not occur within the PR-1A or PR-1B MOAs. Air traffic within the Billings-Miles City-Gillette triangle would be impacted as described for Alternative A.

Alternative C does not include the PR-4 MOA or the Gap C MOA. This means that airports and airfields at Mott, Elgin, Hettinger, Lemmon, McIntosh, and Bison would not be under a MOA. Traffic to and from these communities could occur under IFR or VFR below FL180 even if the PR-4 ATCAA were activated. Traffic into and out of Bismarck, Dickinson, and local smaller airports would not be impacted below FL180. Traffic on V-491 between Dickinson and Rapid City under the Gap C ATCAA and the Gateway ATCAA would be able to transit the area IFR or VFR below FL180 even when the ATCAA was activated.

This could result in some pilots flying at less efficient altitudes than desired. Table 4.1-1 summarizes IFR and other impacts for public airports under Alternative C.

Communication with ATC and/or Ellsworth AFB would be required by pilots operating from these airfields to ascertain the activation status of the PR-4 ATCAA or of Alternative C MOAs if flight plans took them through the PRTC. This communication and the altitude limitation of FL180 during PR-4 ATCAA activation would be the primary impacts to the eastern side of the airspace.

4.1.3.3.4 Other Civilian Use

Commercial Carriers

Commercial carriers operating on the eastern side of the airspace under the PR-4 ATCAA would be able to fly IFR below FL180 during the time the PR-4 ATCAA was activated. Commercial carriers using V-491 would also be able to fly below FL180 during the time that the PR-4 ATCAA was activated. This altitude limitation could result in some commercial carriers being required to fly at less efficient altitudes than would otherwise be desired. Commercial carriers on the western side of the airspace operating within the Billings-Miles City-Gillette triangle would be impacted as described under Alternative A. Radio frequency communication and radar coverage limitations throughout the PR-2 and PR-3 MOA/ATCAAs and along the northern edge of the Alternative C airspace would continue to impact aircraft access as described under Alternative A. This limited radio and radar coverage would affect airports and air traffic under or adjacent to the PR-2 and PR-3 MOAs/ATCAAs as well as the Gap B MOA/ATCAA. Commercial carriers operating in the PR-2 and PR-3 MOAs and on the Gap A and Gap B MOA/ATCAA under Alternative C would be impacted as described under Alternative A.

Other General Aviation

Other general aviation throughout the Alternative C MOAs would be impacted as described under Alternative A for the PR-1A, PR-1B, PR-2, PR-3, and associated Gap MOA/ATCAA. This includes the inability to fly IFR within activated MOAs, limitations on radio communication capabilities to determine real-time MOA conditions, and uncertainty regarding where and when low-level B-1 training would occur throughout the MOAs during scheduled training in the MOAs. Under Alternative C, the PR-4 MOA would not be created and all general aviation activities under LFE-activated PR-4 and Gap C ATCAAs would be able to function below FL180 as under existing conditions. Alternative C aerial application and skydiver/glider impacts within the PR-1A, PR-1B, PR-2, and PR-3 MOAs would be as described for Alternative A. Agricultural aerial applications under the Alternative C PR-4 ATCAA or Gap C ATCAA would not be impacted. There would be no impacts to agricultural operations with Alternative C under the PR-4 ATCAA or under the Gap C ATCAA. Skydiving and glider activity, where it occurs under the PR-4 ATCAA would not be impacted at altitudes below FL180.

Weather modification programs under the Alternative C PR-4 ATCAA below FL180 would not be impacted. Weather modification activities where they occur within the PR-1A, PR-1B, PR-2, or PR-3 MOAs would be as described for Alternative A. Additional communication would be required to coordinate with weather modification programs. Military training pilots would be briefed where weather modification activity could occur and would use see-and-avoid techniques to work with weather modification activities. Activity below FL180 would not be impacted under the PR-4 ATCAA. Any weather modification or similar activities in PR-1A, PR-1B, PR-2, PR-3, or associated Gap MOAs and ATCAAs would be impacted as described for Alternative A.

Emergency and Related Services

Emergency services, including life flight, fire support, and other emergency support, would be treated the same under Alternative C as under Alternative A. Such emergencies would require communication

with ATC and adjustment in Air Force training and other activities to allow for the emergency. That adjustment could include relocating to another airspace or canceling missions and returning to base, depending upon the extent of the emergency. Related services include natural resource photography and monitoring, which would be conducted during specific times under specific meteorological conditions. The Air Force would work with the appropriate agencies to schedule MOAs and training activities in support of these ongoing monitoring operations.

4.1.3.3.5 FAA Airspace Usage Data

FAA airspace usage data from Figures 3.1-7 through 3.1-12 were used to project potential air traffic impacts under Alternative C. The difference between the Alternative A day-to-day annual missions in the ATCAAs and the Alternative C day-to-day annual missions in the ATCAAs would not substantially change the potential impacts to commercial traffic above FL300. High altitude air traffic impacts in Class A airspace would be the same as those described for Alternative A.

Air traffic below FL180 in the Alternative C PR-1A, PR-1B, PR-2, and PR-3 MOAs would be the same as described for Alternative A. Traffic in the Bismarck-Faith-Dickinson area below FL180 would not be impacted by the activation of the PR-4 ATCAA. This means that Mott, Elgin, Hettinger, Lemmon, McIntosh, and Bison under the PR-4 ATCAA would continue to support IFR traffic within and transiting the airspace below FL180.

Table 4.1-3 contains the estimated number of civilian flights impacted in the MOAs during a normal training day. FAA data, reported public airport operations, and estimated private airfield operations result in an estimated 79 civilian operations impacted for Alternative C. Impacts would be as described under Alternative A.

4.1.3.3.6 LFE Impacts

Alternative C LFE impacts in the ATCAAs would be as described for Alternative A. Table 4.1-4 presents the estimated Alternative C MOA LFE impacts. An average LFE day under Alternative C would impact an estimated 47 civilian operations (see Table 4.1-4). The LFE ATCAA impacts would be the same as those described for Alternative A with the exception that LFE training below FL180 would not occur beneath the PR-4 or Gap C ATCAAs. Impacts to civil traffic during an LFE day would be comparable to those described for Alternative A in Section 4.1.3.1.6 and could include re-routing, ground holds, rescheduling, or flying VFR through an active MOA.

4.1.3.3.7 Deconfliction Measures

The Air Force would employ the same measures listed in Section 2.12 and summarized in Section 4.1.3.1.5 to aid with deconfliction and address impacts.

4.1.3.4 No Action

Under the No-Action Alternative, no change in baseline conditions would occur. The 28 BW and 5 BW would continue to conduct B-1 and B-52 flight training in the Powder River A/B MOAs, and Powder River, Gateway, Crossbow, and Black Hills ATCAAs as permitted under the existing letter of agreement. This means that Powder River A and B MOA effects would be comparable to those described for Alternative A PR-2. Annual sortie-operations in the existing Powder River MOAs/ATCAAs would be expected to occur as under projected baseline conditions. Chaff and flares are not authorized and would not be employed in the airspace. Supersonic activities are unauthorized in the MOAs/ATCAAs and would not be conducted. The structure and management of Powder River A/B MOAs and associated ATCAAs would continue to provide limited and not realistic training to the aircrews of the 28 BW and 5 BW.

4.2 Noise

4.2.1 Methodology

Subsonic and supersonic noise levels were calculated for each PRTC alternative using approved noise metrics and approved Air Force noise level calculation methodologies. Subsonic aircraft noise levels referenced in this section were calculated using the computer programs SEL_CALC and MR_NMAP. Supersonic noise levels were calculated using the programs PCBOOM and BOOMAP. Noise metrics, impact calculation methodologies, and studies relevant to estimation of noise impacts are discussed in greater detail in Appendix H.

4.2.2 Issues and Concerns

Specific issues and concerns about aircraft noise and sonic booms that were identified during scoping included the following:

- Annoyance, startle effect, and activity interference associated with subsonic and supersonic aircraft overflights
- Interference with sleep resulting from late-night overflights and/or day-time overflights (for day-time sleepers, such as night shift workers at the Colstrip power plant)
- Speech interference
- Learning interference
- Health impacts
- Land uses including hunting, fishing, recreation and outdoor activities, such as rock climbing, agricultural activities
- Safety impacts associated with livestock operations such as calving, branding, and weaning and/or reactions of domesticated animals to noise (e.g., stampedes, horses bucking)
- Impacts to structures
- Interference with tribal ceremonies and culturally-sensitive sites such as Devils Tower, Wind Cave, and Bear Butte
- Socioeconomics and rainfall
- Stress effects on task performance
- Disrupting the natural quiet of the area
- Impacts to domestic and wild animals (such as dogs, deer, etc.), including threatened and endangered species in the ROI (such as sage grouse and several species of raptors)

4.2.3 Environmental Consequences

This section explains the environmental consequences from aircraft overflights. The PRTC would be capable of supporting a higher number of Ellsworth AFB and Minot AFB training sorties, as well as LFEs that would include approximately 20 aircraft of various types.

4.2.3.1 Alternative A: Proposed Action

As described in Section 2.5.2, *Airspace Operations*, the Proposed Action would involve replacement of the existing Powder River airspace with the larger PRTC. The total number of sortie-operations flown in

the proposed PRTC would be greater than had previously been flown in the Powder River airspace and supersonic flight would be allowed, subject to altitude restrictions.

4.2.3.2 Subsonic Noise

The analysis addressed operations of all aircraft expected to use the proposed PRTC airspace including Ellsworth-based B-1 aircraft, Minot-based B-52 aircraft, and transient aircraft from numerous other installations. Section 3.2.3.1 describes subsonic noise. Noise impacts were calculated by comparing estimated day-night average sound levels (DNL) for each alternative against baseline noise levels, as described in Section 3.2.3. Potential effects of noise are diverse and several categories of noise impacts are discussed in this section, as well as in sections of this Environmental Impact Statement (EIS) devoted to other resource areas (such as Sections 4.6 *Biological*, 4.7 *Cultural*, 4.8 *Land Use*, 4.9 *Socioeconomics,* and 4.10 Environmental Justice).

4.2.3.3 Supersonic Noise Analysis

The sonic boom environmental effects under Alternatives A, B, and C have been computed. The analysis is based on the entire airspace being used, with opposing forces typically staging in PR-1A and PR-1B at one end, and PR-4 at the other, then proceeding in general west to east and east to west direction and conducting combat primarily in PR-2 and PR-3. While the entire airspace is modeled, it is expected that the central portion in PR-2, PR-3, and Gap B MOAs would experience more supersonic activity than the east or west ends, as this is where the opposing forces would most often be expected to engage.

Two general types of supersonic operations are proposed. One is air combat by fighter aircraft. This would involve up to 100 sorties per year of transient aircraft, consisting of primarily F-16s and would be expected to include other military fighter aircraft such as the F-22. The second type of operation is evasive maneuvers by B-1 aircraft.

4.2.3.4 Fighter Supersonic Operations

Fighter aircraft may attain supersonic speeds during LFE air combat training events. This can occur as aircraft approach an engagement, at times during an engagement, and during break at the end of an engagement. The events occur in an elliptical region centered along a line between setup points. The cumulative sonic boom exposure is modeled by BOOMAP, a statistical model based on long term sonic boom monitoring in a number of airspaces. BOOMAP has been run for 100 sorties per year, consisting of a 50/50 mix of F-16 and F-22 aircraft. To account for the expected higher activity in the central portion, operations were modeled with three overlapping maneuver ellipses. Sixty percent of operations were placed in a central ellipse that covers PR-2 and PR-3 and Gap B, and parts of adjacent airspace units. The other two ellipses, each with 20 percent of operations, are at the west and east ends. Figure 4.2-1 shows the three ellipses.

The calculated boom environment, as C-weighted Day-Night Average Sound Level (CDNL) and numbers of booms per year for each airspace unit, are shown in Table 4.2-4. The maximum CDNL in the center of the airspace is 36 C-weighted decibel (dBC), where there would be about six booms from fighters per year. The booms would occur during the LFE, four times a year for a period of two to three days each. There would be one to two booms calculated to be experienced throughout this area during each LFE. The boom environment away from the center would be less, about 10 decibels (dB) lower and one tenth as many booms near the edge. There is a calculated 10% to 20% chance that, during each LFE, a boom from a fighter would be heard near the edge of the airspace.

4.2.3.5 B-1 Supersonic Operations

Supersonic events by the B-1 are expected to consist of evasive dashes. If pursued by an opposing fighter, the B-1 would accelerate to supersonic speed, and then decelerate after the fighter gives up

pursuit. During LFEs, an estimated 60 such operations per year would be expected, with supersonic duration of about 30 seconds for each operation. Details of the maneuver vary, and particularly depend on whether the aircraft dives or remains at constant altitude. Two maneuver profiles have been analyzed, which bracket the expected range of expected maneuvers in terms of intensity of sonic boom impacts. Sonic booms from these maneuvers have been computed using PCBOOM.

- Profile 1, where the aircraft dives at a 5 degree angle, beginning around 25,000 feet MSL. It exceeds Mach 1 at 23,500 feet, and reaches a maximum speed of Mach 1.1 30 seconds later. It then decelerates, falling below Mach 1 before reaching 20,000 feet MSL. Deceleration from Mach 1.1 to 1.0 takes about 5 seconds.
- Profile 2, where the aircraft accelerates in level flight at 25,000 feet MSL. Acceleration from Mach 1.0 to 1.05 takes about 30 seconds. Deceleration back to Mach 1 takes 2 to 3 seconds.

One aspect of these maneuvers is that they involve low supersonic Mach numbers. A sonic boom will reach the ground only if the aircraft speed exceeds a cutoff Mach number that is usually greater than 1. For level flight at 25,000 feet MSL in the standard atmosphere with ground elevation at 4,000 feet MSL the cutoff Mach number is 1.08. Under standard conditions, Profile 2 booms would not reach the ground, and only part of Profile 1 booms would reach the ground. The atmosphere varies, however, and this variation is important in determining cutoff conditions. A tail wind at altitude reduces cutoff Mach number, increasing propagation to the ground, while a headwind at altitude increases cutoff Mach number, reducing propagation to the ground. Variations in the atmosphere were accounted for by analyzing calendar year 2009 wind data at 25,000 feet for Rapid City, SD, the nearest reporting station (NOAA 2009). Table 4.2-1 shows the percent of time that wind speed was in various ranges. These data are based on all 731 upper air soundings conducted in the year.

Table 4.2-1. Distribution of Wind Speed at FL250

Wind Speed, knots	*Percent of time*
0-10	2.8
10-20	9.0
20-30	12.3
30-40	19.3
40-50	17.6
50-60	11.6
60-70	11.1
70-80	6.3
80-90	4.2
90-100	3.4
100-110	1.1
110-120	0.7
120-130	0.4

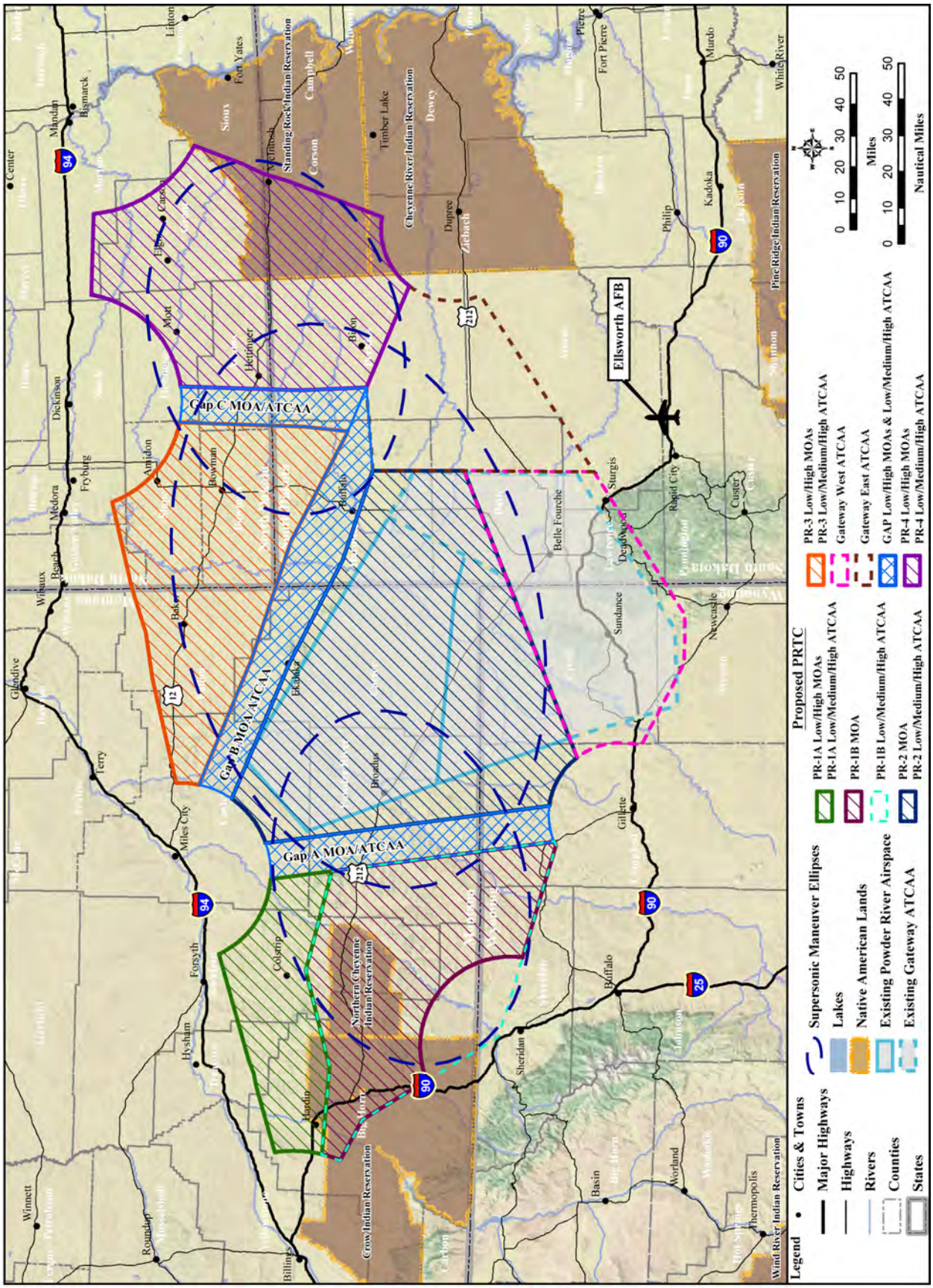

Figure 4.2-1. Supersonic Maneuver Ellipses

Wind direction varies, as does the flight direction for the evasion maneuver. Allowing for this difference in direction, a distribution of head/tail winds was prepared. PCBOOM was run for each head/tail wind speed range. The area of each footprint, square miles exposed to various boom overpressures, was obtained. The areas from each footprint were weighted by the percent time for the wind, to obtain square miles per boom. The final areas were then scaled by 60 operations per year and the area of the airspace to obtain the probability of a boom impacting any particular location in each year. For this analysis, all B-1 supersonic events were assumed to take place in the central portion of the airspace, PR-3, PR-4 and Gap B, and booms were modeled as occurring anywhere in that region. Table 4.2-2 shows the annual probability of boom exceeding various levels for each of the two profiles. For comparison, the probability of fighter boom in the center of the airspace is shown.

Some B-1 supersonic operations may occur outside of the central portion of PRTC, so actual probabilities would be slightly lower than those presented in Table 4.2-2, and there would be some (at a lesser rate) in the other regions. Note that the occurrence of B-1 booms is rare, both as compared to fighter booms and on an absolute basis. The probability of a person anywhere on the ground experiencing a B-1 boom is about once every six years, as compared to an average of six fighter booms per year toward the center of the airspace.

The average boom, when a boom is heard, will be 1.6 psf for B-1 Profile 1, 0.7 psf for B-1 Profile 2, and 0.8 psf for fighters. Louder booms would be heard less frequently. Approximately 1,300 acres (2 square miles) could experience a sonic boom of 4.0 psf and smaller acreage could experience a higher focus boom. A boom of 5.0 psf or greater would be heard an average of once every 150 years for B-1 Profile 1 and an average of once every 17 years from fighters. Fighter booms away from the airspace would be less frequent, as discussed in 4.2.3.4. The likelihood of significant damage from a sonic boom is thus very low, although it could occur. Any claims from Air Force-related damage would begin by contacting Ellsworth AFB Public Affairs.

Communities in northeast WY, such as Sundance, and west central SD are under the Gateway ATCAA where supersonic training could occur during LFEs.

The cumulative exposure from B-1 supersonic operations is smaller than that from fighters. CDNL for B-1 exposures in Table 4.2-2 is 26 dBC for Profile 1 and 16 dBC for Profile 2. Combining 26 dBC with the 36 dBC fighter exposure yields a total of 36.4 dBC. The cumulative CDNL values in Tables 4.2-4, shown to the nearest dB, are the same for the total environment as for fighters alone.

Expected Supersonic Events

The majority of the estimated 6 sonic booms during 10 days of LFEs would be primarily the result of fighter aircraft. For the purposes of this analysis, the number of expected sonic booms to be experienced at any location is rounded up to approximately one per LFE day. Table 4.2-4 lists the maximum CDNL and number of sonic boom events expected to occur each year under each of the proposed airspace units, including sonic booms generated by both B-1 and transient fighter aircraft.

Table 4.2-2. Probability (per year) of Sonic Boom at Any Location Near the Center of PRTC

PSF	*B-1 Profile 1 (Dive Maneuver)*	*B-1 Profile 2 (Level Acceleration)*	*Fighter Aircraft (Air Combat Maneuvering)*
0	0.1689	0.1433	6.0000
1	0.0999	0.0185	1.1234
2	0.0448	0.0022	0.3876
3	0.0136	0.0006	0.1782
4	0.0086	0.0002	0.0955
5	0.0065	0.0001	0.0565
6	0.0054	0.0001	0.0358
7	0.0050	0.0000	0.0238
8	0.0042	0.0000	0.0165
9	0.0024	0.0000	0.0118
10	0.0014	0.0000	0.0087
11	0.0009	0.0000	0.0065
12	0.0006	0.0000	0.0050
13	0.0004	0.0000	0.0039
14	0.0003	0.0000	0.0031
15	0.0002	0.0000	0.0025
16	0.0000	0.0000	0.0020

Noise Impact Analysis

Several categories of noise impacts that could potentially be associated with the Proposed Action are discussed below.

ANNOYANCE

Annoyance is a common response to noise. An individual's response to noise is impossible to predict accurately and depends on several acoustic and non-acoustic factors including, but not limited to, how the individual feels about the noise source and the activity the person is engaged in at the time the noise occurs (Newman and Beattie 1985). Extensive social surveys have found that the percentage of exposed *populations* that become "highly annoyed" after being exposed to a particular *time-averaged* noise level is predictable. This relationship has been studied for both the A-weighted Day-Night Average Sound Level (DNL) metric used to describe subsonic aircraft noise levels and CDNL used to describe impulsive noise events such as sonic booms (Schultz 1978; Finegold *et al.* 1994; Stusnick *et al.* 1992; Committee on Hearing Bioacoustics and Biomechanics 1981). The findings of these studies are summarized in Table 4.2-3. The projected CDNL under the PRTC MOAs is calculated to be 36 dBC.

Table 4.2-3. Relation Between Noise Level Metrics DNL and CDNL and Annoyance

DNL	*CDNL*	*Average Percent Population Highly Annoyed*
45	***42***	***0.83***
50	***46***	***1.66***
55	51	3.31
60	56	6.48
65	60	12.29

Source: Finegold et al. 1994; Stusnick et al. 1992; Committee on Hearing Bioacoustics and Biomechanics 1981

The Air Force-approved noise models MR_NMAP, PCBOOM, and BOOMAP were used to model noise impacts associated with subsonic and supersonic operations, respectively. Table 4.2-3 shows subsonic and supersonic aircraft noise levels under baseline conditions and the Proposed Action. Under the Proposed Action, wherever ATCAA airspace overlies MOA airspace, noise generated in the MOA airspace dominates overall noise levels such that noise generated by aircraft operations in the ATCAA would not quantitatively add to the overall Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) in areas beneath the airspace.

Neither the Onset Rate-Adjusted Day Night Average Sound Level (DNL_{mr}) nor the CDNL associated with PRTC training would be above 55 DNL or 52 CDNL for any airspace. Decreases in DNLmr would occur in areas beneath existing Powder River MOAs. Increases would occur in areas not located beneath existing MOAs, where noise is estimated to be below DNL 45 dB. A DNL increase in excess of 5 dB would be expected to be noticed by residents and could be perceived as a significant increase in noise by residents or visitors. In areas where the DNL_{mr} is less than 45 dB, noise from individual aircraft over flights would be noticed, but less than 1 percent of the populations would be expected to become highly annoyed (Schultz 1978; Finegold, et al.,1994) .

A summary of impacts presented in Table 4.2-4 is provided below:

- **Powder River A MOA (Under existing Powder River A):** Under the Proposed Action, the DNLmr noise level would decline by 2 dB from 49 dB to 47 dB in areas beneath this currently existing MOA. This decrease in noise level would occur because the total area of airspace across which air operations would be spread consists of a larger volume of airspace than under projected baseline conditions. The number of overflights per day exceeding Sound Exposure Level (SEL) of 65 dB would increase by 0.2 from 0.2 to 0.4. This means that 4 out of 10 days there would be overflights which would exceed 65 dB SEL. These overflights would occur randomly and could be anywhere in the airspace.

  An average approximately one sonic boom during each LFE day could be experienced anywhere beneath the airspace where no sonic booms have been experienced in recent years and CDNL would be 36 dBC. The sonic booms would typically be distant thunder-like sound. The sharp crack-crack experienced by a receptor directly in the line of the air pressure change would be infrequent at any given location. B-1 supersonic event would result in sonic booms that would be heard, on average, once every six years at any given location in the airspace, with an average amplitude of 1.6 psf. Each boom could result in approximately 1,300 acres experiencing an overpressure of 4 psf or greater. Sonic booms could result in annoyance to persons exposed to the boom and focused booms could result in damage to structures.

- **Powder River B MOA (Under existing Powder River B):** The DNL_{mr} noise level under this airspace unit would minimally decline by 2 dB from 49 dB to 47 dB. The number of overflights per day exceeding 65 dB SEL would remain approximately the same (roughly 1 every other day on average). The number of sonic booms would increase from 0 to approximately one per LFE day (10 days) per year and CDNL would be 36 dBC.

- **Gateway East and West ATCAAs (Existing Gateway ATCAA):** Noise levels beneath the Gateway East and West ATCAAs would remain below 45 dB DNLmr. The increased number of aircraft overflights would be noticed by, and may be annoying to, some residents. However, the average noise level would remain below the United States Environmental Protection Agency (USEPA) identified level of 55 dB DNL as the threshold below which adverse impacts would not be expected to occur. Overflights exceeding 65 dB SEL would remain at approximately 0.4 per day.

The number of sonic booms would be approximately one per year and CDNL in each airspace unit would be as shown in Table 4.2-4.

Table 4.2-4. Existing and Alternative A Military Aircraft Noise Levels

		Baseline[1]				Alternative A			
Proposed Airspace	*Existing Special Use Airspace*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*CDNL*	*Sonic Booms Per Year*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*Center of Airspace CDNL*	*Sonic Booms Per Year*
PR-1A MOA/ATCAA	None	<45	-	-	-	46[2]	0.3	20	0.6
PR-1B MOA/ATCAA	None	<45	-	-	-	46[2]	0.3	30	2.4
PR-1B ATCAA[3]	None	<45	-	-	-	<45	0.2	30	2.4
Gap A MOA/ATCAA	None	<45	-	-	-	<45[2]	0.1	34	3.6
PR-2 MOA/ATCAA	Powder River A MOA/Powder River ATCAA	49	0.6	-	-	47[2]	0.4	36	6.0
	Powder River B MOA/ Powder River ATCAA	49	0.8	-	-	47[2]	0.4	36	6.0
	Gateway ATCAA	<45[4]	0.4	-	-	47[2]	0.4	36	6.0
	None	<45	-	-	-	47[2]	0.4	36	6.0
Gap B MOA/ATCAA	None	<45	-	-	-	<45[2]	0.1	35	4.8
PR-3 MOA/ATCAA	None	<45	-	-	-	47[2]	0.4	31	3.6
Gap C MOA/ATCAA	None	<45	-	-	-	<45[2]	0.0	34	3.6
PR-4 MOA/ATCAA	None	<45	-	-	-	47[2]	0.3	32	2.4
Gateway East ATCAA	None	<45	-	-	-	<45[4]	0.3	29	1.2
Gateway West ATCAA	Gateway ATCAA	<45[4]	0.4	-	-	<45	0.3	25	0.6
	None	<45	-	-	-	<45	0.3	25	0.6

Notes: 1. Estimated baseline noise levels under airspace.
2. Dominated by aircraft operations in the MOA; overlying ATCAA noise contributions do not add to overall L_{dnmr} noise level beneath the SUA.
3. Areas overlain by PR-1B ATCAA only
4. Calculated military aircraft noise is below the DNL ambient sound of below 45 dB.
A – Ambient noise levels. See Table 3.2-2, Estimated Baseline Noise Levels Under Airspace.

Table 4.2-5 lists the number of overflight events per day with Onset Rate-Adjusted Sound Exposure Level (SEL_r)above 65, 75, and 85 dB that a person located in several representative locations would be likely to hear under baseline conditions and Alternative A. The locations selected for analysis are shown in Figure 3.2-3. The number of events exceeding a SEL_r of 65 dB per day would between <0.1 and 0.4 at all locations studied. In other words, events exceeding 65 dB SEL_r would occur no more than once every other day on average.

Table 4.2-5. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative A (Page 1 of 2)

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
5	Thunder Basin National Forest (northern section)	None	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.2	<0.1
6	Thunder Basin National Forest (southern section)	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
7	Black Hills National Forest	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
8	Custer National Forest (western section)	None	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
9	Custer National Forest (central section)	Powder River A	0.6	0.2	<0.1	PR-2 MOA/ATCAA	0.4	0.2	<0.1
10	Custer National Forest (southeastern section)	none	n/a	n/a	n/a	Gateway East ATCAA	0.3	0.1	<0.1
11	Little Missouri National Grassland	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
12	Grand River National Grassland	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.4	0.2	<0.1
17	Hardin, MT	none	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
18	Colstrip, MT	none	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1

Table 4.2-5. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative A (Page 2 of 2)

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
19	Broadus, MT [4]	Powder River A MOA	0.6	0.2	0.1	PR-2 MOA/ATCAA	0.4	0.3	<0.1
20	Ekalaka, MT	none	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.3	<0.1
21	Baker, MT	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
22	Elgin, ND	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
23	Bowman, ND	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
24	Bison, SD	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
25	Buffalo, SD	none	n/a	n/a	n/a	Gap B MOA/ATCAA	0.1	<0.1	<0.1
26	Sundance, WY	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
27	Belle Fourche, SD	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1

Notes:

1. Because several of the listed noise-sensitive areas are very large, locations were selected from within the designated areas that are near the center of proposed airspace units.
2. Devils Tower published aircraft avoidance area is 5 NM horizontally and 18,000 feet AGL
3. Little Bighorn Battlefield published aircraft avoidance area is ¾ nautical mile horizontally and 2,000 feet AGL.
4. Broadus, MT published aircraft avoidance area is 3 NM horizontally and 1,500 feet AGL

SLEEP DISTURBANCE

Several studies have been carried out on the relationship between aircraft noise and behavioral arousals or awakenings from sleep. The results of these studies have often been contradictory and depend on a number of situation-specific factors, including but not limited to depth of sleep, background noise levels, familiarity with surroundings, and previous exposure to aircraft noise. As recommended by sleep interference studies, a conservative approach was used in estimating sleep interference impacts for this proposed action.

The USEPA identified an indoor DNL of 45 dB as being necessary to protect against sleep interference at a frequency that would be considered problematic (USEPA 1974). Standard frame homes have an outdoor-to-indoor noise reduction of about 20 dB, so an outdoor sound level of 65 dB DNL is an appropriate lower threshold for this category of impact (USAF 1999). There are some areas overflown by the proposed PRTC where home construction may be less than standard and may not provide attenuation up to 20 dB. Under the Proposed Action, noise levels would not exceed 65 dB DNL under any of the proposed Special Use Airspace (SUAs).

In locations where the DNL sound level does not exceed 65 dB, individual overflights may still cause awakenings. The probability of awakening can be approximately predicted based on indoor SEL

resulting from an aircraft overflight (Federal Interagency Committee on Aviation Noise 1997, Federal Interagency Committee on Noise 1992). When exposed to indoor SEL noise levels of 45 (assumed equivalent to 65 dB outdoor noise level), roughly 1 percent of subjects were awakened. As indicated in Table 4.2-4, areas beneath the proposed airspace would experience between less than 0.1 and 0.4 overflight events exceeding a SEL of 65 dB per day. Table 3.2-1 lists SEL_r associated with aircraft configurations at various overflight altitudes. An indoor SEL of 113 dB would be the highest indoor noise level expected to occur under the Proposed Action. This noise level would occur only directly beneath the aircraft flight path and only as the result of B-1 maneuvers that make up a small portion of the total mission time. Persons affected by indoor SEL of 113 dB would be expected to be awakened. Overflight noise of this intensity would be expected to occur once or twice per mission. The relatively low population density of the ROI (see Table 3.9-4) would make the occurrence of an overflight maneuver impacting a residence rare.

Sonic booms would be experienced under the airspace approximately 6 times per year, as described in Table 4.2-4, an average of approximately one during each LFE day. CDNL would be well below levels considered compatible with sleeping indoors. Individual sonic booms could result in additional awakenings.

Relatively few aircraft sorties occur during late-night hours (10 p.m. to 7 a.m.) when most people are asleep. People sleeping during the day may be exposed to overflight events exceeding a SEL of 65 dB as noted in Table 4.2-4. Each location under the airspace would be expected a noise 65 dB or greater less than once a training day on average.

Speech Interference

Noise can interfere with activities that involve listening, such as conversation, watching television, and listening to the radio. Conversation in a normal voice (assumed to be 70 dB) at a distance of 2 meters (6.56 feet) can be held with 95 percent sentence intelligibility in a steady noise environment of 60 dB (USEPA 1981). In noise environments exceeding this level, the speaker and listener must either move closer together or raise their voices in order to maintain sentence intelligibility. Aircraft overflight noise events nearing or exceeding this level may cause a reduction in sentence intelligibility. Under the Proposed Action, noise events that would potentially disrupt speech would occur relatively infrequently and would be of a brief duration.

Effects on Learning

It has been demonstrated that chronic exposure of children to high aircraft noise levels, as would occur near an airport, may impair learning (Shield and Dockrell 2008). DNLmr beneath all PRTC airspace units would be low enough that schools would be considered a compatible land use. While intense overflight noise events would occur under the Proposed Action, these events would be infrequent (less than one per day exceeding 65 dB SEL) and would not be expected to affect the ability of students to learn. Teachers have noted that a sudden noise event during a class, whether an overflight or a sonic boom, will disrupt the class and require a few minutes to return to academics. Impacts of noise on children are also discussed in Section 4.10, *Environmental Justice*.

Impacts to Health (auditory and non-auditory)

Hearing loss is generally defined as the loss of ability of the ear to hear sounds below a specified level. Hearing threshold shifts can be permanent or temporary. The USEPA has established 70 dB for a 24-hour exposure period as the average noise level standard required to protect 96 percent of the population from a permanent threshold shift (USEPA 1978). Because the DNL is weighted with a 10 dB penalty for late-night events, actual un-weighted noise levels experienced would be lower than the DNL

value reported. DNLmr beneath the proposed SUAs (listed in Table 4.2-4) would not exceed 70 dB and would not be over a long duration. No long-term permanent threshold shifts would be expected to occur as a result of implementation of the Proposed Action.

Non-auditory noise-induced health impacts on humans (e.g., cardiovascular problems, birth weight effects, mortality rates) have not been found to occur at time-averaged noise levels of less than 75 dB. No long-term impacts to human health are expected to occur (see additional information on direct safety impacts of noise in Section 4.3.2.7, *Noise Impacts on Safety)*.

LAND USES

Increases in noise levels do not directly affect land use, but land uses could potentially change in an area if noise levels were to make existing land uses untenable or undesirable. After extensive study of several categories of noise impacts (e.g. health, activity interference, annoyance), the USEPA established 55 dB DNL as the threshold below which adverse impacts would not be expected to occur (USEPA 1974). A DNL value of 65 dB is widely used as the threshold above which residences are not considered to be compatible without incorporation of special noise attenuation measures. This threshold is a compromise between acceptable noise and economic practicality. A primary consideration in establishment of this threshold was the USEPA-established goal of maintaining indoor living environments at or below 45 dB. Frame homes with some open windows have an outdoor-to-indoor noise reduction of about 20 dB, so an exterior level of 65 dB means that 45 dB will be achieved indoors. Weather conditions in the ROI lead most residents to keep windows and doors closed through much of the year, so a higher outdoor-to-indoor noise reduction than 20 dB would be expected. Higher levels of outdoor-indoor noise attenuation are achieved in houses with heavier construction or with special acoustic design features. Structural noise attenuation does not provide benefits to people while they are out-of-doors.

Agriculture, rangeland, and open space make up approximately 99% of the area beneath the proposed PRTC. Agriculture (including livestock production) and agriculture-related activities (e.g., harvesting) are considered to be fully compatible with noise levels up to 75 dB DNL (Air Force 1999). Effects of noise on individual livestock species are discussed in Section 4.6, *Biological Resources,* and Section 4.9, *Socioeconomics*.

The ROI supports excellent opportunities for hunting, fishing, and tourism. These activities may be temporarily disrupted by aircraft noise, but disruptions would be relatively infrequent. It is not expected that noise would strongly affect the way in which the area is regarded by potential hunters, fishermen, and tourists. All these activities currently occur under the existing Powder River A and B MOAs. Single event overflights or sonic booms could result in annoyance to individual hunters, fishermen, or tourists. Further discussion of noise and recreational activities is included in Section 4.9, *Land Use.*

NOISE IMPACTS TO SAFETY

Safety issues associated with noise are discussed in Section 4.3, *Safety*. As discussed in this section, noise levels associated with the proposed aircraft training operations, are not expected to result in hearing loss or any other human health and safety impacts.

Horses, cattle, and other large livestock sometimes “spook” at sudden-onset sounds such as the noise created by low-altitude, high-speed aircraft. These reactions can be particularly hazardous to the animals and people in close proximity to the animals, while the animals are penned in a relatively small area, as is the case during branding and weaning operations. In the existing Powder River A/B MOAs, when notified by a rancher that branding or weaning operations are underway the 28 BW establishes temporary avoidance areas to prevent direct overflight. This practice would continue throughout the PRTC airspace under the proposed action or an alternative. When contacted, Ellsworth AFB would

request locations and timing of noise sensitive operations and establish temporary avoidance areas to protect ground assets from low-level overflight impacts. Because sonic booms are affected by meteorological conditions, it is not possible to prevent sonic booms from reaching the ground in a specific area, although knowledge of specific branding times could be included in LFE planning and scheduling.

Low-altitude aircraft overflights also have the potential to startle people at sensitive times, such as while they are driving, riding horses, or rock-climbing. Any safety hazard associated with this type of startle event would be difficult to predict and would be highly dependent on situation-specific factors. Safety procedures associated with usage of explosives for mining are designed to prevent inadvertent explosions caused by vibrations, such as those caused by aircraft overflight. Overpressures in open areas could be sufficient to disturb loose rock or other materials. This could have the potential to impact safety (see Section 4.3). Locations under ATCAAs and not under MOAs, such as Devils Tower and Bear Butte, would not be subject to low-level overflights.

NOISE IMPACTS TO STRUCTURES

Sonic booms could be experienced anywhere under the proposed airspace an average of approximately once per day during the 10 LFE days per year. There would be a potential for sonic booms to damage structures or other items as summarized in Table 4.2-6. At 1 pound psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). At 10 psf, the probability of breakage is between one in a hundred and one in a thousand (Haber and Nakaki 1989). Damage to plaster is in a comparable range but depends on the condition of the plaster. Adobe faces risks similar to plaster, but assessment is complicated by adobe structures being exposed to weather, where they can deteriorate in the absence of any specific loads (Sutherland 1989). Typical outdoor structures such as buildings, windmills, radio towers, etc., are resilient and routinely subject to wind loads far in excess of sonic boom pressures. Foundations and retaining walls, which are intended to support substantive earth loads, are not typically at risk from sonic booms below 4 psf. Fighter aircraft flying supersonic between 10,000 and 12,000 feet AGL could produce comparable overpressures (Figure 2.6). Fighter aircraft would fly supersonic below FL180 approximately four percent of the time. Nearly all the B-1 supersonic events would be between 15,000 and 20,000 feet AGL. Table 4.2-7 shows probabilities of booms that exceed various overpressures. The probability of a 5 psf boom is about one in 16 years. As demonstrated in Table 4.2-6, such an overpressure has the potential to cause damage to structural and free-standing items such as bric-a-brac. The Air Force follows established procedures for claims against the government in cases where damage is claimed to result from sonic booms or other Air Force activities.

Table 4.2-6. Possible Damage to Structures from Sonic Booms

Sonic Boom Overpressure Nominal (psf)	*Item Affected*	*Type of Damage*
0.5 - 2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards.
	Glass	Rarely shattered; either partial or extension of existing cracks.
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole.
	Damage to outside walls	Existing cracks in stucco extended.
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break.
	Other	Dust falls in chimneys.
2 - 4	Glass, plaster, roofs, ceilings	For elements nominally in good condition, failures show that would have been difficult to forecast in terms of their existing localized condition.
4 - 10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses.
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster.
	Roofs	High probability rate of failure in slurry wash in nominally good state; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily.
	Walls (out)	Old, free standing, in fairly good condition can collapse.
	Walls (in)	Internal ("party") walls known to move at 10 psf.
Greater than 10	Glass	Some good window glass will fail when exposed to regular sonic booms from the same direction. Glass with existing faults could shatter and fly. Large window frames move.
	Plaster	Most plaster affected.
	Ceilings	Plaster boards displaced by nail popping.
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and wall-plate cracks; domestic chimneys dislodged if not in good condition.
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage.
	Bric-a-brac	Some nominally secure items can fall; e.g., large pictures, especially if fixed to party walls.

Source: Haber and Nakaki 1989

Table 4.2-7. Sonic Boom Peak Overpressures (psf) for B-1, F-16, and F-22 Aircraft at Mach 1.2 Level Flight

Aircraft Type[1, 4]	ALTITUDE (FEET AGL)[2]						
	10,000	***15,000***	***16,000***	***21,000***	***25,000***	***30,000***	***40,000***
B-1	10.21	7.21	6.81	5.31	4.51	3.81	3.03
F-16	4.24	2.95	2.78	2.13	1.78	1.48	1.13
F-22[3]	5.37	3.75	3.53	2.71	2.27	1.88	1.44

Notes:
1. Overpressure is at Mach 1.2, straight and level flight; produced using PCBOOM 4 computer program; assumed standard U.S. atmospheric conditions. Boom exposure for fighters was computed with BooMap, which accounts for aircraft maneuvers. B-1 boom exposure was computed using PCBOOM for actual planned maneuvers and accounting for atmospheric variability.
2. Overpressure values provided here are intended to provide a general picture of overpressures resulting from B-1 supersonic flight. Actual overpressure would vary based on maneuvers (climb/descent, turns, accel/decel) and specific weather conditions (winds, vertical temperature / pressure profile). Aircraft maneuvers result in concentration of sonic boom energy ("focus booms") that may exceed overpressure shown here, or defocusing that may result in lower overpressures.
3. F-15, F-22, and F/A-18 overpressures are comparable.
4. B-1 supersonic flight would be limited to 20,000 feet MSL minimum and fighter supersonic flights would be limited to 10,000 feet AGL minimum. Supersonic flights would only be permitted during LFEs.

NOISE IMPACTS TO CULTURAL RESOURCES

Impacts of noise on cultural resources are discussed in Section 4.7, *Cultural Resources*. Cultural resources, as defined under 36 Code of Federal Regulations (CFR) Part 800.16, include several categories of historically or culturally-important structures and sites. While many historical structures may have incipient damage and may be more sensitive to noise impacts than other structures, these structures are routinely currently exposed to loads resulting from high winds and other natural forces. Sonic boom or low-level overflights could produce overpressures of sufficient magnitude to damage historic structures under the airspace. Impacts to structures may be more severe if the structure is in poor condition.

Aircraft overflight noise could potentially disrupt Native American tribal or individual activities. Consultation with Native American tribes is underway to identify sensitive locations and times. Additional discussion on this topic can be found at Section 4.7, *Cultural Resources*.

The natural quiet of a cultural or historic site may be one element of its cultural value. Aircraft overflights may disrupt this natural quiet. Disruptions would be expected to be relatively infrequent and would not be expected to affect the way in which most people perceive the area as a whole. Individuals could see the noise or visual intrusion as an annoyance and an impact upon the experience value of the historic or cultural site.

EFFECTS ON SOCIOECONOMICS

Effects of noise on socioeconomics are discussed in Section 4.9, *Socioeconomics*. Concerns were raised during scoping about how aircraft noise would affect the economy and, especially, the tourism industry in the affected area, which centers on hunting, fishing, and sight-seeing. In the highly unlikely event of a sonic boom or low altitude overflight occurring at a critical time in a hunt, the hunter could be annoyed. At levels below 55 dB DNL, aircraft noise would not typically be expected to elicit strong community reaction and is generally not considered to be an important factor in determining people's attitudes towards the area affected by the noise (Committee on Hearing, Bioacoustics, and Biomechanics 1977).

Startle effects from sudden low-level overflight and associated noise was cited by scoping participants as a concern. B-1 or B-52 low-level flight 2,000 feet AGL or below would overfly one-quarter of a mile each

side of the flight path between 2 and 4 percent of the ground area under the MOAs each training day. This means that, on average, any specific location under the airspace could expect to be overflown between five and nine times a year (see Section 4.9.3.1.5). Any given location could be overflown more or less than average during a year. Noise and startle effects would be infrequent but could be perceived as significant by overflown persons.

During scoping, members of the public expressed concern that sonic booms might interfere with the formation of clouds, thereby reducing rainfall and affecting crop production. Cloud formation depends on the amount of moisture in the air, together with local temperature and pressure at the cloud layer. Aerodynamic loads (lift and drag; pressure on the wings) on an aircraft in flight have a localized effect on temperature and pressure. These loads are sometimes made visible by local condensation. The resulting vapor cloud is actually a condensation cloud in low-pressure expansion regions. The effect is transient, reacting to the local pressure and returning to normal after the aircraft passes. The pressure field of an aircraft (either subsonic or supersonic) does not remove moisture or change atmospheric conditions and aircraft noise under the Proposed Action would not be expected to have any direct or indirect impact on rainfall.

Performance Effects Resulting From Noise-Related Stress

Aircraft overflights that would occur under the Proposed Action would have the potential to cause startle responses in exposed persons. Several studies have been conducted on the relationship between noise-induced stress and performance loss (see Appendix H). These studies have found that intermittent sounds, such as flyover noise, are more likely to disrupt performance than continuous sounds of the same level and that the level of impact is strongly linked to the type of task and the sensitivity of the individual performing the work. Noise events would be infrequent under the PRTC airspace with less than 1 event per day exceeding an SEL of 65 dB expected to be experienced at any location. Although such events could be momentarily startling, they would not be expected to substantially impact performance of a specific task.

Noise Impacts to Animals

The effect of noise on domestic and wild animals was a concern expressed by public commenters. The impact of noise on animals is discussed in Section 4.6, *Biological Resources,* Section 4.9, *Socioeconomics,* and Section 4.8, *Land Use*.

For domestic animals, public concern generally focuses on adverse effects on the use of or economic value of the animals. Since over three-quarters of the total land area beneath the proposed PRTC is grazing and agriculture, ranchers expressed concern regarding damage that could occur if livestock were panicked by noise or sonic booms. Ranchers were particularly concerned about the impact of overflights during calving, branding, weaning, or other penning operations. Stampeding of penned livestock after low-level aircraft overflight has been known to lead to injury, escape of large domestic stock animals, and damage to fences (Air Force 1994). Existing avoidance areas have been established for seasonal ranching activities under the Powder River A and B MOAs. Avoidance areas would be established in the PRTC to minimize the likelihood of physical injury to livestock due to initial reactions to overflight noise. Open communication between ranchers and the Air Force would be important to ensuring that appropriate avoidance procedures are enacted. When the Air Force knows of such activities, the avoidance areas are part of the aircrew briefing described in Section 2.2.1.3.

A majority of studies conducted to date have shown little or no effect of aircraft noise on the long-term health and productivity of cattle. After compilation of the results of studies of milk production in cows exposed to aircraft overflights, no connection between noise and milk yield was found (Air Force 1994).

Studies on spontaneous abortions in cattle have been inconclusive, with the majority of studies indicating no relationship between aircraft noise and spontaneous abortions (Air Force 1994).

Horses may exhibit behavioral reactions to aircraft overflights, but typically habituate to the stimulus over time (Air Force 1994). To date, no linkage has been established between aircraft noise and spontaneous abortions or other long-term health effects in horses (LeBlanc *et al* 1991).

Studies of aircraft noise effects on weight gain, food intake, and reproduction rates of swine have indicated little or no effect. Exposure of swine to aircraft noise frequently resulted in increased heart rates, hypertension, and electrolyte imbalances, but these effects typically subsided after the noise levels were reduced (Air Force 1994).

Domestic fowl may panic when exposed to sudden, intense aircraft noise and this panic can lead to bruising and other damage to the birds, which could reduce marketability (Air Force 1994). These effects are more likely to occur when birds are densely crowded and when they are naïve to aircraft noise. Egg productivity has not been found to be affected by aircraft overflight noise, even when the birds were exposed to noise levels of 130 dB (Air Force 1994).

Domestic dogs and cats may become excited or stressed by aircraft overflight noise. However, no permanent effects on dogs or cats are expected to occur as a result of overflights.

Response of wild animals to noise differs markedly between species (Manci *et al* 1988). It has been found that many species habituate to noise over time (Manci *et al* 1988). Military aircraft operations in areas where no military aircraft operations had occurred previously may cause behavioral responses in exposed animals (startle response, fleeing the sound source, or becoming temporarily motionless). Responses to overflight noise would be expected to diminish as the exposed animals grow more accustomed to the stimulus. Effects of noise on wildlife, including threatened and endangered species, are described in section 4.6, *Biological Resources*.

Areas Not Currently Beneath SUAs: Areas not currently beneath SUAs are typically overflown by aircraft at high altitudes. Low-altitude military overflights are infrequent and would only occur on MTRs. Ambient noise levels in these areas are typically low, estimated to be below 45 dB DNL. Under the Proposed Action, aircraft-generated noise levels beneath portions of PR-2 that are currently within Powder River A/B MOAs would decrease from 49 to 47 dB DNLmr. Noise levels in areas of PR-1A/B, PR-2, PR-3, and PR-4 MOA/ATCAA included in Powder River A/B MOAs would increase from less than 45 dB DNL to a calculated 47 dB DNLmr. Noise levels beneath Gap A, Gap B, Gap C MOA/ATCAA from aircraft would remain below 45 dB DNLmr as would areas beneath ATCAAs only. Subsonic military aircraft operations in the ATCAAs would occur at such high altitudes that they would not affect the overall DNL_{mr} noise level on the ground. Noise level changes from less than 45 dB DNL to greater than 45 dB DNL could be noticed and could be annoying to some people. However, noise levels would remain below the USEPA identified level of 55 dB DNL. Depending on the airspace, Table 4.2-4 calculates the number of sonic booms experienced at any given location to increase from 0 to 6 per year or approximately one per LFE day, and CDNL would be 36 dBC toward the center of the airspace. Increases in noise levels in these areas could produce annoyance to residents and frequent visitors, but infrequent sonic booms would not be expected to result in impacts to human health.

4.2.3.6 Alternative B

Noise impacts of Alternative B would be the same as Alternative A except that it would not include creation of the PR-1A/B MOAs or the Gap A MOA. Aircraft operations in SUAs other than PR-1A/B MOA or Gap A MOA would be the same as described under Alternative A, and the sortie operations would be conducted in PR-1A/B MOA and Gap A MOA. Subsonic and supersonic noise levels beneath airspace units would be the same as described in Table 4.2-4 with the exception of areas beneath the proposed

PR-1A/B ATCAA and Gap A ATCAA. Noise levels beneath each of the PRTC airspace units under Alternative B are displayed in Table 4.2-8. Noise impacts would be similar in nature but slightly less intense than the impacts that would occur under Alterative A in airspace units where the noise levels differ between the two alternatives.

Table 4.2-8. Existing and Alternative B Military Aircraft Noise Levels

		BASELINE[1]				ALTERNATIVE B			
Proposed Airspace	*Existing Special Use Airspace*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*CDNL*	*Sonic Booms Per Year*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*Center of Airspace CDNL*	*Sonic Booms Per Year*
PR-1A ATCAA	None	<45	-	-	-	<45	0.2	18[2]	0.3
PR-1B ATCAA	None	<45	-	-	-	<45	0.2	30	2.4
Gap A ATCAA	None	<45	-	-	-	<45	<0.1	33	3.6
PR-2 MOA/ATCAA	Powder River A MOA	49	0.6	-	-	47[2]	0.4	36	6.0
	Powder River B MOA	49	0.8	-	-	47[2]	0.4	36	6.0
	Gateway ATCAA	<45[4]	0.4	-	-	47[2]	0.4	36	6.0
	None	<45	-	-	-	47[2]	0.4	36	6.0
Gap B MOA/ATCAA	None	<45	-	-	-	<45[2]	0.1	35	4.8
PR-3 MOA/ATCAA	None	<45	-	-	-	47[2]	0.4	31	4.3
Gap C MOA/ATCAA	None	<45	-	-	-	<45[2]	<0.1	34	3.6
PR-4 MOA/ATCAA	None	<45	-	-	-	47[2]	0.3	32	2.4
Gateway East ATCAA	None	<45	-	-	-	<45[4]	0.3	29	1.2
Gateway West ATCAA	Gateway ATCAA	<45[4]	0.4	-	-	<45	0.3	25	0.6
	None	<45	-	-	-	<45	0.3	25	0.6

Notes: 1. Estimated baseline noise levels under airspace.
2. Calculated military aircraft noise is below the ambient sound level of 28 to 44 dB.
A – Ambient noise levels. See Table 3.2-2, Estimated Baseline Noise Levels Under Airspace.

Table 4.2-9 lists the number of overflight events per day with SEL_r above 65, 75, and 85 dB that a person located in several representative locations beneath PRTC would be likely to hear under baseline conditions and Alternative B. The locations selected for analysis are shown in Figure 3.2-3. The number of events exceeding a SEL_r of 65 dB per day would be between <0.1 and 0.4 at all locations studied. The number of events would differ from the number of events under Alternative A only in locations located beneath PR-1A/B and Gap A ATCAAs.

Table 4.2-9. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative B (Page 1 of 2)

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A ATCAA	0.2	0.1	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
5	Thunder Basin National Forest (northern section)	None	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.2	<0.1
6	Thunder Basin National Forest (southern section)	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
7	Black Hills National Forest	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
8	Custer National Forest (western section)	None	n/a	n/a	n/a	PR-1B ATCAA	0.2	0.1	<0.1
9	Custer National Forest (central section)	Powder River A	0.6	0.2	<0.1	PR-2 MOA/ATCAA	0.4	0.2	<0.1
10	Custer National Forest (southeastern section)	none	n/a	n/a	n/a	Gateway East ATCAA	0.3	0.1	<0.1
11	Little Missouri National Grassland	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
12	Grand River National Grassland	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B ATCAA	0.2	0.1	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B ATCAA	0.2	0.1	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.4	0.2	<0.1
17	Hardin, MT	none	n/a	n/a	n/a	PR-1A ATCAA	0.2	0.1	<0.1
18	Colstrip, MT	none	n/a	n/a	n/a	PR-1A ATCAA	0.2	0.1	<0.1

Table 4.2-9. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative B (Page 2 of 2)

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
19	Broadus, MT [4]	Powder River A MOA	0.6	0.2	0.1	PR-2 MOA/ATCAA	0.4	0.3	<0.1
20	Ekalaka, MT	none	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.3	<0.1
21	Baker, MT	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
22	Elgin, ND	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
23	Bowman, ND	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
24	Bison, SD	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
25	Buffalo, SD	none	n/a	n/a	n/a	Gap B MOA/ATCAA	0.1	<0.1	<0.1
26	Sundance, WY	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
27	Belle Fourche, SD	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1

Notes: 1. Because several of the listed noise-sensitive areas are very large, locations were selected from within the designated areas that are near the center of proposed airspace units.
2. Devils Tower published aircraft avoidance area is 5 NM horizontally and 18,000 feet AGL
3. Little Bighorn Battlefield published aircraft avoidance area is ¾ nautical mile horizontally and 2,000 feet AGL.
4. Broadus, MT published aircraft avoidance area is 3 NM horizontally and 1,500 feet AGL

4.2.3.7 Alternative C

Alternative C would not involve creation of the PR-4 MOA or the GAP C MOA, but would be the same as Alternative A in all other respects. Aircraft operations in SUAs other than beneath PR-4 ATCAA or Gap C ATCAA would be the same as described under Alternative A. No sortie-operations would be conducted in the PR-4 MOA or Gap C MOA. Subsonic and supersonic noise levels beneath airspace units would be the same as described in Table 4.2-4 with the exception of areas beneath PR-4 ATCAA and Gap C ATCAA. Noise levels beneath each of the PRTC airspace units under Alternative C, are displayed in Table 4.2-10. The average number of overflights exceeding SEL_r 65, 75, and 85 dB per day at several representative locations beneath PRTC are listed in Table 4.2-11**.** A map showing the representative locations analyzed can be found at Figure 3.2-3. Noise impacts would be similar in nature but slightly less intense than the impacts that would occur under Alterative A in the airspace units where noise levels would differ between the two alternatives.

Table 4.2-10. Existing and Alternative C Military Aircraft Noise Levels

		Baseline[1]				Alternative A			
Proposed Airspace	*Existing Special Use Airspace*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*CDNL*	*Sonic Booms Per Year*	L_{dnmr}	*Number of events/ day SEL_r > 65 dB*	*Center of Airspace CDNL*	*Sonic Booms Per Year*
PR-1A MOA/ATCAA	None	<45	-	-	-	46[2]	0.3	20	0.6
PR-1B MOA/ATCAA	None	<45	-	-	-	46[2]	0.3	30	2.4
PR-1B ATCAA[3]	None	<45	-	-	-	<45	0.2	30	2.4
Gap A MOA/ATCAA	None	<45	-	-	-	<45[2]	0.1	34	3.6
PR-2 MOA/ATCAA	Powder River A MOA	49	0.6	-	-	47[2]	0.4	36	6.0
	Powder River B MOA	49	0.8	-	-	47[2]	0.4	36	6.0
	Gateway ATCAA	<45[4]	0.4	-	-	47[2]	0.4	36	6.0
	None	<45	-	-	-	47[2]	0.4	36	6.0
Gap B MOA/ATCAA	None	<45	-	-	-	<45[2]	0.1	35	4.8
PR-3 MOA/ATCAA	None	<45	-	-	-	47[2]	0.4	31	3.6
Gap C ATCAA	None	<45	-	-	-	<45[2]	<0.1	33	3.6
PR-4 ATCAA	None	<45	-	-	-	<45	0.3	30	1.2
Gateway East ATCAA	None	<45	-	-	-	<45[4]	<0.1	29	1.2
Gateway West ATCAA	Gateway ATCAA	<45[4]	0.4	-	-	<45	0.3	25	0.6
	None	<45	-	-	-	<45	0.3	25	0.6

Notes: 1. Estimated baseline noise levels under airspace.
2. Calculated military aircraft noise is below the ambient sound level of 28 to 44 dB.
A – Ambient noise levels. See Table 3.2-2, Estimated Baseline Noise Levels Under Airspace.

Table 4.2-11. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative C (Page 1 of 2)

ID#	*General Description*	*Baseline Airspace*	*Baseline # Events Per Day Exceeding*			*Proposed Airspace*	*Proposed # Events Per Day Exceeding*		
			65 dB SEL	**75 dB SEL**	**85 dB SEL**		**65 dB SEL**	**75 dB SEL**	**85 dB SEL**
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
5	Thunder Basin National Forest (northern section)	None	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.2	<0.1
6	Thunder Basin National Forest (southern section)	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
7	Black Hills National Forest	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
8	Custer National Forest (western section)	None	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1

Table 4.2-11. Average Frequency of Military Aircraft Noise Events at Selected Representative of Noise-Sensitive Locations Under Alternative C (Page 2 of 2)

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding 65 dB SEL	Baseline # Events Per Day Exceeding 75 dB SEL	Baseline # Events Per Day Exceeding 85 dB SEL	Proposed Airspace	Proposed # Events Per Day Exceeding 65 dB SEL	Proposed # Events Per Day Exceeding 75 dB SEL	Proposed # Events Per Day Exceeding 85 dB SEL
9	Custer National Forest (central section)	Powder River A	0.6	0.2	<0.1	PR-2 MOA/ATCAA	0.4	0.2	<0.1
10	Custer National Forest (southeastern section)	none	n/a	n/a	n/a	Gateway East ATCAA	0.3	0.1	<0.1
11	Little Missouri National Grassland	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
12	Grand River National Grassland	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
17	Hardin, MT	none	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
18	Colstrip, MT	none	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
19	Broadus, MT [4]	Powder River A MOA	0.6	0.2	0.1	PR-2 MOA/ATCAA	0.4	0.3	<0.1
20	Ekalaka, MT	none	n/a	n/a	n/a	PR-2 MOA/ATCAA	0.4	0.3	<0.1
21	Baker, MT	none	n/a	n/a	n/a	PR-3 MOA/ATCAA	0.4	0.2	<0.1
22	Elgin, ND	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
23	Bowman, ND	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
24	Bison, SD	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
25	Buffalo, SD	none	n/a	n/a	n/a	Gap B MOA/ATCAA	0.1	<0.1	<0.1
26	Sundance, WY	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
27	Belle Fourche, SD	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1

Notes:
1. Because several of the listed noise-sensitive areas are very large, locations were selected from within the designated areas that are near the center of proposed airspace units.
2. Devils Tower published aircraft avoidance area is 5 NM horizontally and 18,000 feet AGL
3. Little Bighorn Battlefield published aircraft avoidance area is ¾ nautical mile horizontally and 2,000 feet AGL.
4. Broadus, MT published aircraft avoidance area is 3 NM horizontally and 1,500 feet AGL

4.2.3.8 No-Action

Under the No-Action Alternative, the PRTC would not be charted and a large percentage of sorties would continue to be carried out at remote locations. The existing Powder River airspace would remain

in place and training sorties would be at projected baseline conditions as the base returns to a peacetime operational tempo. No intentional supersonic operations would take place in the existing Powder River airspace. Unintentional supersonic flight may occur as B-1 aircrews undergo intensive training maneuvers. Pilots quickly reduce speed after becoming aware of having exceeded the speed of sound. Noise conditions under No-Action would be as described in Table 3.2-3.

4.3 Safety

4.3.1 Methodology

Numerous federal, civil, and military laws and regulations govern operational safety. Individually and collectively these laws and regulations prescribe measures, processes, and procedures required to ensure safe operations and to protect the public, military, and property.

PRTC elements with a potential to affect safety are evaluated to determine the degree to which such elements increase or decrease safety risks. Communication, flight, ground, and bird-aircraft strike safety are assessed for the potential to increase risk. The 28 BW capability to manage risk by responding to emergencies is described. Any changes in the uses and handling requirements for explosive materials are identified and addressed. Analysis of flight risks correlates Class A mishap rates and Bird/Wildlife Aircraft Strike Hazards (BASH) with projected airspace utilization.

4.3.2 Issues and Concerns

Safety concerns were expressed at scoping meetings about increasing the amount of airspace used for low altitude military training flights and the limited communication available to general aviation pilots. Aircraft accidents and the adequacy of disaster response, especially fire response, were noted as concerns during public scoping. Potential concerns associated with electronic emissions and wake vortices were expressed. Concerns were noted about the use of chaff and flares in the proposed PRTC expanded airspace.

4.3.3 Environmental Consequences

4.3.3.1 Alternative A: Proposed Action

4.3.3.1.1 COMMUNICATION SAFETY

The Proposed Action would add additional low-altitude airspace to the ROI. The existing Powder River A and B MOAs which constitute the large majority of the proposed PR-2 MOA currently have low-level B-1 training. During public scoping meetings, some general aviation pilots expressed the opinion that the existing MOA airspace is unsafe under "see-and-avoid" conditions. Some pilots commented that they could not adequately communicate with the FAA during a flight to learn whether the MOA was actively being used for military training.

There is no proposal for increased radio frequency coverage or radar coverage for the proposed PRTC airspace where coverage is lacking. General aviation pilots would have several methods to receive status updates as to the activation of a PRTC MOA via NOTAMS or on-line. General aviation pilots could call Ellsworth AFB Airspace Management Office prior to departure to determine the status or obtain a pre-flight briefing from the FAA flight services operators.

Based upon the limited airspace radio frequency and radar coverage, public commenters have stated that the PRTC, without communication and radar improvements, has the potential to significantly impact civil aviation safety. Low-level overflights in the PR-3 and PR-4 MOAs would not be expected to be authorized until adequate communication is available. Changes to the Proposed Action to somewhat mitigate safety impacts include setbacks from major airports and adjusting the widths of Gap MOAs.

Limited communication would continue to impact the airspace around the proposed PR-2, PR-3, the eastern portion of PR-1A/1B, and the western portion of PR-4. The existing Powder River A and B MOAs (most of the PR-2) do not have adequate communication for ATC to support airborne civil aviation.

4.3.3.1.2 FLIGHT SAFETY

All 28 BW training in the local airspace would noticeably increase with four PRTC MOAs. Flight safety associated with a Class A safety mishap is directly related to the experience with the training airframes and the expected duration of training within the airspace.

SUPERSONIC EVENTS

Supersonic events in and of themselves create no specific flight safety hazard. Commenters at scoping meetings asked whether a supersonic event could impact safety of a light aircraft in flight. The likelihood of an air pressure variation from a sonic boom during the 10 days of LFEs per year actually intersecting an aircraft flying VFR in an active MOA would be so slight as to be not quantifiable. Even if such an extremely unlikely event were to occur, potential pressure changes as high as 10 psf or more would be within the structural design of an aircraft. Aircraft are regularly exposed to pressure changes in excess of those generated by a supersonic event, for example, a light single-engine Cessna 150 has a wing loading of 10 lbs/sq ft and a twin-engine Cessna 414 has a wing loading in excess of 40 lb/sq ft. No in-flight impacts would be expected.

CLASS A MISHAPS

As described in Section 3.3.2, the overall probability of a B-1 Class A mishap is 0.0000084, or one chance in 840,000. This equates to a lifetime mishap rate of 4.32 per 100,000 hours. B-1s were involved in twenty-two Class A mishaps between 1984 and 2007. Risks of a Class A mishap remain unchanged from current conditions. Accident rates for B-52 aircraft are lower, with 98 Class A mishaps from 1955 to 2007. The B-52 has flown over 7 million hours with an accident rate of 1.27 per 1,000 hours. Table 4.3-1 presents existing and projected Class A mishap data associated with the increased training within the proposed PRTC. The increased frequency of mishaps in the larger airspace is the result of mathematical calculations associated with the additional training use of the airspace during day-to-day and LFE training.

Table 4.3-1. Projected Class A Mishaps for PRTC Alternatives

	AIRCRAFT		
	B-1	*B-52*	*F-16*[2]
Lifetime Mishap Rate per 100,000 Flight Hours[1]	4.32	1.27	3.98
Baseline Annual Hours in Powder River Airspace	875.0	300.0	24.0
Baseline Years Between Projected Mishaps	26.5	262.5	1046.9
Alternative A Projected Annual Hours	2360.0	712.5	163.0
Alternative A Years Between Projected Mishaps	9.8	110.5	154.1
Alternative B Projected Annual Hours	1990.0	678.0	162.0
Alternative B Years Between Projected Mishaps	11.6	116.1	155.1
Alternative C Projected Annual Hours	1990.0	678.0	161.0
Alternative C Years Between Projected Mishaps	11.6	116.1	156.1

Note: 1. Lifetime thru Fiscal Year (FY) 07; B-52 Calendar Year (CY) 55-FY 08, B-1 CY84-FY07
2. Representative transient aircraft.

Source: Air Force Safety Center 2009

BIRD-AIRCRAFT STRIKE

The increased training flight activity over a larger area would be expected to increase the total number of bird strikes. There would be no expected change in the incidence rate of bird-aircraft strikes other than from the increased amount of training operations. As described in Section 3.3.3.4, an average of 1 to 2 bird strikes occurred in the Powder River training airspace per year between 1999 and 2008 with the majority being in the Powder River B MOA. The PR-3 and PR-4 Low MOAs are in the Central and Mississippi flyways and would have a higher potential for bird strikes than the PR-1A, PR-1B, or PR-2 MOAs. Based upon the increased training activity described in Section 2.5.2, the estimated average annual bird strikes would be 3 to 6 in the proposed PRTC. Use of the Aviation Hazard Advisory System, the Bird Avoidance Model and pilot briefings prior to sorties (see Section 2.2.1.3.4) would continue to identify avoidance areas and provide a method to minimize risks from bird strikes in any new airspace regardless of the alternative selected.

ATCAA USAGE

For the existing Powder River airspace, there is an existing agreement between Ellsworth AFB and FAA with limits on ATCAA time and altitudes of use. The FAA has noted that a comparable agreement to the Powder River airspace agreement will be required for altitudes and timing of PRTC ATCAA use for military training. The proposed PRTC has the potential to significantly impact commercial and other aircraft overflight of the area. An agreement would be required with the respective ARTCCs to avoid re-routing of commercial aircraft into already congested airspace or the need to execute flow control on commercial airports at least from Chicago and New York to the Pacific Northwest.

During LFEs, specific scheduled time for high-altitude training would need to be coordinated with ARTCC to ensure safe transit by commercial and other aircraft using high-altitude corridors. The Air Force will coordinate with FAA to have in-place agreements with the ARTCC regarding the timing, altitudes, and duration of LFE training. The ATCAA altitudes have the potential to significantly impact the national airspace. FAA has stated that there would be a need to evaluate airspace users to determine when or if ATCAA airspace, especially above FL300, would be available for LFEs.

AIRPORTS

The Billings airport requires a buffer to the east to allow for low-level approach and higher altitude climbing and descending. The revised proposed PR-1A and PR-1B avoid encroaching on the Billings airport operations and prevent significant impacts to the safe operation of the airport. Similar low-altitude approach setbacks have been added to support the Bismarck and Dickinson, ND, airports.

Civil aviation operations from airports under an activated MOA would not be able to fly IFR. If such aircraft launched and flew VFR using GPS in an activated MOA, they would fly using see-and-avoid techniques. This is what occurs in the current Powder River A and B MOAs. If pilots sought to convert from VFR to IFR to account for weather or other conditions, they could have difficulty communicating with ARTCC in much of the proposed PRTC. Civil aviation pilots expressed the opinion that such constraints upon their operations and the uncertainty associated with B-1 training schedules and altitudes create a significant impact to regional civil aviation safety in the PR-1, PR-3, and PR-4 MOAs. The Air Force changed the aeronautical proposal to provide specific airspace scheduled hours during the morning and late afternoons Monday through Thursday and Friday morning. The specific schedule combined with stacking the PR-1A, PR-3, PR-4, and Gaps with a Low MOA and a High MOA are designed to reduce the impact on IFR civilian aircraft.

The proposal to expend chaff in the PRTC airspace would not be expected to create any flight safety issues. The only type of chaff which would be permitted would be RR-188, RR-112, RR-179, or

equivalent and configured so as to reduce interference with FAA radar. Some improved FAA radars have the ability to detect and track all chaff. Because chaff might be detected by improved FAA radars chaff would be deployed only after receiving clearance from the Frequency Management Authority. The frequency clearance would include specific delivery restrictions to insure chaff operations would not interfere with other users of the frequency spectrum.

WAKE VORTICES

The trail of disturbed air that follows an aircraft is called a wake vortex. Larger aircraft and lower altitudes and longer wingspans produce a greater potential for a wake vortex effect. Aircraft vortices represent a safety issue raised during scoping. As aircraft move through the air, they create vortices from their wing tips. These vortices, collectively called wake turbulence, trail immediately behind the aircraft for thousands of feet while diminishing in strength farther from the aircraft.

The strength of wing tip vortices depends upon the amount of lifting force an aircraft is required to generate in order to fly. The heavier the aircraft, the more lifting force required, and therefore the stronger the vortices. At cruising altitudes, wake turbulence directly behind the aircraft can cause handling difficulties for following aircraft, especially when a small aircraft trails a larger aircraft. FAA regulations dictate safe following distances and procedures to avoid wake turbulence, both in flight and during landing or takeoff. For aircraft en-route, the FAA Aeronautical Information Manual has specified separation minimums of 5 nm between a Heavy Aircraft (such as a Boeing 757) and any smaller aircraft which is following or crossing behind at the same level or less than 1,000 ft below. No special longitudinal wake turbulence separations based on time are required (FAA 2010).

Aircraft flying closer to the ground create wake turbulence, which trails behind the aircraft generally moving downward and lessening in intensity. Depending upon a variety of factors, including the wingspan, speed, altitude, and aircraft mass, a wake vortex can vary from a light breeze to a strong, brief wind turbulence and can dissipate quickly near the ground or last for a minute or more at altitude. This creates an interface between flight safety and ground safety.

Nearly all of the proposed PR-2 MOA is the existing Powder River airspace A and B MOAs. There have not been any reports of wake vortex problems from training by B-1 and other aircraft in the existing Powder River A or B MOAs. The B-1 operates for an estimated 20 to 30 minutes below 2,000 feet AGL during each training sortie. At this altitude, the B-1 could produce a strong, brief wind turbulence. Most structures are designed to accommodate such turbulence. Rare, rapid turns or a pull-up maneuver by a B-1 flying below 1,000 feet AGL can result in wing vortex wind velocities greater than 27 mph at 22 feet AGL behind and below the aircraft. These infrequent high-energy wing vortices, although extremely improbable, could damage a ranch windmill structure. Structures, objects, persons, wildlife, and livestock in the area underlying the proposed airspace are frequently subject to average winds and wind gusts that match potential B-1 wing vortex wind speeds. The Air Force has a procedure for damage claims which begins by contacting Ellsworth Public Affairs with details of any claim.

4.3.3.1.3 GROUND SAFETY

Operations and maintenance procedures conducted by 28 BW personnel at Ellsworth AFB would not change from current conditions. All activities would continue to be conducted in accordance with applicable regulation, technical orders, and Air Force Occupational Safety and Health standards.

CHAFF AND FLARES

One aspect of the proposed PRTC action which could create new or unique ground safety issues is the use of defensive flares in the airspace. Currently, expenditure of chaff and flares is not permitted in the existing Powder River MOAs and ATCAAs. Under the Proposed Action, defensive chaff and flare training

use in the expanded PRTC MOA/ATCAA airspace would be permitted under certain conditions. Chaff, although ejected from the aircraft by a pyrotechnic charge, is not explosive. As described in Appendix C, the composition of chaff is similar to those components found in the earth's crust, and presents no human health or safety risk. Through numerous studies, chaff has never been found to be specifically harmful to domestic animals or wildlife (Appendix C). Chaff residual materials are described in Section 2.4.6.3. An average of one piece of residual plastic, felt, or wrapper material would fall on 115 acres per year. These residual pieces would not constitute a safety risk, but could be an annoyance if such a plastic piece were found on the ground and identified.

Use of flares in the proposed PRTC airspace would be conducted in accordance with ACC and Ellsworth AFB regulations. Use of flares within the PRTC would incorporate the following management practices:

- All aircrew/units planning flare employment in the PRTC airspace will contact 28 Bomb Wing Operations Office for current flare restrictions.
- Current flare restrictions will be briefed to all aircrew planning on employing flares, the day of the sortie, and prior to flight operations in PRTC.
- When not further restricted, minimum altitude for flare release within the boundaries of PRTC airspace in training areas other than government-owned or controlled property would not be below 2,000' AGL. (ACC supplement to AFI 11-214, 22 December 2005).
- When 28 Bomb Wing Operations Office determines fire danger to be extreme (via National Fire Danger Reporting System) flare use will be temporarily suspended in the affected PRTC airspace unit.
- Air Force public affairs would work with local fire departments underlying the airspace to educate them on flare deployment and use. This education would include distributing flyers to fire departments describing flare residual materials and dud flares.
- Current flare restrictions will be checked no earlier than 24 hours prior to PRTC entry time. When mission planning is done well in advance, an additional call will be required within 24 hours of airspace entry to ensure the most recent restrictions are attained. The Air Force would continue to cooperate with local fire agencies for mutual aid response to wildland fires.

The burn-time of a flare is approximately 5 seconds and the flare would burn out within approximately 500 feet (see Appendix D). This provides an approximate 1,500-foot margin of safety to keep burning material from contacting the ground. The potential for a flare-initiated fire is very small.

There are four types of flare failures. A failure can occur if a flare does not ignite and remains in the aircraft, does not burn the prescribed duration or temperature, ignites but is not dispersed, or does not ignite after ejection (a dud flare). Historic data on range clean-ups where flare use is intensive in a relatively constrained geographic area (such as Barry M. Goldwater Range in Arizona and Utah Test and Training Range) indicate that of all flares expended, an estimated 0.01 percent were actually found on the ground as duds (Air Force 2001e). Based on expected use, these overall reliability data indicate that of the estimated approximately 3,300 flares proposed for use each year (Section 2.5.5), approximately one dud flare in every three years could fall to the ground somewhere under the entire airspace comprising PRTC.

Instructions will be provided by Ellsworth AFB to fire departments and other organizations within on the identification of a dud flare and a contact at Ellsworth AFB if a suspected dud flare is found. The risk from dud flares is minimal (Air Force 2001e). It is extremely unlikely that a dud flare could fall from an aircraft and strike an individual on the ground. Should such an extremely remote accident occur, it

could result in injury or death. With a dud rate on the ground of approximately 0.01 percent, and a population of fewer than two persons per square mile, the possibility of such an accident is so remote that it is very near zero. Although the risk of combustion of such a dud on the ground is low, it could be ignited by a hot (400 degrees Fahrenheit [°F]) fire or by friction from a strike with something like a power saw or a bullet. On a military range, a dud flare is treated as unexploded ordnance. The basic rule for the public to follow if a dud flare were found is to identify its location, do not touch it or experiment with it, and notify a local safety authority of its location. The authority, in turn, will notify Ellsworth AFB which has the personnel and facilities to handle dud flares, should they be encountered

Capability for fire response is located on Ellsworth AFB and the impacted communities. The Ellsworth AFB Fire Department is party to mutual aid support agreements with the nearby communities. Ellsworth AFB and the Montana Bureau of Land Management have a Memorandum of Understanding establishing training temporary flight restrictions to support firefighting activity (BLM-MOU-MT925-1001 approved 7 October 2009). All of these agreements will continue in effect. Air Force personnel will cooperate with local agencies for mutual aid response to fires, and develop an education program for fire departments beneath the airspace to include information on flares.

Flares proposed for use for defensive training in the PRTC include M-206, MJU-7 A/B, MJU-10/B, and MJU-23/B flares. Table 4.3-2 presents the residual materials deposited on the surface following deployment of each flare type. The MJU-23/B is used by the B-1. The majority of the residual flare materials that fall after deployment of a flare have surface area to weight ratios that would not produce any substantial impact when the residual flare piece fell to the surface. The one item that could fall with enough force to impact an object on the ground is the Safe & Initiation device with a weight of 0.7 ounces. The Safe & Initiation device would strike the earth with approximately the same force as a large hailstone and could cause injury in the extremely unlikely event an individual were struck on an unprotected head with no hat. With the frequency of flare use and the average population density of fewer than two persons per square mile, such an event would be unmeasurably unlikely.

Table 4.3-2. Residual Material Deposited on the Surface Following Deployment of One Flare

	FLARE TYPE			
Material	***M-206***	***MJU-7/B***	***MJU-10/B***	***MJU-23/B***
End Cap	One 1 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 1 inch x 1/4 inch plastic or nylon	One 2 inch x 2 inch x 1/4 inch plastic or nylon	One 2 3/4 inch diameter x 1/4 inch thick round plastic disc
Piston	One 1 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 1 inch x 1/2 inch plastic or nylon	One 2 inch x 2 inch x 1/2 inch plastic or nylon	One approximately 2 3/4 inch diameter x 1/2 inch aluminum (or plastic) piston
Spacer	One or two 1 inch x 1 inch felt	One or two 2 inch x 1 inch felt	One or two 2 inch x 2 inch felt	One 1/2 inch thick x 2 3/4 inch diameter rubber shock absorber sealant, two (1/8 inch x 2 3/4 inch diameter) felt discs, up to four 1 inch x 10 inch felt strips
Wrapping	One up to 2 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 3 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 inch x 17 inch piece of aluminum-coated stiff duct-tape type material	One up to 4 1/2 inch x 20 inch piece of aluminum-coated stiff duct-tape type material
Safe & Initiation Device	N/A	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device	One 2 inch x 1 inch x 1/2 inch nylon and plastic spring device

The residual materials would not be expected to result in a safety impact. If a rancher or recreationist were to find a piece of residual flare material on the ground, and identified it as a piece of plastic or material from a deployed flare, the individual could be annoyed.

EMERGENCY GROUND ACTIVITY

Any ground safety emergency that involves a life-flight would continue to be supported by stopping military training in the affected airspace. Section 4.1 describes actions to provide for life-flight, firefighting, or other emergencies.

SUPERSONIC EVENTS

Supersonic overpressures could impact physical items beneath the airspace (Table 4.2-5). Fighter aircraft are proposed to be supersonic at or above 10,000 feet AGL and B-1s at or above 20,000 feet MSL. Table 4.2-6 (Section 4.2.3.5) presents the possible damage to structures from overpressures above 4.0 psf. Bric-a-brac balanced on shelf edges, such as on mantles or book cases, could fall and break. If a person were inside or near such damaged or falling objects, the persons could be injured. The random nature of training flights and the infrequent quarterly LFE sonic events would not be expected to cause frequent safety impacts. Scoping concerns included the desire for fair compensation for property damage. In the event of damage, there is an established procedure for claims which begin by contacting Ellsworth AFB Public Affairs.

RANCH OPERATIONS

Horses, cattle, and other large livestock, as well as exotics, such as ostriches, sometimes "spook" and create a safety hazard at sudden-onset sounds, especially sounds accompanied by visual effects created by low-altitude, high-speed aircraft. These reactions can be hazardous to the animals. Range cattle and calves can be especially subject to being spooked by low flying aircraft or by sudden noise when the animals are penned in a relatively small area, such as during weaning and branding activities. Typically, a sonic boom without any follow-on visual cues is not as likely to cause as much reaction as a sudden loud overflight noise accompanied by a visual stimulus. Should cattle or calves stampede during such an event, the cattle or calves could be seriously injured or killed and fencing could be damaged. The 28 BW coordinates with ranchers beneath the existing Powder River A and B MOAs and seeks to establish temporary avoidance areas around ranches while branding and weaning operations are known to be underway. The success of such avoidance areas is dependent on communication. Ellsworth AFB has a contact program with airspace schedulers and pilot briefings include avoidance areas. This approach, when sensitive ranching operations are scheduled and the locations are known by airspace schedulers, has the potential to mitigate by avoidance impacts to ranching operations.

Sudden onset sounds can cause reactions to penned livestock. Communication of ranch seasonal branding operations identifies avoidance areas to reduce the potential for impacts.
Photo courtesy of A.S. Elliott

LOW-LEVEL OVERFLIGHT

During scoping meetings, commenters expressed concern that the startle effect of low-level high-speed aircraft could affect the safety of livestock, riders on horses, and recreationists. Low-altitude aircraft overflights have the potential to startle people at sensitive times, such as while they are driving, riding horses, or rock-climbing. Any safety hazard associated with this type of startle event would be difficult to predict and would be highly dependent on situation-specific factors. Existing low-level training occurs

within the existing Powder River A and B MOAs and there were reports during scoping meetings of individuals being startled if they had not observed the aircraft before the overflight.

The low-level training activity could occur anywhere within a proposed MOA, such as PR-1A, PR-1B, PR-2, PR-3, or PR-4, during daily scheduled training or under the Gap MOAs during LFEs where such overflight does not regularly occur. Low-altitude training would not have a specified altitude but would occur during Monday through Thursday and Friday morning scheduled airspace training times. The MOA land areas and training time were used to calculate the average annual number of times any specific location could be directly overflown within one quarter of a mile by a military aircraft flying 2,000 feet AGL or below. Any area under the proposed airspace would have a low-level overflight an average of 6 to 9 times a year. This is an annual average and the number of actual overflights experienced by any specific location could be more or fewer (see Section 4.9.3.1.5). Should an event occur, the resulting safety impacts to a recreationist on a horse which could be spooked or a rancher working cattle in open range could be seen as significant by the individual experience the low-level overflight.

Electronic Emissions

Safety procedures associated with usage of explosives for mining are designed to prevent inadvertent explosions caused by vibrations or electronic emissions, such as those caused by aircraft overflight. Significant impacts could result from inadvertent and/or premature setting off of mining explosives or otherwise impacting mining operations. No current procedure is in place for the Air Force to communicate with mining operations within the proposed PRTC to ascertain the radio frequencies used for mining operations. The radio frequencies and electronic emissions of training aircraft would need to be compared with the mining operations and procedures will need to be developed and implemented regarding stand-off distance, intensity of electronic emissions, radio frequencies used, and low-altitude overflight to prevent significant impacts. Safety impacts to mining operations could be significant without establishing and implementing such procedures.

Towers

Section 4.9.3.1 discusses avoidance areas for towers and FAA requirements for structures which exceed specific heights and could pose a hazard to aircraft. Such structures are mapped and avoided by civil and military pilots.

4.3.3.2 Alternative B

Alternative B includes all of the ATCAAs from Alternative A and the PR-2, PR-3, and PR-4 MOAs. The Gap B MOA and Gap C MOA are also included in Alternative B. This means that Alternative B contains no PR-1A, PR-1B, or Gap A MOAs.

4.3.3.2.1 Communication Safety

There would be no increased radio or radar communication or tracking capability within the PR-2 or PR-3 MOAs. This means the communication safety impacts in PR-2, PR-3, the western portion of PR-4, and the associated Gap MOAs would be the same as with Alternative A. Civil aircraft could fly from Miles City to the south and west below FL180 and airports under the PR-1A/1B ATCAAs, such as Colstrip, would not need additional communication. Civil aircraft could transit the area below the PR-1A/1B ATCAAs and Gap A ATCAA using IFR, VFR, and GPS navigation below FL180 even when the ATCAAs were activated. Communication impacts would not be expected in the area under the PR-1A/1B or Gap A ATCAAs.

4.3.3.2.2 FLIGHT SAFETY

ATCAAs and high-altitude commercial and other jet traffic impacts would be the same as those described for Alternative A. Civil aircraft flight safety risks in PR-2, PR-3, and PR-4 MOAs would be the same as described for Alternative A. Civilian aircraft would be able to fly VFR using GPS navigation under see-and-avoid conditions in an active MOA, but would not be able to fly IFR in an activated MOA. The PR-3 and PR-4 MOAs would be stacked into Low and High to support IFR traffic, but the lack of communication and tracking would not support IFR flights. Safety risks and potential impacts within the PR-2, PR-3, PR-4, and associated Gap MOAs would be the same as described for Alternative A.

Class A mishap safety risks would not be somewhat less than those described for Alternative A (see Table 4.3-1). Bird aircraft strikes would not be expected in the area under the PR-1A, PR-1B or the Gap A ATCAAs because most bird aircraft strikes occur well below FL180. The number of bird aircraft strikes in PR-2, PR-3, and PR-4 MOAs and associated Gap MOAs would be comparable to those for Alternative A, or approximately 2 per year. Continued use of the Aviation Hazard Advisory System, the Bird Avoidance Model and pilot briefings prior to sorties would provide a method to minimize risks from bird strikes under Alternative B.

Flight safety impacts under Alternative B are comparable to those for Alternative A within all PRTC proposed airspaces with the exception of the airspace under the PR-1A, PR-1B or the Gap A. Under those ATCAAs, flights below FL180 could fly IFR or VFR without low-level bomber training in the airspace. There would be a need for civil aircraft to communicate to learn activities status of ATCAAs or adjacent MOAs. Flights above FL180 could be affected if the ATCAA were activated. In general, under the PR-1A/1B ATCAAs and the Gap A ATCAA, there would be no significant environmental impacts to flight safety.

Emergency procedures for air ambulance, fire, or related emergency activities under Alternative B would be treated the same as described for Alternative A. These flight safety requirements would apply to areas where Alternative B included low-level MOAs. No special emergency procedures would be expected to apply to areas under the PR-1A, PR-1B or the Gap A.

4.3.3.2.3 GROUND SAFETY

Alternative B low-altitude safety risks from overflight would not be expected under the PR-1A, PR-1B, or Gap A ATCAAs because there would be no PR-1A, PR-1B, or Gap A MOAs. Impacts to recreational or ranching activities under PR-3 and PR-4 MOAs and associated Gap B and C MOAs would be as described for Alternative A. Low-altitude safety risks for the proposed PR-2 would be comparable to those experienced under existing conditions. The identification of seasonal ranch activities and the establishment of seasonal avoidance areas could reduce potential impacts to ranch activities as described in Alternative A. Wake vortex effects under PR-2, PR-3, and PR-4 MOAs and associated Gap MOAs would be as described for Alternative A. The proposed PR-2 MOA currently has low-level B-1 training and there have not been reports of wake vortex impacts.

Flare usage and chaff and flare residual materials within the PR-2, PR-3, and PR-4 MOAs and the ATCAAs would be under the same conditions and as described for Alternative A. The estimated dud distribution and distribution of residual chaff and flares materials would be approximately the same as described for Alternative A, with some reduction of chaff and flare materials under the PR-1A, PR-1B or the Gap A. Flare fire risk would remain extremely low throughout the airspace. The use of flares above FL180 in the PR-1A, PR-1B, and Gap A ATCAAs and the prohibition of their use during extreme fire conditions would effectively result in no potential for a flare-caused fire under those ATCAAs.

There would be no low-altitude flights or electronic emissions from training aircraft below FL180 under the PR-1A, PR-1B or the Gap A. Military aircraft training at these altitudes would not be expected to cause electronic triggering or surface vibration impacts to mining operations in the Colstrip area or under the PR-1A, PR-1B or the Gap A. Communication with mining operators would still be required to ensure safety. Infrequent sonic booms above FL180 could still be felt under PR-1A, PR-1B or the Gap A and overpressures of 4 psf could be experienced infrequently (see Section 4.2.3.5).

4.3.3.3 Alternative C

Alternative C includes all of the ATCAAs from Alternative A and the PR-1A, PR-1B, PR-2, and PR-3 MOAs. The Gap A and Gap B MOA extension are included in Alternative C. This means that Alternative C does not include a PR-4 MOA or Gap C MOA.

4.3.3.3.1 Communication Safety

There would be no increased radio or radar communication or tracking capability within the Alternative C airspace. This means the communication impacts in the PR-1A, PR-1B, PR-2, PR-3 MOAs, and the Gap A and the Gap B MOAs would be same as with Alternative A. Communication and radar coverage have limited ability to contact low-level civil aircraft in the existing Powder River A and B MOAs which constitute most of the proposed PR-2 MOA. Civil aircraft flying from Dickinson to the southeast and from airports under the PR-4 ATCAA, such as Hettinger, could use VFR and GPS navigation below FL180. Communication impacts would not be expected in the area under the PR-4 or Gap C ATCAAs.

4.3.3.3.2 Flight Safety

Alternative C would not have military training airspace or associated impacts under the PR-4 or Gap C ATCAAs. Alternative C would have the same ATCAAs and the same high-altitude commercial and other jet traffic impacts as those described for Alternative A. Class A mishap safety risks would not be discernibly different from those described in Alternative A. Civil aircraft flight safety risks in the PR-1A, PR-1B, PR-2, PR-3, Gap A, and Gap B MOAs would be the same as described for Alternative A. Civilian aircraft would not be able to fly IFR in an activated MOA although they could choose to fly using VFR under see-and-avoid conditions in activated MOAs. Safety risks and potential impacts within the MOAs would be the same as described for Alternative A.

Bird aircraft strikes would not be expected in the area under the PR-4 ATCAA or the Gap C ATCAA because most bird aircraft strikes occur well below FL180. The number of bird aircraft strikes in the Alternative C MOAs would be comparable to those for Alternative A, or approximately 2 to 3 per year. Continued use of the Aviation Hazard Advisory System, the Bird Avoidance Model and pilot briefings prior to sorties would continue to provide a method to minimize risks from bird strikes under Alternative C. Flight safety impacts under Alternative C are comparable to those for Alternative A within all airspaces except under the PR-4 ATCAA and the Gap C ATCAA where there would be no MOAs (see Table 4.3-1). There would be a need for civil aircraft pilots to ascertain the activation status of overlying ATCAAs or adjacent MOAs for safe flight above FL180. In general, under the Alternative C PR-4 ATCAA and the Gap C ATCAA there would be no environmental impacts to civil aircraft operations.

Alternative C emergency procedures for air ambulance, fire, or related emergency activities would be treated the same as described for Alternative A. These flight safety requirements would apply to areas where Alternative C included low-level MOAs.

4.3.3.3.3 Ground Safety

Alternative C would not have low-altitude overflight safety risks under the PR-4 or Gap C ATCAAs. Low-altitude safety risks from overflight to recreational or ranching activities under the PR-1A, PR-1B, PR-2,

PR-3, Gap A, and Gap B MOAs would be as described for Alternative A. The identification of seasonal ranch activities and the establishment of seasonal avoidance areas could reduce potential impacts to ranch activities as described in Alternative A. Wake vortex impacts under the PR-1, PR-2, and PR-3 MOAs and Gap A and Gap B MOAs would be as described for Alternative A. There have been no wake vortex impact claims within the PR A or B MOAs (most of the proposed PR-2).

Flare usage and discharge of chaff and flare residual materials within the PR-1, PR-2, PR-3, Gap A, and Gap B MOAs would be the same as described for Alternative A. The estimated dud distribution and distribution of residual chaff and flares materials would be approximately the same as described for Alternative A, with some reduction of chaff and flare materials under the PR-4 ATCAA and Gap C ATCAA when compared with Alternative A. Flare fire risk would remain extremely low throughout the airspace. The use of flares above FL180 in the PR-4 ATCAA and the Gap C ATCAA and prohibition of their use in an airspace during extreme fire danger as determined by the National Fire Danger Rating System would effectively result in no potential for a flare-caused fire under those ATCAAs.

Alternative C mining impacts and the need to establish safety procedures, especially within the PR-1A and PR-1B MOAs, would be as described for Alternative A. Supersonic event safety impacts would be as described for Alternative A.

4.3.3.4 No-Action

No changes to 28 BW training airspace would occur under the No-Action Alternative. Under the No-Action Alternative, the PRTC would not be charted and a large percentage of sorties would continue to be carried out at remote locations. The existing Powder River airspace would remain in place and sorties flown in the airspace would be at projected baseline conditions as the base returns to a peacetime operational tempo.

This means that B-1 and B-52 training would occur in the Powder River A and B MOAs and associated ATCAAs. Low-level overflight effects, communication requirements regarding MOA activation, and other consequences would continue in the existing airspace.

4.4 Air Quality

4.4.1 Methodology

Air emissions resulting from the Proposed Action and the Action Alternatives were evaluated in accordance with federal, state, and local air pollution standards and regulations. Air quality impacts from a proposed activity or action would be significant if they:

- Increase ambient air pollution concentrations above any National Ambient Air Quality Standard (NAAQS);
- Contribute to an existing violation of any NAAQS;
- Interfere with or delay timely attainment of NAAQS; or
- Impair visibility within any federally mandated Federal Class I area.

The approach to the air quality analysis was to estimate the increase in emission levels due to implementation of the Proposed Action and action alternatives.

The air quality impact analysis evaluated both direct and indirect emissions associated with the Proposed Action and action alternatives. There are no construction activities associated with the Proposed Action. The analysis of aircraft emissions associated with the proposed training focuses on aircraft operations that occur below 3,000 feet (914 meters) AGL. Below 3,000 feet AGL is the average

depth of the mixing layer where emissions released into this layer could affect ground-level pollutant concentrations. Emissions that are released above the mixing layer generally would not be expected to appreciably affect ground-level air quality.

An action would be addressed for a significant impact to air quality if project emissions would exceed applicable federal, state, and local regulations. For inert pollutants such as particulate matter less than 10 microns in diameter (PM_{10}), the effects are generally limited to a few miles downwind from a source. The effects for ozone (O_3) may extend much farther downwind than for inert pollutants. O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. O_3 precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from the source.

The potential effects of proposed greenhouse gas (GHG) emissions are by nature global and cumulative. Currently, there are no formally adopted or published National Environmental Policy Act (NEPA) thresholds of significance for GHG emissions. Given the global nature of climate change and the fact that B-1 and B-52 aircraft would expend the same fuel commuting for lesser training, there is no net impact expected to national GHG emissions. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact.

4.4.2 Issues and Concerns

Air quality is generally in attainment throughout the four-state region encompassed by the proposed PRTC. Scoping commenters expressed concern with air quality around mining operations such as at Colstrip. Commenters also expressed concern that jet aircraft exhausts could affect visibility. Concerns were also expressed that aircraft emissions could affect public health either independently or in conjunction with other emission generators, such as coal. Questions were also raised about the effects of chaff or flares upon air quality.

4.4.3 Environmental Consequences

4.4.3.1 Alternative A

Air quality impacts associated with Alternative A were determined by comparing the net change in emissions between current baseline operations and future proposed operations within the PRTC. Proposed flights within PRTC were evaluated by assuming engines were operating in military mode, which is a higher fuel burning and emitting setting than actually anticipated (see power setting in Table 3.2-1). Alternative A operational data were derived from Section 2.5. The emission factors used to calculate combustive emissions from proposed aircraft operations were obtained from the *Air Emissions Inventory Guidance Document for Mobile Sources at Air Force Installations* (Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis 2003). Emission factors for flares were obtained from USEPA AP-42, Chapter 15 Signals and Simulators (USEPA 2008).

According to USEPA's General Conformity Rule in 40 CFR Part 51, Subpart W, any proposed federal action that has the potential to cause violations in a NAAQS nonattainment or maintenance area must undergo a conformity analysis. A conformity analysis is not required if the Proposed Action or Alternative Action occurs within an attainment area.

Table 4.4-1 presents estimates of the annual criteria pollutant emissions that would occur within each state air basin. Portions of the Northern Cheyenne and Crow Reservations are within the Lame Deer and Sheridan nonattainment areas for PM_{10} (Section 3.4.3). As quantified in Table 4.4-1, the PM_{10} emissions

from the proposed action in Montana would not exceed the applicable general conformity *de minimis* thresholds of 100 tons per year. Therefore, a conformity analysis is not required.

Section 169A of the Clean Air Act (CAA) provides special protection to air quality within Mandatory Federal Class 1 areas. As indicated in Section 3.1.2, the nearest Mandatory Federal Class 1 areas to Alternative A training operations are: (1) Wind Caves National Park, SD, located approximately 30 miles south of the PR-1BMOA, and (2) Badlands National Park, SD, located about 42 miles southeast of the PR-1B MOA. Alternative A training activities would occur far enough away from the Federal Class 1 areas, are intermittent, and occur at elevations that are well above ground level, such that Alterative A would not produce air quality impacts to these Class 1 areas. Additionally, PR-1 traverses through the Northern Cheyenne Native American Reservation, MT, which has been designated by the state as a Prevention of Significant Deterioration (PSD) Class 1 area.

Alternative A would not produce significant impacts to visibility within the Northern Cheyenne Native American Reservation, as (1) the expected PM_{10} emissions that would occur over that region are quite small (about 1.35 tons per year), (2) the proposed aircraft emissions would be transient and intermittent in nature, and (3) proposed aircraft emissions would be adequately dispersed over a large region and would occur at elevations significantly greater than ground levels. Thus, Alternative A would not substantially impact visibility within the Northern Cheyenne Native American Reservation or the other Mandatory Federal Class 1 areas, and it would not be expected to result in air quality impacts to any potentially affected Class 1 areas.

There are no current regulations for GHGs under the CAA that are directly applicable to the proposed action. GHG emissions, discussed below, use draft Council on Environmental Quality (CEQ) guidance to quantitatively consider local GHG emissions. There would be no National emission GHG change with any alternative, including the No-Action Alternative, because B-1 and B-52 training would occur under all alternatives.

Table 4.4-1. Annual Local Criteria Pollutant Emissions from Alternative A (tons/year)

State	*VOC*	*CO*	*NO_x*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
MT						
Total Emissions From Proposed Action	1.39	5.04	67.21	36.70	12.25	12.25
Net Change from Existing Conditions	1.15	3.32	40.63	22.16	8.80	8.80
ND						
Total Emissions From Proposed Action	0.52	2.03	27.73	15.12	4.79	4.79
Net Change from Existing Conditions	0.52	2.03	27.73	15.12	4.79	4.79
SD						
Total Emissions From Proposed Action	0.54	1.97	26.28	14.34	4.79	4.79
Net Change from Existing Conditions	0.51	1.73	22.48	12.26	4.30	4.30
WY						
Total Emissions From Proposed Action	0.54	1.08	14.15	7.74	2.67	2.67
Net Change from Existing Conditions	0.43	0.26	1.57	0.83	1.02	1.02
Total Change in Emissions	**2.6**	**7.3**	**92.4**	**50.4**	**18.9**	**18.9**
General Conformity Threshold [1]	*100*	*100*	*100*	*100*	*100*	*N/A*

Note: 1. Based on USEPA's General Conformity Rule.

Local GHGs emitted would include (1) carbon dioxide (CO_2), (2) methane, and (3) nitrous oxide (N_2O). Table 4.4-2 shows annual emissions for aircraft combustive emissions and calculates a total carbon dioxide equivalent (CO_2e). These data show that the proposed training under Alternative A would increase local GHG emissions relative to the existing conditions found in Table 3.4-4. B-1 and B-52

aircraft would continue to fly to remote ranges for limited training and the national GHG emissions would not be expected to change. The ratio of annual average local CO_2e emissions from the operations proposed under Alternative A to the CO_2e emissions associated with net sources in the U.S. in 2007 would be approximately 0.016/6,088 million metric tons, or about 0.0003 percent of the U.S. CO_2e emissions inventory (USEPA 2010 Greenhouse Gas Inventory Report 2009). Since local GHG emissions from Alternative A would equate to such a minimal amount of the overall U.S GHG emissions inventory, and there would be no net change in the national GHG emissions, Alternative A would not substantially contribute to global climate change. Therefore, GHG emissions from the operation of Alternative A would not be expected to result in significant impacts to the environment.

Table 4.4-2. Annual Local GHG Emissions from Alternative A (metric tons/year)

State	*CO_2*	*Methane (CH_4)*	*N_2O*	*CO_2e*
MT	12,992.47	0.36	0.37	12,941.45
Net Change from Existing Conditions	7,116.98	0.20	0.18	7,003.48
ND	5,492.65	0.15	0.18	5,492.03
Net Change from Existing Conditions	5,492.65	0.15	0.18	5,492.03
SD	5,068.87	0.14	0.15	5,060.14
Net Change from Existing Conditions	4,228.91	0.12	0.12	4,211.25
WY	2,686.87	0.07	0.07	2,675.02
Net Change from Existing Conditions	(120.87)	(0.00)	(0.02)	(162.57)
Total Change in Local Emissions[1]	**16,717.68**	**0.46**	**0.46**	**16,544.19**

Note: 1. No change in National emissions

The estimated GHG emissions from this alternative are included herein for informational purposes. As discussed in Section 3.1.2, the Draft Council on Environmental Quality guidance suggests a quantitative and qualitative assessment be prepared for proposed actions which emit 25,000 metric tons or more of CO_2e on an annual basis. As shown in Table 4.4-2, the estimated local annual emission increases that would result from Alternative A would not exceed 25,000 metric tons per year and there would be no net increase in national GHG emissions.

Alternative A would emit Toxic Air Contaminants (TACs) and a scoping question was asked whether such TACs could potentially impact public health. Toxic Air Contaminants generally are subsets of VOC and PM_{10} emissions. The data in Table 4.4-1 show that Alternative A would generate an increase of 21.5 tons of VOC and PM_{10} emissions for a combined total of 27.49 tons over an area of 35,200 square miles (Table 2-12). Since emissions would occur over such a large region, at various altitudes, and would be intermittent, training aircraft would produce minimal (essentially unmeasurable) Toxic Air Contaminants at any ground level location. As a result, air emissions caused by Alternative A would not produce impacts to public health.

The Lame Deer PM_{10} non-attainment area is in Rosebud County, MT, south of Colstrip. The total increase in PM_{10} emissions in MT for the proposed PRTC is estimated to be 8.80 tons per year. The area represented by Rosebud County is approximately 16.4 percent of the total proposed airspace area in MT. B-1 and B-52 aircraft are projected to fly below 3,000 feet AGL approximately 18.7 percent of total PR-1A, PR-1B, and PR-2 MOA/ATCAA training time. This means that approximately 1.65 tons of PM_{10} per year would be the Alternative A annual emissions contribution in Rosebud County. This amount of annual emissions would not be expected to increase the number of PM_{10} exceedance days experienced in the Lame Deer PM_{10} non-attainment area.

The Sheridan PM_{10} non-attainment area is in Sheridan County, WY, and is partially under the proposed PR-1B MOA. The total PM_{10} emissions increase in WY for the proposed PRTC is 1.02 tons per year. The

area represented by Sheridan County is approximately 18.9 percent of the total proposed airspace area in WY. B-1 and B-52 aircraft are projected to fly below 3,000 feet AGL approximately 18.7 percent of total PR-1A, PR-1B, and PR-2 MOA/ATCAA training time. This means that approximately 0.19 tons of PM_{10} per year would be the Alternative A annual emissions contribution in Sheridan County. This amount of annual emissions would not be expected to increase the number of PM_{10} exceedance days experienced in the Sheridan PM_{10} non-attainment area.

Environmental concerns associated with flare use were air quality and ash deposition. Studies on ash components have been performed by measuring residual materials after flares were ignited in a controlled experiment. Constituents from combustion were identified to calculate whether flare emissions or flare ash could result in an environmental impact.

Modern flares proposed for use in PRTC do not contain lead although some earlier flares had lead in the firing mechanism. Some flares contain trace amounts of chromium in the firing mechanism. A statistical model was used to calculate emissions concentrations of chromium to estimate what it would take to achieve a level of toxicity of chromium as a result of flare use. The model calculated that 1.6 million flares would have to be released annually below 400 feet over a 765 square mile training range before the level of chromium emissions would become a health risk (Air Combat Command [ACC] 1997). No location in the world has this combination of flare numbers, altitude, and training area. ACC uses fewer than 400,000 flares annually in all applications worldwide, and the number of defensive flares proposed for the PRTC is approximately 3,300. The number of flares is smaller, the minimum altitude is higher, and the training area is larger for the PRTC than what would be required for flare emissions to constitute a health risk. Flare emissions are not now, nor is it feasible that they could become, a health hazard.

There are also trace quantities of boron in flare ash. The amount of flare ash that would be required to raise the boron concentration to triple the background level of the upper inch of one acre of soil was estimated to annually require flare ash from approximately 4,000 flares. It would be impossible for training aircraft to deposit 4,000 flares on one acre of land in a year (ACC 1997). Flare burning and flare ash are extremely unlikely to result in measurable air quality or physical effects to the environment.

Alternative A would not affect air quality attainment within the four-state region. The analysis purposefully used military power on the engines at all times which results in conservatively higher estimates of projected emissions than could be achieved. Engines do not run at military power during an entire mission. Flare burning emissions were calculated in the total emissions.

Consequently, Alternative A aircraft training activities are not expected to produce emissions that would significantly affect air quality or visibility within the four-state region.

4.4.3.2 Alternative B

Air quality impacts associated with Alternative B were determined by comparing the net change in emissions between current baseline operations and Alternative B proposed operations within the PRTC. Emissions from proposed flights were evaluated with engines operating in military mode. Operational data were derived from Section 2.6. Chaff and flare emissions were estimated using Section 2.6 usage numbers.

The nearest Mandatory Federal Class 1 areas to Alternative B training operations are: (1) Wind Caves National park, located approximately 30 miles south of the PR-1B MOA, and (2) the Northern Cheyenne Native American Reservation is approximately 15 miles west of the PR-2 MOA. Alternative B training activities would occur far enough away from the Federal Class 1 areas, are intermittent, and occur at elevations well above ground level, such that Alternative B would not be expected to result in any air quality impacts to the Class 1 areas.

Table 4.4-3 presents estimates of the annual PRTC emissions that would occur within each state air basin. These data show that Alternative B operations would produce annual emissions that would not exceed the applicable general conformity *de minimis* threshold of 100 tons per year. Therefore, Alternative B would not be expected to result in significant air quality impacts within the four-state region.

Table 4.4-3. Annual Local Criteria Pollutant Emissions from Alternative B (tons/year)

State	*VOC*	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
MT						
Total Emissions From Proposed Action	0.81	3.05	41.12	22.45	7.32	7.32
Net Change from Existing Conditions	0.57	1.33	14.54	7.91	3.87	3.87
ND						
Total Emissions From Proposed Action	0.52	2.05	28.08	15.30	4.83	4.83
Net Change from Existing Conditions	0.52	2.05	28.08	15.30	4.83	4.83
SD						
Total Emissions From Proposed Action	0.55	1.99	26.52	14.46	4.82	4.82
Net Change from Existing Conditions	0.52	1.74	22.72	12.38	4.33	4.33
WY						
Total Emissions From Proposed Action	0.21	0.74	9.69	5.30	1.82	1.82
Net Change from Existing Conditions	0.10	(0.08)	(2.90)	(1.61)	0.17	0.17
Total Change in Emissions	**1.72**	**5.04**	**62.44**	**33.98**	**13.20**	**13.20**
General Conformity Threshold [1]	*100*	*100*	*100*	*100*	*100*	*N/A*

Note: 1. Based on USEPA's General Conformity Rule.

Alternative B training activities would produce local GHG emissions due to aircraft operation. The local GHGs emitted by proposed operations would include (1) CO_2, (2) methane, and (3) N_2O. Table 4.4-4 shows annual local GHG emissions for aircraft combustive emissions and calculates the total CO_2e emissions. These data show that the proposed training under Alternative B would increase local GHG emission relative to the existing conditions although, as described in Alternative A, the national GHG emissions would not change as B-1 and B-52 aircraft commuted to other locations for training. The ratio of local annual average CO_2e emissions from the operations proposed in Alternative B to the CO_2e emissions associated with net sources in the U.S. in 2007 is approximately 0.011/6,088 million metric tons, or about 0.0002 percent of the U.S. CO_2e emissions inventory (USEPA 2009). Local GHG emissions from Alternative B would equate to a minimal amount of the overall U.S GHG emissions inventory and would not produce a net increase in GHG emissions. GHG emissions from the operation of Alternative B would produce less than significant impacts to the environment with respect to climate change.

The data in Table 4.4-3 show that Alternative B would generate an increase of 14.92 tons of VOC and PM_{10} emissions for a combined total of 20.88 tons. Alternative B would not include overflights within any non-attainment area. Since proposed PRTC emissions would occur over a large region and would be intermittent in nature, they would produce minimal Toxic Air Contaminants at any ground level location. Alternative B would not be expected to result in significant impacts to public health.

As with Alternative A, Alternative B training activities are not expected to produce emissions that would significantly affect air quality or visibility impacts within the four-state region.

Table 4.4-4. Annual Local GHG Emissions from Alternative B (metric tons/year)

State	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
MT				
Total Emissions From Proposed Action	7,950.57	0.22	0.26	8,025.01
Net Change from Existing Conditions	2,075.09	0.06	0.07	2,087.05
ND				
Total Emissions From Proposed Action	5,520.23	0.16	0.18	5,572.68
Net Change from Existing Conditions	5,520.23	0.16	0.18	5,572.68
SD				
Total Emissions From Proposed Action	5,071.12	0.14	0.16	5,118.94
Net Change from Existing Conditions	4,231.16	0.12	0.14	4,270.05
WY				
Total Emissions From Proposed Action	1,822.37	0.05	0.06	1,839.37
Net Change from Existing Conditions	(985.37)	(0.03)	(0.03)	(998.22)
Total	**10,841.11**	**0.31**	**0.35**	**10,931.55**

4.4.3.3 Alternative C

Air quality impacts associated with Alternative C were determined by comparing the net change in emissions between current baseline operations and Alternative C operations within the PRTC. Emissions from proposed flights were evaluated with engines operating in military power throughout the missions although aircraft do not run at military power for an entire mission. Operational data were derived from Section 2.7. Chaff and flare emissions were derived from Section 2.7 usage numbers.

The nearest Mandatory Federal Class 1 areas to the project region are 1) the Wind Caves National park, located approximately 30 miles south of the PR-1B MOA; 2) Badlands National Park, SD, located about 42 miles southeast of the PR-1B MOA; and 3) The Northern Cheyenne Native American Reservation is a state-designated Class 1 area and is approximately 15 miles west of the PR-2 MOA . Alternative C training activities would occur far enough away from the Federal Class 1 areas, are intermittent, and occur at elevations well above ground level, such that Alternative C would not produce air quality impacts to those Class 1 areas.

Alternative C includes the Lame Deer PM_{10} and portions of the Sheridan PM_{10} non-attainment areas. Environmental effects for these areas would be as described for Alternative A. Table 4.4-5 presents estimates of the annual PRTC emissions that would occur within each air basin/state. These data show that Alternative C flight operations would produce annual emissions that would not be expected to result in any significant impacts as described for Alternative A. Therefore, Alternative C would not be expected to result in significant air quality impacts within the four-state region.

Table 4.4-5. Annual Criteria Pollutant Emissions from Alternative C (tons/year)

State	*VOC*	*CO*	*NO_X*	*SO_X*	*PM_{10}*	*$PM_{2.5}$*
MT						
Total Emissions From Proposed Action	1.43	5.29	71.15	38.83	12.76	12.76
Net Change from Existing Conditions	1.19	3.58	44.57	24.29	9.30	9.30
ND						
Total Emissions From Proposed Action	0.14	0.72	10.64	5.78	1.53	1.53
Net Change from Existing Conditions	0.14	0.72	10.64	5.78	1.53	1.53
SD						
Total Emissions From Proposed Action	0.26	1.00	13.70	7.48	2.38	2.38
Net Change from Existing Conditions	0.22	0.76	9.90	5.40	1.89	1.89
WY						
Total Emissions From Proposed Action	0.32	1.14	15.20	8.31	2.80	2.80
Net Change from Existing Conditions	0.21	0.33	2.61	1.39	1.15	1.15
Total Change in Emissions	**1.76**	**5.38**	**67.72**	**36.87**	**13.88**	**13.88**
General Conformity Threshold [1]	*100*	*100*	*100*	*100*	*100*	*N/A*

Note: 1. Based on USEPA's General Conformity Rule.

Alternative C training activities would produce local GHG emissions due to aircraft operations although there would be no national change in GHG emissions as described in Alternative A. The local GHGs emitted by proposed operations would include (1) CO_2, (2) methane, and (3) N_2O. Table 4.4-6 shows annual local GHG emissions and calculates the total CO_2e emissions. These data show that the proposed training under Alternative C would increase local GHG emission relative to the existing conditions. Total national GHG emissions would not be expected to change as B-1 and B-52 aircraft commuted to distant ranges for limited training. The ratio of local annual average CO_2e emissions from the operation of Alternative C to the CO_2e emissions associated with net sources in the U.S. in 2007 is approximately 0.012/6,088 million metric tons, or about 0.0002 percent of the U.S. CO_2e emissions inventory (USEPA 2009). Since local GHG emissions from Alternative C would equate to such a minimal amount of the overall U.S GHG emissions inventory, they would not substantially contribute to global climate change. Therefore, GHG emissions from the operation of Alternative C would not be expected to result in any significant impacts to the environment.

Table 4.4-6. Annual Local GHG Emissions from Alternative C (metric tons/year)

State	*CO_2*	*CH_4*	*N_2O*	*CO_2e*
MT				
Total Emissions From Proposed Action	13,704.88	0.39	0.44	13,834.63
Net Change from Existing Conditions	7,829.40	0.22	0.25	7,896.66
ND				
Total Emissions From Proposed Action	2,259.21	0.06	0.07	2,280.66
Net Change from Existing Conditions	2,259.21	0.06	0.07	2,280.66
SD				
Total Emissions From Proposed Action	2,679.51	0.08	0.09	2,704.84
Net Change from Existing Conditions	1,839.55	0.05	0.06	1,855.96
WY				
Total Emissions From Proposed Action	2,883.85	0.08	0.09	2,911.15
Net Change from Existing Conditions	76.11	0.00	0.00	73.55
Total	**12,004.27**	**0.34**	**0.39**	**12,106.83**

The data in Table 4.4-5 show that Alternative C would generate an increase of 15.64 tons of VOC and PM_{10} emissions for a combined total of 21.62 tons. Since proposed PRTC emissions would occur over a large region and would be intermittent, they would produce minimal Toxic Air Contaminants at any ground level location. As a result, Alternative C would not be expected to result in any significant impacts to public health. Alternative C aircraft training activities are not expected to produce emissions that would significantly affect air quality or visibility in the region.

4.4.3.4 No-Action Alternative

The No-Action Alternative would not establish the PRTC. The No-Action Alternative represents continued use of the existing Powder River airspace for training at baseline levels. Use of remote complexes for training would continue to expend a substantial number of flying hours and would be expected to produce levels of GHG and other emissions comparable to those described for Alternative A. No different operational activities would occur due to the No Action Alternative. Therefore, the No-Action Alternative would not produce any new air quality impacts. No-Action would produce the same level of GHG emissions, as described for Alternatives A, B, or C.

4.5 Physical Sciences

4.5.1 Methodology

Physical sciences include topography, geology, soils, and water. In any area of the arid west, any potential effects to water availability and water quality would be of concern to agencies and the public. Adherence to applicable regulations under the various project actions is assessed in this section. Impacts are assessed if there is a potential to reduce water availability to existing users, endanger public health or safety by creating or worsening health hazards or physical resource safety conditions, or to violate laws or regulations adopted to protect or manage water resources. An impact to water resources would be considered significant to monitoring agencies if the impact adversely affected water quality or endangered public health by creating or worsening adverse health hazard conditions or violated established laws or regulations that have been adopted to protect or manage water resources of an area.

The water divisions of the states MT, ND, SD, and WY and the U.S. Army Corps of Engineers (USACE) are the regulatory agencies that govern water resources in the ROI. State agencies have adopted the USEPA's applicable environmental rules and regulations. The Clean Water Act (CWA) of 1977 regulates pollutant discharges to waters of the U.S.

Protection of unique geologic features and minimization of soil erosion in relation to potential geologic hazards and soil limitations are considered when evaluating impacts to earth resources (soils and geology).

Impacts to soil resources can result from earth disturbance that would expose soil to wind or water erosion. Analysis of physical resources typically includes examination of the potential effects that an action may have on the resource and assessment of the significance of any potential impacts. Analysis of impacts to soil resources examines the suitability of locations for any proposed construction.

4.5.2 Issues and Concerns

Soils impacts are expected to be minimal under the proposed PRTC action as there are no construction or ground-disturbing activities included in the Proposed Action. Potential impacts to water resources would be highly unlikely given the low occurrence of water bodies in the ROI. Under all alternatives, chaff and flare use would be introduced to areas of the ROI that have not previously had such defensive training. The potential impacts to physical resources from this use are discussed in this section.

4.5.3 Environmental Consequences

4.5.3.1 Alternative A - Proposed Action

The primary constituents of chaff are silica and aluminum. These are the most common elements in the earth's crust and in soils. The component of chaff that has the potential to affect soil or water chemistry is aluminum, which tends to break down in acidic and highly alkaline environments. Aluminum is the most abundant metallic element in the earth's crust and is a common constituent of soils. Modern chaff is composed primarily of very fine glass fibers coated with aluminum to achieve its radar-reflective properties (Arfsten *et al.* 2002). Chaff also contains trace amounts of iron, copper, magnesium, and zinc. Chaff fibers are coated with stearic acid in order to prevent clumping during deployment (Arfsten *et al.* 2002). Stearic acid (octadecanoic acid) is a saturated fatty acid derived from animal and vegetable fats and oils (Heryanto *et al.* 2007). Stearic acid has been used in the development of drug delivery systems because it is considered to be inert, inexpensive, and biocompatible, as well as of a low toxicity.

Laboratory and field analyses (Air Force 1997) indicate that the pH of water in the soil or in a water body is the primary factor that determines the stability of the aluminum coating of chaff. The coating is the most soluble and likely to release aluminum if the soil or water pH is less than 5.0 (extremely acidic) or greater than 8.5 (strongly alkaline). In arid conditions such as those found in the ROI, soil pH tends to be neutral to alkaline, and there is usually not enough water in the soils of this region to react with the aluminum (Air Force 1997). As discussed in Section 3.5.3.3 Soils, 99 percent of the soils in the ROI have a pH between 5.0 and 8.5, outside the normal range for chaff coating to release aluminum into the soil. The low percentage of soils in the ROI with a pH within the range to react with the chaff coating aluminum in combination with the low soil water content, results in conditions that would be extremely improbable for detectable aluminum concentrations to be produced from chaff particles that weather on the ground. Analysis to detect chaff concentration in aquatic and soil environments, where chaff has been deployed for decades, was unable to detect any but a few chaff particles. This is because chaff on the ground rapidly breaks down to silica and aluminum, the two most common elements of the earth's crust, and becomes indistinguishable from native soils (Air Force 1997)

Confined aquatic habitats could be affected if there were a potential for significant accumulation and decomposition of chaff fibers. Water areas compose less than 0.86 percent (Section 3.8.3) of the ROI to be exposed to chaff and flare release under the Proposed Action. Because chaff would be broadly distributed with low density in any one area, it is unlikely that chaff would be detectable or significantly accumulate within confined water bodies. Water bodies in the ROI are neutral to slightly alkaline in pH similar to soils, and outside the pH range necessary to degrade the aluminum coating. Chaff particles that fell on surface water would be chemically stable and subject to mechanical degradation. No impact to water bodies would be anticipated, even in a highly unlikely event such as an entire clump of undispersed chaff falling into a small, confined water body. Additional discussion of chaff and flare impacts to wetlands is included in *Biological Sciences*, Section 4.6 and Appendices C and D.

Existing chaff mechanically breaks down quickly into silica and aluminum. Under normal pH, the decomposition of aluminum in chaff is extremely slow. Only under very high or low pH could the aluminum in an undispersed clump of chaff become soluble and potentially toxic (Air Force 1997). Few organisms would be present in water bodies with such extreme pH levels. Given the small amount of diffuse or aggregate chaff material that could possibly reach water bodies and the moderate pH of regional water bodies, water chemistry would not be expected to be affected.

Flares are magnesium which burns quickly to create a target for heat-seeking missiles. The magnesium in flares would be toxic only at extremely high levels, a situation that is unlikely as flare use would not be repeated or concentrated in localized areas (see Section 4.4.3.1). Flare ash would disperse over wide areas; thus, no impact to local soils and water systems is expected from the magnesium in flare ash. The probability of an intact dud flare falling to the ground during training is extremely low (0.01 percent of flares deployed was estimated in Utah and Arizona) (Air Force 2001). The probability of an intact flare falling into an aquatic system is much smaller, given the very low proportion of water bodies in the ROI. Therefore, no effect of flares on water quality would be expected.

Chaff and flare plastic and wrapper residual materials are typically inert and not expected to impact soils or water bodies. Section 2.4.6.3 describes these residual materials. Overall, no significant impacts to soil and water resources in the ROI are expected from implementation of the Proposed Action.

4.5.3.2 Alternative B

Alternative B would expand existing airspace, increase airspace operations, and introduce the use of chaff and flares into new training areas similar to the Proposed Action. Alternative B primarily differs from the Proposed Action, Alternative A, by not including the proposed PR-1A, PR-1B, or Gap A MOAs,

which would reduce local low-level training airspace as compared with Alternative A. Chaff and flares would be used for training in the ATCAAs. The total number of chaff bundles and flares deployed annually under Alternative B would be expected to be approximately the same as under Alternative A. Soil and water consequences from chaff and flare use would be as described for Alternative A. Impacts are expected to be similar to those for the Proposed Action and less than significant.

4.5.3.3 Alternative C

Alternative C would also expand existing airspace, increase airspace operations, and introduce the use of chaff and flares into new training areas similar to the Proposed Action. This alternative differs from Alternative A in that it would include no PR-4 MOA and no Gap C MOA and result in a reduction in local low-level training area as compared with Alternative A. The total number of chaff and flares units deployed annually would be expected to be approximately the same as under Alternative A. Impacts would not differ measurably from those of the Proposed Action. Thus, Alternative C is not expected to affect soil or water resources differently from the Proposed Action in any measurable way, and impacts would be less than significant.

4.5.3.4 No Action Alternative

The effects to physical resources under the No Action Alternative would be the same as current conditions. No defensive chaff and flares training would occur. No changes to physical resources would occur under this alternative.

4.6 Biological Sciences

4.6.1 Methodology

Assessing impacts to biological resources and the significance of those impacts is based upon federal and state determinations of: 1) the importance (legal, commercial, recreational, ecological, or scientific) of the resource, 2) the rarity of a species or habitat regionally, 3) the sensitivity of the resource to proposed training activities, 4) the proportion of the resource that would be affected relative to its occurrence in the region, and 5) the duration of the impact. Federal or state agencies consider impacts to biological resources to be greater if priority species or habitats are adversely affected, if substantial effects occur over relatively large areas, and/or if disturbances cause reductions in population size or distribution of a priority species.

4.6.2 Issues and Concerns

Impacts to biological resources from the Proposed Action may result from operational effects from the use of chaff and flares, low-level overflights, sonic booms, and/or bird-aircraft collisions. All effects on wildlife species would be expected to be initially greatest in areas not formerly included within the active airspace, until a period of habituation can occur and the animals begin to associate no threat with overflights and other training activities.

The potential sources of impacts to wildlife from aircraft overflights include the visual effect of the overflying aircraft and the associated noise. Approximately 87 percent of the sortie-operations for the Proposed Action would take place at altitudes greater than 2,000 feet AGL, which is higher than the altitudes associated with most documented reactions to visual stimuli by wildlife (Lamp 1989, Bowles 1995). Low-level startle effects and noise effects, along with other potential impacts, are presented below.

4.6.3 Environmental Consequences

4.6.3.1 Alternative A - Proposed Action

CHAFF

Defensive countermeasures that would be used under all alternatives include the dropping of chaff and flares. Once the chaff reaches the ground, the primary potential effects on wildlife include ingestion or inhalation of fibers, and direct body contact. Dispersed chaff consists of very fine strands of aluminum-coated silica fibers that are thinner than human hair. In general, chaff is released at high altitudes, drifts over very large areas, and is greatly dispersed before falling to the Earth's surface. The average deposition of chaff and flare residual materials would be approximately one piece per 115 acres annually. Chaff fiber deposition would be estimated to average approximately 0.0049 ounce (0.14 grams) per acre per year. Winds at the deployment altitude of chaff would affect drift and deposition. In rare cases, a bundle of chaff may fall to the ground without being dispersed.

Chaff fibers are comprised of aluminum-coated silica fibers and contain trace amounts of iron, copper, magnesium, and zinc. See Section 4.5, *Physical Resources*, for a discussion on the activity of aluminum in soils and water bodies. Application of chaff at rates described above would not result in a measurable increase in elemental aluminum in the soils. There is no evidence of chaff affecting vegetation, and, under current condition of the soils, mobility within the soils and increased vegetation uptake of aluminum is not expected to occur. Aluminum is one of the most abundant materials in the earth's crust and the addition of aluminum from chaff would not have a measurable effect on the abundance or availability of aluminum in soils or vegetation.

Analyses of chemical components of chaff indicate that chaff fibers may only be toxic in large amounts under certain conditions. Under project alternatives, these chemicals would be deposited in the environment at rates that are not only sub-toxic but also undetectable. A study completed in 1977 for the U.S. Navy found no evidence that chaff was acutely toxic to six species of aquatic organisms within the Chesapeake Bay (Arfsten *et al*. 2002). Chaff fibers are not expected to dissolve in fresh water bodies unless they fall into acidic waters. Even in this case, concentrations of aluminum would not be expected to become toxic. Because chaff would be broadly distributed with low density across the ROI, it is unlikely that chaff would be detectable or significantly accumulate within a particular wetland. Given this and the mild pH (neither excessively acid nor excessively alkaline) in regional water bodies, water quality for biological resources would not be expected to be adversely affected by the increased use of chaff within the ROI. For further discussion of activity of aluminum in soils see Section 4.5.

Ingestion of chaff by either ranch animals or wildlife is expected to also be negligible. Several studies have been conducted on cattle and goats that showed they would avoid eating clumps of chaff that were placed directly into their food, and only consumed chaff when coated with molasses and thoroughly mixed with food. Those animals that did ingest the chaff showed no signs of health effects (Barrett and MacKay 1972). It has been suggested that ingestion of chaff by waterfowl could be possible, with possible health effects including blockage or reduced function of the gizzard. However, no data on ingestion of chaff by waterfowl is available and no known deaths of waterfowl have occurred from ingesting chaff (Air Force 1997). Given that the chaff deposition is expected to be approximately 0.00469 ounce per acre annually from training operations, adverse effects from ingestion are not expected and impacts would be less than significant.

Inhalation of chaff fibers is not expected to have negative effects on terrestrial wildlife. Studies on inhalation of chaff fibers by humans and livestock demonstrated that chaff fibers are too large for inhalation and are expelled through the nose or swallowed (Air Force 1997). Based on calculations of

the application rate of chaff under the proposed action and alternatives, the probability of an individual animal (livestock or wildlife) or person encountering single filaments or fragments of chaff or groups of filaments is highly unlikely.

External contact with chaff is not expected to be significant due to the flexible nature and softness of the chaff fibers. Studies conducted at Nellis AFB in 1997 reported finding no difference in animal abundance and nesting activity in areas where chaff were present. Chaff was not found in rodent burrows or in nesting material of bird nests (Air Force 1997).

FLARES

Toxicological studies on flare residual materials indicate that no chemical effects are expected for biological resources. The amount of magnesium dispersed from flares (as the combustion product magnesium oxide) is too small to result in levels that would be associated with acute exposure (Air Force 1997a; see Section 4.4.3.1, *Air Quality*). The concentration of flare ash residue at any location would be undetectable under normal circumstances due to dispersal of the minimal amount of residue produced by a burning flare deployed in the airspace. No impacts would be expected to state-listed species dependent on small aquatic habitats, including the northern redbelly dace and the northern leopard frog, which are found in bogs, small ponds, and lakes.

The probability of a dud flare hitting the ground is extremely low (estimated rate of 0.01 percent of flares deployed). Given that wetlands occur on less than one percent of the project area, the likelihood of an intact dud flare landing in a wetland is even lower. If this event did occur, there would be minimal to no effects of the metallic magnesium from the flare on the wetland. Magnesium is already a significant natural component of the earth and the amount from a flare would be comparably insignificant (Air Force 1997). Due to the low concentrations of flare residue and the extremely low probability of flare residue coming in contact with wildlife, flare releases are expected to have minimal and less than significant effects on wildlife.

CHAFF AND FLARE RESIDUAL MATERIALS

Pieces of plastic, Mylar, and/or paper fall to the earth with each bundle of chaff or flare deployed. Such materials are inert and are not likely to be seen by species as food. Some species of bird and rodents (e.g., pack rats) often select shiny material for their nests. Studies conducted at Nellis AFB in 1997 reported finding no difference in animal abundance and nesting activity in areas where chaff and flare residual materials were present. Flare residual materials were not found in rodent burrows, pack rat nests, or in nesting material of bird nests (Air Force 1997). Behavioral responses from wildlife as a result of the presence of chaff and flares are also not expected to be significant. Flares would not be released below 2,000 feet AGL and would likely not be a visible intrusion, even at night, to nocturnal wildlife on the ground. While defensive flares released at night can be bright, the light usually lasts approximately 5 seconds.

AIRCRAFT OVERFLIGHT AND SONIC BOOM NOISE

Low-level flights and infrequent supersonic events create noise and startle effect to species on the ground. An estimated 2 to 4 percent of the land area under the proposed PRTC would be overflown each training day (see Section 4.9.3.1.5). The proposed airspace could experience approximately one sonic boom per day during the 10 days of LFEs per year (see Section 4.2.3.5). Supersonic activity would be the same under all alternatives. Additional information on noise levels and effects can be found in Section 4.2, *Noise*. Section 4.8, *Land Use*, addresses effects of noise on livestock. The majority of studies have been conducted on domestic animals because of noise damage claims for injury or losses in domestic livestock (Manci *et al*. 1988).

Potential general issues related to noise effects on wildlife or livestock include the following:

- Possible startle response injury due to trampling or uncontrolled running or flight.
- Increased expenditure of energy, particularly during critical periods.
- Decreased time spent on life functions (e.g., seeking food or mates).
- Temporary masking of auditory signals from other animals of the same species, predators, or prey (e.g., noise could prevent an animal from hearing the approach of a predator).
- Damage to eggs or nestlings if a bird is startled from its nest.
- Temporary exposure of eggs or young in nest to environmental conditions or predation if a parent flees.
- Temporary increased risk of predation if startled animals flee from nests, roosts, or other protective cover.
- Site abandonment.

Studies addressing the effects of overflight noise and sonic booms on wildlife suggest that impacts vary depending on the species as well as a number of other factors such as duration and frequency of flights, type of aircraft, flight speed, proximity, etc. Natural factors which affect reaction include season, group size, age and sex composition, on-going activity, motivational state, reproductive condition, terrain, weather, and temperament (Bowles 1995). Individual animal response to a given noise event or series of events also can vary widely due to a variety of factors, including time of day, physical condition of the animal, physical environment (such as whether the animal is restrained or unrestrained), the experience of the individual animal with noises, and whether or not other physical stressors (e.g., drought) are present (Manci *et al*. 1988). Therefore, it is difficult to generalize effects of noise across species. Studies suggest that overflight noise from military aircraft, including sonic booms, could elicit startle responses from individual animals and may cause physiological and/or behavioral responses possibly affecting an animal's fitness or survivability.

Noises that are close, loud, and sudden and that are combined with a visual stimulus produce the most intense reactions. Rotary-wing aircraft (helicopters) generally induce the startle effect more frequently than fixed-wing aircraft (Gladwin *et al*. 1988; Ward *et al*. 1999). Animals under newly proposed MOAs are expected to be temporarily more sensitive to noise due to lower previous exposure than animals under the existing Powder River MOAs. Some species habituate to repetitive noises, especially noise associated with overflight of fixed-wing aircraft, better than other species (Conomy *et al*. 1998; Krausman *et al*. 1998, Downing 2006).

Studies have primarily focused on avian species and large ungulates such as elk and pronghorn. Findings would also be applicable to domestic animals. Increased heart rate, as well as startle responses (such as moving, running or flushing), have been observed in species such as elk, pronghorn, raptors, and certain species of waterfowl (Downing 2006; Manci *et al*. 1988). Such reactions have been especially noticed with low-level rotary wing aircraft flights. While such responses have been observed, little information is available on indirect or long term effects on the vigor or survivability of free-ranging wildlife populations due to overflight noise compared to other environmental factors. Ellis *et al.* (1991) examined behavioral and reproductive effects of several raptor species to low-level flight. They found no incidents of reproductive failure and that site re-occupancy rates were high the following year. Bald eagle behavioral responses varying from altering posture to taking flight and/or departing the area have been associated with closely-approaching aircraft (Grubb and Bowerman 1999). However, no evidence

of reduced reproductive success in bald eagles exposed to overflights or other military noise has been reported (Fraser *et al*. 1985, Grubb and Bowerman 1999). Palmer *et al*. (2003) detected only subtle effects on parental behavior of peregrine falcons from jet aircraft overflights and found no evidence that nest attendance patterns were negatively affected.

Sound exposure levels (SEL) above 90 dB may be detrimental to mammals and are associated with a number of behaviors such as retreat from the sound source, freezing, or a strong startle response (Manci *et al*. 1988). Although not directly applicable to the PRTC, Harrington and Veitch (1992) studied the effects of low-level jet overflight on woodland caribou calf survival and found that mortality rates were significantly higher in groups exposed to the flights. Increased use of low-altitude aircraft in remote areas in Alaska occupied by ungulate populations has focused attention on possible effects of aircraft disturbance on wildlife (Klein 1973 in Manci *et al*. 1988). Such disturbance is most detrimental in treeless terrain where escape cover is lacking.

Studies of large ungulates include observations of flight distances and other behavior of caribou in Alaska. Results were recorded in relation to altitude and angle of fixed-wing aircraft and helicopter approach, intensity and frequency of sound, and external factors such as weather and terrain. Running and panic occurred when the aircraft was at altitudes of 200 feet or less, and such reactions decreased as flight altitudes increased. Above 500 feet, no panic response was observed. The minimum altitude for training in the proposed PRTC is 500 feet, with most (87 percent) of training hours above 2,000 feet AGL. Groups of fewer than 10 animals responded less strongly to the aircraft than larger groups. Groups consisting primarily of cows, calves, and yearlings tended to show a stronger response to the aircraft than groups of bulls. Calef *et al*. (1976 in Manci *et al*. 1988) demonstrated that unfamiliar noise stimuli increased the incidence of miscarriages and lowered the birth rates of caribou and, therefore, recommended that aircraft fly above a minimum altitude of 500 feet during summer and fall migrations, and 1,000 feet at other times.

Studies on pronghorn response to overflight by jet aircraft and helicopters have suggested rapid habituation to overflight after initial responses, which include running for short distances (Workman *et al.* 1992, Bayless *et al.* 2004). In the Bayless *et al.* (2004) study, which included day and night exposures to nearby helicopter activity, movements in response to overflight during nighttime hours were less than movements in response to overflight during daylight, suggesting a visual component to the reaction in addition to noise.

In many studies, animals exhibited continually decreasing responses to increased noise exposure, suggesting habituation. Reactions of captive elk, pronghorn, and bighorn sheep to the impulse noise of sonic booms decreased with exposure (Workman *et al.* 1992). For pronghorn, initial responses were an increased heart rate (that returned to normal within 1½ minutes), running for short distances, and increased alertness. By the third exposure to a sonic boom, the animals' heart rate response had decreased by half and they did not run. Aircraft noise has the potential to be most detrimental during periods of stress, especially during winter, during gestation, and during calving (DeForge 1981). Wildlife management agencies regularly use helicopters and fixed-wing aircraft for radio tracking, monitoring, and surveying wild ungulate populations.

Threatened, Endangered, and Other Special Status Species

The piping plover, least tern, whooping crane, and yellow-billed cuckoo are all rare migrants in the ROI; therefore, minimal to no effects on these species are expected from training flights. For more details on federally listed species refer to Appendix K.

Simulated sonic boom experiments with turkeys did not reveal any reaction other than a few seconds of head alert behavior.

The greater sage-grouse, recently added as a federal candidate species for listing, is of concern in western states that support mature sagebrush habitat. The species also occurs on U.S. Forest Service (USFS) and Bureau of Land Management (BLM) sensitive lists. Likely because the species is showing historic declines and is a popular game bird, much research has been conducted on the potential effects of oil and gas development, which is increasing in the region. Effects of noise, in particular aircraft noise, on greater sage-grouse have been minimally studied. Related research on other upland game birds includes observations on the behavior of four wild turkey (*Meleagris gallapavo*) hens on their nests during real and simulated sonic booms (Lynch and Speake 1978 cited in Manci *et al*. 1988). Simulated sonic booms were produced by firing 5-centimeter mortar shells, 300 to 500 feet from the nest of each hen. Recordings of pressure for both types of booms measured 0.4 to 1.0 psf at the observer's location. Turkey hens exhibited only a few seconds of head alert behavior at the sound of the sonic boom. No hens were flushed off the nests, and productivity estimates revealed no effect from the booms. Twenty brood groups were also subjected to simulated sonic booms. In no instance did the hens desert any poults (young birds), nor did the poults scatter or desert the rest of the brood group. In every observation, the brood group returned to normal activity within 30 seconds after a simulated sonic boom.

Aircraft overflight noise and sonic booms have the potential to affect breeding behavior of sage-grouse; however, no specific research has been completed on these effects. Sage-grouse are known to select their leks (communal breeding display areas) based on good acoustic properties, and depend on auditory communication for mating behavior (Braun 2006). Most sage-grouse leks were established decades ago and are used year after year. Impacts, if any, would depend on the season and altitude of low-level flights, the time of day, and loudness of the sonic booms. Sage-grouse studies on the effects of oil and gas development have shown that light traffic disturbance (1 to 12 vehicles per day) during the breeding season might reduce nest-initiation rates and increase distances hens moved from leks for their nest site selection (Lyon and Anderson 2003). In a heavily-cited dissertation, Holloran (2005) found that declines in the number of displaying male sage-grouse were positively correlated with proximity of leks to gas-field-related sources of disturbance, increased levels of development surrounding leks, increased traffic volumes within 3 kilometers of leks, and increased potential for greater noise intensity at leks. He also found that nesting and brooding females avoided areas with active drilling rigs and producing wells. Holloran suggested that a lag period occurs between when an individual sage-grouse is affected by an anthropogenic disturbance and when survival probabilities are influenced, suggesting negative fitness consequences for females subjected to noise and activity from natural gas development during the breeding or nesting periods. Naugle *et al*. (2006) found that by 2005, active sage-grouse leks, and large and medium-sized leks, were more often found outside or adjacent to coalbed natural gas fields than within coalbed natural gas fields. Potential Proposed Action-related noise such as overflights and sonic booms differ from oil and gas effects as they are more random, not sustained, and not fixed in location. Impacts to sage-grouse from these types of noise disturbances will likely differ and need further study.

Currently, supersonic flights are not permitted within the existing Powder River airspace and rarely will aircraft inadvertently achieve supersonic speeds. As a result, wildlife under the airspace rarely experience sonic booms. Supersonic activity above 20,000 feet MSL for B-1s or above 10,000 feet AGL for other transient fighters could produce sound levels in the 0.5 psf range over broad areas and in the 4 psf range in smaller areas (see Section 4.2.3.5). An estimated average 6 sonic booms per year toward the center of the airspace would produce very infrequent startle effects. Many studies have shown that

wildlife have the ability to habituate to noise and become tolerant to overflights (Downing 2006). Operation activities occurring in new areas may affect the behavior of sensitive species that occur within the airspace during the initial exposures. However, any effects would likely be short term and unlikely to significantly adversely affect the populations.

BIRD- AND OTHER WILDLIFE-AIRCRAFT STRIKES

One potential impact on migratory birds within the training airspace is the possibility of bird-aircraft collisions, or strikes. Discussion of the safety aspects of bird aircraft strike hazards is included in the Section 3.3.3.4, *Safety*. As explained in Section 3.6.3.2, the eastern project area occurs under the convergence of the Central and the Mississippi flyways for migratory birds, which increases the chance for bird-aircraft strikes during the spring and fall seasons in the ROI. Studies have demonstrated that 95 percent of migratory birds fly at altitudes less than 10,000 feet, with the majority of them occurring below 3,000 feet. Most aircraft collisions occur during low level flight, especially around airfields (where low level flight is most frequent) and over water bodies (which attract large numbers of migratory birds). Approximately 87 percent of the time spent in the airspace on sortie-operations under the Proposed Action would take place at altitudes greater than 2,000 feet AGL and water bodies are relatively scarce in the ROI. Although migratory birds such as geese, swans and some raptors have been known to fly at altitudes above 10,000 feet AGL during migration (Lincoln *et al*. 1998), the chance of collision is very low.

Bird-aircraft strike data recorded from 1999 through 2007 indicates that Ellsworth-based aircraft experienced 11 bird strikes in the existing Powder River A and B MOAs during that 9-year period. Of these, 41 percent occurred during July, August and September. PR-3 and PR-4 MOAs overlie the Mississippi and Central Flyways (Figure 3.2-6) and PR-1A and PR-1B MOAs overlie more diverse environment than the PR A and PR B MOAs. There is a greater potential for bird-aircraft strikes in the proposed MOAs than in the existing Powder River A and B MOAs. The migratory birds within the region are protected by the Migratory Bird Treaty Act. If a migratory bird species is involved in a bird-aircraft strike, it would be considered an incidental taking during military training, which is exempt from any permitting requirement by Section 315 of the Fiscal Year (FY) 03 National Defense Authorization Act. These rare bird-aircraft strikes would not be expected to adversely affect any species on the population or regional level.

FIRE POTENTIAL

Wildfires from any cause can impact wildlife. Fire danger is discussed in Chapter 3.3.3.3. The potential for a defensive training flare-initiated wildfire to affect wildlife habitat is considered minimal for a number of reasons. Once flares are released they burn out within 5 seconds and within approximately 500 feet of the release altitude. Deployment of defensive flares would be limited to above 2,000 feet AGL and would be discontinued under extreme fire conditions below an airspace. Altitude restrictions are expected to result in complete flare combustion more than 1,500 feet above the ground. Any residual materials, such as plastic end caps, would not have the ability to cause a fire. Occasionally flares may not ignite (approximately 0.01 percent of the flares deployed) and the dud flare could fall to the ground. The magnesium within the flare is quite stable and it would take a hot fire to ignite a dud flare, although a dud flare could be ignited by a strike with a power saw or a bullet.

If a wildland fire were to occur as a result of an Air Force activity, a loss of canopy and/or understory vegetation would likely occur depending on the severity of the fire, land condition at the time, and if and how soon fire control can respond. Recovery of the vegetation would depend on the plant species burned, season, and severity. Vegetation types such as grasslands naturally have a fairly frequent fire regime, and therefore are composed of species that can recover quickly from fires. Woodlands and shrubland communities recover over longer time periods depending on severity of the fire and climatic

conditions (especially precipitation and temperature regimes) available following fire. Although project-related fires would be expected to be very infrequent, loss of plant cover could increase erosion and sedimentation downslope in some areas. Bare ground as a result of fires can allow the spread of invasive non-native plant species such as annual grasses (e.g., cheatgrass), depending on the nature of the vegetation burned and the presence of invasive species in surrounding areas. Post-fire conditions of erosion, sedimentation, or invasion of non-native species are generally unfavorable for wildlife and reduce productively of habitats to support species.

A wildland fire may result in direct effects on wildlife and livestock, including displacement from important habitat or range. The degree of effect varies by the severity of the fire, the season of the fire, and the type of habitat that was burned. Fires temporarily decrease available cover and foraging habitat, and fires started during breeding season could adversely affect ground nesting birds and interrupt breeding rituals for resident species. As previously stated, the potential for wildland fires as a result of Air Force activity is minimal and not considered a significant risk to wildlife habitat quality or quantity in the ROI.

4.6.3.2 Alternative B

Alternative B would expand existing airspace assets, increase airspace operations, allow supersonic activity, and introduce the use of chaff and flares into the training area similar to the Proposed Action. Potential biological effects would be similar to and comparable to those described for Alternative A, the Proposed Action. Alternative B differs from the Proposed Action by not including PR-1A, PR-1B, or Gap A MOAs. This would result in less local low-level training overflight in the more varied terrain on the western end of the proposed PRTC. As discussed under the Proposed Action, although most animals would be expected to habituate to a level of overflights and sonic booms, the increase in active airspace and frequency of flights could affect the behavior of some wildlife species in the newly proposed MOAs. Overall, Alternative B would be expected to result in slightly fewer adverse effects to wildlife and sensitive species compared to the Proposed Action because the MOA area is smaller and low-altitude overflights would not occur under the PR-1A/1B and associated Gap A ATCAAs. Sonic booms and chaff and flare use would continue from aircraft training in the ATCAA. Overall, Alternative B would not be expected to adversely affect vegetation or wildlife resources.

4.6.3.3 Alternative C

The total MOA airspace included for Alternative C is smaller than that for the Proposed Action. The more varied terrain to the west would be overflown at low levels and consequences would be comparable to those described for Alternative A. Alternative C does not include PR-4 MOA and Gap C MOA. The biological resources present would be generally very similar to those described for the Proposed Action and Alternative B. There would not be low-level overflight in flyways to the east side of the proposed airspace. Potential impacts would be similar to those described for Alternative A except under the PR-4 and Gap C ATCAAs where no low-level training would occur. Any adverse effects to vegetation or wildlife resources from Alternative C would be less than significant.

4.6.3.4 No-Action Alternative

The No-Action Alternative would not create the PRTC or expand training airspace. As a result, conditions would remain the same as those described in Section 3.6, *Existing Conditions* for the biological resources present in the ROI. This would include continued low-level training in the Powder River A and B MOAs which represent most of the proposed PR-2 MOA.

4.7 Cultural and Historic Resources

4.7.1 Methodology

Impact analysis for cultural resources focuses on assessing whether the Proposed Action or alternatives have the potential to affect cultural resources that are eligible for listing in the National Register of Historic Places (NRHP) or have traditional significance for Native American groups. Under Section 106 of the National Historic Preservation Act (NHPA), the proponent of the action is responsible for determining whether any historic properties are located in the area; assessing whether the proposed undertaking would adversely affect the resources, and notifying the State Historic Preservation Officer (SHPO) or Tribal Historic Preservation Officer of any adverse effects.

An adverse effect is any action that may directly or indirectly change the characteristics that make the historic property eligible for listing in the NRHP. If an adverse effect is identified, the federal agency consults with the SHPO/Tribal Historic Preservation Officer and federally recognized Native American tribes to develop measures to avoid, minimize, or resolve the adverse effects of the undertaking.

Direct impacts may occur by physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activity and determining the exact location of cultural resources that could be affected. Indirect impacts generally result from increased use of an area and are harder to quantify.

Impacts to cultural resources are evaluated for lands beneath the proposed PRTC airspace, and especially the proposed low-level training MOA airspace in portions of several counties in ND, SD, WY, and MT. Because the proposed project is an airspace action only those cultural resources that would reasonably be affected by visual and noise intrusions are considered in this EIS.

Visual and noise intrusions could include low-level overflights, sonic booms, and chaff and flare residual materials. Cultural resources potentially affected include very significant historic sites such as National Historic Landmarks or properties listed on, or eligible for listing on, the NRHP that qualify because of setting or feeling, historic architectural resources or archaeological resources with standing structures (such as historic ranches or forts that could be affected by vibrations), national historic trails, and traditional cultural resources that are associated with places that require isolation or quiet. The Air Force recognizes that hundreds of other cultural resources, some documented and some not yet discovered, exist under the airspace. Aircraft operations have the potential to affect historic structures and districts where setting is an important criterion for significance and where noise vibrations from sonic booms or low-level overflights could adversely impact those types of resources. These resources are typically found on the NRHP or State Register. Conversely, if NRHP-listed properties are not affected by the project elements, then non-listed resources are unlikely to be affected.

Prehistoric and historic archaeological sites lacking standing structures are not included as they are generally surface or even subsurface deposits that would not be directly affected by visual or noise intrusions associated with training aircraft. Some prehistoric archaeological sites could contain natural structures such as rock shelters or caves. These structures often house petroglyphs or pictographs, which are etched or painted onto the rock surfaces. Studies have found that these types of natural formations are affected more by erosion than by sonic booms (Battis 1983).

4.7.2 Issues and Concerns

Concerns mentioned by the general public and Native American tribes during the EIS scoping process include disturbance to traditional or sacred sites, interference with religious ceremonies, and visual effects to sites and sacred areas from overflights and chaff and flares. Correspondence with potentially affected tribes is contained in Appendix M.

Elements under the proposed PRTC include creation of new airspace, flying at low altitudes in the MOAs, use of supersonic speed above specified altitudes in the airspace, and release of defensive chaff and flares. Under the Proposed Action, B-1 supersonic flight would be permitted above 20,000 feet MSL and would be permitted by transient fighters above 10,000 feet AGL. Supersonic flight operations would be permitted during 10 days of LFEs only. The release of defensive flares and chaff would be permitted within all MOA and ATCAA airspaces. Current training operations in the existing Powder River airspace do not permit supersonic flight or the release of chaff and flares.

4.7.2.1 Visual Intrusions

Visual intrusions can include aircraft overflights which intrude into the viewshed of a cultural resource, thus adversely affecting its setting. The aircraft flying overhead has the potential to adversely affect the setting, feeling, and character of cultural resources within sight of the aircraft. For the proposed PRTC MOAs, aircraft would be flying at an altitude as low as 500 feet AGL. At these altitudes aircraft could have visual impacts to resources on the ground.

Questions were raised at scoping about Tribal sovereignty and airspace over Tribal lands. As explained in Section 1.4, Congress has charged the FAA with administering all navigable airspace. FAA is responsible for all airspace associated with the U.S. including airspace over Tribal lands, private property, and public property.

Visual intrusions can include overflight of a Tribal ceremony. During Government-to-Government consultations, Tribal members regularly cited their concerns that low-level overflights would intrude upon their ceremonies and vision quests. Air Force representatives assured the Tribal members that, when told of a specific location to avoid, the Air Force would establish reasonable avoidance areas to protect the privacy of participants.

The release of chaff and flares could have a visual effect from residual materials which remain on the ground or land on structures or at sacred sites. Studies have shown that chaff and its residual materials do not pose a significant threat to the visual integrity of archaeological and architectural resources (GAO 1998). Chaff does not accumulate to any great degree and the fibers, if found, were often mistaken for natural elements such as animal fur or plant material. The fibers generally dissipate within a few days due to mechanical breakdown from wind, sediment erosion, and rain or snow. The residual materials from flares and chaff are described in section 2.4.6.3. Chaff residual plastic materials are typically one inch by one inch. Flare residual plastic materials, usually red or blue in color, can be one inch by two inches or larger. Overall, chaff and flares are unlikely to adversely affect cultural resources. The residual materials from chaff and flares fall to the ground in a dispersed fashion and do not collect in quantities great enough to adversely affect the NRHP status of archaeological or architectural resources. Impacts to traditional cultural resources are more difficult to assess and no studies have been conducted on traditional cultural resources with regard to chaff and flare residual materials. Chaff or flare residual materials have been identified by ranchers on their property. When a plastic chaff or flare piece is found and identified in conjunction with a cultural resource, the individual finding the piece may be annoyed.

4.7.2.2 Noise Intrusions

SUBSONIC

Experimental data and models (Battis 1988, Sutherland 1990, King 1985, King *et al.* 1988) show that damage to architectural resources, including adobe buildings, is unlikely to be caused by subsonic noise and vibrations from aircraft overflights. Subsonic, noise-related vibration damage to structures requires high dB levels generated at close proximity to the structures and in a low frequency range (USFS 1992, cf. Battis 1983, 1988). Aircraft must generate a maximum sound level (L_{max}) of at least 120 dB to potentially result in structural damage (Battis 1988) and, even at 130 dB, structural damage is unlikely (refer to Appendix H). Sutherland (1990) found that the probability of damage to a poorly constructed or poorly maintained wood frame building is less than 0.3 percent even when the building is directly under a large, high-speed aircraft flying only a few hundred feet AGL.

SUPERSONIC

The proposed action would allow for supersonic flights of transient fighter aircraft within the proposed PRTC airspace at altitudes above 10,000 feet AGL with the majority occurring above 18,000 feet MSL or higher (Table 2-8). B-1 bomber supersonic flight would be permitted above 20,000 feet MSL. Supersonic training flights would only be authorized during LFEs and could result in a location toward the center of the airspace experiencing an average of approximately one sonic boom per day during the 1 to 3 days of LFEs per quarter. Sonic booms could be described as ranging from the sound of distant thunder to a sharp double crack.

Sonic booms can be associated with structural damage. Most damage claims are for brittle objects, such as glass and plaster. Table 4.2-6 summarizes damage that could occur at various overpressures. There is a large degree of variability in damage experience, and much damage depends on the pre-existing condition of a structure. Breakage data for glass, for example, spans a range of two to three orders of magnitude at a given overpressure. At 1 pound psf, the probability of a window breaking ranges from one in a billion (Sutherland 1990) to one in a million (Hershey and Higgins 1976). These damage rates are associated with a combination of boom load and glass condition. At 10 psf, the probability of breakage is between one-in-a-hundred and one- in-a-thousand. Laboratory tests of glass (White 1972) have shown that properly installed window glass did not break at overpressures below 10 psf, even when subjected to repeated booms.

Damage to plaster occurs at similar ranges to glass damage. Plaster has a compounding issue in that it will often crack due to shrinkage while curing, or from stresses as a structure settles, even in the absence of outside loads. Sonic boom damage to plaster often occurs when internal stresses are high from these factors. Some degree of damage to glass and plaster should thus be expected whenever there are sonic booms, but usually at the low rates noted above.

The effects of noise on cultural resources may also be related to setting. Noise and startle effect impacts to Native American traditional cultural resources may be related to interference with ceremonies and other traditional activities at sacred sites. Undisturbed habitats, resources, and settings are considered to be critical to religious practices (National Park Service 1994). Potential impacts can be identified only through consultation with the affected groups.

4.7.3 Environmental Consequences

4.7.3.1 Alternative A – Proposed Action

Impacts to cultural resources could occur from an increase in noise, both subsonic and supersonic noise. The low-level overflights would have a startle effect and a noise effect, due to the low altitude and

speed of training aircraft. For the proposed action, an average of approximately one sonic boom would be experienced toward the center of the airspace per day during the 1 to 3 day quarterly LFE. The booms could be experienced as a sharp crack-crack or more often, as distant thunder. The potential for damage is presented in Table 4.2-6. The types of structures most susceptible are glass and adobe or similar plaster-type materials. Historic standing structures within the land beneath the affected airspace consist primarily of wood or log buildings with no window glass and some adobe or earth block structures. The infrequency and the random nature of the sonic booms suggest that structural damage to historic structures would not be expected.

Tables 3.7-2 through 3.7-7 provide a summary of all cultural resources that were documented as of Spring 2010 during the background research of areas that underlie the airspace associated with Alternative A. Two hundred and thirty-seven NRHP properties lie in this area; these include historic districts, archaeological sites, ranches, bridges, dams, and a variety of other structures (see Table 4.7-1). Each of these properties currently being overflown by training aircraft is listed as "existing" in Tables 3.7-2 through 3.7-7. None of these properties is currently subject to sonic booms. Neither the noise nor the visual presence of these overflights has affected the NRHP-eligibility status of the resources that are currently being overflown.

Nine other types of cultural resources have been identified beneath the proposed airspace for Alternative A; in some cases these overlap the NRHP properties. There are two National Monuments beneath the affected airspace, Devils Tower is beneath the Gateway ATCAA, and the Little Bighorn Battlefield is beneath the proposed PR-1B MOA. There are also three National Landmarks: Bear Butte, the Frawley Ranch, and the Deadwood Historic District. All but Bear Butte and the Little Bighorn Battlefield are currently overflown by an ATCAA with a floor of 18,000 feet MSL. The Little Big Horn National Monument has a charted 0.75 NM avoidance square around the north and south portions (Custer Battlefield and Reno-Benteen Battlefield). Each is charted with a minimum altitude of 2,000' AGL and this would not change under Alternative A. Currently Bear Butte is on the edge of an ATCAA and the proposed overlying airspace would be an ATCAA. Wind Cave, SD is outside the proposed PRTC. The effects of overflights above 18,000 feet MSL on Bear Butte or Devils Tower would be negligible. Little Bighorn Battlefield would be under a proposed MOA airspace.

Other sites that are eligible for the NRHP but have not yet been listed are also present beneath the affected airspace, these properties include battlefields, prairie churches, and a variety of other sites with standing structures. There are 23 ghost towns beneath the affected airspace, 26 historic ranches, and 1 historic trail. The Tongue River Valley Cultural landscape also underlies the proposed airspace of Alternative A.

Portions of three Native American reservations are underneath the proposed MOA airspace for Alternative A, the Crow, Cheyenne River, and Standing Rock Reservations. The Northern Cheyenne Reservation is completely under the proposed MOA airspace for Alternative A. Beneath Alternative A airspace, eight traditional cultural properties have been directly identified. In addition to these eight, a number of other battlefield sites, archaeological sites, and landscape areas have been identified as being probable sacred areas.

Table 4.7-1. Cultural Resources Under Alternative A Affected Airspace

Resource Type	*Number of Resources*
NRHP Listed Sites	237
National Monuments	2
National Landmarks	3
Ghost Towns	23
Historic Ranches	26
Historic Trails	1
Cultural Landscapes	1
Traditional Cultural Properties	8

Low-level overflights in the newly established PR-1A, PR-1B, PR-3, PR-4, and associated Gap MOAs would impact the setting of cultural properties and cultural resources which have not been used previously for MOA training. SEL_r from B-1 or B-52 aircraft flying level at 500 feet AGL could be in the 108-117 dB range outdoors (Table 3.2-1) and 88-97 dB indoors with windows closed. Should a B-1 perform a maneuver requiring the afterburner to be engaged, SEL_r could increase to 133 dB, but this would be on a very infrequent basis. The numbers of overflights exceeding 65, 75, and 85 dB SEL_r at representative locations under PRTC are shown in Table 4.7-2. A map showing the representative locations listed in Table 4.7-2 as well as other locations can be found at Figure 3.7-1. Overflight noise would be relatively infrequent, with noise levels exceeding 65 dB SEL_r occurring between less than 0.1 times per day and 0.4 times per day. While certain frequencies (such as 30 hertz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second above a sound level of 130 dB are potentially damaging to structural components (Committee on Hearing, Bioacoustics, and Biomechanics 1977). It is possible, but unlikely, that architectural or archaeological resources would be physically damaged by an average of 6 to 9 low-level overflights per year. Sonic boom effects would be infrequent, approximately one per LFE day (10 LFE days per year), and random and could be felt anywhere under the Alternative A airspace. In the extremely unlikely event that a sonic boom high overpressure damaged a historic structure, a claim to repair the structure would start by contacting Ellsworth AFB Public Affairs.

As described in Section 4.9.3.1.5, an average of 6 to 9 low-altitude overflights per year and an average of approximately one sonic boom per LFE day would be expected in the proposed airspace. The change in setting created by increased noise from these low-altitude overflights and sonic booms would have an adverse impact on traditional cultural properties and cultural landscapes. Establishing altitude restrictions and avoidance areas would be one way to reduce adverse effects on these properties. The Air Force would establish reasonable temporary or seasonal avoidance areas or could adopt other measures identified in consultation with affected tribes to reduce intrusive impacts.

Table 4.7-2. Number of Overflights Exceeding 65, 75, and 85 dB SEL_r at Representative Culturally-Sensitive Locations Under PRTC Under Baseline Conditions and Alternative A

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.4	0.2	<0.1

Notes:
1. Because several of the listed noise-sensitive areas are very large, locations were selected from within the designated areas that are near the center of proposed airspace units.
2. Devils Tower published aircraft avoidance area is 5 NM horizontally and 18,000 feet AGL
3. Little Bighorn Battlefield published aircraft avoidance area is ¾ nautical mile horizontally and 2,000 feet AGL.

Native American Concerns

Portions of three Native American reservations are underneath the proposed MOA airspace for Alternative A, the Crow, Cheyenne River, and Standing Rock Reservations. The Northern Cheyenne Reservation, including its population center Lame Deer, is completely under the proposed MOA airspace for Alternative A. Consultation with local tribal governments is ongoing. Part of the consultation process is working to identify periods of avoidance locations to reduce noise and visual impacts on religious ceremonies for all Tribes affected by the proposed PRTC. In addition to traditional cultural properties, cultural landscapes, archaeological sites, and natural sites (such as rivers) are all locations where religious ceremonies are held. Alternative A, which overflies at low level, parts or all of four reservations, would have greater impacts than either Alternative B or Alternative C.

The change in setting created by increased noise due to low level overflights was identified during Government-to-Government consultations as having a potentially significant impact to Native American Reservations. The Northern Cheyenne, Standing Rock, and Cheyenne River Reservations have expressed concern over noise effects to domestic stock animals during calving season. Financial loss is a concern. The Northern Cheyenne have also expressed concern over the economic welfare of the tribe, which could be adversely impacted by increased noise. Through the consultation process several tribes have requested periods of avoidance for calving season as well as for Tribal and individual ceremonies.

4.7.3.2 Alternative B

Under Alternative B, the PR-1A, PR-1B, and Gap A ATCAAs would be established, but the low-level PR-1A, PR-1B, and Gap A MOAs would not be created. Table 4.7-3 shows the types and numbers of affected properties under the MOAs in Alternative B airspace.

Table 4.7-3. Cultural Resources Under Alternative B Affected Airspace

Resource Type	*Number of Resources*
NRHP Listed Sites	202
National Monuments	1
National Landmarks	3
Ghost Towns	23
Historic Ranches	22
Historic Trails	1
Cultural Landscapes	0
Traditional Cultural Properties	6

The greatest change in effect can be noted for the properties and reservations under the PR-1A, PR-1B, and Gap A ATCAAs. The creation of an ATCAA with training flights above 18,000 feet MSL reduces the possibility of noise when compared to low-level overflights like those associated with Alternative A. Random sonic booms could still occur. An ATCAA, due to its higher altitude is far less likely to have any significant effect on the setting of a cultural property.

Under Alternative B, the effects of noise and change in setting would be minimal for the Crow Reservation, the Northern Cheyenne Reservation, the Little Bighorn Battlefield National Monument, and the Tongue River Cultural Landscape. The change in setting will be minimal for these properties and resources because no low-level overflights, like those associated with Alternative A, would occur under this alternative. Training flights over these properties and resources would be above 18,000 feet MSL significantly reducing the possibility of noise impacts. An average of one sonic boom per day for the 10 LFE days per year would be anticipated. In addition, the effect of an ATCAA on two of the traditional cultural properties, the Battle of Wolf Mountains and the Battle of Rosebud Creek sites, would be negligible. These two properties would only be overflown above 18,000 feet MSL (FL180).

High-altitude noise effects to Devils Tower, Bear Butte, the Frawley Ranch, and the Deadwood Historic District would still occur under Alternative B (though as noted above, all of these would be overflown only above FL180 in an ATCAA. The number of overflights exceeding 65, 75, and 85 dB SEL_r at representative culturally-sensitive locations under PRTC is shown in Table 4.7-4. Overflight noise would be relatively infrequent, with noise levels exceeding 65 dB SEL_r occurring between 0.2 times per day (2 out of 10 days) and 0.4 times per day (4 out of 10 days) on average.

Table 4.7-4. Number of Overflights Exceeding 65, 75, and 85 dB SEL_r at Representative Culturally-Sensitive Locations Under PRTC Under Baseline Conditions and Alternative B

ID#	General Description	Baseline Airspace	Baseline # Events Per Day Exceeding			Proposed Airspace	Proposed # Events Per Day Exceeding		
			65 dB SEL	75 dB SEL	85 dB SEL		65 dB SEL	75 dB SEL	85 dB SEL
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A ATCAA	0.2	0.1	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B ATCAA	0.2	0.1	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B ATCAA	0.2	0.1	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 MOA/ATCAA	0.4	0.2	<0.1

Note: 1. Because several of the listed noise-sensitive areas are very large, locations were selected from within the designated areas that are near the center of proposed airspace units.
2. Devils Tower published aircraft avoidance area is 5 NM horizontally and 18,000 feet AGL
3. Little Bighorn Battlefield published aircraft avoidance area is ¾ nautical mile horizontally and 2,000 feet AGL.

Native American Concerns

The Standing Rock and a small portion of the Cheyenne River Native American Reservations would be affected by aircraft overflights and their associated changes in noise and setting due to the establishment of the PR-4 MOA. The change in setting created by increased noise from lower altitude overflights, startle effects, and very infrequent sonic boom noise would have an adverse impact on at least four traditional cultural properties, as well as other areas where traditional ceremonies are held. Concerns over impacts to domestic stock animals similar to those discussed under Alternative A would also apply to Alternative B. Establishing altitude restrictions and reasonable avoidance areas would be one way to reduce adverse effects on these properties. The Air Force would establish reasonable temporary or seasonal avoidance areas or could adopt other measures identified in consultation with affected tribes to reduce intrusive impacts.

4.7.3.3 Alternative C

Under Alternative C, there would be no PR-4 or Gap C MOAs. The PR-4 and Gap C ATCAAs would be established for training above 18,000 feet MSL. Table 4.7-5 shows the types and numbers of affected properties under the ATCAAs in Alternative C airspace.

Table 4.7-5. Cultural Resources Under Alternative C Affected Airspace

Resource Type	*Number of Resources*
NRHP Listed Sites	208
National Monuments	2
National Landmarks	3
Ghost Towns	22
Historic Ranches	23
Historic Trails	1
Cultural Landscapes	1
Traditional Cultural Properties	8

The greatest change in effect can be noted for the properties under the PR-4 and Gap C ATCAAs. The creation of an ATCAA reduces the possibility of noise damage and is far less likely to have any significant effect on the setting of a property. As shown in Table 4.7-6, the number of overflights exceeding 65 dB SEL_r would be 0.3 per day on average at several culturally-sensitive locations selected for analysis.

Table 4.7-6. Number of Overflights Exceeding 65, 75, and 85 dB SEL_r at Representative Culturally-Sensitive Locations Under PRTC Under Baseline Conditions and Alternative C

ID#	*General Description*	*Baseline Airspace*	*Baseline # Events Per Day Exceeding*			*Proposed Airspace*	*Proposed # Events Per Day Exceeding*		
			65 dB SEL	**75 dB SEL**	**85 dB SEL**		**65 dB SEL**	**75 dB SEL**	**85 dB SEL**
1	Inya Kara Mountain	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.1	<0.1
2	Devils Tower [2]	Gateway ATCAA	0.4	0.1	<0.1	Gateway West ATCAA	0.3	0.2	<0.1
3	Little Bighorn Battlefield National Monument [3]	None	n/a	n/a	n/a	PR-1A MOA/ATCAA	0.3	0.2	<0.1
4	Bear Butte	None	n/a	n/a	n/a	Gateway West ATCAA	0.3	0.1	<0.1
13	Crow Native American Reservation (Crow Agency, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
14	Northern Cheyenne Native American Reservation (Lame Deer, MT)	none	n/a	n/a	n/a	PR-1B MOA/ATCAA	0.3	0.2	<0.1
15	Standing Rock Native American Reservation	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1
16	Cheyenne River Native American Reservation	none	n/a	n/a	n/a	PR-4 ATCAA	0.3	0.2	<0.1

Under Alternative C, the effects of noise and change in setting would be minimal for the Standing Rock and Cheyenne River Native American Reservations. These reservations would only be subject to high

altitude noise effects (above 18,000 feet MSL). High-altitude ATCAA overflight noise effects to Devils Tower, Bear Butte, the Frawley Ranch, and the Deadwood Historic District would occur under Alternative C, but no change in noise levels would be discernable. An estimated average of one sonic boom per LFE day could be experienced anywhere under the airspace during the 10 LFE days per year.

NATIVE AMERICAN CONCERNS

The Crow Native American Reservation and the Northern Cheyenne Native American Reservation would be affected by changes in noise and setting as described for Alternative A. The change in setting created by increased noise from lower altitude overflights, increased sorties, and very infrequent sonic boom noise would have an adverse impact on traditional cultural resources and cultural landscapes. Concerns over impacts to domestic stock animals similar to those discussed under Alternative A would also apply to Alternative C. Establishing altitude restrictions and avoidance areas would be one way to reduce adverse effects on these properties. The Air Force would establish reasonable temporary or seasonal avoidance areas or could adopt other measures identified in consultation with affected tribes to reduce intrusive impacts.

4.7.3.4 No-Action Alternative

Under the No- Action Alternative, there would be no changes in airspace activities within the existing Powder River airspace and the PRTC would not be established. There would be no change in visual or noise intrusions which currently occur to existing properties listed in Table 3.7-2 and summarized in Table 4.7-7. No Native American Reservations are located under the existing Powder River A or B MOAs. Aircraft would continue to fly over these areas and avoidance procedures in effect would continue. The No-Action Alternative would result in no changes to cultural resources.

Table 4.7-7. Cultural Resources Under No-Action Alternative Affected Airspace

Resource Type	*Number of Resources*
NRHP Listed Sites	96
National Monument	1
National Landmarks	2
Ghost Towns	15
Historic Ranches	11
Historic Trails	1
Cultural Landscapes	0
Traditional Cultural Properties	5

4.8 Land Use and Recreation

4.8.1 Methodology

During scoping, participants from many rural areas explained that they consider visual and noise qualities important to that use of the land. Of particular concern to some scoping meeting participants was the original Air Force proposal with the possibility of sudden overflights or sonic booms at any time and the potential effect of such training activities on their use of the land. Land uses include ranching, farming, recreation, and rural communities.

Land use and recreational resources are evaluated to determine if any proposed project activity would preclude or alter the suitability of an area for ongoing or intended land uses. In general, land use impacts would occur if project activities were (1) inconsistent or noncompliant with applicable land use plans and policies, (2) preventing or displacing continued use or occupation of an area or severely

diminishing its attributes for ongoing uses, or (3) incompatible with affected areas to the extent that public health or safety is threatened.

Recreation resources would be affected if there were a change in access or availability of recreation sites or activities, or a change in the qualities of an area and thereby reducing the recreational opportunities.

The proposed PRTC would not place restrictions on land use. Any restrictions on towers or tall structures would be established by local agencies and the FAA (see Section 3.3.3.2). Noise from aircraft operations is the primary source of impact on land use and recreation. The following factors are considered in evaluating noise impacts on land use.

4.8.2 Issues and Concerns

General issues for land use and recreation expressed during public scoping include:

- Potential effects from aircraft noise and, during LFEs, sonic booms (particularly on small residential communities and rural quiet of isolated residences, ranching operations, tourism, hunting and fishing, and other livelihoods) and non-commercial recreational pursuits (see also Section 4.2).
- Potential for the proposal to displace existing or planned land uses, or to significantly alter or degrade conditions that are intrinsic to the viability of current and planned uses (see also Section 4.8).
- Changes or disruption to aviation access (see also Sections 4.1 and 4.9).
- Potential effects of noise on wildlife to have indirect effects on hunting (see also Section 4.6).
- Potential effects on ranching and agriculture from flare-caused fires (see also Sections 4.3 and 4.6).
- Potential effects on ranching viability from cattle ingestion of chaff (see also Section 4.6).

Specific issues for land use and recreation identified during scoping:

- Potential incompatibility between current wind farm operations and anticipated development with low-level flights and chaff (Baker MT, Bowman County, Newell to New Underwood, SD, and Mead County SD) (see also Sections 4.1, 4.3, 4.9 and 5.0).
- Effects on hunting, specifically on sage grouse (see also Section 4.6).
- Effects of aircraft noise on quiet rural areas (see also Section 4.2).
- Effect of noise and startle effects on recreational quality and opportunity in Custer National Forest, Little Bighorn Battlefield, or Devils Tower National Monument (see also Section 4.7).
- Effects of noise and startle effects on ranching operations, particularly, seasonal calving, calf weaning, and roundup (see also Sections 4.2 and 4.9).
- Impacts of low level flight and startling noise on persons living under affected airspace (see also Sections 4.2 and 4.7).
- Interference with sleep of night-shift workers who sleep during the day (see also Section 4.2).
- Potential occupational, personal, and recreational safety concerns when animals react to sudden onset noise low-level flight operations and supersonic events (for example, cattle

stampeding or running into fencing;, horses throwing riders or bolting) (see also Sections 4.2, 4.3, and 4.9).

- Effects on private general aviation operations and on the activities and occupations of the residents (see also Sections 4.1 and 4.9).
- Potential incompatibility between low level operations with recreational flying, such as sky divers, gliders, and parasailing (Belle Fourche, SD; Bowman, MT) (see also Section 4.1).

Issues covered elsewhere in this EIS:

- Flight safety for VFR and IFR air operations for private and commercial purposes; affecting weather modification operations (cloud seeding), crop spraying, and fire suppression throughout the region (see Sections 4.1 and 4.3).
- Effects on property values and disclosure requirements for properties underlying affected airspace (see Section 4.9).
- Potential disruption in weather modification programs in western ND (see Section 4.1).
- Potential for widespread fires in oil and gas production areas (see Sections 4.3 and 4.9).
- Potential effects of noise on wildlife populations (see Sections 4.2 and 4.6).
- Potential effects of noise on domestic animal productivity (see Sections 4.2 and 4.6).
- Potential safety risk from dud flares igniting due to ground disturbing activity (e.g., plowing, excavations for construction) (see Section 4.3).
- Potential safety risks from wake turbulence on civilian aircraft (see also Section 4.3).
- Potential safety issues from sonic booms or other impulse noise on sensitive electronic equipment at power plants and coal mines (Colstrip, MT) (see Section 4.3).

As a result of public and agency review comments on the original Air Force proposed action, the Air Force incorporated a series of mitigations into a revised proposal. Mitigation measures, summarized in Section 2.12, are proposed to reduce potential impacts to expressed land use concerns.

4.8.2.1 Noise Effects on Communities and Residential Land Uses

Aircraft low-level overflights, noise, and chaff or flare residual materials could be annoying intrusions, but are not likely to change any land uses under the proposed airspace.

Section 4.2 addresses effects of noise on people, including sleep, interference with speech and communicating, and a variety of factors that affect health, and social and economic functions. These intrusions contribute to annoyance. The Air Force revised proposal has specified morning and afternoon-evening schedules Monday through Thursday and Friday morning. This would provide information to individuals desiring to know when a low-level overflight could occur. As described in Section 4.2, studies have correlated average noise levels with community annoyance as a percentage of the affected population (see 14 CFR part 150, Table 1; FAA Order 1050.1E, App. A, p. A-15). Using this information, several agencies adopted guidelines with 65 DNL as a criterion for compatibility with residential land uses. Some commenters at scoping noted that more sporadic noise exposure may cause greater annoyance due to the unpredictability of the overflights. There has been some investigation to determine if dose/response data on annoyance developed in urban contexts is generally similar in rural

environments (Air Force 1992). The majority of these studies have been done in conjunction with sightseeing overflights of National Parks. Typically, rural environments have low ambient noise levels, and an average of 6 to 9 low-level overflights per year or the expected 10 days per year when LFEs with a sonic boom could introduce momentary disruption between the ambient sound and the incidental noise event. A low ambient noise combined with a short, high noise could heighten the reaction of individuals to noise.

The amount of change in noise level is another way to evaluate impact of noise more broadly over a large area. While human perception of, and reaction to, noise can vary, in general, most people can detect a 3 dB change. Even below 65 DNL, a 3 dB change can be perceived as a degradation of the noise environment (Federal Interagency Committee on Noise 1992).

Startle effects are experienced when a loud noise occurs in a context where not expected and when there is no visible or audible warning. Low-flying military aircraft and sonic booms can startle humans and animals. Unpredictability of flight operations in MOAs may "increase people's annoyance because they do not know when the overflights will occur, making affected persons even more prone to 'startle effects'" (Air Force 1992). Startle effects to animals can affect ranching operations; for example, cattle could stampede if startled during specific ranching operations such as calf weaning and branding.

4.8.2.2 Noise Effects on Recreational Land Use

Reactions to noise in recreational settings vary. A study by the USFS found that visitors to wilderness areas did not generally notice high-altitude aircraft noise intrusions, although, startle effects from low-flying high-speed aircraft were noticed and reported as annoying by some visitors (USFS 1992). Visitors varied on whether aircraft overflights were a positive or detrimental factor to their outdoor experience. Recreational opportunity is classified by the BLM as a combination of the type of challenge provided, in part based on the degree of isolation and remoteness. Quiet and naturalness is an intrinsic part of some recreational experiences. Changes to quiet settings could constitute an effect on the range of recreational opportunities in an area or region, but would not be expected to change the land use of the area.

During scoping, several persons expressed concern that noise could interfere with hunting activities and have a secondary affect on motels and restaurants. During the expected 10 annual days of LFEs any area under the airspace could experience approximately one sonic boom per day. During regular training there could be a low-level overflight of a military aircraft at 2,000 feet AGL or below calculated at an average for any location of 6 to 9 times per year. If such an event occurred at exactly the time a hunter was preparing to shoot, it is possible for an animal to be startled. Should such a noise cause the hunter to miss an opportunity, the hunter would likely be annoyed. Some animals or birds (such as pheasants and sage grouse) may be susceptible to noise and scatter when a sudden loud noise occurs. Also, a sudden noise can be undesirable for the quality of the outdoor experience to some hunters. While these isolated events can happen, behavior of game animals and their reproduction and populations are not significantly affected by noise (see Section 4.6). Hunting is a viable local land use under the existing Powder River airspace in SD, MT, and WY and in other parts of the U.S. where low flying military overflights occur. The fact that hunting can and does coexist with infrequent and random low-level overflights does not reduce the perceived significance of the impact to residents or visitors under the proposed PRTC.

Startle effects could affect other recreation. Startle effects could cause a safety risk for rock climbers or other physically challenging tasks requiring a high degree of concentration. The wide distribution of low-level overflight, the fact that such overflight would not normally be scheduled from Friday noon through the weekend, the premier rock climbing locations under the ATCAAs as opposed to under the

MOAs, and the scheduling of day-to-day training and the advance publication of LFE dates when supersonic events could be anticipated all contribute to a low possibility of overflight or sonic boom impacts on recreational land uses.

4.8.2.3 Aircraft Noise and Land Use

The primary impact of sonic booms or low-level overflight on human populations would be annoyance. In response to concerns expressed at scoping, the Air Force revised the aeronautical proposal to schedule supersonic training only during an expected LFE for 10 days per year, typically 1 to 3 days per quarter to reduce the uncertainty of the sonic boom occurrence. A calculated average total of 6 sonic booms could be experienced toward the center of the airspace during the 10 annual days of LFEs. For the purpose of this EIS, this number is rounded up to approximately one sonic boom per LFE training day. Sonic booms may be experienced as a loud crack-crack or be heard as distant, low, rolling thunder.

There are few studies that can help predict annoyance or land use effects from sonic booms. Sonic boom noise may combine with noise exposure from other sources (including subsonic aircraft noise) to cause annoyance. Humans tend to respond to the high frequency sounds in a sonic boom, while structures tend to respond to the low frequencies which cause shaking. Shaking can have a visible and audible component that can be disturbing to persons, and can cause physical damage (such as broken household items) as described in Section 4.2. Most community annoyance is experienced within the primary boom envelope from short duration, high overpressure booms. Guidelines correlate C-weighted measurements of impulsive noise (CDNL) with community annoyance and result in equivalents to A-weighted standards for compatibility. A 65 DNL equates to about 60 CDNL as a guideline for residential compatibility. The projected CDNL in the main areas subject to sonic booms is calculated to be less than 38 dBC. This is below any level of quantified impact (see Section 4.2).

Low-level overflights, like other sudden unexpected sounds, can startle and disturb sleep. Similar effects on recreational experiences could occur as low-level aircraft operations are experienced. There would be an annual average of 6 to 9 low-level overflights of a military aircraft 2,000 feet AGL or below and within one-quarter mile of any location under the airspace. Infrequent low-level overflights or infrequent sonic booms would not be expected to change land use, but they could be annoying to individuals who experienced the startle event.

4.8.3 Environmental Consequences

4.8.3.1 Alternative A

Alternative A includes 1) modification to existing MOA/ATCAA airspace, 2) creation of new airspace consisting of MOA/ATCAA, 3) authorization for supersonic operations during LFEs (expected to be 10 days per year) in the new and existing airspace above 10,000 feet AGL for transient fighters and above 20,000 feet MSL for B-1s, and 4) authorization for defensive chaff and flare use in new and modified airspace.

Land Use Under Existing Airspace

For more than 20 years, land under the existing Powder River airspace has been overflown by a variety military aircraft, mostly operating out of Ellsworth AFB, but also from other regional military installations. Currently, the areas underlying the existing Powder River airspace experience an average of about 1,200 overflight hours per year (Table 2-25). The Powder River airspace overlies mostly private land in MT and mostly federal land in WY, including portions of the Thunder Basin Grassland and Black Hills National Forest. The land under the Powder River airspace is primarily rangeland with a small amount of forest.

The existing Powder River airspace includes active coal, oil, and gas production areas. The operations and maintenance associated with resource extraction fields brings daily noise associated with vehicles, trucks, and other equipment. Oil and gas well sites frequently have continuous noise from pumps and generators. Noise is localized around well and distribution facility sites. In some of the forest areas, timber harvesting equipment generates intermittent noise, also in localized areas in the ROI. Noise from all of these activities is either intermittent and/or localized. The background noise level of the natural surroundings prevails in most locations of the ROI.

The Bighorn Battlefield memorializes the U.S. Army's 7th Cavalry and the Sioux and Cheyenne in one of the Indians last armed efforts to preserve their way of life.

Average noise levels in the existing Powder River MOAs of approximately 49 dB DNL could decrease imperceptibly to 47 dB DNL in the modified PR-2 MOA/ATCAA as training aircraft were distributed throughout the proposed PRTC. Existing land uses have become compatible with the military flight training. DNL would not reach levels which would affect land use compatibility as noted in Appendix H, Table H-4.

The Air Force has established operating procedures to avoid low altitude overflight of specific land use locations considered to be sensitive to aircraft noise or otherwise require avoidance of aircraft overflights. The types of locations addressed by these special operating procedures include residences, ranches, private and commercial airstrips, communication towers, and communities.

Concerns were raised during scoping about specific activities including current and anticipated land uses for wind turbine sites and development, communication towers, and other tall objects. The proposed PRTC would not change the use of public or private land. Any existing or new tall structures, such as wind energy generators or communication towers, would be charted by FAA on sectional aeronautical charts and avoided by aircraft. These guidelines would continue to apply and would not be altered by the proposed PRTC. Larger communities would have a 1,000-foot vertical avoidance above the highest obstruction and a radius of 2,000 feet (14 CFR Part 91.119). The existing 5 NM avoidance of Devils Tower National Monument, which is under an ATCAA, would continue in effect.

Land Use Under Proposed PRTC

The proposed PRTC would enlarge the footprint of land under military training airspace from the existing Powder River airspace of 9,748 square miles to the proposed PRTC of 35,200 square miles. There would be a total of approximately 27,790 square miles with minimum operating altitudes of 500 feet AGL (Section 3.8.3.2). A similar spectrum of land uses occurs on areas underlying the Powder River airspace as under the proposed PRTC described in Section 3.8. The PR-1A, PR-1B, PR-3, PR-4 MOA/ATCAAs, and associated Gap MOA/ATCAAs overlie a combination of tribal, public and private land uses, including large areas of national forest and grasslands. The Little Bighorn Battlefield National Monument is under the PR-1A MOA. Cattle ranching, dispersed recreation and hunting, and other resource productive uses, are the predominant land uses. Residents mostly live in small, widely separated, communities, with scattered individual homes and farms and a few larger communities. Public concerns for land use expressed at scoping

The Grand River National Grasslands are part of the Dakota Prairie Grasslands and are publicly owned lands administered by the USDA USFS.

included the potential impact of noise from low-level overflight and supersonic flight on existing land uses. Noise can cause individual annoyance, and it can cause sleep disturbance and interference in communication. Noise under the MOAs would go from ambient levels of below 45 dB DNL to an aircraft calculated 30 to 47 DNLmr under the PR-1A, PR-1B, PR-3, and PR-4 MOAs. The projected DNL levels are below the 55 dB DNLmr identified by USEPA as being protective of public health and welfare (USEPA 1974). There would not be a noticeable change from existing conditions under ATCAAs not associated with MOAs except for infrequent sonic booms during LFEs. Alternative A would have approximately one sonic boom experienced toward the center of the airspace each day during the 1 to 3 days quarterly of LFEs (for an expected total of 10 days per year). These projected noise levels are compatible with land uses under existing compatibility guidelines used by the FAA or the DoD (see Appendix H). The Proposed Action would not change general land use patterns, ownership, land management or activities in these areas.

Under Alternative A, overflights by individual aircraft operating at low altitude may have single events as loud as 133 dB SEL (for a B-1 using afterburners at 500 feet AGL). Given the size of the proposed airspace, overflight of any particular location would be sporadic and is estimated to be, on average, 6 to 9 times per year, although any location could experience more or less low-level overflights than average. Approximately 2 to 4 percent of the land areas under the activated MOAs would be overflown each training day within one-quarter mile by a military aircraft 2,000 feet AGL or below (see Section 4.9.3.1.5).

Low-level overflights from fast-moving military aircraft can startle persons or animals on the ground and have caused animals, especially penned ranch animals, to stampede or bolt. While proposed military operations represent a change for areas not under the PRTC, existing areas under the Powder River airspace and other areas in the western U.S. have supported and sustained ranching and other livestock land uses with military operations for decades. This indicates that military training and ranching are not intrinsically incompatible. Intermittent noise startle events would not change the basic suitability of the current land uses.

Ellsworth AFB has and would continue to work with noise sensitive land uses such as residences, ranches, farms, and communities to identify avoidance areas and reduce noise levels of single event overflights. Concerns were expressed about the effects of aircraft noise on ranching land uses, particularly when calves are weaned in the spring and being handled in confined areas, such as being corralled in the fall. The Air Force, with information from ranchers, has identified seasonal low-level overflight restrictions at selected locations under the existing Powder River airspace. Comparable restrictions would be briefed to pilots when the Air Force was made aware of the need for land use avoidance areas under the proposed PRTC.

Agriculture and ranching land uses in the region are supported by aviation activities such as crop and herd monitoring and cloud seeding programs. Fire suppression and general aviation operations also regularly occur. To some degree, the economic activity of commercial land uses relies on aviation activities. In scoping, it was noted that aviation is used for routine access by ranchers to aid in efficient operations. Avoidance of specific locations, scheduled MOA activation, and stacking of MOAs so that ATC could support IFR traffic are part of the Air Force's revised proposal to reduce potential impacts of the proposed PRTC on commercial operations that are important to regional land uses.

Operations that are less flexible and more intensive, such as fire fighting, could require real-time deconfliction (including temporary altitude limits or relocation of training military aircraft) to ensure safety. Potential issues of flight safety for these operations are addressed in Sections 4.1, *Airspace/Air Traffic* and 4.3, *Safety*. Low-altitude agricultural applications could be affected by a low-altitude flight of a military training aircraft. Most general aviation could continue using "see-and-avoid" procedures in an active MOA.

A concern noted by scoping participants was the potential incompatibility of low-level flight with land dedicated to wind farms due to the height and electromagnetic emissions of the wind turbines. Like other tall structures, existing and future structures must be officially charted with FAA and avoided by appropriate vertical and lateral distances. As a precaution for proposed night operations and other commercial and private flight, tall structures are required to have lights that warn of their presence. Overflights at altitudes would avoid the physical structure and electromagnetic emissions of wind turbines. The Proposed Action would not inhibit the development of future wind farms or other industrial land uses.

Concern was expressed at scoping that residential land uses could be impacted by late aircraft overflights after 10 p.m. with the potential to disturb sleep, depending on the location and sound exposure level of particular events. Under current (and proposed) operations, night flying in the PRTC would not occur after midnight, since the home airfields are not active after 12:30 AM. Isolated incidents that disturb sleep may occur. The percentage of operations projected for after 10 p.m. and before 7 a.m. (about 17 percent) and the dispersion of these operations over the PRTC, would result in an average of less than one after 10 p.m. low level overflight below 2,000 feet AGL per year throughout the airspace, although specific locations could experience more or fewer overflights. Such disturbance would not be expected to regularly cause disruption to sleep patterns or otherwise impact residential land uses (see Section 4.2).

Persons at scoping expressed concern with potential changes in the peace and quiet that is part of the regional land use. Overall, average noise levels in the PRTC would increase from below 45 dB DNLmr to an aircraft-calculated DNLmr of 47 dB. Average noise would remain below the 55 dB DNL, the threshold established by USEPA below which adverse impacts would not be expected to occur (USEPA 1974). Low-level overflights and infrequent sonic booms during LFEs may result in annoyance and could lessen an experience of recreation. Low-level overflight of any particular location by a training aircraft would average 6 to 9 times a year although specific areas could be overflown more or less frequently. The suddenness and unpredictability of infrequent overflights during scheduled MOA activation and sonic booms during the 10 days of LFEs per year could be seen as an impact to local land uses by some persons.

Recreational activities such as four-wheeling, horseback riding, fishing, hunting, hiking, and climbing typically occur in remote landscapes where the primary noise source is from recreational activities. Sudden and intense noise could result in disruptions to the expected dominant land use. Reactions vary depending upon individual expectations and the context in which aircraft-caused noise occurs. These incidences are not likely to be persistent and would have only temporary impacts on any given experience. These events are not expected to change visitor habits or recreational land uses overall, but such intermittent overflight could be annoying to some residents and visitors.

Public lands and private lands support recreation, camping, off-road vehicle activities, and hunting. Highly valued or frequently visited special recreation areas or developed sites can be identified. Table 3.8-4 identifies some of the larger areas with special status locations under the proposed PRTC. Many people recreate on weekends and military flight training is scheduled in morning and late afternoons on weekdays. Therefore, the potential for significant impacts on recreationists seeking quiet recreation is somewhat reduced.

Hunting is an important land use. Effects on wildlife would be imperceptible and game populations would not be affected. A low overflight could startle an animal or hunter and possibly result in a less successful hunt, but the likelihood is very low. If such an event occurred, the hunter would likely be annoyed. The overall behavior of game animals would not be expected to change from infrequent startle effects that hunting would be impacted. Based on experience under the existing Powder River A and B MOAs, it is

unlikely that hunters would modify or cease their hunting activities as a result of the Proposed Action or an alternative.

Other recreational pursuits were identified during scoping with concerns that they may be incompatible with low level military aircraft operations. Recreational aviation, parasailing, and paragliding operate in the lower altitude strata of the proposed low-level MOAs. The Air Force would provide advance schedules of training missions in MOAs and the public would have access to information about low-level MOA activation during scheduled training and/or NOTAMs. Local recreationists would be able to learn about scheduled MOA activation. This would help define the time when recreational operations may either select to not fly or continue using "see-and-avoid" procedures. Military training would normally not be scheduled after noon on Friday to Monday morning. Scheduling would result in an inherent deconfliction with weekend recreation. The proposed PRTC would not be expected to change the use of public or private land.

Land uses on Tribal lands underlying the proposed PR-1A, PR-1B, and PR-4 MOAs are similar to the land uses on surrounding lands. Effects on persons and uses would be similar to those described above. Specific sensitive uses and activities on Tribal lands are addressed in Section 4.7.

Supersonic Operations and Aircraft Noise

Under this alternative the number of supersonic flights in areas underlying the PRTC would go from none to approximately one per LFE day toward the center of the airspace during the 1 to 3 days quarterly when an LFE was scheduled. This means that during an expected 10 days per year, not to exceed 3 days per quarter, individuals under the MOAs and ATCAAs could experience sonic booms. The sound of booms would vary from distant thunder to a loud double crack. The primary effect on humans is annoyance, startle effects, and sleep disturbance, particularly at locations near the center of the boom energy. Although infrequent sonic booms would not cause hearing or health impairment, even infrequent sonic booms can be annoying. The schedule for LFEs would be provided to local news media by Ellsworth Public Affairs so that residents and visitors could be aware of the LFE training activity and the potential for sonic booms.

Even very infrequent sonic booms may cause annoyance for land uses and activities where quiet is desirable, such as dispersed outdoor recreation including hiking and hunting. Because of their infrequency, sonic booms may be startling but should have a minimal effect on the overall quality of recreational opportunities or experiences. LFE training and associated supersonic events would not be expected to occur on weekends when more people are recreating.

Sonic booms produce results similar to those of low-level, high speed subsonic aircraft operations and can startle livestock and cause them to stampede or disperse. This could reduce ranching efficiency and result in accidents. A sonic boom is affected by aircraft speed, aircraft altitude, aircraft attitude, and meteorological conditions. There is no way to specifically avoid a location from experiencing a sonic boom if aircraft are performing supersonic maneuvers in an overlying, or even nearby, MOA or ATCAA. Cattle reproduction, weight gain, or milk production would not experience any appreciable declines from a 3 day per quarter period of LFE training and sonic booms. The effect would not be common, but a ranching activity could not be avoided by a sonic boom if the ranching activity occurred during an LFE. Communication of LFE schedules well in advance could help avoid conflicting land use activities when LFEs could result in sonic booms.

Vibrations from infrequent sonic booms during LFEs can cause indoor items such as bric-a-brac, plates, and dishes to rattle. Items on ledges could fall and break. This may be disconcerting for home dwellers but would not impact land use. In rare instances, sonic booms can cause windows to break or otherwise damage structures (see Section 4.2). The Air Force has a standard process for parties seeking

compensation for specific damages caused by training operations. Sonic booms during LFEs, while annoying, would not be expected to change any land use under the proposed airspace.

CHAFF, FLARES, AND LAND USE

The proposed use of chaff and flares in PRTC represents a new activity. Modern chaff is not toxic in the environment and would not harm crops or rangeland (Air Force 1997). The effects of chaff on cattle and domestic livestock are addressed in Section 4.6. Domestic animals avoid ingesting chaff or clumps of chaff fibers (Air Force 1997). Chaff fibers are very small, disperse and break down quickly, and do not affect ground activities or land uses.

One scoping concern for range land use is any potential for flare-caused fires. Fire damages crops, rangelands, timber, and/or ranch infrastructure. National grasslands, forests, and agricultural areas under the airspace are vulnerable to fire. The effect of fire in ecological systems is addressed in Section 4.6. Altitude restrictions on flare release above 2,000 feet AGL are designed to have flares burn out a minimum of 1,500 feet above the ground surface. Flare use would be discontinued in a MOA where an extreme fire danger existed. The possibility of a flare-caused fire is remote. There is an extremely remote possibility that a dud flare could fall to the ground under the training airspace. A dud flare would require a heat source to cause it to ignite and would not be expected to ignite if run over by farm equipment. The likelihood of a dud flare located on the ground is extremely remote. An estimated one dud flare in three years would be expected to reach the ground somewhere under the PRTC airspace. As noted in Section 4.3, *Safety*, a dud flare should not be handled and safety personnel should be notified in the extremely unlikely event that a dud flare was found. Safety risks from flares are addressed in Section 4.3. These remote risks would not affect land uses in the region.

During release, defensive chaff and flares deposit residual materials in the ground. Such residual materials consist of wrappers and plastic or felt caps which are small and widely dispersed. At the rate of use described in Section 2.4, an estimated chaff or flare residual plastic, paper, or wrapper piece would be deposited an average of one piece per 115 acres per year. An estimated average of 0.0049 ounce per acre of chaff would be deposited annually. The visibility or effect of this plastic, felt, or wrapping material would be negligible given the patterns of human activity in the underlying areas. Residual materials, if found and identified, could be seen as an annoyance by a rancher, recreationist, or other persons finding the materials.

Overall, chaff and flare use, given altitude restrictions proposed and the distribution of use, would not be expected to impact land use.

4.8.3.2 Alternative B

Alternative B does not include the PR-1A, PR-1B, and associated Gap A MOAs. This results in no low-level overflights over sensitive land uses under PR-1A or PR-1B. The PR-1A and PR-1B ATCAAs would have a minimum operating altitude of 18,000 feet MSL.

MODIFICATION TO POWDER RIVER AIRSPACE

Effects on modifications to existing airspace would be the same as described for Alternative A.

ESTABLISHMENT OF THE PRTC AIRSPACE

Alternative B would have similar effects as described for Alternative A, except that lands underlying PR-1A and PR-1B MOA would not experience low-altitude overflights. These land uses, which include the Northern Cheyenne Reservation, portions of the Crow Native American Reservation, the Little Bighorn Battlefield National Monument, and other sites, would experience a minimal increase in average noise from training operations operating above 18,000 feet MSL. The predicted average noise

level would be similar to current ambient conditions. The projected average number of events exceeding SEL of 65 dB in Alternative B airspace would be as described for Alternative A. The potential for loud startling events would be unlikely under the PR-1A and PR-1B ATCAAs. Recreational activities in portions of Thunder Basin National Grassland and Black Hills and Custer National Forests would not experience low-level overflights under Alternative A. Potential impacts to residential land uses on the Crow and Northern Cheyenne Reservations would be lower under Alternative B than under Alternative A or Alternative C where low-level MOAs overfly residential portions of the reservations (see Section 4.7).

Noise and land use effects in the remainder of the proposed PRTC would be the same as described for Alternative A in Section 4.8.3.1.

SUPERSONIC OPERATIONS

Supersonic operations would be essentially the same and have the same effects as described for Alternative A. Supersonic events would be slightly less in areas under PR-1A and PR-1B ATCAAs since LFE supersonic fighter operations would be limited to above FL180.

CHAFF AND FLARE USE

Chaff and flare use for Alternative B would be essentially unchanged from the discussion for Alternative A.

4.8.3.3 Alternative C

Under Alternative C, the PR-4 and the associated Gap C MOAs would not be established. The PR-4 and Gap C ATCAAs would have a minimum operating altitude of 18,000 feet MSL.

MODIFICATION TO POWDER RIVER AIRSPACE

Effects on modifications to existing airspace would be the same as described for Alternative A.

ESTABLISHMENT OF THE PRTC AIRSPACE

Alternative C effects would be similar to Alternative A. Land use impacts under the proposed PR-1A, PR-1B, PR-2, PR-3, and associated Gap MOAs would be as described for Alternative A.

Areas underlying PR-4 MOA or the Gap C MOA would not experience low-altitude overflight. Land use under PR-4, which includes mostly private land in ND and SD and portions of the Standing Rock and Cheyenne River Native American Reservations, would experience a minimal increase in average noise from training aircraft operating above 18,000 feet. The predicted average noise level would be similar to current ambient conditions. The projected average number of low-level events exceeding a SEL of 65 dB in any given airspace would approximately as described for Alternative A, with the exception that there would be no low level training flights under the PR-4 ATCAA and Gap C ATCAA. Recreational activities in portions of Grand River National Grassland would not experience low-level overflights under Alternative C. Water fowl hunting in Grant and Adam Counties, ND, would not be impacted by Alternative C.

Potential impacts to crop dusting operations would be expected to be less under Alternative C since there would be no low-level overflight below the PR-4 ATCAA where agricultural land uses are prevalent. Agricultural applications and general aviation operations below FL180 would not be affected under the PR-4 ATCAA. Potential impacts to Standing Rock and Cheyenne River Tribal areas are less under Alternative C than under Alternative A or Alternative B. Potential impacts to Crow and Northern Cheyenne tribal areas would be as described for Alternative A (see Section 4.7).

Land use effects in the remainder of the proposed PRTC would be the same as described for Alternative A.

SUPERSONIC OPERATIONS

Supersonic operations would be essentially the same and have the same effects as described for Alternative A above. Supersonic events would be slightly less in areas under PR-4 ATCAA since LFE supersonic fighter operations would be limited to the AATCAs.

CHAFF AND FLARE USE

Chaff and flare use would be essentially unchanged from the discussion for Alternative A.

4.8.3.4 No-Action Alternative

Under the No-Action Alternative, conditions would continue as described for the Powder River airspace. Conditions for land use and recreation would not change.

4.9 Socioeconomics

4.9.1 Methodology

The socioeconomic impact analysis examines the potential effects of the proposed airspace modifications, low-altitude overflight, supersonic flight, and chaff and flare use on the social and economic resources of the ROI. These social and economic resources are defined in terms of resident population and economic activity. Under the proposed airspace modifications, Air Force personnel and operations and maintenance procedures would not be expected to change from projected baseline conditions. Potential secondary socioeconomic effects of the action alternatives have been evaluated for airspace use, noise conditions, and fire hazard in the affected area. The potential effects of the airspace modifications, changes in use, and chaff and flare use were evaluated to determine their potential impacts on human and livestock populations, economic pursuits, and land values in the ROI.

4.9.2 Issues and Concerns

Issues and concerns involving socioeconomic resources were identified during the public scoping process. Many of the socioeconomic concerns are listed in Section 4.8.2, *Land Use*. These concerns are related to economic factors including agricultural and mining industry and development, potential property damages, property values, and restrictions on safe flight by general aviation. Public concern was expressed regarding potential detrimental environmental conditions associated with the proposed airspace modifications that could impact the economy or land values in the affected area. There was concern that noise events or fire hazard could negatively impact agriculture or the recreation industry, including hunting and fishing. Concerns were raised regarding potential hazards to activities associated with oil, gas, and coal extraction and wind power generation. Concerns were expressed that military training use would constrain general aviation flight through the airspace and local airports under the airspace.

4.9.3 Environmental Consequences

Based on the issues and concerns noted above, potential socioeconomic impacts were evaluated relative to three elements: (1) modifications in airspace use; (2) noise disturbances from overflights and sonic booms; and (3) flare-caused fire hazard. Other resource analyses in this EIS, specifically airspace management, noise, safety, physical, biological resources, and land use address aspects of these and other issues. This section reviews the potential consequences which may result in social or economic impacts within the region.

4.9.3.1 Alternative A

4.9.3.1.1 AIRSPACE MODIFICATIONS

Alternative A expands the existing Powder River airspace by establishing new MOAs and ATCAAs as described in Tables 2-10 and 2-11. Flight activity, in terms of the number of hours flown, would increase under Alternative A with between four and eight training aircraft flying in the proposed airspace. Normally, the proposed PR-1A, PR-1B, PR-2, PR-3, and PR-4 MOAs would be scheduled from Monday through Thursday from 7:30 a.m. to 12:00 p.m. local time and again from 6:00 p.m. to 11:30 p.m. The same airspace units would be scheduled from 7:30 a.m. to 12:00 p.m. on Fridays. The airspaces could be scheduled all other times by NOTAM. Training time would be distributed in a large volume of airspace. Approximately 17 percent of the average daily flight hours would be 2,000 feet AGL or below.

Supersonic operations would only be scheduled during LFEs which would occur once a quarter for up to 10 days per year. B-1 supersonic operations would be limited to 20,000 feet MSL and above. Fighter supersonic operations would be limited to 10,000 feet AGL and above (Table 2-8). The social or economic impacts of sonic booms and low-level overflight would be directly related to the location and intensity of the boom or overflight and the activity beneath the sonic boom or overflight. Section 4.9.3.1.5 discusses sonic boom effects. The infrequent sonic booms and the daily average low level overflight within one-quarter mile below 2,000 feet AGL of approximately 2 to 4 percent of the airspace each training day would not be expected to affect the regional economy. This analysis is described in more detail in Section 4.9.3.1.5 and in Table 4.9-3.

Defensive countermeasures including chaff and flares would be authorized throughout the airspace. Chaff dispensing would be restricted to 2,000 feet AGL and higher over the existing Belle Fourche ESS. Flares would be restricted to 2,000 feet AGL and above in training areas and discontinued in a MOA during periods of extreme fire danger as rated by the National Fire Danger Rating System. For additional discussion of these issues, also see Section 4.1, *Airspace and Range Management*, and Section 4.3, *Safety*. Socioeconomic effects of chaff and flare use are discussed in Section 4.9.3.1.6.

Property Values

During public scoping, concerns were expressed that property owners underneath the proposed PRTC MOAs would be required by law to disclose that their property is under a MOA during real estate transactions. According to MT, ND, SD, and WY state laws, there is no requirement for property owners to disclose military or commercial airspace over their properties. The state of MT has a law that applies to property in the vicinity of take-off and landing approaches for airports that govern zoning and building restrictions for safety purposes, however, this law applies only to designated 'airport affected areas' that are typically within a few miles of an airport (MT Code 67-7-201). The states of MT and SD have laws that require real estate licensees (such as realtors or real estate brokers) to disclose any knowledge of an 'adverse material fact' to potential buyers. The definition of an adverse material fact for each state typically involves disclosing whether past environmental hazards which are required by law to be disclosed (i.e., lead-based paint, asbestos), or factors that present a health risk, or material defect on the property (MT Statute 37-51-102, SD Real Estate License Law 36-21A-125). The state of WY lists specific factors that must be disclosed by real estate licensees including any significant damage to the property from water, fire, or infestation, defects in the structural or utility systems of the property, and the presence of any hazardous or regulated materials (State of WY Senate File SF0158).

There is little to suggest that airspace modifications under the Alternative A would impact land values in the affected area. Interviews with property appraisers in Carter, Custer, and Powder River counties, MT under the existing Powder River airspace revealed that the existence of the Powder River A or B MOAs is not used in determining the value of a property. The complex nature of property valuation factors

makes any estimation of the potential effects of airspace modifications on land values highly speculative. Ranching operations, communities, and private airports all exist and function under the existing Powder River A and B MOAs. Other socioeconomic factors, such as business activity, employment, interest rates, and land scarcity (or availability) are much more likely to affect property values than training airspace. Neither the training flight activity under the existing Powder River airspace nor the training flight activity under the expanded PRTC is expected to affect the value of property under the airspace.

4.9.3.1.2 Civil Aviation in MOAs

The proposed PRTC MOAs would not prohibit civil aviation use because MOAs are joint use airspace. While MOAs are active, civil and military pilots operate under VFR see-and-avoid rules. Aircraft cannot fly IFR in an active MOA. When the MOAs are inactive, civil pilots would be able to fly IFR. During scoping meetings, pilots expressed concern that they did not feel safe within the existing MOAs under see-and-avoid rules and requested improved communications when military training aircraft were in the vicinity. Section 3.1 explains that there is limited communication or radar coverage below FL180 in much of the area. PRTC alternatives do not include any improved communication or tracking systems. The Air Force would notify ATC when entering or leaving an active MOA. Civil pilots would have to communicate with ATC prior to and during a general aviation flight in order to learn whether they could fly IFR through an airspace scheduled for training.

Tables 3.1-3 and 3.1-4 in Section 3.1.3.3.3 list public airports and private airfields under the proposed PRTC airspace. The facilities, as well as the magnitude and nature of their operations are described. Each public airport under the proposed PRTC would have an avoidance area of at least 3 NM in diameter and an altitude of 1,500 feet AGL established in accordance with FAA Order 7400.2G. Areas requiring additional avoidance distance or not covered by standing guidance will be evaluated individually between the 28 BW and that organization needing avoidance. All military aircraft maintain contact with Ellsworth AFB and Ellsworth AFB maintains contact with ATC to allow for deconfliction with civil aviation emergencies.

Airports directly below or in close proximity to the proposed PRTC have the potential to be impacted through the activation and use of MOAs and low-altitude military operations. Military training operations could result in IFR civil aircraft ground holds or re-routing of commercial traffic which would increase costs in terms of fuel consumption and flight delays. The Gap MOAs and ATCAAs are on existing Victor Airways and are designed to serve as transit corridors for commercial and general aviation. The Gap MOAs and ATCAAs would only be scheduled for military operations during LFEs for a total of 10 days per year. Many pilots in the region fly point to point and do not use Victor Airways as demonstrated by Figures 3.1-14, 3.1-15, 3.1-16, 3.1-17, 3.1-20, 3.1-21, 3.1-22, and 3.1-23. Re-routing to the Gap MOAs could increase civil aviation delays and fuel costs. FAA has noted that the airports likely to experience adverse economic impacts from the proposed airspace are small public airports and associated fix-based operators under the airspace that rely heavily on transient traffic for their revenues. The Air Force revised aeronautical proposal includes weekly schedules for MOA activation, MOA stacking to support IFR traffic, and setbacks from airports, such as the Billings International Airport, to avoid adverse impacts to traffic patterns.

The significance of impacts to civil aviation would be dependent on the amount of time that the MOAs are active and the ability for civil aviation to coordinate flight schedules with military flight operations. In response to comments from the public and the FAA, the Air Force revised the proposal presented during the scoping meetings and proposed stacked MOAs and ATCAAs. This stacking allows the Air Force to activate only the airspace that is needed for the specific training missions and allows IFR traffic

in an airspace segment after military training is completed. The Air Force would train below 2,000 feet AGL in the Low MOAs for only brief periods of time between 15 and 20 minutes before transiting to higher airspace. When the Low MOA is no longer being used by the Air Force for training it would be inactivated to allow IFR traffic. Likewise, the proposed ATCAAs would be stacked into Low ATCAA (above FL 180 to FL260), Medium ATCAA (above FL260 to FL370) and High ATCAA (above FL370 to FL600). Only the ATCAAs being utilized for training would be scheduled and activated by the FAA for the military. The inactive airspace would then be available for civil aircraft to transit the airspace.

Public airports under the proposed airspace would have designated avoidance areas of 3NM and 1,500 feet AGL. If the Low MOA is active pilots originating in the airspace would fly VFR through the activated MOA until reaching altitude in an inactive MOA or into an ATCAA. Pilots need to maintain contact with ATC in order to know the status of the MOAs and ATCAAs during flight although much of the airspace has limited communication capabilities below FL180. Pilots who are not comfortable transiting an active MOA VFR may choose to hold on the ground until such a time as the MOAs are inactive or weather permits transit VFR. These ground holds could be expected to range from 2 to 4 hours and could result in adverse impacts to the pilots and their business decisions.

Private airfields under Alternative A airspace would be affected in much the same way public airports are affected. It would not be possible to fly IFR in an active MOA and civil aircraft pilots, even ones associated with low-level agricultural applications, would need to decide to fly VFR see-and-avoid in an active MOA where a military aircraft could be randomly flying below 2,000 feet AGL and, as low as 500 feet AGL. This could result in delays estimated to be up to two hours for airfields under an activated airspace or comparable delays to pilots outside the airspace who could not transit the airspace IFR and chose not to transit the airspace VFR. The proposed PR-1A, PR-3, PR-4, and ATCAAs are stacked with low and high MOAs to allow civil aircraft to transit IFR through the airspace in inactive MOAs or ATCAAs even if the military is training in a MOA or ATCAA above or below the inactive airspace. Pilots would need to contact ATC prior to flights for information on the active airspace.

Aerial applications (crop dusting) for agriculture are conducted well below 500 feet and applicators typically fly under 1,000 feet AGL. Frequently, such applications are performed during times of light wind to reduce dispersion of the materials being deposited. Aerial applicators often fly near maximum gross weight. The inability of an aerial applicator to know where or at what altitude a training bomber could overfly the area scheduled for application could affect business decisions. Although some applicators could elect to perform all transit to and from an application at altitudes below 500 feet, most applicators would be expected to fly higher than 500 feet AGL when transiting to or from a field. The uncertainty of low-level bomber overflight could affect the ability of such aerial applicators to safely perform their jobs and could be seen by them as a significant socioeconomic impact.

Adverse impacts to civil aviation are also likely during LFEs when the entire proposed PRTC would be active to accommodate additional training aircraft. Impacts to civil aviation throughout the region are expected to be seen as significant by local airports under, and pilots seeking to transit, the airspace. See Section 4.1.3 for more details. The Air Force would notify the civil aviation community and airports by publishing the scheduled use times through advance NOTAMs, and through access for coordination by the local airports. The scheduled times would ensure the airspace availability for training. As soon as the training mission was completed, the Air Force would notify ATC that the MOA could be used for IFR traffic. This would allow for civilian pilots flying IFR to adjust their flight patterns as required.

Table 4.9-1 summarizes the annual published operations by public airports under each proposed PRTC MOA from Table 3.1-6 (Section 3.1.3.3). The daily timing of published airport operations is not available. Most air taxi operations would be expected to occur during business days whereas local and transient operations could occur on any day during the year. Civil aircraft flight operations are assumed to occur

any time during the year. The Air Force revised proposal has specific hours for MOA activation Monday through Friday. This would provide civil aviation pilots unable to fly IFR or unwilling or unable to transit an active MOA VFR with scheduling information.

Table 4.9-1. Alternative A Public Airports Under Proposed PRTC MOAs

		Reported Operations		
		Annual	*Daily*[1]	*Monday to Thursday Flights Affected*[2]
Airports Under PR-1A/1-B (includes Gap A)				
Colstrip	MT	5,750	16	9
Hardin	MT	6,600	18	11
PR-1A/1-B Totals		**12,350**	**34**	**20**
Airports Under PR-2 and Currently Under Powder River MOAs				
Belle Creek	MT	550	1	1
Broadus	MT	5,350	15	9
PR-2 Totals		**5,900**	**16**	**10**
Airports Under PR-3 (includes Gap B)				
Baker	MT	7,000	19	11
Bowman	ND	4,140	11	7
Ekalaka	MT	2,028	6	3
Harding-Buffalo	SD	2,300	6	4
PR-3 Totals		**15,468**	**42**	**25**
Airports Under PR-4 (includes Gap C)				
Bison	SD	5,500	15	9
Elgin	ND	160	1	1
Hettinger	ND	4,450	12	7
Lemmon	SD	12,500	34	20
McIntosh	SD	70	<1	<1
Mott	ND	1,690	5	3
PR-4 Totals		**24,370**	**67**	**40**
PR-1 to PR-4 Totals		**67,048**	**159**	**95**

Notes: 1. Assumes 365 flying days per year
2. Weekday: Monday through Thursday; approximately one-third civilian flights affected Friday morning

Source: From Table 3.1-6

The daily number of civil aircraft at public airports estimated to be potentially affected by a PRTC Alternative A is presented in Table 4.9-2. Private airfields do not provide the FAA with annual operation numbers which are published. Estimates of civil aircraft operations at private airfields under the proposed airspace were made by calculating the public airport published operations per based aircraft. Table 4.9-2 combines Table 4.9-1 with FAA data and the estimated civil operations at private airfields under the proposed airspace to produce a number of daily civil operations estimated under the proposed airspace for each PRTC alternative. Table 4.9.2 data are taken from Table 3.1-10.

Table 4.9-1 presents the civil operations which could be impacted daily by military training. The degree of impact would depend upon pilot choices, the PRTC alternative, and the ability of FAA to provide for IFR traffic. MOAs would be scheduled 10 hours Monday through Thursday and 4.5 hours on Friday mornings. If IFR traffic could not be accommodated and VFR pilots elected to or could not fly see-and-avoid in an active MOA, and assuming a distribution of civilian flights during the day based on FAA data, Table 4.9-2 provides the estimated affected civilian flights from Monday through Thursday. The impact

could be a delay of 2 to 4 hours or a diversion for pilots seeking to fly IFR but unable to do so in an active MOA and pilots unwilling or unable to fly VFR using see-and-avoid in an active MOA. During LFEs, the impact could be a 2 to 4 hour delay with no realistic diversion possible. Such delays could be perceived as a significant impact by civil aviation operators under the proposed PRTC.

Table 4.9-2. Estimated Daily MOA Civil Operations Affected by PRTC Alternatives

Estimated Affected Civil Operations in MOAs									
		Alternative A		*Alternative B*		*Alternative C*		*No-Action*	
Proposed MOA	*Daily Civil Operations*[1]	Day-to-Day[2]	LFE[3]	Day-to-Day[2]	LFE[3]	Day-to-Day[2]	LFE[3]	Day-to-Day[2]	LFE[4]
PR-1A/1B	53	32	16			32	16		
PR-2	25	15	8	15	8	15	8	7	
PR-3	52	32	16	32	16	32	16		
PR-4	83	50	25	50	25				
Gap A	8		3				3		
Gap B	14		5		5		5		
Gap C	7		3		3				
Daily Total	242	129	76	97	57	79	48	7	NA

Notes: 1. From Table 3.1-10
2. Civil operations during scheduled Monday through Thursday day-to-day hours represent approximately 60 percent (Friday mornings would affect approximately 20 percent of daily civil operations)
3. Civil operations during four LFE hours represent approximately 30 percent
4. LFE cannot be accomplished in existing airspace

Scheduling civil aviation flights around military training, communicating with ATC regarding a MOA's status, and flying IFR in an inactivated MOA would reduce potential delays. Ground delays would have the potential to affect economic activity through increased travel time. The extent of travel time increased would be related to when the MOA would be inactivated after military training aircraft left the MOAs. The ground delays would be somewhat alleviated due to the Air Force's ability to specify scheduled times of training which pilots could use to plan their own flights or plan detours around the MOAs. However, unforeseen circumstances such as weather or mechanical difficulties could require military training to be conducted outside of the regularly scheduled times. The Air Force would notify the public 2 hours in advance through NOTAMs of when the airspace would be active. Civilian pilots would need to contact ATC prior to or during transit of the airspace to be aware of the status of the airspace

Uncertainty regarding where a low-level bomber could be within a MOA could affect decisions to traverse an airspace. IFR transit within an active MOA would not be permitted, and much of the area has limited radar or radio frequency coverage to permit adequate in-flight communication. Delays and uncertainty would be expected to produce local impacts to airport access, and pilots would be annoyed by the inability to use IFR or the unwillingness to transit an active MOA using VFR. Impacts could occur to public airports and private airfields under the airspace that are dependent on transient traffic for revenues. Active MOAs could encourage private pilots to re-route around the active airspace and avoid public airports or private airfields under the active airspace. Based on Table 4.9-2, approximately 60 percent of the day-to-day civilian MOA traffic would be affected Monday through Thursday. On Friday mornings, approximately 20 percent of the civilian traffic would be affected. During LFE's, approximately 30 percent would be affected with no work-arounds except delay or fly see-and-avoid in an active MOA.

During scoping meetings, concerns were expressed about whether the proposed airspace could prevent or interfere with emergency flight operations such as firefighting or air ambulances. Under positive ATC, emergency flights, including fire and medical aircraft are given priority over military operations. Under specific situations, the FAA can establish Temporary Flight Restrictions to temporarily restrict access for civil and military aviation in specified areas. These situations include hazardous conditions, such as fires, special events, or general warnings. These procedures are applied to the current Powder River airspace. Pilots are notified of Temporary Flight Restrictions through NOTAMs and pilots are restricted access unless under specified conditions, such as firefighting aircraft. These Temporary Flight Restrictions would allow firefighting aircraft unimpeded access to the airspace above a fire to conduct prolonged firefighting operations. No impacts would be expected other than increased communication.

For non-emergency flights, such as fire reconnaissance, U.S. Fish and Wildlife (USFWS) surveys, Angel flights, and cloud seeding, the pilot could coordinate with Ellsworth AFB to work to deconflict military operations. Weather modification flights need to respond rapidly to cloud formation and other meteorological conditions. Notification to Ellsworth AFB of the seasonable possibility of cloud seeding operations and notification of when and where cloud seeding was occurring would permit the Air Force to deconflict training missions.

Civil aviation and public airports have the potential to be impacted by the proposed expansion of airspace by requiring additional communication from private pilots to determine when the MOAs are active. The extent of potential impacts would be dependent on scheduling, the duration of the ground holds, and the amount of time that the MOAs were active. The airspace use and related activities associated with the PRTC Alternative A could result in delay, uncertainty, or other impacts to an estimated 129 civil operations during Monday through Thursday and approximately one-third that number on Friday morning (see Table 4.9-2). Civil operations would include a takeoff, landing, or transit through a proposed airspace. In addition to the directly affected flights from airports and airfields under the proposed airspace, there are airports and airfields on the periphery of, or near, the airspace which could also be impacted. Tables 3.1-3 and 3.1-4 identify the public airports and private airfields under and near the proposed PRTC, and Table 3.1-6 presents the reported operations from the public airports listed as near the proposed airspace. A review of Figures 3.1-14, 3.1-15, 3.1-20, and 3.1-21 shows a substantial number of civil flight paths with an origin or destination at these airports near the proposed PRTC. Airport operations data do not specify the number of flights from the airports which would potentially be traversing the airspace and would be impacted, to some degree, by activated PRTC MOAs. The estimated 129 daily operations should be seen as a quantifiable and reasonable estimate of the total number of civil aircraft operations impacted. The change in airspace use for military training could be seen by civil airspace users as a significant, adverse impact on the human, social, or economic resources of the region.

4.9.3.1.3 Civil Aviation in ATCAAs

Potential impacts to Victor Airways and to Jet Routes are described in Section 4.1.4.3. In response to FAA-identified potential impacts to commercial aviation, the Air Force has revised the proposal to include Low ATCAAs, from FL180 to FL260, Medium ATCAAs, above FL260 to FL370, and High ATCAAs, above FL370 to FL600. The Air Force would work with FAA to activate only the airspace required to conduct adequate training. The remaining airspace would be available for civil and commercial aviation under ARTCC direction.

PR-3 and PR-4 Medium and High ATCAAs and all other high ATCAAs would be requested for LFEs only (see Table 2.11). This would reduce the potential for impacts to higher altitude commercial flights traversing the airspace. During LFEs, the Air Force would work with FAA to identify time periods when

higher altitude airspace could be activated. LFE impacts to higher altitude above FL180 could average from 43 to 244 flights per day (see Section 4.1.3.1.3). LFE impacts could include re-routing around the activated airspace and such re-routing or other schedule effects could be seen as substantial economic impacts to commercial carriers and other high altitude traffic.

4.9.3.1.4 Energy Resource Development

Public scoping comments included the concern that the proposed airspace modifications could interfere with energy resource development, particularly oil and gas exploration, coal mining, or the development of wind farms. Concerns were expressed during scoping that the proposed airspace expansions would interfere with proposals by private and state entities to develop wind farms underneath the proposed airspace. In 2007, the Department of Defense released a letter stating that the DoD would not oppose the development of wind farms or other sources of renewable energy that would not impact military readiness or training. The Air Force would coordinate with FAA and other regulatory agencies to evaluate wind farm proposals under the proposed airspace on a case-by-case basis. If there were a concern about a wind farm proposal, the Air Force would raise those concerns to the appropriate authority. Concerns have been expressed, for example, when wind farms have been proposed in the approach pattern of military airfields. The Air Force would not have the final decision in any wind farm proposals.

Wind farms, towers and other obstructions over 200 feet tall are required to have warning lights installed per FAA regulations. General flight rules state that low-level flight operations would occur at least 200 feet above the highest obstruction within the flight area. With a floor of 500 feet AGL, low-level flights from the B-1s would occur 500 feet above the highest obstruction within the area. For example, if there is a wind farm or other towers underneath the proposed airspace that extend to 400 feet then low-level flight operations at that area would occur not lower than 900 feet AGL.

Altitude overflight restrictions would be established over community airports and over tall structures, such as the power plant stacks at Colstrip. The minimum overflight above a public airport would be 1,500 feet AGL for a 3-NM radius circle centered on the airfield. A comparable avoidance area over Colstrip would place training aircraft a minimum of 500 feet above the structures.

The effects of very infrequent sonic boom overpressure during LFEs or low altitude overflight upon mining operations or major construction projects could impact features of the operations. In most cases, the mining operations would be impacted by overpressures below 5 psf. The overpressure effects would be rapidly dissipated underground. Sonic boom or low-altitude flight overpressure effects upon surface mining would depend upon the focus of the sonic boom or overflight and the distance from the mining operations. Overpressure effects from sonic booms could vary from the sound of distant thunder to a sharp crack-crack with enough overpressure to loosen unstable soils and raise dust. Atmospheric effects, as well as aircraft speed and altitude (turning, descending), all contribute to the intensity of a sonic boom and even determine if it will be felt at ground level. In the unlikely event that a focused boom was directly experienced at a mining operation, the effect could be dust and/or loosening of unstable surface materials. Communication regarding overflights scheduling and mine operations would be required to reduce the potential for surface mining impacts although sonic booms cannot be specifically directed away from a sensitive location.

Electronic capabilities in B-1 and transient fighter aircraft could be at frequencies and levels to cause concern to mining operations. Mining requires frequent blasting with electronically triggered explosives. Mining operations could be significantly impacted if a B-1 or other aircraft were to exercise certain frequencies which interfered with mine blasting. The only way to avoid such a significant risk to safety and mining economics would be for the Air Force and mining operators to ascertain the electronic frequencies involved and abstain from using those frequencies where they could affect mining operations. Such interactions to identify the potential for, and to implement procedures to avoid, such impacts do not exist under the current Powder River A and B MOAs and would require additional communication, procedures, and avoidance areas where existing and potential mining and blasting operations could occur.

Coordination and communication will be required to ensure that mining economics and safety are not impacted by the B-1 or transient fighter electronic capabilities.

4.9.3.1.5 Noise Disturbances

The total number of training sorties is projected to be distributed throughout the proposed PRTC. The relatively low acoustical effects can be attributed to the dispersion of training flights into a large volume of airspace. Average noise levels would be slightly reduced from projected baseline conditions in the PR-2 MOA which is approximately the same as the existing Powder River A and B MOAs. Most receptors in the expanded PRTC would experience higher levels of noise. Animals and humans in these areas are expected to be temporarily more sensitive to noise due to lower previous exposure. Animals and humans under the expanded PRTC would be exposed to higher noise levels than currently experienced under PR-1A, PR-1B, PR-3, and PR-4 MOAs/ATCAAs. For a more detailed discussion, see Sections 4.2, *Noise* and 4.6, *Biological Resources*.

During public scoping meetings, several participants expressed concern that the low-level overflights and supersonic activity would significantly impact their lives. This was especially stated in scoping meetings under and adjacent to the PR-1A, PR-1B, PR-3, and PR-4 MOAs and associated Gap MOAs. The typical human response to noise effects associated with aircraft overflights is annoyance. The USEPA has identified a DNL of 55 dB to be a level protective of the public health and welfare. This represents a threshold below which adverse noise effects are generally not expected. Noise levels for Alternative A are below this level. There are changes in the predicted noise levels in areas under the proposed PRTC. The average annual noise level in those areas could increase to 47 dB DNL and is likely to be noticeable. Although this is below the USEPA-identified level, the sudden and unexpected nature of even infrequent low-level or supersonic events during LFEs could cause surprise and annoyance.

Low-altitude subsonic overflights or infrequent higher-altitude sonic booms could result in short-term negative impacts to wildlife, livestock, or humans (e.g., increased heart rate, flight, potential injury). During scoping meetings, individuals expressed concerns that the startle effect of low-altitude subsonic overflights or sonic booms would adversely affect economic activity, especially ranching during calving or when ranchers are working with concentrations of cattle such as weaning and branding. Impacts could include injury to animals, damage to infrastructure, and time to round up the livestock. As discussed in Section 4.3, *Safety*, the 28 BW currently coordinates with ranchers under the existing

Areas currently under the Gateway ATCAA would experience infrequent sonic booms from supersonic training in the expanded Gateway ATCAA.

Powder River A and B MOAs to identify areas with large concentrations of cattle, particularly during calving, weaning, and branding operations, and to establish temporary avoidance areas for low-level overflights. Such avoidance areas minimize startle effects from overflights. Under the proposed airspace expansion, communication with the 28 BW would be important for ranchers to coordinate temporary avoidance areas. The nature of sonic booms is that the location where a sonic boom could be experienced is dictated by a variety of factors, including meteorology. Anywhere under the airspace could experience average of one sonic boom per LFE day. Public commentors at scoping expressed the opinion that they would consider the sudden onset noise of a low-level overflight or a sonic boom to be a significant impact. During scoping, the estimated number of low-level overflights or sonic booms per year had not yet been calculated. It would not be possible to prevent sonic booms in a sensitive area if an aircraft were performing supersonic maneuvers at altitude during an LFE, although the Air Force would provide advance notice of the one to three days per quarter when LFEs would be conducted. This advance notice would help with knowledge of when a sonic boom could occur.

Concern was expressed at public hearings that noise conditions may negatively affect wildlife and livestock. Animals have demonstrated that they can habituate to loud, regular noises such as sonic booms. The levels of noise anticipated as a result of PRTC could startle penned individual livestock but are not expected to result in biological effects that would impair overall animal populations. Low-level overflights with sudden noise accompanied by a visual stimulus can result in reactions by wild and domestic animals. Should a sonic boom or low-level overflight result in a hunter losing an opportunity, the hunter would be expected to be annoyed. Should a sonic boom or low-level overflight result in a livestock stampede with damage to fences and the livestock, a rancher could suffer economic loss and potentially be placed in harm's way.

Supersonic training in the Gateway East ATCAA or Gateway West ATCAA during LFEs could result in very infrequent sonic booms being experienced in the cities of Sturgis and Deadwood, SD, under the southeast portion of the ATCAA and Belle Fourche and Spearfish, SD, and Sundance, WY, under the ATCAA. Other small communities are also under the ATCAA. B-1 bombers would train at supersonic speeds within the Gateway ATCAA at altitudes above 20,000 feet MSL and fighters could go supersonic above 18,000 feet MSL during LFEs only because the proposed Gateway ATCAAs would begin at 18,000 feet MSL. In the proposed MOA airspace, fighters would be authorized to go supersonic down to 10,000 feet AGL.

The sonic booms during LFEs would be infrequent with approximately one calculated to be experienced each LFE day. These supersonic flights would not be expected to detrimentally impact the region's economy. The infrequent sonic booms could be annoying and, in the case of a focused boom, could result in property damage. The nature of sonic boom creation and the atmospheric effects which determine where or whether a sonic boom reaches the ground make it impossible for an aircraft performing a supersonic maneuver to avoid a sonic boom occurring at any particular location. The sonic boom would typically be experienced as thunder, but approximately 1,300 acres could experience an overpressure of four psf or greater which have the potential for window or other damage. The Air Force has established procedures for damage claims which begin by contacting Ellsworth AFB Public Affairs.

The extent of area affected by a daily average low-level flight below 2,000 feet AGL was estimated using the Chapter 2.0 tables of time by altitude and an assumption of 240 days of flying per year. B-1 and B-52 would be 2,000 feet AGL or below each day as presented in Table 4.9-3. The estimated daily area affected by low-level overflight is presented in Table 4.9-3.

Table 4.9-3 means that, on average, an area within a MOA could be subject to an average of 6 to 9 low-level startle effect overflights per year. The actual number of low-level overflights over a specific area could not be precisely calculated due to the random nature of aircraft training. Any specific area could

be overflown at low-level, more or less frequently. Figures 3.1-14 and 3.1-20 demonstrate the random nature of B-1 training in the existing Powder River A and B MOAs from FAA traffic data. The random looping tracks within the PR-A/B MOAs are B-1 training aircraft, and the straight lines represent other transiting aircraft within the airspace. The figures show that low-level overflights are generally not along the edges of the airspace. The existing Powder River A and B MOAs, which constitute nearly all the proposed PR-2 MOA, have an estimated 8 to 9 times per year when, on average, any location would be overflown. Any specific location could be overflown more or less frequently. Pilots performing low-level training are briefed to avoid communities, noise-sensitive areas, and, to the extent possible, farm or ranch buildings (see Sections 2.2.1.3 and 2.2.2.3).

Table 4.9-3. Alternative A Estimated Percent of Area Impacted by Low-Level Overflight Below 2,000 Feet AGL

	PR-1A/1B	*PR-2*	*PR-3*	*PR-4*	*Total*
Area under MOA nm[2] (including Gap MOAs)[2]	5394	6215	4708	4667	20984
Annual B-1 hours 2,000 AGL and below[1]	94.36	155.93	89.30	90.87	430.46
Annual B-52 hours below 2,000 AGL	41.40	41.40	2.30	13.80	98.90
Annual Fighter hours below 2,000 AGL	4.45	4.31	3.42	3.74	15.92
Daily[4] B-1 hours 2,000 AGL and below	0.3932	0.6497	0.3721	0.3786	1.7936
Daily B-52 hours below 2,000 AGL	0.1725	0.1725	0.0096	0.0575	0.4121
Daily Fighter hours below 2,000 AGL	0.0185	0.0180	0.0143	0.0156	0.0664
Daily[3,5] Area estimated impacted by B-1	106.16	175.42	100.46	102.23	484.27
Daily[6] Area estimated impacted by B-52	31.05	31.05	1.73	10.35	74.18
Daily[7] Area estimated impacted by Fighters	5.01	4.85	3.85	4.21	17.91
Total Area Potentially impacted average day	142.21	211.32	106.04	116.79	576.35
Percent Area Affected per Day	2.64	3.40	2.25	2.50	2.75
Average Time any Location Overflown/year	6.33	8.16	5.41	6.01	6.59

Notes:

1. Training hours at altitude from Tables 2-17, 2-23, and 2-29.
2. Airspace MOA areas in square nm.
3. Low-level overflight effect estimated at ¼ nm each side of flight centerline.
4. Assumes 240 flying days per year, including Day-to-day and LFE.
5. B-1 at 2,000 feet AGL or below includes all hours below 2,000 feet AGL plus 75% of flight hours from 2,000 to 4,999 feet AGL at a speed of 540 nm per hour.
6. B-52 includes all hours below 2,000 feet AGL at a speed of 360 nm per hour.
7. Fighters include all hours below 2,000 feet AGL at a speed of 540 nm per hour.

The low population density of 0.2 to 4.0 persons per square mile under the proposed low-level airspace and the infrequent number of annual supersonic events make it highly unlikely that flight activity associated with PRTC would result in significant social or economic impacts to the region. It is likely that there would be specific cases of an individual or animal being startled by an overflight or sonic boom at a specific time and place. Supersonic events would only be scheduled during the 10 days annually when LFEs would be conducted. A low-level overflight would be difficult to predict given the rural nature of the area, the random and dispersed nature of flight operations, and the large airspace area. An individual startled by a low-level overflight or sonic boom could see the overflight as an impact. The duration of supersonic flight would be brief and not be expected to have any effect on other aircraft flying the region. Speculation regarding potential injury to humans as a result of startle reaction to sonic boom has not been supported by any documented incidents or studies.

Outdoor structures such as water towers, wind turbines, and radio towers are routinely subject to wind loads far in excess of sonic boom overpressures and are sufficiently resilient to withstand the anticipated overpressure. Section 4.1.3 provides additional discussion of general aviation and towers

within the airspace. No impacts to elevated ground structures, wind farms, oil and gas, or mining are expected. Wake vortex impacts to stock windmills could occur. In the event of property damage due to Air Force activity, individuals would be able to contact Ellsworth AFB Public Affairs for established procedures to file damage claims.

Overflight noise and startle effects, although annoying, are not expected to significantly impact regional economics. This is especially the case if specific economic activities, such as ranch branding operations and mining operations, can be communicated in advance and an avoidance area can be identified and briefed to pilots as part of the training mission described in Section 2.2.1.3.4. Scoping comments suggest that the low overflight and sonic boom impacts to the social and economic features of the community are as likely to be from the uncertainty that such an overflight could occur at any time as from the actual noise from the estimated average of 6 to 9 low-level overflights per year. The fact that such a low-level event could occur at any time and at any location, even infrequently, was identified as a significant potential impact by some commenters during scoping. The Air Force proposal has scheduled weekday hours for MOA activation when low-level events could occur.

The potential for impacts to concentrations of livestock during branding or weaning can be reduced by communicating with Ellsworth AFB to identify a temporary avoidance area over the location.

4.9.3.1.6 Chaff and Flare Use

Under Alternative A, chaff and flare use would be authorized in the PRTC airspace. More discussion of chaff and flares may be found in Sections 4.3, *Safety*, 4.4, *Physical Resources*, 4.5, *Biological Resources*, and Appendices C and D.

Chaff is very fine silica strands coated with aluminum and cut to lengths to reflect radar. Through numerous studies, chaff fibers have never been found to be specifically harmful to wildlife, domestic animals, or humans. Chaff dispenses widely when ejected from aircraft and can travel for long distances before settling to the ground. Once settled to the surface of the earth, chaff breaks down to constituent parts of silica and aluminum, the two most common elements in soil. Chaff is highly unlikely to accumulate in quantities that would result in any negative impact to surface conditions on land or water. It is highly unlikely that chaff residual materials would accumulate in sufficient quantities to affect property values or land uses. On average there would be one plastic, felt, or wrapper piece of chaff or flare residual material deposited on 115 acres per year. It is unlikely that a piece of residual material would be found. As noted in Section 4.8.3.1, some individuals could express annoyance if a chaff or flare end cap or other residual material were found on their property or at a recreation location, but this is not expected to affect land values or regional economics.

Flares are designed to be fully consumed before reaching the ground. Under Alternative A, flare use would occur throughout the proposed PRTC. The risk of fire as a result of flare use is minimal due to the low failure rate of flares and procedures that require flare use above 2,000 feet AGL. During extreme fire conditions, flares would not be authorized in a MOA.

Fire is an ever present concern in the arid west. Altitude restrictions of, normally 2,000 feet AGL, and discontinued during extreme fire conditions, would result in defensive flares burning out over 1,500 feet AGL. Flares are not deployed in a way which could contribute to fire danger.

Fire of any cause is a serious concern in the arid areas under the proposed airspaces. Flare initiated fires would not be expected to occur in the region although the use of flares minimally increases fire risk. Any fires of a natural or non-natural source may adversely affect vegetation, injure wildlife or livestock, and destroy property such as fences or buildings. Any potential loss of forage, livestock, or infrastructure due to fire could result in economic impacts to affected landowners. The Air Force follows established procedures for claims in the unlikely event that an Air Force-caused fire should occur and subsequently damage livestock or infrastructure.

4.9.3.2 Alternative B

Alternative B would establish the PRTC ATCAAs in the same manner as Alternative A. There would not be PR-1A, PR-1B, or a Gap A MOA. Low, Medium, and High PR-1A ATCAAs, PR-1B ATCAAs, and Gap A ATCAAs would begin at 18,000 MSL and extend up to 60,000 MSL. The consequences discussed under Alternative A for property values, supersonic flights, chaff and flares, low-altitude noise disturbances, and high-altitude civil aircraft overflights would all be applicable for PR-2, PR-3, PR-4 and associated Gap MOAs and ATCAAs. Under Alternative B, PR-1A and PR-1B ATCAAs would be included, but there would be no training airspace below FL180.

The estimated civil aircraft annual operations and estimated workday operations by public airports under the Alternative B MOAs are presented in Table 4.9-4. Table 4.9-4 estimates the daily workday operations for public and private airports which could be impacted by military aircraft training. Table 4.9-2 includes FAA data and private airfields to identify a total of 160 average daily flights in MOAs under the Alternative B airspace (see Table 4.9-2: daily operations for PR-2, PR-3, and PR-4). The average daily civilian traffic affected could be 97 flights (see Table 4.9.2). The impact could be a delay of 2 to 4 hours, require a diversion, or require a civilian pilot to fly see-and-avoid in an active MOA. Aircraft operating from public airports could incur a delay of 2 to 4 hours if pilots could not transit the active MOA IFR or were unwilling to transit an active MOA VFR. Alternatively, a pilot could use a Gap MOA corridor or otherwise divert around an active MOA. These impacts could be viewed as significant by pilots operating under the PR-2, PR-3, PR-4, and associated Gap MOAs.

With Alternative B, there would be no low-level overflight under the PR-1A, PR-1B, or Gap A ATCAAs and this area would not be subject to low-level startle impacts. This would apply to ranching and mining operations, such as at Colstrip, under the PR-1A or PR-1B ATCAAs. Mining operations under the PR-1A or PR-1B ATCAAs would not be expected to be impacted by electronic emissions from military training aircraft flying above FL180. Coordination to learn radio frequencies and potential explosive risks would be required to avoid safety risks to mining economics.

The airports under the PR-1A or PR-1B ATCAAs or pilots using the Gap A ATCAAs corridor below FL180 would not be impacted by a MOA or by low-altitude flights in the area beneath the proposed PR-1A or PR-1B ATCAAs. The effect on civil aircraft pilots seeking to fly above FL180 would be a requirement to contact ARTCC and learn the status of the ATCAAs.

Table 4.9-4. Alternative B Impacts to Public Airports Under Proposed PRTC MOAs

		Reported Operations		
		Annual	*Daily*[1]	*Monday to Thursday Flights Affected*[2]
Airports Under PR-1A: No MOA				
Airports Under PR-1B: No MOA				
Airports Under PR-2 and Currently Under Powder River MOAs				
Belle Creek	MT	550	1	1
Broadus	MT	5,350	15	9
PR-2 Totals		**5,900**	**16**	**10**
Airports Under PR-3				
Baker	MT	7,000	19	11
Bowman	ND	4,140	11	7
Ekalaka	MT	2,028	6	3
Harding-Buffalo	SD	2,300	6	4
PR-3 Totals		**15,468**	**42**	**25**
Airports Under PR-4				
Bison	SD	5,500	15	9
Elgin	ND	160	1	1
Hettinger	ND	4,450	12	7
Lemmon	SD	12,500	34	20
McIntosh	SD	70	<1	<1
Mott	ND	1,690	5	3
PR-4 Totals		**24,370**	**67**	**40**
PR-1 to PR-4 Totals		**45,738**	**125**	**75**

Notes: 1. Assumes 365 flying days per year
2. Weekday: Monday through Thursday; approximately one-third civilian flights affected Friday morning

Source: From Table 3.1-6 and Table 3.1-7

Table 4.9-5 estimates the daily area impacted by low-level flights for the Alternative B MOA. Approximately 2.31 percent of the PR-3 MOA and approximately 2.57 percent of the PR-4 MOA would be daily affected by low-level overflight of B-1 or B-52 bombers below 2,000 feet AGL or below and within one-quarter mile of the flight centerline. On average, any location under the airspace would be subject to low-level overflights approximately 6 to 9 times per year. Because the flight training pattern is random, actual low-level overflight could occur more frequently or not at all at any specific location. Most of the proposed PR-2 MOA is within the currently overflown Powder River A and B MOAs.

The remaining components of the PRTC, including the potential for impacts to public airports underneath the proposed PR-2, PR-3, PR-4, and Gap MOAs, would be essentially the same as those airspaces described for Alternative A. The effects of Alternative B would be the same as those discussed under Alternative A with the exception of no low-level effects in PR-1A, PR-1B, and Gap A MOAs in Big Horn County, Rosebud County, Treasure County, Powder River County, and Custer County, MT.

Table 4.9-5. Alternative B Estimated Percent of Area Impacted by Low-Level Overflight Below 2,000 Feet AGL

	PR1A/1B	*PR-2*	*PR-3*	*PR-4*	*Total*
Area under MOA nm[2] (including Gap MOAs)[2]	**5394**	**6215**	**4708**	**4667**	**20984**
Annual B-1 hours 2,000 AGL and below[1]	**0**	**158.73**	**91.47**	**93.26**	**343.46**
Annual B-52 hours below 2,000 AGL	**0**	**41.40**	**2.30**	**13.80**	**57.50**
Annual Fighter hours below 2,000 AGL	**0**	**4.77**	**3.86**	**4.22**	**12.85**
Daily[4] B-1 hours 2,000 AGL and below	**0**	**0.6614**	**0.3811**	**0.3886**	**1.4311**
Daily B-52 hours below 2,000 AGL	**0**	**0.1725**	**0.0096**	**0.0575**	**0.2396**
Daily Fighter hours below 2,000 AGL	**0**	**0.0199**	**0.0161**	**0.0176**	**0.0536**
Daily[3,5] Area estimated impacted by B-1	**0**	**178.57**	**102.90**	**104.92**	**386.39**
Daily[6] Area estimated impacted by B-52	**0**	**31.05**	**1.73**	**10.35**	**43.13**
Daily[7] Area estimated impacted by Fighters	**0**	**5.37**	**4.34**	**4.75**	**14.46**
Total Area Potentially impacted average day	**0**	**214.99**	**108.97**	**120.02**	**443.98**
Percent Area Affected per Day	**0**	**3.46**	**2.31**	**2.57**	**2.12**
Average Time any Location Overflown/year	**0**	**8.30**	**5.56**	**6.17**	**5.08**

Notes:

1. Training hours at altitude from Tables 2-17, 2-23, and 2-29.
2. Airspace MOA areas in square nm.
3. Low-level overflight effect estimated at ¼ nm each side of flight centerline.
4. Assumes 240 flying days per year, including Day-to-day and LFE.
5. B-1 at 2,000 feet AGL or below includes all hours below 2,000 feet AGL plus 75% of flight hours from 2,000 to 4,999 feet AGL at a speed of 540 nm per hour.
6. B-52 includes all hours below 2,000 feet AGL at a speed of 360 nm per hour.
7. Fighters include all hours below 2,000 feet AGL at a speed of 540 nm per hour.

4.9.3.3 Alternative C

Alternative C would expand the existing Powder River airspace over the same surface as Alternative A. Alternative C would not establish the PR-4 MOA or Gap C MOA. PR-4 ATCAA and Gap C ATCAA would begin at 18,000 MSL and extend up to 60,000 MSL stacked into Low, Medium, and High ATCAAs. The remaining components of the PRTC would be the same as described for Alternative A. Alternative C consequences to property values, supersonic flights, chaff and flares, low-altitude noise disturbance, and high-altitude civil aircraft overflights would be essentially the same as discussed for Alternative A. There would not be low-altitude training flights under the PR-4 and the Gap C ATCAAs.

Potential impacts to civil aviation and public airports below the proposed PR-1A, PR-1B, PR-2, PR-3, and associated Gap MOAs would be as described for Alternative A. The number of daily operations potentially impacted if the Alternative C airspace were active for the scheduled time would be 79 civil operations (see Table 4.9-2).

Table 4.9-6 presents the estimated civil aircraft annual operations for public airports under the Alternative C MOAs. The impact would depend on the number of flights seeking to fly IFR in an active MOA or unwilling to fly VFR in an active MOA. There could be a delay of 2 to 4 hours or a required diversion. A pilot could divert using a Gap MOA corridor or otherwise divert around an active MOA during day-to-day operations although the Gap MOAs would be unavailable during LFEs. These delays and diversions are could be viewed as a significant impact by pilots operating in the PR-1A, PR-1B, PR-2, PR-3, and associated Gap MOAs.

Table 4.9-6. Alternative C Impacts to Public Airports Under Proposed PRTC MOAs

		Estimated Operations		
		Annual	***Daily[1]***	***Monday to Thursday Flights Affected[2]***
Airports Under PR-1A/1B (includes Gap A)				
Colstrip	MT	5,750	16	9
Hardin	MT	6,600	18	11
PR-1 Totals		**12,350**	**34**	**20**
Airports Under PR-2 and Currently Under Powder River MOAs				
Belle Creek	MT	550	1	1
Broadus	MT	5,350	15	9
PR-2 Totals		**5,900**	**16**	**10**
Airports Under PR-3 (includes Gap B)				
Baker	MT	7,000	19	11
Bowman	ND	4,140	11	7
Ekalaka	MT	2,028	6	3
Harding-Buffalo	SD	2,300	6	4
PR-3 Totals		**15,468**	**42**	**25**
Airports Under PR-4: No MOA				
PR-1 to PR-4 Totals		**33,718**	**92**	**55**

Notes: 1. Assumes 300 flying days per year; all air taxi during 250 workdays; transient and local proportional to flying days
2. Assumes that in 300 flying days the military is scheduled for 26.7 percent of the time.

Table 4.9-7 estimates Alternative C daily areas impacted by low-level flight by MOA. Approximately 1.45 percent of the PR-1 MOA and approximately 1.59 percent of the PR-3 MOA would be affected daily by low-level overflight of B-1 or B-52 bombers below 2,000 feet AGL. Most of the proposed PR-2 is currently overflown by B-1 aircraft as part of the Powder River A and B MOAs. It is impossible to predict what area would be overflown by random training aircraft. An average location under the Alternative C airspace would be subject to low-level overflights approximately three to five times per year. As explained in Section 4.9.3.1, actual low-level overflight of a specific location could occur more frequently or not at all during any given year. The PR-4 and Gap C ATCAAs would overlie Hettinger County, Grant County, and Adams County, ND and Perkins County, Corson County, and Ziebach County, SD. There would be no low-level MOAs under the PR-4 and Gap C ATCAAs.

Table 4.9-7. Alternative C Estimated Percent of Area Impacted by Low-Level Overflight Below 2,000 Feet AGL

	PR1A/1B	*PR-2*	*PR-3*	*PR-4*	*Total*
Area under MOA nm[2] (including Gap MOAs)[2]	5394	6215	4708	4667	20984
Annual B-1 hours 2,000 AGL and below[1]	96.77	158.25	91.11	0	346.13
Annual B-52 hours below 2,000 AGL	13.80	41.40	2.30	0	57.50
Annual Fighter hours below 2,000 AGL	4.83	4.67	3.79	0	13.29
Daily[4] B-1 hours 2,000 AGL and below	0.4032	0.6594	0.3796	0	1.4422
Daily B-52 hours below 2,000 AGL	0.0575	0.1725	0.0096	0	0.2396
Daily Fighter hours below 2,000 AGL	0.0201	0.0195	0.0158	0	0.0554
Daily[3,5] Area estimated impacted by B-1	108.87	178.03	102.50	0	389.40
Daily[6] Area estimated impacted by B-52	10.35	31.05	1.73	0	43.13
Daily[7] Area estimated impacted by Fighters	5.43	5.25	4.26	0	14.94
Total Area Potentially impacted average day	124.65	214.34	108.49	0	447.48
Percent Area Affected per Day	2.31	3.45	2.30	0	2.13
Average Time any Location Overflown/year	5.55	8.28	5.53	0	5.12

Notes:
1. Training hours at altitude from Tables 2-17, 2-23, and 2-29.
2. Airspace MOA areas in square nm.
3. Low-level overflight effect estimated at ¼ nm each side of flight centerline.
4. Assumes 240 flying days per year, including Day-to-day and LFE.
5. B-1 at 2,000 feet AGL or below includes all hours below 2,000 feet AGL plus 75% of flight hours from 2,000 to 4,999 feet AGL at a speed of 540 nm per hour.
6. B-52 includes all hours below 2,000 feet AGL at a speed of 360 nm per hour.
7. Fighters include all hours below 2,000 feet AGL at a speed of 540 nm per hour.

4.9.3.4 No-Action Alternative

Under the No-Action Alternative, the Air Force would continue to use the current configuration of the existing Powder River airspace. The existing Powder River MOAs and ATCAA overlie portions of Custer County, Powder River County, and Carter County, MT; Butte County and Harding County, SD; and Campbell County, Crook County, and Weston County, WY. Flight activity and noise levels would not change from projected baseline conditions. No-Action low-level overflights would be, on average, approximately 8 to 9 per year. No-Action daily civil operations impacted are projected to be 7 (see Table 4.9-2). There would be no supersonic or chaff and flare training. The socioeconomic effects would essentially continue to be as described for the PR-2 MOA under Alternative A without supersonic flight or chaff and flare training.

4.10 Environmental Justice and Protection of Children

4.10.1 Methodology

The approach applied in the environmental justice analysis is in accordance with the *Interim Guide for Environmental Justice with the Environmental Impact Analysis Process* (Air Force 1997b). The minority and low-income communities and youth population under the proposed airspace were quantified based on census block-group data. These numbers were compared with county and state demographic data to determine whether any disproportionate low-income, minority, or youth population concentrations were located in potentially affected areas.

Environmental justice analysis applies to adverse environmental impacts. Consequently, potential disproportionate impacts to minority or low-income populations are assessed only when adverse

environmental consequences to the general human population are anticipated. The same is true for protection of children from health and safety risks, as the potential for such risks would be driven by adverse environmental impacts.

Health and safety factors of the proposed action were analyzed to determine the potential for adverse environmental impacts that could affect the human population and have the possibility of environmental justice concerns. In addition, potential environmental health or safety hazards were examined to assess potential special risks to children. If significant impacts to the human population are expected, these impacts are analyzed further to determine the potential for disproportionate effects to environmental justice populations or special health and safety risks to children.

Affected Areas

Environmental justice data for the ROI by county are presented in Table 4.10-1. The data show that the overall minority population ranges by state aggregated ROI counts from 8.3 to 12.0 percent. Table 4.10-2 presents environmental justice data for areas under the proposed PRTC airspace. Total population for this area is estimated to be 84,420 persons, based on block-group data from Census 2000, the most recent detailed data available. The actual minority population for the affected area is estimated to be 12,661 persons, representing 15.0 percent of the total affected population. Minority persons, comprised almost entirely of Native Americans, are concentrated in areas in which reservation lands are located, primarily Big Horn (64 percent minority) and Rosebud (53 percent) counties in MT. A total of 77 percent of the minority population under the proposed PRTC airspace resides primarily under the proposed PR-1B MOA in these two MT counties.

The population in the affected area is 16.4 percent low-income overall, with poverty rates generally similar to or lower than respective county levels. Areas with a relatively high incidence of poverty include Big Horn (30 percent low-income) and Rosebud (27 percent) in MT, Grant (20 percent) and Sioux (32 percent) in ND, and Harding (21 percent) and Ziebach (40 percent) in SD.

Children under the age of 18 years comprise 27.1 percent of the total potentially affected population. Areas with high percentage youth population include Big Horn (36 percent youth) and Rosebud (38 percent) in MT, Golden Valley (42 percent) and Morton (35 percent) in ND, and Harding (33 percent) in SD.

PRTC Airspace

Environmental justice data for the individual proposed PRTC airspace elements are presented in Table 4.10-3. The majority of the potentially affected minority population resides on lands under the Gateway ATCAA and the PR-1A and PR-1B MOAs and ATCAAs. Environmental justice populations are highest under the PR-1A and PR-1B airspace elements, where minorities account for 57 percent of the total affected population, low-income persons account for 28 percent, and children comprise 36 percent of the population.

Table 4.10-1. Environmental Justice Data for the ROI by County

ROI Counties	2000 Population	Minority Population		Low-Income Population		Youth Population	
		Number	Percent	Number	Percent	Number	Percent
MT[5]	**902,195**	**94,372**	**10.5**	**128,355**	**14.6**	**230,062**	**25.5**
Big Horn	12,671	8,214	64.8	3,632	29.2	4,534	35.8
Carter[1]	1,360	21	1.5	242	18.1	361	26.5
Custer[1]	11,696	468	4.0	1,700	15.1	2,939	25.1
Fallon	2,837	47	1.7	349	12.5	724	25.5
Powder River[1]	1,858	55	3.0	235	12.9	494	26.6
Rosebud	9,383	3,424	36.5	2,063	22.4	3,143	33.5
Treasure	861	38	4.4	125	14.7	239	27.8
ND[5]	**642,200**	**53,051**	**8.3**	**73,457**	**11.9**	**160,849**	**25.0**
Adams	2,593	43	1.7	262	10.4	601	23.2
Billings	888	14	1.6	113	12.8	221	24.9
Bowman	3,242	47	1.4	259	8.2	780	24.1
Golden Valley	1,924	54	2.8	276	15.3	545	28.3
Grant	2,841	95	3.3	565	20.3	666	23.4
Hettinger	2,715	34	1.3	393	14.8	624	23.4
Morton	25,303	1,142	4.5	2,386	9.6	6,823	27.0
Sioux	4,044	3,467	85.7	1,564	39.2	1,630	40.3
Slope	767	3	0.4	130	16.9	194	25.3
Stark	22,636	714	3.2	2,691	12.3	5,781	25.5
SD[5]	**754,844**	**90,259**	**12.0**	**95,900**	**13.2**	**202,649**	**26.8**
Butte[1, 2]	9,094	537	5.9	1,147	12.8	2,575	28.3
Corson	4,181	2,630	62.9	1,692	41.0	1,544	36.9
Harding[1, 3]	1,353	46	3.4	277	21.1	440	32.5
Lawrence[1, 4]	21,802	1,171	5.4	3,073	14.8	5,045	23.1
Meade[1, 4]	24,253	2,041	8.4	2,195	9.4	6,877	28.4
Pennington	88,565	12,768	14.4	9,967	11.5	23,565	26.6
Perkins[2]	3,363	118	3.5	561	16.9	811	24.1
Ziebach	2,519	1,855	73.6	1,256	49.9	1,023	40.6
WY[5]	**493,782**	**54,983**	**11.1**	**54,777**	**11.4**	**128,873**	**26.1**
Campbell[1]	33,698	1,997	5.9	2,544	7.6	10,456	31.0
Crook[1, 2]	5,887	158	2.7	529	9.1	1,581	26.9
Sheridan	26,560	1,438	5.4	2,775	10.7	6,412	24.1
Weston[1, 4]	6,644	346	5.2	628	9.9	1,598	24.1

Notes: 1. Portions of county under existing MOAs or ATCAAs.
2. Proposed training airspace 50 to 75 percent ATCAA.
3. Proposed training airspace 10 to 20 percent ATCAA.
4. Proposed training airspace all ATCAA.
5. Total of state population

Source: U.S. Census 2000

Table 4.10-2. Environmental Justice Data for Affected Areas under the Proposed PRTC Airspace (by County)

Counties with Land Area Under the Affected Airspace	2000 Affected Population	Affected Minority Population		Affected Low-Income Population		Affected Youth Population	
		Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
MT[1]	***22,625***	***9,873***	***43.64%***	***5,595***	***24.73%***	***7,610***	***33.64%***
Big Horn	10,187	6,484	63.65%	3,040	29.85%	3,648	35.81%
Carter	1,359	21	1.54%	245	18.03%	361	26.55%
Custer	254	7	2.78%	45	17.86%	57	22.27%
Fallon	2,728	46	1.69%	337	12.36%	696	25.51%
Powder River	1,857	55	2.96%	239	12.90%	494	26.59%
Rosebud	6,169	3,258	52.82%	1,676	27.18%	2,337	37.89%
Treasure	71	1	1.33%	10	14.69%	18	25.19%
ND[1]	***10,731***	***217***	***2.02%***	***1,451***	***13.52%***	***2,518***	***23.46%***
Adams	2,592	43	***1.66%***	269	***10.37%***	601	***23.17%***
Billings	7	0	***0.00%***	1	***12.84%***	0	***0.00%***
Bowman	3,237	47	***1.44%***	264	***8.15%***	779	***24.05%***
Golden Valley	35	0	***0.00%***	4	***10.78%***	15	***42.24%***
Grant	2,698	90	***3.33%***	536	***19.88%***	621	***23.01%***
Hettinger	1,313	8	***0.61%***	212	***16.13%***	284	***21.61%***
Morton	125	1	***0.80%***	19	***15.33%***	43	***34.48%***
Sioux	156	26	***16.49%***	50	***32.15%***	36	***22.93%***
Slope	567	3	***0.53%***	96	***16.95%***	140	***24.71%***
Stark	1	0	***0.00%***	0	***21.40%***	0	***0.00%***
SD[1]	***43,402***	***2,331***	***5.37%***	***6,089***	***14.03%***	***10,767***	***24.81%***
Butte	9,089	537	***5.90%***	1,163	***12.79%***	2,574	***28.32%***
Corson	759	95	***12.46%***	149	***19.64%***	208	***27.42%***
Harding	1,352	46	***3.40%***	285	***21.05%***	440	***32.51%***
Lawrence	20,859	1,055	***5.06%***	3,000	***14.38%***	4,763	***22.83%***
Meade	8,004	485	***6.06%***	922	***11.52%***	1,986	***24.81%***
Pennington	0	0	***0.00%***	0	***0.00%***	0	***0.00%***
Perkins	3,292	114	***3.46%***	551	***16.75%***	783	***23.80%***
Ziebach	48	0	***0.00%***	19	***39.92%***	13	***27.76%***
WY[1]	***7,662***	***240***	***3.13%***	***697***	***9.09%***	***2,012***	***26.25%***
Campbell	403	8	***2.09%***	28	***7.02%***	91	***22.69%***
Crook	5,866	158	***2.69%***	529	***9.01%***	1,575	***26.85%***
Sheridan	240	16	***6.53%***	26	***10.93%***	53	***22.19%***
Weston	1,154	58	***5.06%***	114	***9.85%***	292	***25.30%***

Notes: 1. Total of affected populations within state.
Source: U.S. Census 2000.

Table 4.10-3. Environmental Justice Data by PRTC Airspace

Proposed PRTC Airspace	2000 Affected Population	Affected Minority Population		Affected Low-Income Population		Affected Youth Population	
		Number	*Percent*	*Number*	*Percent*	*Number*	*Percent*
PR-1A MOAs & ATCAAs	7,517	2,218	29.50%	1,260	16.76%	2,371	31.55%
PR-1B ATCAA	9,578	7,564	78.97%	3,535	36.91%	3,784	39.51%
PR-1B MOA	9,229	7,499	81.26%	3,474	37.64%	3,703	40.12%
PR-2 MOAs & ATCAAs	3,261	91	2.79%	519	15.93%	911	27.94%
PR-3 MOAs & ATCAAs	6,964	106	1.53%	793	11.38%	1,766	25.36%
PR-4 MOAs & ATCAAs	9,897	361	3.64%	1,620	16.37%	2,339	23.63%
Gap A MOAs & ATCAAs	335	4	1.06%	31	9.36%	75	22.47%
Gap B MOAs & ATCAAs	1,373	23	1.66%	241	17.58%	364	26.54%
Gap C MOAs & ATCAAs	693	5	0.79%	105	15.14%	146	21.07%
Gateway East ATCAA	1,003	35	3.46%	190	18.89%	281	28.04%
Gateway West ATCAA	43,799	2,255	5.15%	5,537	12.64%	10,868	24.81%

Source: U.S. Census 2000.

4.10.2 Issues and Concerns

Issues and concerns related to Environmental Justice were expressed during the public scoping process, as well as Government-to-Government consultations with each of the Native American tribes with reservations located underneath the proposed airspace. Concerns expressed included disruption of spiritual and cultural ceremonies from the audible and visual effects from overflights such as noise, sonic booms, and contrails; air quality; interference with civil aviation; and effects of chaff and flares on livestock and sacred sites. Concern was also expressed that noise levels and low overflights would interfere with economic development efforts on the reservations, such as building new business ventures including development of a coal power plant and a casino.

4.10.3 Environmental Consequences

4.10.3.1 Alternative A

Section 4.7 *Cultural Resources* identified the potential for adverse impacts to cultural landscapes and traditional cultural properties as a result of the increased noise and sonic booms related to military operations within the proposed airspace. Under the airspace proposed for Alternative A, the affected population is 84,420 persons including affected populations on four Native American reservations: Crow, Northern Cheyenne, Standing Rock, and Cheyenne River. The affected minority population is 12,661 and 13,831 persons live below the poverty line. Beneath the airspace proposed in Alternative A there are eight traditional cultural properties, as well as a number of battlefield sites, archaeological sites, and landscape areas that have identified as probable sacred sites. Of these areas, some are located on the four Native American reservations. Throughout the year, many Native Americans visit these and other sacred sites for spiritual ceremonies and vision quests. The largest of these ceremonies typically occur during the summer months from May through September, depending on the practices of the individual tribes. During these ceremonies, low overflights and sonic booms have the potential to disrupt these sacred sites and tribal members participating in spiritual ceremonies. Because these sites are located on tribal reservations and the ceremonies are conducted by Native Americans, the potential for adverse impacts to these cultural resources would be disproportionate for the four reservations located beneath the proposed airspace.

The Air Force would be able to establish temporary avoidance areas for the largest ceremonies performed at these sacred sites at specific times of year. Flying at higher altitudes during the specified time period could reduce the noise and visual disturbances of their ceremonies by military operations. Advance coordination between the Air Force and the tribes on the scheduling of LFEs could address potential impacts from sonic booms on the largest ceremonies conducted under the airspace. However, there is the potential that small or individual ceremonies would continue to be disturbed and the potential exists for adverse impacts to these Native American cultural resources. Alternative A, which overflies at low level, parts or all of four reservations, would have greater consequences than Alternative C or Alternative B, and Alternative C with its overflight of populated areas on the Crow and Northern Cheyenne Reservations would have greater consequences than Alternative B.

The youth population in the affected counties is similar, in proportion, to the affected state levels. The primary difference is the youth population under the PR-1B MOA which is proportionately higher than under other proposed MOAs. As discussed in Section 4.2.3.7, no long-term impacts are expected to occur as a result of noise levels under the proposed airspace. Additionally, DNLmr would be low enough that schools would be considered a compatible land use. While infrequent low-level overflights may temporarily disrupt learning, these overflights are not expected to have long-term health effects on children. No other health or environmental conditions have been identified which could adversely impact children.

The highest concentration of minorities, low income, and youth populations are located under the proposed PR-1B MOA. These conditions create the potential for disproportionate environmental impacts to populations under PR-1B.

4.10.3.2 Alternative B

Under the PR-2, PR-3, and PR-4 MOAs which would be subject to low level overflights the affected population is 20,122 persons of which 558 are minority and 2,932 persons live below the poverty level including the affected populations within the Standing Rock and Cheyenne River reservations. No overflights below FL180 would occur over the Crow or Northern Cheyenne Reservations. When compared to Alternative A, 16,745 fewer persons would be affected by low level overflights.

Under PR-2, PR-3, and PR-4 low level overflights and sonic booms would have the potential for adverse impacts to sites which are culturally or spiritually significant to Native Americans located on or near reservations and ceremonies being conducted by Native Americans at these sites. The potential for adverse impacts at these culturally significant sites would be disproportionate for the Native Americans associated with the four reservations located beneath the proposed PRTC. The effects to sacred sites and ceremonies in areas below the PR-1A and PR-1B ATCAAs would not be from low-level overflights but could be from infrequent sonic booms. The western one-third of the Standing Rock Reservation would be located beneath the proposed PR-4 MOA and subject to low level overflights. The northwest corner of the Cheyenne River Reservation is under the proposed PR-4 MOA. Areas overflown on these two reservations would experience a change in the noise and visual setting that would have an adverse impact on spiritual ceremonies and sacred sites conducted by Native Americans on the reservations as described in Section 4.7.3.2.

The Air Force is continuing Government-to-Government consultations and has discussed coordinating flight schedules with affected tribes to avoid the largest ceremonies at these sacred sites at specific times of year. Establishing temporary avoidance areas and/or restricting flight to higher altitudes during specified time periods could reduce the disturbance to the sacred sites and ceremonies. Advance coordination between the Air Force and the tribes on the scheduling of LFEs could address potential impacts from sonic booms during the largest ceremonies conducted under the airspace. Specific

agreements have not been established. There is also the potential that individual or smaller ceremonies would continue to be disturbed. The potential exists for adverse impacts to Native American ceremonies. The impacts would be less with Alternative B than with Alternative A or Alternative C because low-altitude overflights would not occur over more heavily populated areas of the Crow or all of the Northern Cheyenne Reservations.

The higher concentrations of youth population under the PR-1A and PR-1B MOAs would not be overflown at low altitude. No long-term impacts are expected to occur as a result of noise levels under Alternative B. Schools would be considered a compatible land use and infrequent low-level overflights may temporarily disrupt learning. No other health or environmental conditions have been identified which could adversely impact children.

4.10.3.3 Alternative C

Under Alternative C, there would be the potential for disproportionate adverse impacts to the Crow and the Northern Cheyenne reservations as described for Alternative A. The Standing Rock and Cheyenne River Reservations would be overflown by the PR-4 ATCAA and would not be subject to low level overflights. Alternative B overflies at low attitude 9,897 fewer persons than Alternative A. The population under the PR-1A, PR-1B, PR-2, and PR-3 MOAs which include the Crow and Northern Cheyenne Reservations, is 27,319 persons, of which 9,979 persons would be minority and 6,107 persons live below the poverty level. Section 4.7.3.3 identified the change in cultural landscapes as a result of the noise and visual effects of the low level overflights and sonic booms as an adverse impact. Many of the traditional cultural properties and other cultural sites, such as Little Bighorn Battlefield are located under PR-1A or PR-1B MOAs. The Northern Cheyenne reservation is completely overflown by the PR-1B MOA. Because these sacred sites and spiritual ceremonies are conducted by Native Americans on reservations, there would be the potential for disproportionate adverse impacts.

The impacts of Alternative C would be greater than those for Alternative B because larger reservation areas and a greater proportion of minority and low income persons would be impacted.

4.10.3.4 No-Action Alternative

Under the No Action Alternative, there would be no disproportionate impacts upon environmental justice population. The Air Force would continue to use the existing Powder River airspace, which does not directly affect Native American reservations or other areas where the populations of concern may be disproportionately represented.

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