*Draft*

# NASA SCIENTIFIC BALLOON PROGRAM PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

Prepared for
National Aeronautics and Space Administration
Goddard Space Flight Center
Wallops Flight Facility
Wallops Island, VA

June 2010

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION**

**NOTICE:** XX-WFF-XX

**National Environmental Policy Act:** Scientific Balloon Program

**AGENCY:** National Aeronautics and Space Administration (NASA)

**ACTION:** Draft Finding of No Significant Impact

**SUMMARY:** Pursuant to the National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321, *et seq.*); the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508); and NASA policy and procedures (14 CFR Part 1216, Subpart 1216.3); NASA has prepared a Draft Finding of No Significant Impact (FONSI) with respect to its proposed increase in scientific balloon launches at the Columbia Scientific Balloon Facility (CSBF). Under the Proposed Action, CSBF would launch up to 10 additional scientific balloons per year from CSBF Fort Sumner, New Mexico, while launches from CSBF Palestine, Texas would remain at current levels.

**ADDRESS:** Copies of the Draft Scientific Balloon Program Programmatic Environmental Assessment (PEA) may be viewed at the following locations:

(a) Fort Sumner Public Library, 235 West Sumner Avenue, Fort Sumner, New Mexico 88119 (575-355-2832)

(b) Palestine Public Library, 1101 North Cedar Street, Palestine, Texas 75801 (903-729-4121)

(c) NASA Headquarters Library, Room 1J20, 300 E Street, S.W., Washington, D.C. 20546-0001 (202-358-0168)

On the Internet at: http://sites.wff.nasa.gov/code 250/docs/BPO_PEA.php

A limited number of hard copies of the Draft PEA are available by contacting:

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NEPA Program Manager
NASA Wallops Island Flight Facility, Code 250.W
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**FOR FURTHER INFORMATION CONTACT:** Joshua Bundick, (757) 824-2319 (phone); (757) 824-1819 (fax)

**SUPPLEMENTAL INFORMATION:** NASA has reviewed the Draft Programmatic Environmental Assessment (PEA) prepared for the balloon launches at the Columbia Scientific Balloon Facility (CSBF) and has concluded that the Draft PEA represents an accurate and adequate analysis of the scope and level of associated environmental impacts. NASA hereby incorporates the Draft PEA by reference in this Draft FONSI. NASA is soliciting public and agency review and comment on the environmental impacts of the proposed action through:

1. Publishing a notice of availability of the Draft PEA in the *Federal Register*, the DeBaca County News, and the Palestine Herald;
2. Making the Draft PEA available at the Palestine Public Library, Palestine, Texas, the Fort Sumner Public Library, Fort Sumner, New Mexico, and the NASA Headquarters Library in Washington, D.C.;
3. Publishing the Draft PEA on the internet;
4. Consulting with federal, state, and local agencies; and
5. Mailing the Draft PEA directly to interested parties.

Comments received will be taken into consideration in developing the Final PEA.

CSBF is composed of two facilities that launch scientific balloons. The main facility is located in Palestine, Texas, while the other facility is located in Fort Sumner, New Mexico. Though CSBF Palestine is the main facility, most balloon launches occur from the Fort Sumner facility due to its more remote nature. As balloon flight paths are wind-driven, their landing sites could be in adjacent states. An analysis of the past ten years of flights indicates that the majority of balloons and payloads are recovered from Texas, New Mexico, and Arizona. Very few balloons or payloads have landed in the neighboring states of Oklahoma, Kansas, and Colorado.

The PEA describes the potential impacts from the Proposed Action as well as the No Action alternative. Under the Proposed Action, NASA would increase the number of scientific balloons launched each year. Balloon flights originating from CSBF Fort Sumner would increase from 15 to 25 annually; balloons launched from the CSBF Palestine would continue at approximately 6 per year. No construction would take place at either of the two launch sites and no increase in the personnel staff at either CSBF Fort Sumner or CSBF Palestine is proposed.

Under the No Action alternative, NASA would not increase the number of balloon launches from either CSBF location, and the *status quo* would be maintained with 21 conventional balloons launched annually.

**SUMMARY OF ENVIRONMENTAL IMPACTS:** The potential environmental impacts from implementation of the Proposed Action are summarized below.

**Airspace and Balloon Operations:** No adverse impacts to airspace management or balloon operations are anticipated under this proposal. CSBF would continue to adhere to the letter of agreement with the Federal Aviation Administration Air Route Traffic Control Center (ARTCC) Albuquerque and ARTCC

Fort Worth. CSBF would continue to notify Cannon Air Force Base prior to balloon launches to further enhance safety in the region. As such, impacts to other users of the airspace or to balloons launched from CSBF Fort Sumner or CSBF Palestine would not be adverse.

**Safety:** NASA and CSBF have extensive safety regulations and standard safety procedures for launch and recovery activities that ensure safety of staff and the general public. Models developed by NASA are used to predict the landing location of the balloon system. Along with real-time computer monitoring systems and controls, population centers and Special Use Land Management Areas (SULMAs) can be avoided virtually eliminating the potential for injury to people or property. Adverse impacts from implementing the Proposed Action are not anticipated.

**Air Quality:** Vehicular travel by research scientists and students to the CSBF Fort Sumner location would increase under this proposal; however, the emissions would be minimal. Air emissions would not be perceptibly changed within the CSBF Operations Area due to the small increase in trips to be conducted by recovery vehicles and tracking planes used during the balloon and payload/parachute descent. Overall, no perceptible change in air emissions would be anticipated.

**Socioeconomics:** Fort Sumner Village would experience a short-term positive economic impact each year during balloon campaigns at CSBF Fort Sumner from the purchase of food, supplies, and lodging by CSBF staff and research scientists and students. An adequate supply of restaurants and lodging accommodations exists to meet the needs of the CSBF staff and research scientists/students. The City of Palestine currently experiences positive economic impacts from CSBF activities. Under this proposal, balloon launches from Palestine would not increase; therefore, no change in socioeconomic impacts would be anticipated.

**Land Use:** CSBF currently avoids special use land management areas (SULMAs) and would continue this practice under the Proposed Action. The CSBF Operations Area spans portions of six states; the chances of a balloon/payload landing in the same location are unlikely. Recovery operations are often complete within 24 hours after landing has occurred. Should a balloon/payload land within a SULMA, or on private land, the land manager/landowner would be contacted prior to the CSBF recovery team accessing the site. If required, CSBF would obtain a permit or authorization to retrieve the balloon/payload. Overall, no adverse impact to land use would be expected.

**Biological Resources:** Minor adverse impacts to biological resources are anticipated under the Proposed Action. CSBF would continue to avoid known critical habitats and wetlands. If unplanned circumstances resulted in the need to land a payload within a designated Critical Habitat, CSBF would initiate contact with U.S. Fish and Wildlife Service to determine the best method for payload recovery, with the least amount of environmental impact.

**Cultural Resources:** Increased balloon operations would constitute an increased probability for adverse effects to cultural resources from balloon/payload landing and recovery activities; however, the probability for impacting culturally significant resources would be extremely low. Predictive modeling used by CSBF for balloon/payload landing would continue to be used for avoidance of all known culturally significant areas. If unplanned circumstances resulted in the need to land a payload within a culturally sensitive area, CSBF would initiate contact with the responsible State or Tribal Historic Preservation Officer to determine the best method for payload recovery, with the least amount of impact.

**Hazardous Materials and Systems:** Strict operational controls measures are followed when hazardous materials are used during balloon staging and operations. Should a release of any hazardous materials occur during payload landing/recovery operations, CSBF staff would implement NASA-approved procedures for clean up in accordance with applicable federal and state regulations. Accordingly, impacts to personnel or the environment would not be expected.

**Transportation:** Transportation or traffic issues are minimal in the regions surrounding the CSBF launch sites. Vehicles used in recovery operations would not impact transportation systems across the CSBF Operations Area. As such, no adverse impacts to transportation resources in the region surrounding the CSBF launch sites or within the Operations Area are anticipated.

**Cumulative Effects:** Cumulative impacts were evaluated for potentially affected resources. No cumulative impacts are anticipated from implementation of the Proposed Action. No other known or foreseeable actions would be anticipated to affect resource areas impacted by CSBF balloon launch, flight, termination, or recovery activities.

**Conclusion:** NASA has identified no other issues of potential environmental concern. Based on the Draft PEA for the NASA Scientific Balloon Program, and review of underlying reference documents, NASA has preliminarily determined that the environmental impacts associated with the Proposed Action will not individually or cumulatively have a significant impact on the quality of the human environment. Therefore, an environmental impact statement will not be required.

_____ _____

Edward J. Weiler
Associate Administrator
Science Mission Directorate

Date

# DRAFT PROGRAMMATIC ENVIRONMENTAL ASSESSMENT
# NASA SCIENTIFIC BALLOON PROGRAM

**Lead Agency:** National Aeronautics and Space Administration

**Proposed Action**: Increased Columbia Scientific Balloon Facility Balloon Launches

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**Date**: June 2010

**Abstract**: For over 25 years, NASA has launched and monitored the flights of balloons launched from the Columbia Scientific Balloon Facility (CSBF) located in Fort Sumner Village, New Mexico and Palestine, Texas. Balloons are used to collect scientific data and conduct research on the atmosphere and near- space environment. NASA's CSBF currently launches a total of 21 scientific balloons each year. Under this proposal, the NASA Balloon Program Office (BPO) would increase the total number of balloons launched to 31 each year raising the number of balloon launches originating at CSBF Fort Sumner from 15 to 25 annually. Scientific balloons launched from the CSBF Palestine would continue at approximately 6 per year. No construction would take place at either of the two launch sites and no increase in the personnel staff at either CSBF Fort Sumner or CSBF Palestine is proposed.

The primary purpose of the NASA scientific balloon program is to support NASA's Science Mission Directorate for near-space scientific research initiatives. This includes NASA science disciplines of Particle Astrophysics, Geospace Science, Infra-red/Submillimeter Astrophysics, Gamma Ray/X-Ray Astrophysics, Solar and Heliospheric Physics, Planetary Science, and Earth Science. NASA's balloon program provides the lowest cost access to near-space for science instruments used for seminal research initiatives. In addition, the NASA balloon program provides the lowest cost platform in support of the development of space-based observatories and technologies required to support future space missions.

The Programmatic Environmental Assessment analyzes the potential environmental consequences of balloons launched from CSBF Fort Sumner and CSBF Palestine under the No Action alternative (i.e., *status quo*) and increased balloon launches from CSBF Fort Sumner under the Proposed Action. This assessment evaluates airspace and balloon operations; safety; air quality; socioeconomics; land use; biological resources; cultural resources; hazardous materials and systems; transportation; and cumulative effects.

*Draft*

# NASA SCIENTIFIC BALLOON PROGRAM PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

June 2010

# EXECUTIVE SUMMARY

# EXECUTIVE SUMMARY

This Programmatic Environmental Assessment (PEA) analyzes the potential environmental consequences resulting from increasing scientific balloon flights from 21 to 31 total flights per year from the National Aeronautics and Space Administration's (NASA) Columbia Scientific Balloon Facilities (CSBF) located in Fort Sumner, New Mexico and Palestine, Texas. This PEA provides the descriptions of current and proposed operations of the NASA CSBF Scientific Balloon Program at CSBF Fort Sumner and Palestine. As a programmatic EA, this document will serve as a reference for which future scientific balloon launches from these two sites will be evaluated to ensure National Environmental Policy Act (NEPA) compliance.

## PURPOSE AND NEED FOR THE PROPOSED ACTION

For over 25 years, NASA has launched and monitored the flights of scientific balloons from the CSBF located in Fort Sumner Village, New Mexico and Palestine, Texas. Balloons are used to collect scientific data and conduct research on the atmosphere and near-Earth and space environment, in an efficient and cost effective manner. The primary purpose of the NASA scientific balloon program is to support NASA's Science Mission Directorate for near-space scientific research initiatives. The need for the Proposed Action is to support an increase in on-going civilian and academic scientific research and provide a platform for scientists and engineers.

## PROPOSED ACTION AND NO ACTION ALTERNATIVE

Under the Proposed Action, the NASA Balloon Program Office (BPO) is proposing to increase the number of scientific balloons launched each year from the current total of 21 balloon flights to 31 annually. Balloon flights originating from CSBF Fort Sumner would increase from 15 to 25 per year. Balloons launched from the CSBF Palestine would continue at approximately 6 per year. The No Action alternative represents baseline conditions. Under the No Action alternative, the NASA BPO would not increase the annual number of scientific balloon launches at this time. CSBF Fort Sumner would continue to launch approximately 15 scientific balloons annually; CSBF Palestine would continue to launch approximately 6 scientific balloons annually.

## SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

According to the analysis in this PEA, implementation of the Proposed Action would result in negligible impacts for the following resource areas: airspace and balloon operations, safety, air quality, socioeconomics, land use, hazardous materials and systems, and transportation. The Proposed Action has the potential to result in negligible adverse impacts to biological and cultural resources; however the potential for impacts is highly unlikely given the large operations area used by CSBF. The Proposed Action would have no cumulative impacts in relation to other initiatives or projects taking place within the boundaries of the CSBF facilities or within the CSBF Operations Area. The No Action alternative would have similar impacts as the Proposed Action; the impacts would be slightly less in magnitude as there would be fewer flights.

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANSI | American National Standards Institute |
| ARTCC | Air Route Traffic Control Center |
| BLM | Bureau of Land Management |
| BPO | Balloon Program Office |
| CAA | Clean Air Act |
| CEQ | Council on Environmental Quality |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CSBF | Columbia Scientific Balloon Facility |
| CWA | Clean Water Act |
| dB | Decibel |
| dBA | A-Weighted Decibel |
| EA | Environmental Assessment |
| EIS | Environmental Impact Statement |
| EO | Executive Order |
| ESA | Endangered Species Act |
| FAA | Federal Aviation Administration |
| FL | Flight Level |
| FONSI | Finding of No Significant Impact |
| GSA | Government Services Agency |
| GSFC | Goddard Space Flight Center |
| kg | Kilogram |
| km | Kilometer |
| kph | Kilometers per Hour |
| lbs | Pounds |
| LOA | Letter of Agreement |
| mi | Mile |
| mm | Millimeters |
| mph | Miles per Hour |
| MSDS | Material Safety Data Sheet |
| NAAQS | National Ambient Air Quality Standards |
| NASA | National Aeronautics and Space Administration |
| NCAR | National Center for Atmospheric Research |
| NEPA | National Environmental Policy Act |
| NOAA | National Oceanographic and Atmospheric Administration |
| NOTAM | Notice to Airmen |
| NPR | NASA Procedural Requirements |
| NRCS | National Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NSBF | National Scientific Balloon Facility |
| PEA | Programmatic Environmental Assessment |
| SHPO | State Historic Preservation Office |
| SULMA | Special Use Land Management Area |
| THPO | Tribal Historic Preservation Office |
| U.S. | United States |
| USC | United States Code |
| USCB | U.S. Census Bureau |
| USDA | U.S. Department of Agriculture |
| USEPA | U.S. Environmental Protection Agency |
| USGS | U.S. Geological Survey |
| USFWS | U.S. Fish and Wildlife Service |
| WFF | Wallops Flight Facility |

# CHAPTER 1

# PURPOSE AND NEED FOR THE PROPOSED ACTION

# CHAPTER 1
# PURPOSE AND NEED FOR THE PROPOSED ACTION

## 1.1 INTRODUCTION

For over 25 years, the National Aeronautics and Space Administration (NASA) has launched and monitored the flights of balloons from the Columbia Scientific Balloon Facility (CSBF) located in Fort Sumner Village, New Mexico (Figure 1-1) and Palestine, Texas (Figure 1-2). Balloons are used to collect scientific data and conduct research on the atmosphere and near-space[1] environments. Often significant finds, such as the discovery of the ozone hole above the Antarctic in the mid 1980s, have been made by instruments tested or operated on balloon missions launched from CSBF.

**Main Entrance to CSBF Palestine**

NASA's CSBF currently launches a total of 21 scientific[2] balloons each year. Under this proposal, the NASA Balloon Program Office (BPO) would increase the total number of balloons launched to 31 each year raising the number of balloon launches originating at CSBF Fort Sumner from 15 to 25 annually. Scientific balloons launched from CSBF Palestine would continue at approximately 6 per year.

This Programmatic Environmental Assessment (PEA) presents the potential environmental consequences associated with increased scientific balloon mission activities, from launch to recovery. The analysis includes the No Action alternative in which the NASA BPO would not increase the annual number of balloon launches. This PEA has been prepared by NASA in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969; the Council on Environmental Quality regulations implementing NEPA (Title 40 of the Code of Federal Regulations [CFR] Parts 1500-1508); NASA procedures for implementing NEPA (14 CFR 1216.3); and NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act and Executive Order 12114*.

## 1.2 BACKGROUND

The origins of the balloon program started in the 1950's, when the United States (U.S.) Air Force and U.S. Navy began using balloons to conduct scientific research. In addition to the military, there were multiple civilian groups that were using balloons to conduct scientific research, but little cooperation existed between the military and civilian scientific communities. In 1960, the National Center for Atmospheric Research (NCAR) was conceived with a mission:

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[1] Near-space encompasses the region of the atmosphere between which a commercial airliner flies and satellites orbit.

[2] Several types of scientific balloons (i.e., conventional, long duration, and ultra long duration) are used for scientific research. CSBF Fort Sumner and CSBF Palestine primarily launch balloons with flight durations of 6 to 36 hours.

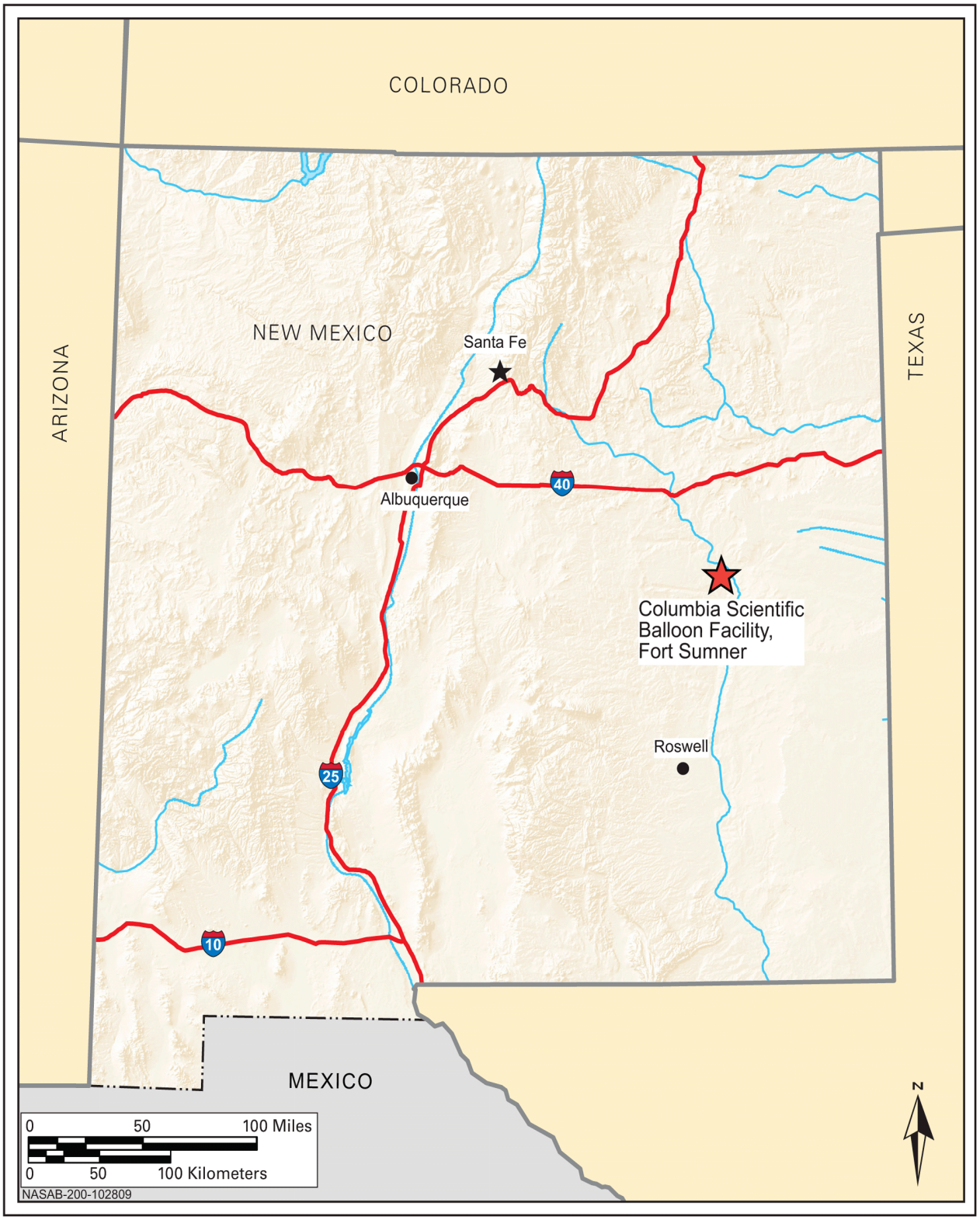



**Figure 1-1 Location of CSBF Fort Sumner in New Mexico**

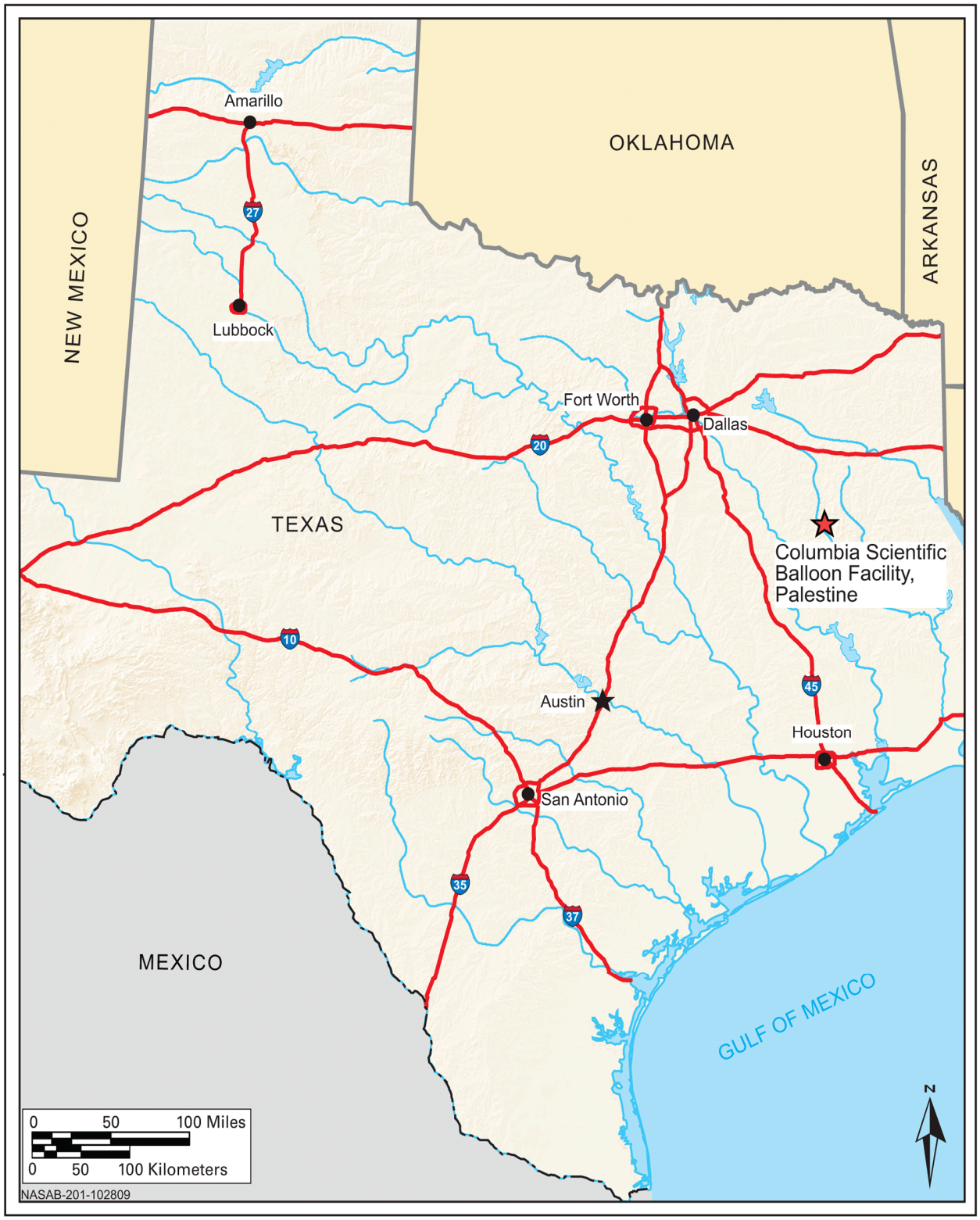



**Figure 1-2 Location of CSBF Palestine in Texas**

*"...To provide, cooperate in providing, or arrange for and support the provision of, national facilities for atmospheric research in such fields as ballooning, research aircraft, rockets, large-capacity computers, micro-meteorological networks, etc..."*

For the military, Holloman Air Force Base in New Mexico had the necessary facilities and infrastructure to support their scientific balloon program; however, without a collaborative partnership civilian research groups were largely on their own. As a result, NCAR sought to establish a balloon launch facility that would be used primarily by the civilian scientific community. With cooperation from the Federal Aviation Administration (FAA), who identified airspace in east Texas that was located away from populated commercial air routes, NCAR chose Palestine, Texas as its permanent launch site (personal communication, Gregory 2009). Infrastructure and facilities were constructed, and in 1963, the first balloon was launched. The Palestine launch site was later named the National Scientific Balloon Facility (NSBF). By the end of 1975, nearly 900 balloons had been launched from NSBF Palestine.

In 1987, the NASA balloon program conducted a flight safety analysis after population growth to the east of the Palestine facility prompted concerns due to encroachment. As a result of the analysis, only westerly flights were authorized from NSBF Palestine. NASA began a search for another potential balloon launch site that would be less encumbered. A detailed survey was conducted over New Mexico, Arizona, and southern Nevada to identify a new semi-permanent western launch location. Thirty candidate sites were identified. Consideration was given to various factors including safety, geography, air traffic activity, meteorology, and existing facilities. In December 1988, based on the analysis from the safety study, Fort Sumner was selected as the best location, not only because the site best met the selection criteria but also because it offered the advantage of being complementary to the NSBF Palestine launch site from the standpoint of downrange tracking and staging of recovery teams. A flight safety risk analysis performed in 1988 resulted in NASA deciding to perform all stratospheric turnaround[3] balloon flights from Fort Sumner rather than Palestine (personal communication, Gregory 2009).

The NASA contract to operate NSBF was awarded to the New Mexico State University Physical Science Laboratory in Las Cruces, New Mexico. The contract is managed by the Goddard Space Flight Center's (GSFC) Wallops Flight Facility (WFF) in Wallops Island, Virginia.

On February 1, 2006, NSBF was renamed CSBF in honor of the NASA astronauts whose lives were lost in the Space Shuttle Columbia disaster (NASA CSBF 2009).

[3] Turnaround occurs when stratospheric zonal winds slow down, become light and variable (0-15 knots), then change to the opposite direction and begin to pick up speed (upwards of 35 knots).

## 1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The primary purpose of the NASA scientific balloon program is to support NASA's Science Mission Directorate for near-space scientific research initiatives. This includes NASA science disciplines of Particle Astrophysics, Geospace Science, Infra-red/Submillimeter Astrophysics, Gamma Ray/X-Ray Astrophysics, Solar and Heliospheric Physics, Planetary Science, and Earth Science. NASA's scientific balloon program provides the lowest cost access to space for science instruments used for inovative research initiatives. In addition, the NASA scientific balloon program provides the lowest cost platform in support of the development of space-based observatories and technologies required to support future space missions. A significant portion of this research utilizes the support provided by university graduate and undergraduate research students; thus, serving as a critical spring board for training of the nation's future scientists, engineers, and technologists. With assistance of the CSBF staff, students receive training in quality control and risk management, deployment of scientific instrumentation, field operations, technical skills associated with launching balloons, and experience in managing data sets from a field experiment, often in collaboration with other members of a scientific team. CSBF provides NASA-sponsored research scientists and students with the balloon; helium; rigging; electronic interface; flight and staging facilities; and services directly associated with flight support at a fraction of the cost associated with a corresponding satellite mission.

The CSBF scientific balloon program offers scientists and engineers the opportunity to explore an experimental concept and develop the hardware to gather and measure data for analysis. Significant contributions have been made to NASA's science program from measurements taken by balloon-borne instruments. Many indirect contributions have also been made to NASA's science program from instruments that were developed and tested using balloons.

In recent years, NASA's scientific balloon program has seen a dramatic increase in sophistication of experiments and demands for service. Because of the flexibility of the program, a steady stream of new instrumentation can be tested that could eventually be flown on future NASA space missions. Many of NASA's leading scientists received invaluable training in the balloon program.

In support of scientific research, and in an ongoing effort to support civilian and academic scientific research and provide a platform for scientists and engineers, the NASA BPO seeks to increase the annual number of scientific balloons launched from CSBF.

# CHAPTER 2

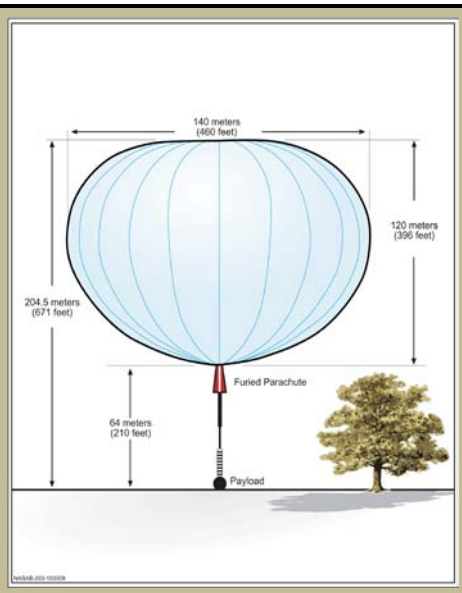
# DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE

# CHAPTER 2
# DESCRIPTION OF THE PROPOSED ACTION AND NO ACTION ALTERNATIVE

This chapter provides a description of the scientific balloon launch/flight operations originating from NASA's CSBF Fort Sumner, New Mexico (Figure 1-1) and CSBF Palestine, Texas (Figure 1-2). Section 2.1 describes the flight procedures of the CSBF balloon program. Section 2.2 presents the Proposed Action. Section 2.3 provides a description of the No Action alternative; the No Action alternative reflects the *status quo*.

CSBF Fort Sumner consists of a large World War II hangar (used for equipment and launch vehicle storage), a NASA payload processing facility that includes offices and an operations control center, and a launch pad. The site, owned by Fort Sumner Village, is a former Army Air Corps Base that eventually became the Fort Sumner Municipal Airport. During seasonal balloon campaigns, approximately 15 CSBF personnel arrive from CSBF Palestine and remain in Fort Sumner Village for up to 8 weeks; no personnel are permanently located at the launch site. During most of the year, the site is empty, and maintained by a single care-taker employed by Fort Sumner Village. CSBF Palestine encompasses about 192 hectares (474 acres) consisting of open and forested lands, two balloon launch pads, and seven permanent buildings; the land and facilities are owned by NASA. Approximately 75 people are permanently assigned to CSBF Palestine.

Typical elements of a NASA scientific balloon flight system include the balloon, parachute, flight train assembly, and gondola/payload with integrated scientific instrumentation suspended from the bottom of the balloon. A standard scientific balloon is composed of thin sheets of polyethylene film (much like a typical trash bag) sealed together with enclosed polyester fibers. Inflation of a typical scientific balloon in preparation for launch requires approximately 3,507 cubic meters (124,000 cubic feet) of gaseous helium. When filled with gaseous helium, these balloons can reach altitudes of 42 kilometers (km) (26 miles [mi]) above the earth, carry payloads up to 3,600 kilograms (kg) (8,000 pounds [lbs]), and stay aloft for up to 36 hours. The distance the balloon system may travel from the launch site varies between a few miles to a few hundred miles. The distance is determined by the mission requirements as well as seasonal variability of the upper atmospheric winds.




**Typical Elements of a Scientific Balloon Flight System**

CSBF receives flight applications from government and private sector research scientists on an annual basis (Appendix A). CSBF considers the basic types of services and equipment that would be required to support each applicant's request. The applications are then reviewed by NASA BPO which makes final approval on the requests and on the flight schedule for each fiscal year. Most of the balloon flights are

scheduled during either the spring or fall campaign periods at CSBF Fort Sumner. The spring campaign typically occurs from March to June; the fall campaign typically takes place August to October. It is during these periods that "stratospheric turnaround" occurs. Turnaround is a period of a few days when the stratosphere above the jet stream (approximately 30 to 46 km above the earth [19 to 28 mi]) slows down and changes zonal direction. As a result, balloons remain aloft nearer to the launch facilities. The turnaround period also allows the balloon to stay aloft for a longer period of time thus extending the periods for experimental instruments to collect data. Turnaround flights only occur at CSBF Fort Sumner.

While many launches may be scheduled during the turnaround period, not all of the fiscal year's flights would be expected to be scheduled in the spring/fall timeframe. CSBF schedules the balloon launches based on specific conditions needed to ensure a successful mission for the scientists. Once all factors have been considered, the fiscal year flight schedule is provided to NASA BPO for final approval. Following NASA BPO approval of the balloon flight schedule, CSBF staff begin meeting with the individual scientific groups to further discuss their specific requirements and criteria that would render a successful mission.

## 2.1 BALLOON FLIGHT PROCEDURES

CSBF staff begins a methodical process of implementing NASA BPO-approved balloon flight procedures for each scheduled balloon launch. Once the science team arrives at the launch site, CSBF staff works with the science team to make final flight preparations. This includes a pre-flight meeting to update the mission requirements, working with the science team to integrate and test the science payload, and conducting a flight readiness review to include review of the flight rules. Upon successful completion of all flight readiness reviews, CSBF then conducts the launch at the next opportunity the weather will allow. CSBF manages the flight throughout its entirety, including flight, termination, and completion of post-flight recovery of the scientific instrumentation, all support equipment, and balloon. The procedural activities involved include a pre-flight meeting; flight plan and readiness; launch operations; in-flight operations; termination; and post-flight recovery operations (NASA CSBF 2006a). Each of these activities is described below.

### 2.1.1 Pre-Flight Meeting

CSBF begins the planning process for each payload/instrument after having received a flight application. Prior to arriving at the launch site, meetings are held between the CSBF and science team to define all the mechanical and electrical interfaces. CSBF also performs a mechanical certification of all components to be used in flight.

When the science team arrives at the launch site, all preparations are complete except for the final integration and testing of the assembled flight systems. CSBF conducts a "launch site" requirements review shortly after arrival of the science team at the launch site to ensure any changes to the experimenter's requirements have been captured and incorporated into the latest planning documentation

and equipment configurations. Over the course of the next few days, the science team finishes final flight preparations of their payload/instrument, which is then integrated with the CSBF flight support systems. Following integration, a complete mechanical and electrical compatibility test is conducted. This is immediately followed by a flight readiness review. If the flight readiness review is successfully completed, the entire integrated science and CSBF systems are declared "flight ready". Launch of the payload/instrument may then occur any time after flight readiness is approved, weather permitting.

**Scientific instrument preparation in progress**

Some scientific instruments may include small quantities of materials (e.g., batteries, cryogens, etc.) that could be hazardous to people or the environment (refer to Section 3.9 for more information). Generally hazardous materials only present potential environmental consequences during preparation of the payload for flight and when the payload lands.

To ensure civilian and public safety, the NASA WFF Safety Office plans, develops, and provides policies and procedures that are implemented during ground, flight, and recovery activities. All hazardous materials to be used by a scientific group are identified well in advance of flight activities. CSBF has standard procedures in place to contain any spills and to store, handle and dispose of hazardous material in accordance with all applicable Federal and state regulations.

On average, it takes 2 to 4 weeks for a scientific group to make the payload/instrument flight ready after arrival at the launch site. CSBF personnel provide electronic communications equipment that is to be attached to the scientific instruments. The communication interface provides a balloon-to-ground link throughout the duration of the flight. This link permits the CSBF staff to monitor the flight path of the balloon and send communications as needed.

**CSBF Command Stations**

While balloons are in flight, the area they cover can be a few hundred miles. To accommodate this large area, there are three line-of-sight telemetry towers forming concentric circles of approximately 650 km (350 nautical miles) each.

Command stations are located at CSBF Fort Sumner, CSBF Palestine, and the Winslow Airport in Arizona. During flight operations, contact with the balloons is maintained by using these communication system towers. The electronic equipment, set on a CSBF-assigned frequency, transmits command, tracking, and telemetry signals between the balloon system and the CSBF ground command station.

Scientific instruments are attached directly to the gondola structure. This is what is often referred to as the "payload". CSBF engineers certify every payload that is flown to insure mechanical integrity throughout the flight. Each payload includes ballast that is used to control assent and maintain a stable altitude. The amount of ballast material required is dependent on the weight of the payload, the size of the balloon, and the required float altitude to collect the scientific data. Ballast consists of very fine glass beads (grain size 0.69 millimeters [mm] to 0.84 mm [0.027 to 0.033 inches]) or fine steel shot (grain size 0.3 mm to 0.5 mm [0.012 to 0.020 inches]). Ballast material can be released to adjust the float altitude of the balloon system. When releasing ballast, the flow rate is no more than 27.2 kg (60 lbs), per minute, and is normally released in 30 second increments.

To be NASA certified, the payload must sufficiently hold the scientific instrumentation, ensure survivability of the scientific instrumentation during landing, maintain integrity of the CSBF electronic equipment, and have sufficient ballast weight. Provided the gondola design meets NASA certification requirements, CSBF crew completes a flight plan and performs a flight readiness review (Appendix A).

### 2.1.2 Flight Plan and Readiness

A flight plan and readiness review is held no more than 72 hours before an anticipated balloon launch. The flight plan specifies the altitude for balloon float and duration at the specified altitude; requirements for maintaining altitude (including release of ballast material); length of time at specific altitudes based on the weight of balloon system; the number and type of recovery vehicles and crew; and identification of hazardous material, if any, that may be present at the recovery site (Appendix A).

To ensure readiness, a compatibility check of the balloon-to-ground communication link is again tested and certification of the gondola and all rigging equipment (parachute, cables, and hardware) is finalized. During the flight readiness review period, CSBF coordinates with the appropriate FAA Air Route Traffic Control Center (ARTCC). For balloons originating from CSBF Palestine, the Fort Worth, Texas ARTCC is contacted. Balloons launched from CSBF Fort Sumner often cross between two separately controlled airspace units requiring coordination with the Fort Worth ARTCC and Albuquerque, New Mexico ARTCC. Coordination with the ARTCCs includes providing the anticipated launch time and preparation of a Notice to Airmen (NOTAM) that will be disseminated by the FAA. A NOTAM is a standard notification disseminated to all pilots informing them of procedures, hazards, or flight activities, temporary or permanent, which may occur within defined airspace units. In addition to the NOTAM, CSBF notifies the Cannon Air Force Base airspace manager prior to launching balloons from Fort Sumner. On launch day, approximately one hour before balloon release/ascent, the CSBF launch facility

notifies the appropriate FAA ARTCC which in turn clears a 130 km (70-nautical mile) radius around the launch site to ensure flight safety in the region.

### 2.1.3 Launch Operations

To have a safe, effective launch, specific weather conditions are required. Wind speeds must be blowing in a constant direction with speeds between 10 to 11 kilometers per hour (kph) (6 to 7 miles per hour [mph]) up to 60 vertical meters (200 vertical feet) and not greater than 19 kph (12 mph) from 60 to 300 vertical meters (200 to 1,000 vertical feet). CSBF meteorologists provide daily briefings and extended forecasts to staff and research scientists to help identify conditions that could affect launch opportunities. Wind speeds exceeding these conditions could result in damage to the balloon. Launches are delayed if such specifications are not met.

**Payload Being Transported to Launch Pad**

CSBF meteorologists use a small tethered pilot balloon to check wind direction and speed prior to the anticipated launch time. If the conditions are considered favorable, the payload is moved from the CSBF staging area via a mobile transport vehicle to the launch pad. A separate vehicle (spool truck) transports the flight train, balloon and parachute to the launch pad. CSBF mission crews lay out the flight train, balloon and parachute and begin the process of rigging the entire balloon system together. When the process of rigging is completed, the electronic communication systems are given a final check to ensure functionality of the balloon-to-ground link.

Next, the balloon is partially inflated with helium gas; only a small fraction of the balloon's volume is filled since the helium expands as it rises. When the balloon has been inflated with the calculated volume of helium, it is released from the spool truck and slowly rises. As the balloon's position becomes vertical to the payload, the payload is released from the mobile transport vehicle and the balloon/payload begins the ascent. The balloon's ascent is monitored so that the average rate is no less than 120 meters (400 feet) per minute from the moment of release to flight level (FL) 600 or approximately 18.3 km (60,000 feet or 11.4 mi) above the earth (FAA 2009).

**Filling balloon**

**Payload Released**

**Balloon/Payload in Ascent**

### 2.1.4 In-Flight Operations

It takes approximately two hours for the balloon to reach float altitude in the stratosphere, generally between 36 and 42 km (22 and 26 mi) above the earth. The balloon system is monitored from the moment of release throughout the duration of the mission by CSBF staff using real-time computer monitoring systems and controls located at CSBF Palestine, CSBF Fort Sumner, and the Winslow Airport (for balloons heading due west) command stations.

The balloon's altitude is controlled via radio commands sent from the command station. If the balloon float needs to be lowered, a command is sent to vent helium until the correct altitude is achieved. Cooling night-time temperatures will cause the helium to contract resulting in loss of balloon lift. CSBF can send a command to slowly release a portion of the ballast material (i.e., glass beads or steel shot) until the correct altitude is again achieved. The amount of ballast material aboard the gondola is about 20 percent of the balloon weight. Large balloon flight systems may be launched with as much as 350 kg (800 lbs) of ballast that would be expended in order to control the rate of ascent and to maintain altitude stability during the night (personal communication, Stepp 2009). Consequently, the duration of the scientific balloon flights are limited by the volume of both ballast material and helium gas.

### 2.1.5 Balloon Flight Termination

The balloon mission is terminated by command once the science requirements of the mission have been met or in order to maintain compliance with NASA flight safety rules.

One hour prior to terminating the balloon flight, CSBF staff contacts the FAA to begin coordination for approval to terminate. CSBF staff is able to predict where the balloon and payload will land using a NASA-developed model. The model takes into account the weight of the balloon flight system and existing wind/weather conditions to provide a line of trajectory from the coordinate point that the termination command will be given.

**The payload, with attached parachute, descends back to the ground**

Using real-time computer monitoring, the trajectory of the balloon/payload is overlaid on an aeronautical chart showing population centers and state and federal special use land management areas (SULMAs) such as tribal lands; national and state forests and parks; and wilderness areas.

Consideration of the population centers and SULMAs provides CSBF with the information to ensure avoidance of these areas. Once the trajectory is known, the appropriate FAA ARTCC is notified; FAA ARTCC clears a 130 km (70-nautical miles) radius around the predicted landing areas of the balloon and payload/parachute. After coordination with the FAA ARTCC is completed, a radio command sent from

the monitoring command station triggers a small, self-contained pyrotechnic device that separates the balloon from the payload while also ripping a hole in the balloon thereby releasing the remaining helium.

Trackers on the ground and in the sky follow the descent of the balloon and payload/parachute. Upon landing, a semi-automatic parachute release system is used to separate the parachute from payload to prevent the payload from being dragged and potentially damaged. The period between radio command for the balloon to separate from the payload and subsequent landing of the balloon, payload, and parachute is approximately 45 minutes. From the moment the command is sent to terminate the balloon flight, the distance covered by the balloon and payload/parachute is typically 32 km (20 mi) and the distance covered by the balloon is typically 11 km (7 mi).

The footprint of a typical payload is less than 10 square meters (100 square feet). The footprint of the balloon varies according to the volume size and varies from a few hundred to a few thousand square meters. Parachutes are sized according to the weight of the payload such that the force of impact on the ground is nominally 6.7 meters per second (22 feet/second), which is standard for decelerators (personal communication, Gregory 2009).

### 2.1.6 Post-Flight Recovery Operations

**Payload landing**

The trajectory of the balloon and payload/parachute can be accurately predicted by CSBF enabling them to place a recovery team, consisting of 2 to 3 CSBF personnel dispatched from either Fort Sumner or Palestine, depending on where the balloon was launched, and 1 to 2 members of the scientific group, on the road prior to the command being sent to terminate the balloon flight. Prior to the command to terminate the balloon flight, the CSBF tracking aircraft is dispatched to be in position with the balloon system. The tracking plane follows the path of the balloon and payload/parachute and relays that information to the CSBF retrieval team on the ground. A communication link exists between the tracking plane, retrieval team, and monitoring command station. Should the command station lose line-of-sight telemetry due to land forms obstructing the electronic signal, the tracking plane and/or retrieval team can communicate when the command to separate the parachute from the payload should be given.

Given the ability to track the balloon and payload/parachute, recovery is often accomplished within 24 hours. Once the balloon system has landed, CSBF staff contact the proper agencies and land owners so that permission to access the landing locations, if required, can be obtained allowing for immediate recovery. Coordination with land owners is typically performed after the balloon system has reached the ground as locations of the balloon system may involve one or more land owners. In addition, a land owner may wish to provide the location for ingress/egress of the recovery team vehicle(s).

A vehicle, like the one pictured below, is often used to lift and transport the sections of the separated balloon system. The recovery team collects all sections of the balloon system leaving no physical evidence at the recovery site.

**Payload Recovery**

**Parachute Recovery**

The team completes a recovery report checklist (Appendix A) and returns to the CSBF launch site. The scientific equipment is returned to the science group, the balloon is disposed of, and the payload/gondola and parachute are inspected for future reuse.

## 2.2 PROPOSED ACTION

### *Balloon Flights*

The NASA BPO is proposing to increase the number of scientific balloons launched each year. Balloon flights originating from CSBF Fort Sumner would increase from 15 to 25 annually. Balloons launched from the CSBF Palestine would continue at approximately 6 per year. Table 2-1 provides baseline and proposed balloon launches from the respective facilities each year. No construction would take place at either of the two launch sites. Figure 2-1 provides a 10-year history (i.e., 1999-2009) of balloon and payload collection points for missions conducted from CSBF Fort Sumner and CSBF Palestine, referred to as the CSBF Operations Area.

**Table 2-1 CSBF Annual Balloon Launches**

| | ***Balloon Launches*** | | ***Launch Period*** | ***Direction of Balloon Float*** |
|---|---|---|---|---|
| | ***Baseline*** | ***Proposed*** | | |
| CSBF Fort Sumner | 6 | 10 | March to June | East to West |
| | 9 | 15 | August to October | West to East |
| CSBF Palestine | 6 | 6 | Summer / Fall | East to West |
| ***Total*** | **21** | **31** | | |

*Source:* Personal Communication, Ball 2009

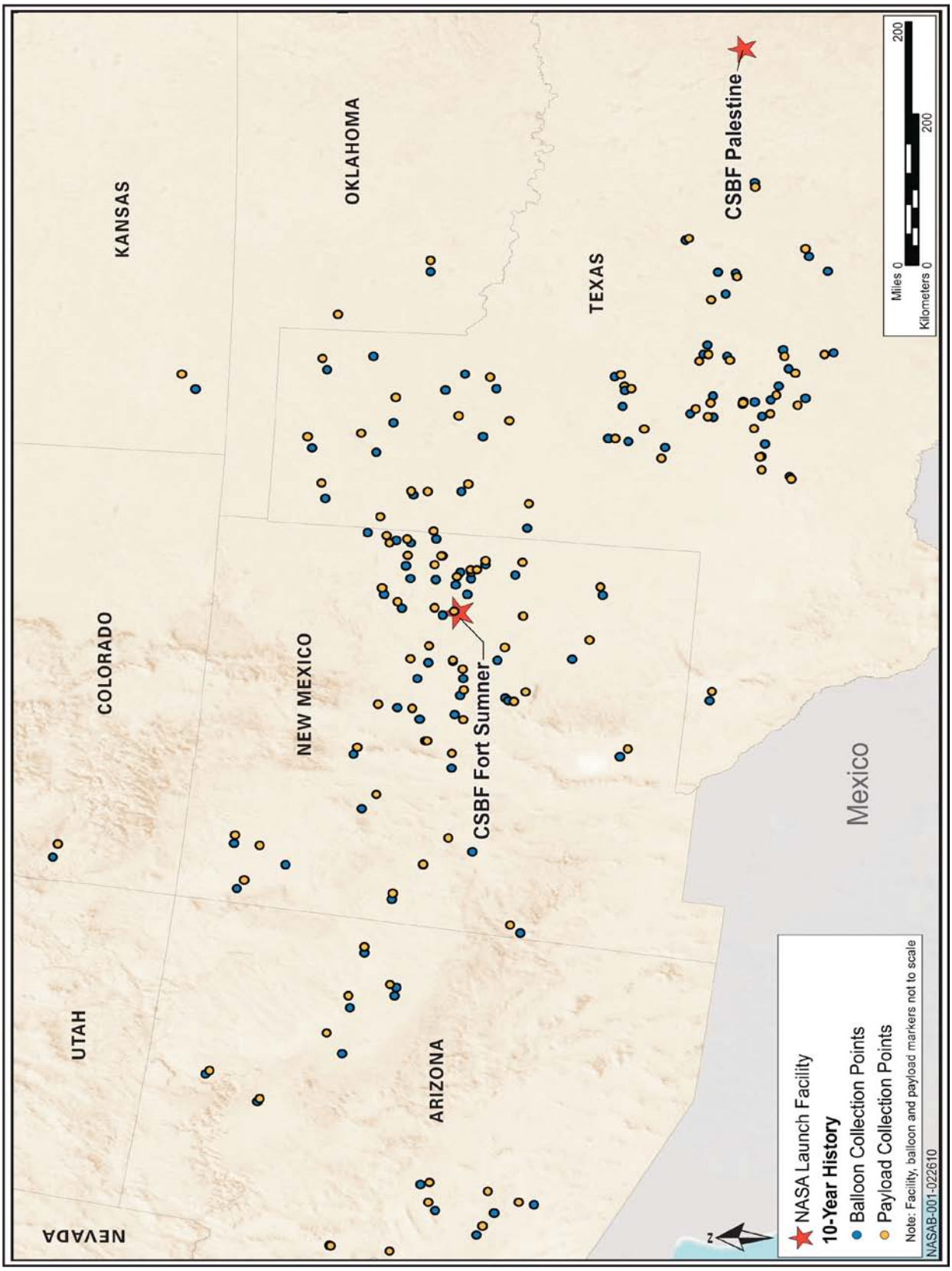



**Figure 2-1 CSBF Operations Area**

***Personnel***

The number of CSBF personnel would not change under the Proposed Action. CSBF Fort Sumner is a remote launch site with no CSBF personnel assigned there on a permanent full-time basis. Balloon launches from CSBF Fort Sumner require personnel to travel from CSBF Palestine for the spring and fall campaign. During campaigns, as many as 15 CSBF people remain on-site for approximately 8 weeks. Up to 40 research scientists/students arrive at CSBF Fort Sumner to prepare their scientific instruments/payload for a duration lasting 3 to 6 weeks (personal communication, Garde 2009).

## 2.3 NO ACTION ALTERNATIVE

The No Action alternative would have similar impacts as the Proposed Action; the impacts would be slightly less in magnitude as there would be fewer flights. Under the No Action alternative, the NASA BPO would not increase the annual number of scientific balloon launches at this time. CSBF Fort Sumner would continue to launch approximately 15 scientific balloons annually; CSBF Palestine would continue to launch approximately 6 scientific balloons annually. The potential for impacts to any of the resources considered in this PEA would remain at *status quo* with no change anticipated to the existing environmental conditions at either the launch sites or within the CSBF Operations Area.

## 2.4 ENVELOPE CONCEPT

As several different scientific balloons and payloads could launch from CSBF, a generic balloon and payload system were chosen as the demonstration or "envelope" to provide a benchmark for assessing impacts on resources at the CSBF launch sites and the CSBF Operations Area. Under the envelope concept, existing and future scientific balloon systems possessing similar qualities as the "envelope" would be expected to have less than or equal impacts. For example, if the envelope scientific balloon system has an insignificant impact on a resource, a smaller system would fall within the same range of impacts and also have an insignificant impact.

The envelope balloon system defines the characteristics of commonly used materials and systems. Future scientific balloon systems not specifically mentioned in this PEA would be considered within the scope of this document if analysis determines that their impacts do not exceed those associated with the envelope balloon system. The subsequent analysis and final determination would be documented in a Record of Environmental Consideration (REC) to be kept in the official project files. If the analysis finds that the impacts are outside the scope of this PEA, further NEPA documentation may be prepared.

Table 2-2 lists the major materials and instruments together with the maximum quantities that would be carried by the balloon system. Minor materials or instruments that are not listed may be included on the balloon system as long as they pose no substantial hazard to the human environment.

NASA BPO has created an Environmental Checklist that will be used prior to each balloon launch campaign. The Environmental Checklist will be used by the NASA BPO to help determine whether the

proposed balloon missions fall within the operations covered by the Scientific Balloon Program PEA, or whether separate NEPA analysis may be required prior to the proposed balloon launch campaign. The Environmental Checklist (Appendix B) provides steps to evaluate whether the balloon system fits within the envelope characteristics.

**Table 2-2 Typical Balloon System Materials and Instruments**

| *Component* | *Envelope* | *Additional Documentation Requirement for REC* |
|---|---|---|
| **Radio Frequency** | Electromagnetic fields must be within ANSI-recognized acceptable levels as stated in IEEE C95.1-1991. | Radio frequency data confirming compliance |
| **Lasers** | Meets ANSI Safety standards (ANSI Z136.1-2000 and Z136.6-2000). | Laser data confirming compliance |
| **Radioactive Materials** | Quantity and type of radioactive material are within the approval authority level of the NASA Nuclear Flight Safety Assurance Manager. | Copy of Radioactive Materials Report as per NPR 8715.3C Section 6 |
| **Biological Agents** | Biological agents must meet conditions of Biosafety Level 1 of the NIH and CDC Biosafety in Microbiological and Biomedical Laboratories. | Laboratory data confirming compliance |
| **Chemical Release** | Must not pose a substantial hazard and cannot have a significant adverse affect on the atmosphere. | Sufficient analysis to support compliance |

## 2.5 NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) GUIDANCE

This NASA Scientific Balloon Program PEA was prepared in accordance with the requirements of NEPA of 1969; the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR 1500-1508); NASA procedures for implementing NEPA (14 CFR 1216.3); and NASA Procedural Requirements 8580.1 *Implementing the National Environmental Policy Act and Executive Order 12114*. This PEA provides the descriptions of current and proposed operations of the NASA CSBF Scientific Balloon Program at CSBF Fort Sumner and Palestine. As a PEA, this document will serve as a reference for which future scientific balloon launches from these two sites will be evaluated to ensure NEPA compliance.

The steps involved in the environmental analysis process used to prepare this PEA are outlined below.

1. *Conduct Scoping.* On October 9, 2009, initial coordination letters were sent to federal, state, and regional government agencies in the states where the NASA BPO has operated scientific balloon missions in the past 10 years (i.e., 1999-2009). Comments were requested on NASA's proposal to increase the annual number of scientific balloon launches. On October 27, 2009, the same coordination letter was sent to the affected states' regional Bureau of Indian Affairs offices. To ensure a more comprehensive coverage of scoping had been conducted, coordination letters were sent to Tribal Historic Preservation Offices (THPO) on March 22, 2010 and April 13, 2010. Chapter 6 provides the list of agencies and organizations to which the initial coordination letters were sent; Appendix C provides a sample coordination letter and responses received; NASA received nine response letters. A primary concern expressed by the New Mexico Bureau of Land Management

(BLM) and Colorado State Historic Preservation Office (SHPO) was for the potential impacts to cultural resources from off-highway vehicles during the balloon system recovery. The Amarillo, Texas BLM Field Office requested that they be contacted should recovery of the balloon system necessitate access to the public land constituting the Crossbar Cooperative Management Area.

2. *Prepare a draft PEA and draft Finding of No Significant Impact (FONSI).* The first comprehensive documents for public and agency review is the draft PEA and draft FONSI. The PEA examines the environmental impacts of the Proposed Action and No Action alternative.

3. *Announce that the draft PEA and draft FONSI have been prepared.* An advertisement was placed in the *Federal Register* on June 11, 2010 notifying the public as to the availability of the draft PEA and draft FONSI for review in local libraries and on the World Wide Web (http://sites.wff.nasa.gov/code250/BPO_PEA.php). An advertisement was also placed in the following newspapers: the Palestine Herald and the DeBaca County News. The draft PEA and draft FONSI were made available at the following libraries: Palestine Public Library, Palestine, Texas; Fort Sumner Public Library, Fort Sumner, New Mexico; and NASA Headquarters Library, Room 1J20, Washington, D.C.

4. *Provide a public comment period.* A 30-day period for public review of the draft PEA and draft FONSI will be initiated. This provides the public and agencies the opportunity to provide comments concerning the findings presented.

5. *Prepare a final PEA.* Following the public comment period, a final PEA is prepared. This document is a revision (if necessary) of the draft PEA, includes consideration of public and agency comments, and provides the decision-maker with a comprehensive review of the Proposed Action and the potential environmental impacts. The final PEA will be made available at the following libraries: Palestine Public Library, Palestine, Texas; Fort Sumner Public Library, Fort Sumner, New Mexico; NASA Headquarters Library, Room 1J20, Washington, D.C. The final PEA will also be made available on the World Wide Web at: http://sites.wff.nasa.gov/code250/docs/BPO_fPEA.php.

6. *Issue a FONSI or a Notice of Intent to Prepare an Environmental Impact Statement (EIS)*. The final step in the process is either a signed FONSI if the analysis supports this conclusion, or a determination that an EIS would be required for the proposal, followed by a Notice of Intent to prepare an EIS. Advertisement of the signed FONSI (as well as availability of the final PEA) would be published in the *Federal Register* and the Palestine Herald and the DeBaca County News. If a determination to prepare an EIS is made, a Notice of Intent would be published in the *Federal Register*.

## 2.6 SUMMARY OF POTENTIAL ENVIRONMENTAL IMPACTS

The potential impacts under the Proposed Action and the No Action alternative are summarized below.

***Airspace and Balloon Operations.*** No adverse impacts to airspace management or balloon operations are anticipated under this proposal. CSBF would continue to adhere to the letter of agreement with the FAA ARTCC Albuquerque and ARTCC Fort Worth. CSBF would continue to notify Cannon Air Force Base prior to balloon launches to further enhance safety in the region. As such, impacts to other users of the airspace or to balloons launched from CSBF Fort Sumner or CSBF Palestine would not be adverse. Under the No Action alternative, the *status quo* would be maintained, with 21 balloon launches a year. No adverse impact would occur from implementing the No Action alternative as existing conditions would remain unchanged.

***Safety.*** NASA BPO and CSBF have extensive safety regulations and standard safety procedures for launch and recovery activities that ensure safety of staff and the general public. Models developed by NASA are used to predict the landing location of the balloon system. Along with real-time computer monitoring systems and controls, population centers and special use land management areas can be avoided virtually eliminating the potential for injury to people or property. Adverse impacts from implementing the Proposed Action or No Action alternative are not anticipated.

***Air Quality.*** Vehicular travel by research scientists and students to the CSBF Fort Sumner location would increase under this proposal; however, the emissions would be minimal. Air emissions would not be perceptibly changed within the CSBF Operations Area due to the small increase in trips to be conducted by recovery vehicles and tracking planes used during the balloon and payload/parachute descent. Overall, no perceptible change in air emissions would be anticipated from implementation of the Proposed Action. Air emissions under the No Action alternative would remain unchanged; no perceptible impact.

***Socioeconomics.*** Fort Sumner Village would experience a short-term positive economic impact each year during balloon campaigns at CSBF Fort Sumner from the purchase of food, supplies, and lodging by CSBF staff and research scientists and students. An adequate supply of restaurants and lodging accommodations exists to meet the needs of the CSBF staff and research scientists/students. The City of Palestine currently experiences positive economic impacts from CSBF activities. Under this proposal, balloon launches from Palestine would not increase; therefore, no change in socioeconomic impacts would be anticipated. Implementation of the No Action alternative would result in no change to socioeconomic conditions, as the number of balloons launched from either CSBF facility would not change.

***Land Use.*** CSBF currently avoids SULMAs and would continue this under the Proposed Action. The CSBF Operations Area spans portions of six states; the chances of a balloon/payload landing in the same location are unlikely. Recovery operations are often complete within 24 hours after landing has occurred.

Should a balloon/payload land within a SULMA, or on private land, the land manager/landowner would be contacted prior to the CSBF recovery team accessing the site. If required, CSBF would obtain a permit or authorization to retrieve the balloon/payload. The same emphasis on avoiding sensitive lands would continue under the No Action alternative. Overall, no adverse impact to land use would be expected.

***Biological Resources.*** No adverse impacts to biological resources are anticipated under the Proposed Action. CSBF would continue to avoid known critical habitats and wetlands. If unplanned circumstances resulted in the need to land a payload within a designated Critical Habitat, CSBF would initiate contact with U.S. Fish and Wildlife Service to determine the best method for payload recovery, with the least amount of environmental impact. There would be no increase in activity under the No Action alternative; therefore, no increased effects from payload landing and recovery operations.

***Cultural Resources.*** Increased balloon operations would constitute an increased probability for adverse effects to cultural resources from balloon/payload landing and recovery activities; however, the probability for impacting culturally significant resources would be extremely low. Predictive modeling used by CSBF for balloon/payload landing would continue to be used for avoidance of all known culturally significant areas. If during a balloon and payload landing were to occur on culturally sensitive lands, CSBF would contact the appropriate State or Tribal Historic Preservation Officer prior to recovery activities. Operations under the No Action alternative would continue as they have for the past 25 years, with continued avoidance techniques to limit potential impacts to culturally sensitive areas. Adverse impacts to cultural resources from implementing either the Proposed Action or No Action alternative would not be anticipated.

***Hazardous Materials and Systems.*** Adequate measures are in place and would be instituted in the event hazardous materials were used during balloon staging and operations. Should a release of any hazardous materials occur during payload landing/recovery operations, CSBF staff would implement NASA-approved procedures for clean up in accordance with applicable federal and state regulations. Accordingly, impacts to personnel or the environment from implementation of the Proposed Action or No Action alternative would not be expected.

***Transportation.*** Transportation and/or traffic issues are currently minimal in the regions surrounding the CSBF launch sites. Vehicles used in recovery operations would not impact transportation systems across the CSBF Operations Area. As such, no adverse impacts to transportation resources in the region surrounding the CSBF launch sites or within the Operations Area are anticipated from implementation of the Proposed Action or No Action alternative.

***Cumulative Effects***. Cumulative impacts were evaluated for potentially affected resources. No cumulative impacts are anticipated from implementation of the Proposed Action. No other known or foreseeable actions would be anticipated to affect resource areas impacted by CSBF balloon launch, flight, terminations, or recovery activities.

## 2.7 MITIGATION MEASURES

NASA BPO and CSBF staff would, to the extent practicable, continue to utilize its real-time mapping and analysis systems to avoid population centers and SULMAs while operating scientific balloons in the CSBF Operations Area. The analysis in this PEA provides the NASA BPO and CSBF staff additional information regarding the location and sensitivity of environmental resources to be avoided that will be incorporated into the balloon flight activities currently administered to ensure any potentially sensitive lands are avoided and that care is taken to minimize any unplanned impacts. Additionally, NASA would continue its ongoing relationship with FAA, and would take into account any concerns expressed from other agencies contacted through the scoping and comment process, including SHPOs, THPOs, BLM, and USFWS, for example. CSBF would continue to contact land managers and/or the local law enforcement prior to entering land of unknown ownership for retrieval activities. General CSBF policy dictates that if private property is damaged, reparations are made through on-site negotiations with the landowner.

# CHAPTER 3

# DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

# CHAPTER 3
# DESCRIPTION OF THE AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

## 3.1 ANALYSIS APPROACH

NEPA requires focused analysis of the areas and resources potentially affected by an action or alternative. It also provides that an Environmental Assessment (EA) should consider, but not analyze in detail, those areas or resources not potentially affected by the proposal. Therefore, an EA should not be encyclopedic; rather, it should be succinct. NEPA also requires a comparative analysis that allows decisionmakers and the public to differentiate among the alternatives. This PEA therefore, focuses on those resources that would be affected by NASA BPO scientific balloons launched each year.

CEQ regulations (40 CFR Parts 1500-1508) for NEPA also require an EA to discuss impacts in proportion to their significance and present only enough discussion of other than significant issues to show why more study is not warranted. The analysis in this PEA considers the current conditions of the affected environment and compares those to conditions that might occur should NASA BPO implement the Proposed Action or No Action alternative. As a programmatic EA, this document will serve as a reference for which future scientific balloon launches from CSBF Fort Sumner and Palestine will be evaluated to ensure NEPA compliance.

***Affected Environment***

The affected environment for this NASA Scientific Balloon Program PEA includes the CSBF launch sites (Fort Sumner and Palestine) and the CSBF Operations Area (as depicted in Figure 2-1) which includes portions of Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas.

***Resources Carried Forward for Detailed Analysis***

Table 3-1 presents the results of the process of identifying resources to be analyzed in detail in this PEA. This assessment evaluates airspace and balloon operations; safety; air quality; socioeconomics; land use; biological resources; cultural resources; hazardous materials and systems; and transportation. These resources are analyzed in detail because they may be potentially affected by implementation of the Proposed Action.

***Resources Not Carried Forward for Detailed Analysis***

Numerous resources were assessed (refer to Table 3-1) that warrant no further examination in this PEA. Potential impacts to these resources (noise; geology and soils; visual resources; environmental justice and protection of children; and global climate change) do not warrant detailed analysis. The following provides the rationale for this approach.

| Table 3-1 Resources Considered in this NASA Scientific Balloon Program PEA | | |
|---|---|---|
| ***Resource*** | ***Potentially Affected by NASA Scientific Balloon Program Activities*** | ***Analyzed in Detail in this PEA*** |
| Airspace and Balloon Operations | Yes | Yes |
| Safety | Yes | Yes |
| Air Quality | Yes | Yes |
| Socioeconomics | Yes | Yes |
| Land Use | Yes | Yes |
| Biological Resources | Yes | Yes |
| Cultural Resources | Yes | Yes |
| Hazardous Materials and Systems | Yes | Yes |
| Transportation | Yes | Yes |
| Noise | No | No |
| Geology and Soils | No | No |
| Visual Resources | No | No |
| Environmental Justice and Protection of Children | No | No |
| Global Climate Change | No | No |

***Noise.*** Noise is often defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, diminishes the quality of the environment, or is otherwise annoying. Human response to noise varies by the type and characteristics of the noise source, the distance from the source, receptor sensitivity, and time of day. Noise can be intermittent or continuous, steady or impulsive, and may be generated by stationary or mobile sources. Sound levels are expressed in decibels (dB), usually weighted for human hearing (dBA). Typically, the noise level for vehicle operations ranges from 50 dB (for light traffic) to 80 dB for diesel trucks. The daily operation of motor vehicles in and around the CSBF launch sites would be considered a minor source of noise. Noise as a result of launch activities is short-term in nature, lasting only as long as each of the balloon launches. The potential to impact the noise environment at either launch site from increased vehicular traffic from research scientists or students would be negligible. Vehicles used during balloon recovery activities would not permanently alter the noise environment at any given location; recovery activities require minimal time; most are completed within 24 hours of the payload making landfall. Noise levels would not be expected to change through implementation of the Proposed Action or No Action alternative.

***Geology and Soils.*** Potential impacts to geology or soils from balloon system launch, landing, or recovery activities would not be anticipated. No construction activities would occur at the launch sites or within the CSBF Operations Area under this proposal. The potential for soils compaction from payload landing or from vehicles used during recovery activities exists but would not be adverse or long-lasting. An inadvertent spill of hazardous materials from recovery vehicles or damaged payload instrumentation would be unlikely; however, in the event that a spill would occur onto ground surfaces, CSBF personnel would implement the spill response procedure developed and approved during the pre-flight plan discussions for each anticipated balloon launch as directed by NASA (GSFC WFF 2008). No adverse impacts to geology or soils would be expected under the Proposed Action or No Action alternative.

***Visual Resources.*** Visual resources are defined as the natural and man-made features that comprise the aesthetic qualities of an area. These features form the overall impression that an observer receives of an area or its landscape character. Visual resources would not be impacted at the CSBF launch sites since the balloon launches represent an ongoing activity that defines the location. Persons on the ground may be able to observe the balloons at float from distances up to 160 km (100 miles) away. This is not anticipated to result in an adverse impact to visual resources as the balloons would move quickly out of range. A balloon sighting would be short-lived and the rate of occurrence at any one location would be inconsequential. CSBF teams ensure that all components of the balloon system (i.e., balloon, payload, and parachute) are removed during recovery activities thereby creating no visual impacts. No permanent change to the landscape character or features within the landscape would be anticipated under the Proposed Action or No Action alternative.

***Environmental Justice and Protection of Children.*** In 1994, EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, was issued to focus attention of federal agencies on human health and environmental conditions in minority and low-income communities and to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. In 1997, EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks (Protection of Children)*, was issued to ensure the protection of children. Environmental justice addresses the disproportionate effect of a federal action on low-income or minority populations. If implementation of the Proposed Action were to have the potential to significantly affect people, those effects would have to be evaluated for how they adversely or disproportionately affect low-income or minority communities. No aspect of NASA's scientific balloon program or the proposed increase in balloon launches would result in a disproportionate impact to the human health or environmental conditions in minority or low-income communities. Neither the Proposed Action nor No Action alternative would result in an adverse impact to the health and safety of children; therefore, further analysis of this resource is not warranted for this PEA. Should a change in operations occur at the CSBF launch sites, NASA BPO would reevaluate the balloon program at those sites in consideration of EO 12898 as documented in the WFF *Environmental Justice Implementation Plan* (GSFC WFF 1996).

***Global Climate Change.*** Concerns exist about the potential for human activities that contribute to the concentration of greenhouse gases which may impact the earth's atmosphere. The surface temperature of the earth is increased because of the presence of gases that absorb infrared radiation, and the gases responsible for the effect are termed "greenhouse gases." The primary greenhouse gases are carbon dioxide, methane, nitrous oxides, and halocarbons. Helium, used to inflate balloons, is non-toxic, non-flammable, and has no harmful effects on the earth's environment. Vehicles used by CSBF staff and research scientists during the balloon preparation, launch, and recovery activities would contribute to the inventory of greenhouse gases. However, the contribution would be extremely small resulting in a negligible impact to the earths' atmosphere when considered in the context of global climate change under both the Proposed Action and No Action alternative.

***Resources Carried Forward for Detailed Analysis.*** As presented in Table 3-1, the following resources are evaluated in detail in this PEA: airspace and balloon operations; safety; air quality; socioeconomics; land use; biological resources; cultural resources; hazardous materials and systems; and transportation.

## 3.2 AIRSPACE AND BALLOON OPERATIONS

This section describes the coordination between CSBF Fort Sumner, CSBF Palestine, and the FAA.

### 3.2.1 Affected Environment

The affected environment for airspace and balloon operations for this PEA includes portions of Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas. The CSBF balloon/payload collection points spanning a 10-year period are provided in Figure 2-1.

***Airspace Operations***

The safe, orderly, and compatible use of the nation's airspace is made possible through a system of flight rules and regulations, airspace management actions, and air traffic control procedures just as use of the nation's highway system is governed by traffic laws and rules for operating vehicles. The national airspace system is designed and managed to protect aircraft operations around most airports and along air traffic routes connecting these airports, as well as within special areas where activities such as military flight training are conducted. The FAA has the overall responsibility for managing the airspace system and accomplishes this through close coordination with state aviation and airport planners, military airspace managers, and other entities. The FAA assigns responsibility for units of airspace to ARTCCs.

Flights originating from CSBF Palestine operate in airspace controlled by the FAA Fort Worth ARTCC; however, balloons launched from CSBF Fort Sumner often cross between two separately controlled airspace units. A letter of agreement (LOA) exists between CSBF Fort Sumner and FAA Albuquerque ARTCC and Fort Worth ARTCC. The LOA was updated in 2009 (Appendix D). In accordance with the LOA, CSBF Fort Sumner is authorized to launch unmanned aerial balloons under Federal Aviation Regulation 101, Subpart D, Unmanned Free Balloons (FAA LOA 2009). The LOA stipulates specific procedures for balloons with payloads less than 2.7 kg (6 lbs) (sounding balloons) and those over 2.7 kg (6 lbs) (scientific). For balloons over 2.7 kg (6 lbs), FAA requires the balloons be equipped with a Mode C transponder. A transponder (short for transmitter-responder) is an electronic device attached to the balloon system that transmits a response to a secondary radar system to assist air traffic controllers in separating aircraft. CSBF is required to activate a balloon's transponder during ascent from launch to FL600 (approximately 18.3 km [60,000 feet or 11.4 mi] above the ground). During descent, the transponder must again be activated at or below FL600. If during the ascent, the transponder fails to operate, the Albuquerque and Fort Worth ARTCCs have the option to request that CSBF cancel the balloon mission. CSBF is also responsible for providing FAA with a NOTAM; the NOTAM alerts pilots of potential hazards for aircraft operating in a specific region or location. The NOTAM is disseminated by the Fort Worth Automated Flight Service Station per the FAA LOA. In addition, for balloon launches

from Fort Sumner, contact is made with Cannon Air Force Base due to the presence of military aircraft operating in the region.

Approximately one hour before a launched balloon's ascent or descent/landing, the appropriate FAA ARTCC is notified. The FAA ARTCC clears a 130 km (70-nautical mile) radius around the launch and predicted balloon and payload/parachute landing zones to ensure flight safety in the region.

***Balloon Operations***

In addition to monitoring the balloon system during ascent/descent via FAA transponder, CSBF maintains communication with the balloon system using electronic line-of-sight telemetry. Line-of-sight telemetry permits the ground station (i.e., CSBF command station) to transmit commands to the balloon system in flight. Commands include those sent to the science instrument(s) and those used to control the balloon flight systems. Commands sent during flight termination include balloon/payload separation; parachute activation, and payload/parachute separation. Balloons launched from CSBF Fort Sumner are commanded by CSBF Fort Sumner and supported by CSBF Palestine as a downrange station for easterly going flights while a mobile telemetry station located at the Winslow Airport in Arizona is used for balloons heading due west. Each command station is capable of transmitting messages within a 650 km (350-nautical mile) radius.

**CSBF Fort Sumner Command Station**

Per the FAA LOA, a balloon in ascent is monitored via electronic tracking with reports to the FAA ARTCC at each 3,050-meter (10,000-foot) level up to and including FL600. The average rate of ascent needs to be 120 meters (400 feet) per minute from the moment of release to FL600 (FAA 2009). A balloon in descent is tracked, both visually and electronically at or below FL600 to the point of ground contact. Visual tracking is accomplished using a tracking van and a tracking aircraft that accompanies the balloon from FL600 to landing all the while maintaining radio communication with the appropriate FAA ARTCC.

**CSBF Palestine Command Station**

### 3.2.2 Environmental Consequences

This assessment of airspace and balloon operations examines how the Proposed Action or No Action alternative would affect FAA management of airspace within the CSBF Operations Area. Factors used to assess the significance of impacts on airspace and air traffic include consideration of the proposed increase in operations which could cause impacts to current airspace usage by both military and civilian operations; require a shift or change in flight patterns to accommodate increased balloon operations; and/or the potential to modify airspace. If major changes to existing airspace usage would be required, the impact would be considered significant.

**Proposed Action**

NASA is proposing an increase of 10 scientific balloon flights per year within the existing CSBF Operations Area encompassing portions of Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas. The FAA LOA stipulates the procedural and operational requirements of scientific balloon launches that CSBF would continue to follow. Given the small increase proposed, no adverse impacts to military and civilian flight operations would be anticipated. No changes to area flight patterns would be required, nor would airspace modifications be necessary. CSBF operational procedures and coordination with FAA Albuquerque and Fort Worth ARTCCs and Cannon Air Force Base would not change, and as such, no impacts to airspace management or balloon operations are anticipated under this proposal.

**No Action Alternative**

Scientific balloon launches would continue at the present rate under the No Action alternative. Impacts of the No Action alternative would be similar to those described under the Proposed Action; however, the impacts would be slightly less due to fewer balloon flights. CSBF operational procedures and coordination with FAA Albuquerque and Fort Worth ARTCCs and Cannon Air Force Base would not change, and as such, no impacts to airspace or balloon operations are anticipated under this alternative.

## 3.3 SAFETY

This section addresses practices utilized by personnel associated with CSBF Fort Sumner and CSBF Palestine balloon program activities to ensure the safety of people and property on the ground. Ground safety considers the activities involved with balloon launch ascent and descent. Recovery assesses the activities associated with balloon flight termination and subsequent recovery of the balloon system components (i.e., balloon, payload, and parachute) from the landing sites.

### 3.3.1 Affected Environment

The WFF Safety Office plans, develops, and provides policies and procedures to ensure safety of personnel and civilians during ground and flight activities. A NASA-approved *Balloon Ground Safety Plan*, developed in accordance with NASA's WFF Range Safety Manual (GSFC WFF 2008), assigns the responsibility for implementing the safety procedures for the balloon program to the on-site CSBF Operations Manager. Safety analyses address the following: pre-flight, balloon launch, balloon flight, balloon system failure, balloon flight termination, and recovery activities.

**Ground Activities**

***Pre-flight***. The safety issues associated with this phase of operations are dependent on the type of research to be conducted and the identification of any hazardous materials such as pressure vessels and NASA-approved pyrotechnics that may be involved in the flight operations. A more detailed discussion of procedures for identifying hazardous materials and the handling procedures are provided in Section 3.9, Hazardous Materials and Systems. Based on information provided by the research scientist or student, specific safety procedures would be instituted to assure the safe handling and storage of

hazardous materials. In addition to the evaluation of materials associated with the payload, the CSBF staff would assess the potential risk to people.

Balloons are flown as "acceptable risk" which is a 'Negligible Risk Criteria' of less than 30 x $10^{-6}$ (or 30 in a million). For any mission that would exceed this risk, approval would be required by the WFF Director of Suborbital and Special Orbital Projects (personal communication, Gregory 2010).

***Balloon Launch.*** Helium, a non-toxic, non-flammable gas is used to inflate balloons. While the gas does not pose a health risk, NASA has implemented a policy in which only CSBF personnel are permitted near the balloon prior to balloon inflation and launch. An area extending 3 meters (10 feet) on either side of the payload and balloon up to the spool truck with a 15-meter (50-foot) radius around the center of the spool truck is cleared. The area remains under clearance conditions until the balloon system is released (NASA CSBF 2006b). Weather conditions prior to the launch are also considered. Winds must be blowing in a constant direction with speeds not greater than 10 to 11 kph (6 to 7 mph) up to 60 vertical meters (200 vertical feet) and not greater than 19 kph (12 mph) from 20 to 300 vertical meters (200 to 1,000 vertical feet) (NASA CSBF 2006a). Wind speeds exceeding these conditions could result in damage to the balloon; launches are delayed if such specifications are not met.

***Balloon Flight.*** Balloon flight scheduling is based on conditions necessary for a successful flight, such as seasonal requirements, type of data to be collected, and/or flight duration. Most of the balloon flights are scheduled during one of two campaigns at CSBF Fort Sumner – spring and fall. The spring campaign typically occurs from March to June; the fall campaign usually takes place August to October. It is during these periods that "turnaround" occurs. The turnaround period is optimal for balloon launches because it allows the balloon to stay aloft for a longer period of time thus extending the periods for experimental instruments to collect data.

Launches from CSBF Palestine are scheduled for periods when balloon and payload/parachute would be expected to make landfall over 320 km (200 mi) west of the City of Palestine (NASA CSBF 2006a); launches from CSBF Fort Sumner are also planned for trajectories to the west (NASA CSBF 2009).

While balloons are in flight, the area they cover can be many hundreds of miles. To accommodate this large area, there are three line-of-sight telemetry towers (CSBF Palestine, CSBF Fort Sumner, and the Winslow, Arizona airport) forming overlapping circles of approximately 650 km (350 nautical miles) each. During all phases of balloon system flight operations, contact is maintained by using these communication system towers.

***Balloon System Failure.*** Balloon system failures, while rare, can occur in one of two ways. The first type of failure results from a gradual helium leak in the balloon resulting in failure to fully achieve requirements for a successful mission. The second type of failure occurs when control of the balloon system is diminished due an abrupt opening of the balloon envelope resulting in the immediate release of the parachuted payload. This second type of failure may impede CSBF ground control's ability to predetermine an optimal landing location. However, significant control of the balloon system still exists and the incidental landing location is known. Pre-mission planning utilizes NASA-approved safety

criteria that takes into account both of these failure modes and constrains operation so as to mitigate risk. During flight, ballast can be released to modify the trajectory in order to avoid populated areas and/or special use land management areas (SULMAs). In examining balloons launched over the past 10 years (i.e., 1999 to 2009) from CSBF Fort Sumner and CSBF Palestine, there has been only a single incident when control of the balloon was diminished resulting in a balloon failure (Table 3-2). This incident did not result in injury to people or damage to structures on the ground (personal communication, Gregory 2009).

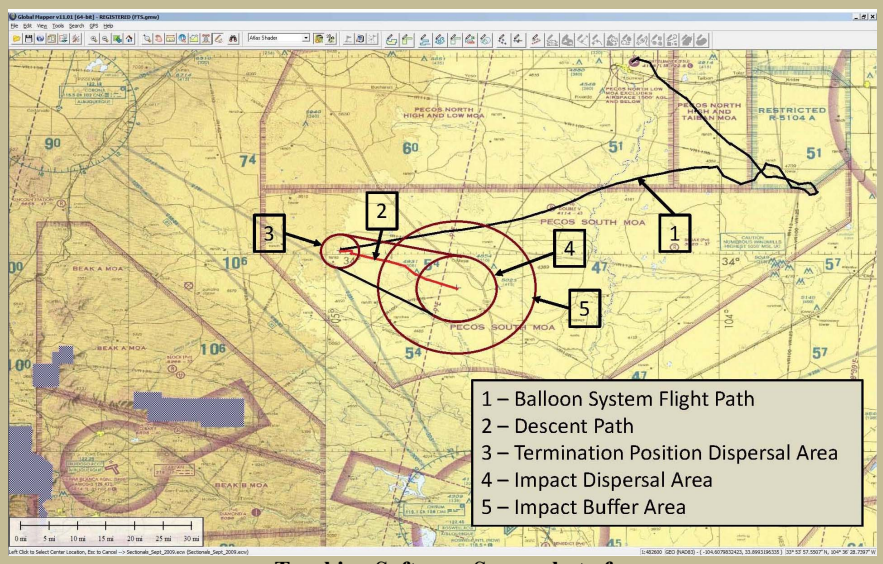
**Table 3-2 Balloon Failure Rates from 1999 to 2009**

| | *Completed Launches* | *Failures* | *Percent Failure* |
|---|---|---|---|
| CSBF Fort Sumner | 90 | 1 | 0.011 |
| CSBF Palestine | 29 | 0 | 0.0 |

*Source*: Personal communication, Gregory 2009

***Balloon Flight Termination***

CSBF staff are able to accurately predict the landing location of the balloon system to within an approximate 9.25 km (5-nautical mile) radius[1]. Models developed by NASA consider the weight of the balloon system (minus the weight of released ballast material), existing wind/weather conditions, and other factors to provide a line of trajectory from the coordinate point that the termination command will be given. Using real-time tracking software, the trajectory of the balloon/payload is overlaid on an aeronautical chart that shows population centers and state and federal SULMAs such as tribal lands; national and state forests and parks; and wilderness areas. The primary goal at balloon flight termination is avoidance of populated areas.




**Tracking Software Screenshot of Predicted Landing Area**

[1] The 9.25 km (5-nautical mile) radius is based on a standard deviation from balloon missions conducted from 1999 to 2009.

NASA CSBF implements standard operating procedures to avoid populated areas (NASA CSBF 2009). These standard operating procedures include:

- The payload impact area is defined as a 9.25 km (5-nautical mile) radius area about the predicted impact point (i.e., payload landing location).
- The buffer area is defined as a 9.25 km (5-nautical mile) ring about the payload impact area, yielding an 18 km (10-nautical mile) radius about the predicted impact point.
- Class 1 towns (population less than 500) may not be directly under the predicted impact point but may be within the payload impact area (9.25 km [5-nautical mile] radius about the landing point).
- Class 2 cities (population 500-4,000) must be outside of the payload impact area but may be within the buffer area (9.25 km [5 nautical-mile] ring about the predicted impact area).
- Class 3 cities (population greater than 4,000) must be outside the buffer area.
- Termination will not be initiated within 3.7 km (2 nautical miles) of any area with a population greater than that of a Class 1 town.

CSBF staff is able to accurately predict the landing location to within an approximate 9.25 km [5-nautical mile] radius using models developed by NASA. As such, population centers and SULMAs can be avoided; this virtually eliminates the potential for injury to people or property. Additionally, improvements have been made to reduce the shock force of a payload hitting the ground.

**Recovery Activities**

Once the balloon system has landed, CSBF staff arrives on site to assess the needs for payload recovery. If the balloon system has landed on private property, or land of which ownership is unclear, CSBF personnel contact the local law enforcement office to determine property ownership, and to request an escort onto the site.

During recovery activities, safety is of paramount concern, as with the other aspects of the balloon mission. Care is taken when disassembling the payload and scientific instrumentation from the gondola to prevent damage to instrumentation and to ensure that no safety risks are incurred. Any substances or instruments that pose specific potential safety hazards are identified early in the balloon flight application process, and are indicated in the ground safety plan. On site recovery teams are made aware of any potential hazards and are equipped with any necessary gear to deal with the unlikely event of a leak or spill, or other unforeseen hazard arising from recovery activities.

### 3.3.2 Environmental Consequences

This assessment of safety examines how the Proposed Action or No Action alternative would affect safety of the CSBF crews and the general public within the CSBF Operations Area (refer to Figure 2-1). Impacts would be considered significant if ground or recovery activities posed a substantial present or potential hazard to human health and safety. NASA BPO and CSBF have extensive regulations and standard safety procedures for launch and recovery activities that ensure protection of the staff and general public.

**Proposed Action**

Safety procedures currently in place for balloon system launch, flight, and termination would continue to be followed. Avoidance of population centers continues to ensure the safety of the general public and protection of property. As noted, over the past 10 years of operations at CSBF Fort Sumner and CSBF Palestine, only one incident occurred in which the balloon did not perform as desired resulting in a mission failure. In addition, CSBF staff would continue to adhere to safety procedures during recovery activities. Increasing the annual number of scientific balloon missions, would not increase concern for the safety of CSBF staff or the general public. CSBF would continue to adhere to procedures to protect the public and staff; therefore the potential risk from implementation of the Proposed Action would be negligible.

**No Action Alternative**

Under this alternative, CSBF balloon launches would not increase; potential impacts to CSBF personnel or the general population would be similar to those described under the Proposed Action, though slightly less since fewer balloon missions would be conducted. Implementing the No Action alternative would not result in increased concerns for the safety of CSBF staff or the general public, as current safety procedures would continue.

## 3.4 AIR QUALITY

Air quality in a given location is described by the concentration of various pollutants in the atmosphere. The significance of the pollutant concentration is determined by comparing it to the federal and state ambient air quality standards. The CAA and its subsequent amendments established the National Ambient Air Quality Standards (NAAQS) for seven “criteria” pollutants: ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter less than 10 and 2.5 microns in diameter, and lead. These standards represent the maximum allowable atmospheric concentrations that may occur while ensuring protection of public health and welfare, with a reasonable margin of safety. Areas that violate a federal air quality standard are designated as non-attainment areas.

The layer of atmosphere closest to the earth’s surface is the troposphere. This layer extends from sea-level to about 18 km (11 mi). The lowest part of the troposphere is referred to as the atmospheric boundary layer. The layer is important in terms of the emission, transport, and dispersion of airborne pollutants. The part of the atmospheric boundary layer between the Earth's surface and the bottom of the inversion layer is known as the mixing layer. Almost all of the airborne pollutants emitted into the ambient atmosphere are transported and dispersed within the mixing layer.

Another factor used in defining the affected environment is mixing height. Mixing height is the upper vertical limit of the volume of air in which emissions may affect air quality. Emissions released above the mixing height become so widely dispersed before reaching ground level that any potential ground-level effects would not be measurable. Emissions of pollutants released below the mixing height may affect ground-level concentrations. The portion of the atmosphere that is completely mixed begins at the earth’s

surface and may extend up to altitudes of a few thousand feet. Mixing height varies from region to region based on daily temperature changes, amount of sunlight, and other climatic factors. An average mixing height of 2,000 meters (6,500 feet) conservatively characterizes the conditions within the CSBF Operations Area. This mixing height was derived from a review of historical data (USEPA 1972).

### 3.4.1 Affected Environment

Helium, used to inflate the balloons, is non-toxic, non-flammable, and has no harmful effects on the earth's environment. The gas exists in small quantities within the earth's atmosphere and is mined from underground pools where it occurs mixed with natural gas deposits. Helium will be released from the balloon during either stratospheric float or at the moment when the balloon flight is terminated.

The ballast of the balloon system provides stability and control of the balloon during ascent. The amount of ballast material required is dependent on the weight of the payload, the size of the balloon, and the required float altitude to collect the scientific data. Ballast, consisting of very fine glass beads (grain size 0.69 mm to 0.84 mm [0.027 to 0.033 inches]) or fine steel shot (grain size 0.3 mm to 0.5 mm [0.012 to 0.020]), can be released to adjust the float altitude of the balloon system (personal communication, Stepp 2009). When releasing ballast, the flow rate is no more than 27.2 kg (60 lbs), per minute, and is normally released in 30 second increments (personal communication, Gregory 2010). The U.S. Environmental Protection Agency (USEPA) regulates particulate matter of size 2.5 and 10 microns (1 micron is equal to 0.001 mm) as these sizes can be easily breathed into the lungs of humans or animals.

Cryogens are substances used for refrigeration purposes, and may be necessary, depending on mission requirements and scientific instrumentation used. Generally, cryogens are used to keep the detectors of scientific instruments very cold, thereby allowing them to be sensitive enough to produce the readings necessary to the scientific mission. Cryogenic liquid helium and nitrogen are used for some CSBF activities. When used, quantities of these substances would vary between 400 to 500 liters (100 to 130 gallons). If exposed to air, these liquids boil-off; the resulting gas is inert and does not have an adverse impact to air quality.

For the purposes of assessing air emissions, only those operations involving the use of ground equipment and vehicles used during balloon system launch and recovery activities are considered. The air quality affected environment for CSBF Fort Sumner is De Baca County; the air quality affected environment for CSBF Palestine is Anderson County. Both counties are in attainment for criteria pollutants.

### 3.4.2 Environmental Consequences

Emission thresholds associated with federal CAA conformity requirements are the primary means of assessing the significance of potential air quality impacts associated with implementation of a Proposed Action. A formal conformity determination is required for federal actions occurring in nonattainment or maintenance areas when the total direct and indirect stationary and mobile source emissions of criteria pollutants or their precursors exceed *de minimis* thresholds. In addition, a formal conformity determination is required for actions defined as regionally significant (i.e., if the total emissions from a federal action exceed 10 percent of a nonattainment area's emission inventory for that pollutant).

If the project emissions would exceed any of the thresholds described above, further analysis of the emissions and their consequences would be performed to assess whether there was a likelihood of adverse impacts on air quality and a conformity analysis was required. The nature and extent of such an analysis would depend on the specific circumstances. For example, the analysis could range from a more detailed and precise examination of the likely emitting activities and equipment to air dispersion modeling analysis. If project emissions were determined to increase ambient pollutant levels from below to above a national or state ambient air quality standard, those emissions would be considered significant.

**Proposed Action**

CSBF Fort Sumner is located in De Baca County, an area in attainment for all NAAQS. The Proposed Action could increase vehicular trips to CSBF Fort Sumner by CSBF Palestine staff travelling to the site where they would remain during the spring and fall campaigns as well as the transport vehicles used during the launch activities. Emissions from vehicular traffic associated with balloon launch activities would be considered minimal. Implementing the Proposed Action would not perceptibly change air emissions within De Baca County. Emissions from vehicular traffic associated with balloon launch activities at CSBF Palestine would not change as no increase in balloon launches is proposed; therefore, air quality within Anderson County under the Proposed Action would remain at *status quo*. The small increase in recovery vehicle traffic (i.e., a modified flatbed truck, private vehicle, and small plane) resulting in approximately 30 round trips annually would not perceptibly changed air quality within the CSBF Operations Area.

No emissions of any criteria pollutants would occur at high altitudes, as there would be no sources to produce them. Motorized equipment utilized by the payload to collect scientific data would all be battery powered. The balloon system would be terminated in the upper atmosphere and release helium well above the atmospheric mixing layer which would not present any impacts within the near earth environment. Although rarely performed, should all the ballast be released at one time, it would travel in the upper atmospheric winds and be dispersed over hundreds of miles. The particle size of the glass beads and steel shot exceeds 10 microns, and as such, neither of these materials is regulated by the USEPA. Overall, no perceptible change in air emissions would be anticipated from implementation of the Proposed Action.

**No Action Alternative**

Negligible impacts to air quality would be anticipated under the No Action alternative. Existing conditions would remain unchanged; therefore, the negligible impacts to air quality from existing CSBF scientific balloon activities would remain at *status quo*.

## 3.5 SOCIOECONOMICS

Socioeconomics is defined as the social and economic activities associated with the human environment, particularly population and typically encompasses employment, personal income, and industrial growth. Socioeconomics for this PEA focus on the general features of the local economies of Fort Sumner, New Mexico and Palestine, Texas that could be affected by the Proposed Action or No Action alternative.

### 3.5.1 Affected Environment

Fort Sumner Village is located within De Baca County, New Mexico; Palestine is located within Anderson County, Texas. Therefore, the region of influence for each of these locations is the county in which they reside. Socioeconomic data for the states of New Mexico and Texas are also provided as a general comparison.

The Census 2000 data represents the best available data at this time in which to make comparisons between Fort Sumner Village and the City of Palestine and the counties De Baca and Anderson since *2006-2008 American Community Survey* data is not available for these locations.

**Fort Sumner Village**

***Population.*** Fort Sumner Village is the county seat of De Baca County, New Mexico. As shown in Table 3-3, Fort Sumner accounted for approximately 56 percent of the county population in 2000. The population of Fort Sumner experienced a decrease of 2.7 percent from 1990 to 2000 while De Baca County experienced a decrease of less than 1 percent in population. By comparison, the population of the State of New Mexico saw a population increase of roughly 20 percent (USCB 2000).

**Table 3-3 Fort Sumner Village Population (Census 2000)**

| Geographic Area | 1990 Population[1] | 2000 Population[1] | Percent Change (1990 to 2000) |
|---|---|---|---|
| Fort Sumner Village | 1,283[2] | 1,249 | -2.7 |
| De Baca County | 2,252 | 2,240 | -0.5 |
| State of New Mexico | 1,515,069 | 1,819,046 | 20.1 |

*Sources:* [1]U.S. Census Bureau, 2000 Census (USCB 2000)
[2] New Mexico Population Estimates (New Mexico 2000)

***Income and Employment.*** The median household income for Fort Sumner Village in 2000 was $19,583; De Baca County was $25,441. Both compare much less than the State of New Mexico which reported a median household income of $34,133. In 2000, median family income for Fort Sumner Village was $28,625; less than that of De Baca County ($32,870) and much less than the $39,425 reported for the State of New Mexico (USCB 2000).

In 2000, the three largest industries in De Baca County with respect to employment were educational and health services (21 percent), retail (16 percent), and public administration (15 percent). By comparison, the three largest industries in the State of New Mexico were educational and health services (19 percent), retail (12 percent), and manufacturing (12 percent) (USCB 2000).

**City of Palestine**

***Population.*** The City of Palestine, Texas is the seat of Anderson County. As shown in Table 3-4, the city accounted for approximately 32 percent of the county population in 2000. The population of the City of Palestine experienced a decrease of 2.5 percent from 1990 to 2000 while Anderson County had a nearly 15 percent increase in population during the same period. By comparison, the population of the State of Texas increased by nearly 23 percent (USCB 2000).

| Table 3-4 City of Palestine Population (Census 2000) | | | |
|---|---|---|---|
| **Geographic Area** | **1990 Population[1]** | **2000 Population[1]** | **Percent Change (1990 to 2000)** |
| City of Palestine | 18,042[2] | 17,598 | -2.5 |
| Anderson County | 48,024 | 55,109 | 14.8 |
| State of Texas | 16,986,510 | 20,851,820 | 22.8 |

*Sources*: [1]U.S. Census Bureau, 2000 Census (USCB 2000)
[2] City of Palestine Master Plan, 1997 (City of Palestine 1997)

***Income and Employment.*** The median household income for the City of Palestine in 2000 was $30,497; Anderson County was slightly higher with $31,957. By comparison, both were much less than the State of Texas ($39,927). In 2000, median family income for the City of Palestine was $35,807; again, slightly less than Anderson County ($37,513) and much less than the $45,861 reported for the State of Texas (USCB 2000).

In 2000, the three largest industries in Anderson County with respect to employment were educational and health services (21 percent), retail (16 percent), and public administration (15 percent). By comparison, the three largest industries in the State of Texas were educational and health services (19 percent), retail (12 percent), and manufacturing (12 percent) (USCB 2000).

### 3.5.2 Environmental Consequences

Thresholds for significant impacts to socioeconomics are specific to the capacity of the affected area to accommodate and respond to economic and social change. The primary focus for the socioeconomic analysis is related to the short-term influx of CSBF personnel and researchers/students who would be expected to arrive during seasonal balloon launch campaigns.

**Proposed Action**

***Fort Sumner Village***

Under the Proposed Action, NASA BPO would increase the number of balloon launches at CSBF Fort Sumner from 15 to 25 each year (refer to Table 2-1). The increased launches would occur during each of the two balloon mission campaign periods (March to June; August to October). At the start of each campaign, up to 15 CSBF personnel from Palestine would arrive and remain in Fort Sumner Village for up to 8 weeks. In addition, up to 40 research scientists/students would transition into Fort Sumner Village for up to 6 weeks as they ready their scientific instruments. While in Fort Sumner Village, the CSBF staff and research scientists/students would purchase food, supplies, and lodging. Estimates for lodging, meals, and incidentals for CSBF staff and research scientists/students staying in Fort Sumner Village in 2010 would total nearly $470,000 (GSA 2009). While these are only estimates of revenue potentially generated during the balloon campaign periods, overall, the Proposed Action would provide a beneficial impact to the community. Fort Sumner Village has an adequate supply of restaurants and lodging accommodations to meet the needs of the CSBF staff and research scientists/students.

***City of Palestine***

Balloon launches at CSBF Palestine generally occur between June and August. An average of 4 research scientists/students is associated with each of the 6 balloon missions conducted each year, on average. The research scientists/students would arrive and remain in Palestine for up to 4 weeks. While in Palestine, the research scientists/students would purchase food, supplies, and lodging. Estimates for lodging, meals, and incidentals for research scientists/students staying in Palestine in 2010 would total nearly $78,000 (GSA 2009). The City of Palestine has an adequate supply of restaurants and lodging accommodations to meet the needs of the research scientists/students. NASA BPO would not increase balloon launches from CSBF Palestine under this proposal. As such, the socioeconomic impact to the City of Palestine would be negligible.

**No Action Alternative**

Socioeconomic resources would not be affected by implementation of the No Action alternative, since baseline conditions would remain unchanged. The short-term economic benefits experienced by Fort Sumner Village and the City of Palestine from balloon campaigns would remain unchanged under this alternative.

## 3.6 LAND USE

The CSBF Operations Area encompasses a vast portion of the south central and southwestern U.S., within Arizona, Colorado, Kansas, New Mexico, Oklahoma, and Texas. Within this large region, lands are managed for a variety of purposes and by a number of agencies, both federal and state. Land use is included in this PEA because landing and recovering a payload on these lands, may conflict with the management strategies set forth by the managing agency. For the purposes of this PEA, the land within the CSBF Operations Area has been divided into SULMAs. These are areas that: (1) are owned and governed by Native Americans; (2) are dedicated to outdoor recreation; or (3) are under the stewardship of federal or state governments for the study or preservation of the lands and their environments. The following SULMAs were identified and analyzed in this PEA. Figure 3-1 shows the land coverage of the SULMAs.

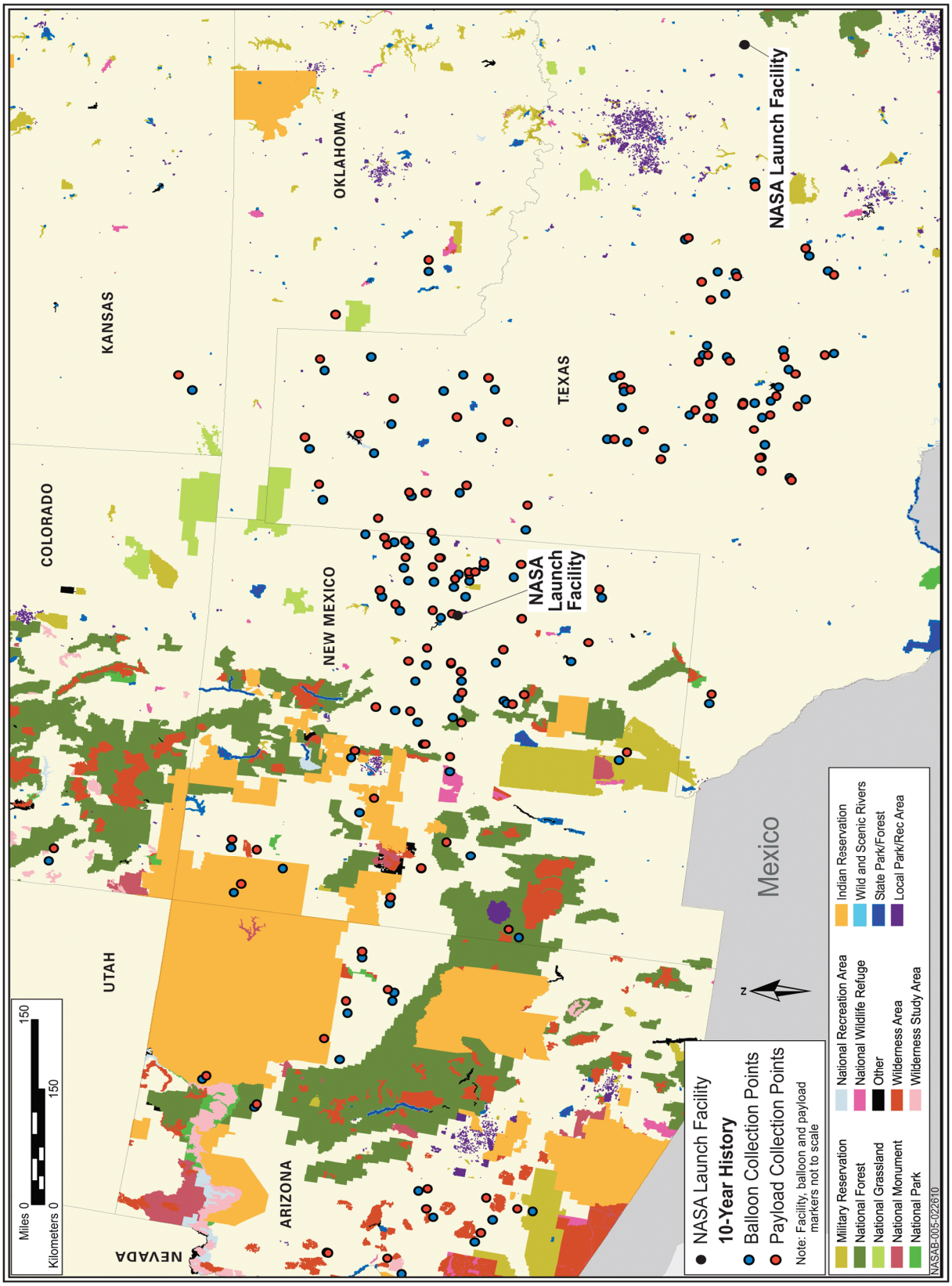



**Figure 3-1 SULMAs within the CSBF Operations Area**

***Indian Reservations.*** An Indian reservation is an area of land managed by a Native American tribe under the United States Department of the Interior's Bureau of Indian Affairs. These lands are reserved for a tribe or tribes under treaty or other agreement with the U.S., executive order, or federal statute or administrative action as permanent tribal homelands, and where the federal government holds title to the land in trust on behalf of the tribe (Bureau of Indian Affairs 2009).

***Military Reservations.*** Military reservations are areas that are federally owned that are operated by the Department of Defense, and may include military installations or training ranges. Generally these lands are not managed for any specific conservation purpose, but are noteworthy due to their size. Access to these lands is usually heavily restricted.

***National Forests.*** A National Forest is defined as a unit of forest land formally established by Congress that is managed by the U.S. Department of Agriculture (USDA) Forest Service. National Forests are part of the National Forest System that includes National Forests, National Grasslands (see below), and various other designated lands managed by the Forest Service. National Forests are administered for sustained yields of multiple uses including outdoor recreation, livestock grazing, timber harvesting, watershed protection, and fish and wildlife habitats (Vincent 2004).

***National Grasslands***. National Grasslands are defined as a unit of grass land designated by the Secretary of Agriculture, and permanently held by the Department of Agriculture under Title III of the Bankhead-Jones Farm Tenet Act. National Grasslands are managed by the USDA Forest Service and are administered with the same multi-purpose goals as National Forests (see above).

***National Parks.*** National Parks are land areas that have been designated by Congress as having nationally significant natural, cultural, or recreational resources. National Parks are part of the National Parks System and are managed by the National Parks Service. These lands are managed with the contradictory mission of facilitating access and serving visitors while protecting and preserving the natural, historic, and cultural integrity of the lands and resources managed by the National Park Service (Vincent 2004).

***National Monuments.*** National Monuments are part of the National Park System, and are generally smaller land areas created to protect historic, scientific, or natural features containing fewer diverse resources than National Parks. These monuments are created by an Executive Order, under the authority of the Antiquities Act of 1906. National Monuments are managed by the National Park Service and are managed with the same intent and goals of National Parks (National Parks Service 2009a).

***National Recreation Areas.*** Authority to designate land a National Recreation Area was created by Federal Executive Branch Policy in 1968 (National Park Service 2009b). These areas are protected to provide the general public with ample natural areas for recreation and use by large numbers of people. These areas are designated by Congress and may be managed by the various federal agencies within the Department of the Interior and the USDA.

***National Wildlife Refuges.*** National Wildlife Refuges are generally large areas of natural land that are designated as protected by Congress and are part of the National Wildlife Refuge System. These lands are primarily for the conservation of animals and plants, but other uses such as hunting, fishing, recreation,

timber harvest, and grazing may be permitted only to the extent that they are compatible with the purposes for which the refuge was created (Vincent 2004). National Wildlife Refuges are managed by various agencies within the Department of the Interior.

***State Forests.*** State Forests are similar to National Forests, but are managed by the individual states. Generally, State Forests are managed for timber harvest by that state's forestry department or other agency. In the southwest U.S., many state forestry departments are responsible for wildfire prevention, and management of state forests makes up a large portion of these activities. Regulations and goals for state forests vary from state to state, but are generally managed to conserve an important state resource in the best interest of the public.

***State Parks.*** State Parks are similar to National Parks, but are designated and managed by the individual states. As such, the regulatory agencies, regulations, and goals for state parks vary from state to state, but they are generally managed to conserve an important state resource and to allow use by the general public for recreational purposes.

***State Recreation Areas.*** State Recreation Areas are areas designated such by an individual state that are to be managed and utilized for recreational activities of the general public. These areas generally are located around large reservoirs and promote recreational use of the reservoir and surrounding lands, but may be any land fitting the individual state's criteria for such a designation.

***Wild and Scenic Rivers.*** Wild and Scenic Rivers are rivers with outstanding natural, cultural, and recreational values in a free-flowing condition, that are designated as protected by Congress, or in certain circumstances the Secretary of the Interior, under the jurisdiction of the National Wild and Scenic River Systems Act of 1968, as amended. Boundaries of these rivers generally average one-quarter mile on either bank (Wild and Scenic Rivers 2009).

***Wilderness Areas.*** Wilderness Areas are wildlands that have been designated protected by Congress under the Wilderness Act of 1964. These lands are managed within the National Wilderness Preservation System. Generally, these lands are undeveloped federal land without permanent improvements that are primarily affected by the forces of nature, relatively untouched by human activities, and primarily valued for solitude and primitive recreation. Tracts of land eligible generally are more than 2,000 hectares (5,000 acres) that can be managed to maintain their pristine condition (Vincent 2004). Wilderness Areas are managed by the various agencies of the Department of the Interior.

***Wilderness Study Areas.*** Wilderness Study Areas are similar to Wilderness Areas, but have not yet been officially designated as such by Congress. These areas are still wildlands, but are undergoing review to determine if they qualify to be included in the National Wilderness Preservation System. These areas are managed by the Department of the Interior, and its agencies, but since they are not designated lands, some activities not allowed in Wilderness Areas, may be allowed in Wilderness Study Areas.

***Other Managed Areas.*** This category includes managed areas that do not fall within the above categories such as National Conservation Areas, National Lakeshore Areas, National Preserve, National Historic Sites, or other federally owned lands.

### 3.6.1 Affected Environment

***CSBF Fort Sumner***

CSBF Fort Sumner is located at the Fort Sumner Municipal Airport. The village of Fort Sumner lies to the southwest, with lands immediately surrounding the CSBF facility being generally vacant, and privately owned. Little agricultural land is in the immediate vicinity. The lands immediately around Fort Sumner do not fall into any of the SULMA categories previously described.

***CSBF Palestine***

CSBF Palestine is located just west of the Palestine Municipal Airport. To the east, lies the town of Palestine. Immediately surrounding the launch facility are wooded lands and agricultural fields. This land is predominately privately owned. As with Fort Sumner, SULMAs do not exist immediately around the Palestine launch facility.

***CSBF Operations Area***

Within the CSBF Operations Area, there are many acres of the managed lands described above (Figure 3-1). Understanding the management strategies and why this land is protected can assist CSBF on deciding where to potentially land a balloon system. Areas of managed land that are sensitive may require specific recovery techniques to minimize disturbance to the natural environment (i.e. helicopter recovery). In general, avoidance of many of these land classifications is already standard procedure by CSBF, with avoidance usually facilitating rapid balloon and payload recovery. Table 3-5 shows the various land management areas, their acreages, and which agency is responsible for management of the lands within the CSBF Operations Area. In some cases, multiple agencies may manage different aspects of the same lands. For instance, in Wilderness Areas, the Forest Service may manage the land, but the Bureau of Land Management may oversee any mineral or mining activity on that land.

**Table 3-5 SULMAs within the CSBF Operations Area**

| Type | Managing Agency | Land Area within CSBF Operations Area in hectares (acres) |
|---|---|---|
| Indian Reservation | Bureau of Indian Affairs | 11,576,192 (28,605,394) |
| Military Reservations | Department of Defense | 3,515,187 (8,686,216) |
| National Forests | Forest Service | 13,317,652 (32,908,367) |
| National Grassland | Forest Service | 1,322,894 (3,268,942) |
| National Parks | National Park Service | 677,984 (1,675,335) |
| National Monuments | National Park Service | 705,924 (1,744,376) |
| National Recreation Areas | National Parks Service | 254,636 (629,220) |
| National Wildlife Refuges | Various Department of Interior Agencies | 586,748 (1,449,885) |
| State Forests/Parks | Varies by State | 436,816 (1,079,395) |
| Local Parks/Recreation Areas | Varies by State | 232,456 (574,411) |

| Table 3-5 SULMAs within the CSBF Operations Area (cont.) | | |
|---|---|---|
| **Type** | **Managing Agency** | **Land Area within CSBF Operations Area in hectares (acres)** |
| Wild and Scenic Rivers | Various Department of Interior Agencies | 50,796 (125,519) |
| Wilderness Areas | Various Department of Interior Agencies | 3,905,524 (9,650,761) |
| Wilderness Study Areas | Various Department of Interior Agencies | 792, 840 (1,959,150) |
| Other | Other | 377, 048 (931,705) |
| **Total** | | **37,752,698 (93,288,946)** |

*Source:* National Atlas 2009

National Forests make up approximately 35 percent of the managed lands within the CSBF Operations Area. CSBF generally avoids National Forest because of the ruggedness of the land, and general lack of infrastructure (i.e., roads) making payload recovery difficult. Indian Reservations occupy approximately 31 percent of the total managed acreage, especially in Arizona and northwestern New Mexico. Historically, CSBF Operations have only landed payloads within Tribal lands on ten occasions within the past decade. Tribal lands are generally avoided, which prevents any unnecessary cultural impacts within these lands. Cultural Resources are discussed further in Section 3.7.

Wilderness Areas and Military Reservations each make up approximately 10 percent of the total managed land areas within CSBF Operations Area. These areas are also generally avoided for landing and recovery activities. Military Reservations generally have very strict access requirements and are therefore not convenient landing areas, as recovery efforts may become problematic. Wilderness Areas do not necessarily have access restrictions, but are generally devoid of any infrastructure, making recovery from these areas potentially difficult. CSBF staff makes all practicable efforts to limit any activities within these lands. The remaining land classifications make up only small portions of the managed lands within the CSBF Operations Area.

When comparing managed lands within the affected states, Texas has exceptionally little managed land. Within the state of Texas, approximately 94 percent of all land area is privately owned, with the remainder belonging to federal, state, and local governments (Schmidly, Parker, and Baker 2001). Private lands require land owner permission to retrieve the payload.

### 3.6.2 Environmental Consequences

While compatibility standards for land use exist, no specific thresholds or significance criteria for land use have been established under NEPA. Land use impacts, therefore, were analyzed qualitatively for the potential degree of change from baseline conditions within the affected acreage of specific land use designation. To evaluate such changes and their magnitude of impact, the analysis will consider the amount land disturbance could occur, and how that disturbance may affect managed lands within the CSBF Operations Area.

**Proposed Action**

***CSBF Fort Sumner and CSBF Palestine***

Increasing operations would pose no change to land use at either of the launch facilities, as there are no plans for construction under this proposal.

***CSBF Operations Area***

Increasing operations at CSBF would increase the chances of a payload landing within any of the managed lands within the Operations Area. This increase in payload landing and recovery would not constitute a serious land use impact to any of the managed lands within the area. Recovery efforts generally are complete within 24 hours, but may require longer depending on circumstance (i.e., ease of access to landing site, finding landowner to grant access, etc.). All efforts are made to quickly recover balloon and payload; therefore, no long-lasting effects would occur from landing and recovery activities. No change in land use management strategies would be required due to increased operations at CSBF.

General CSBF policy dictates that if private property is damaged reparations are made through on-site negotiations with the landowner. Even though Texas is mostly private land, the same considerations are given to avoid land use impacts, just as with the other states within the CSBF Operations Area (Figure 3-1). Operationally, certain lands would continue to be avoided to ensure sensitive lands are not affected by any CSBF activities. Lands avoided would be Indian Reservations, National Forest, National Parks, Wilderness Areas, and Military Reservations. These lands are avoided primarily to ease recovery efforts, and to reduce the possibility of any adverse effects, however unlikely. Should a balloon/payload land within a SULMA, or on private land, the land manager/landowner would be contacted for permission to enter the property. If contact with the land manager/landowner cannot be obtained, CSBF would request escort onto the property by local law enforcement. Only after authorization is granted or escort provided would the CSBF recovery team access the site. Additionally, the New Mexico Office of the Bureau of Land Management has expressed concerns with off-road vehicle use around the Roswell, New Mexico area, which is designated as “limited use” for off-road vehicles. These lands are generally avoided, but if a landing did occur within the “limited use” area, the New Mexico Office of the Bureau of Land Management would be contacted prior to accessing the landing site, per CSBF policy.

**No Action Alternative**

Under the No Action alternative, there would be no increase in operations at either CSBF facility. Impacts would be similar to the Proposed Action, but slightly less due to fewer balloon flights. Operations would continue as they have for the past 25 years, with the same emphasis on avoiding sensitive lands that have been utilized in the past. Adverse impacts from the No Action alternative are unlikely.

## 3.7 BIOLOGICAL RESOURCES

Biological resources encompass plant and animal species and the habitats within which they occur. Biological resources for this PEA include vegetation, wildlife, special-status species, and water.

*Vegetation* includes all existing upland terrestrial plant communities and submerged aquatic vegetation, with the exception of special-status species. The affected environment for vegetation includes both CSBF launch facilities and the entire CSBF Operations Area.

*Wildlife* includes all vertebrate and invertebrate animals with the exception of those identified as threatened or endangered or sensitive, which are discussed separately. Fish, amphibians, reptiles, birds, mammals, and invertebrates are defined as wildlife. The affected environment for wildlife also encompasses both launch facilities and the CSBF Operations Area.

*Special-Status Species* are defined as those plant and animal species listed as threatened, endangered, or proposed as such by the U.S. Fish and Wildlife Service (USFWS). The federal ESA protects federally listed, threatened, and endangered plant and animal species. Species of concern are not protected by the ESA; however, these species could become listed and protected at any time. Their consideration early in the planning process could avoid future conflicts that might otherwise occur.

*Water* resources refer to surface and subsurface water, including lakes, ponds, rivers, streams and wetlands that exist at the launch facilities and within the CSBF Operations Area. Subsurface water, commonly referred to as groundwater, is found in areas known as aquifers. Groundwater is typically recharged during precipitation events and is withdrawn for domestic, agricultural, and industrial purposes. The CWA of 1972 is the primary federal law that protects the nation's waters, including lakes, rivers, aquifers, and coastal areas. The primary objective of the CWA is to restore and maintain the integrity of the nation's waters.

### 3.7.1 Affected Environment

***CSBF Fort Sumner***

The Fort Sumner launch facility is the remnants of an Army Air Corps training facility utilized during World War II, and the adjacent municipal airport. The property is essentially an airfield, mostly consisting of concrete runways, and launch support structures. The natural environment at the facility would be characterized as developed with the surrounding lands being desert scrub. Within the facility boundaries, vegetation is maintained through mowing. Wildlife species that may occur here are those that can co-exist with the operational activities of CSBF. There are no known special-status species or important water resources that occur on the Fort Sumner facility.

***CSBF Palestine***

The launch facility at CSBF Palestine is similar in nature to the Fort Sumner facility, in that it is sited adjacent to the Palestine Municipal Airport. Within the facility boundary, there is a mix of open and forested land. Open lands are kept mowed, and sometimes hayed to provide for local farmers. Forested land is maintained, but unmanaged. As with Fort Sumner, wildlife species here would be ones that could live within a relatively developed environment and can co-exist with CSBF operational activities. There are no known special-status species or important water resources on the Palestine facility.

### *CSBF Operations Area*

Due to the vast size and ecological variation that occurs within the CSBF Operations Area, it becomes cumbersome and less meaningful for planning purposes to attempt to describe all biological resources individually. Exhaustive lists for such resources would be extremely long and varied, as the land occupied within the Operations Area is diverse in nature, transitioning from oak savannas in central Texas, to desert in south western Arizona, and from flat plains and grasslands in the south, to the Rocky Mountains in the north. Instead, to streamline this PEA and present the information in a more usable format, eco-regional descriptions are used.

Eco-regions denote areas of similar ecosystems in type, quality, and quantity of environmental resources (USEPA 2009). The eco-region framework was developed by Omernik (1987) and further refined with collaboration with USEPA. These classifications were developed to aid in environmental planning strategy for landscape level management activities. The individual eco-regions were identified through the analysis and patterns of the composition of biotic and abiotic phenomena that affect or reflect differences in ecosystem quality and integrity (Wiken 1986; Omernik 1987, 1995). There are four levels of eco-region classification, each corresponding to the level of coarseness for habitat that is encompassed within that level. The following is a brief description of the four levels of classification.

- Level I – Coarsest level, divides North America into 15 individual ecological regions
- Level II – The 15 ecological regions from Level I are subdivided into 52 different ecological regions
- Level III – Further subdivision of the Level II regions, into 120 different ecological regions
- Level IV – Finest level of detail; further subdivides Level III regions into more specific localized ecological regions; as of this writing this classification is not complete for all of North America

For the purposes of this PEA, the Level III ecological regions will be described for the two launch facilities and Operations Area utilized by CSBF. The classifications generally describe topography and vegetation characteristics for these areas. Wildlife, water resources, and special status species will be discussed separately.

### *Eco-Regions within the CSBF Operations Area*

There are a total of 16 different Level III eco-regions found within the CSBF Operations Area. The area encompasses east-central Texas west to the Arizona/California border, and from the U.S./Mexican border north to southwestern Colorado (Figure 3-2). Eco-region descriptions are provided in Table 3-6.

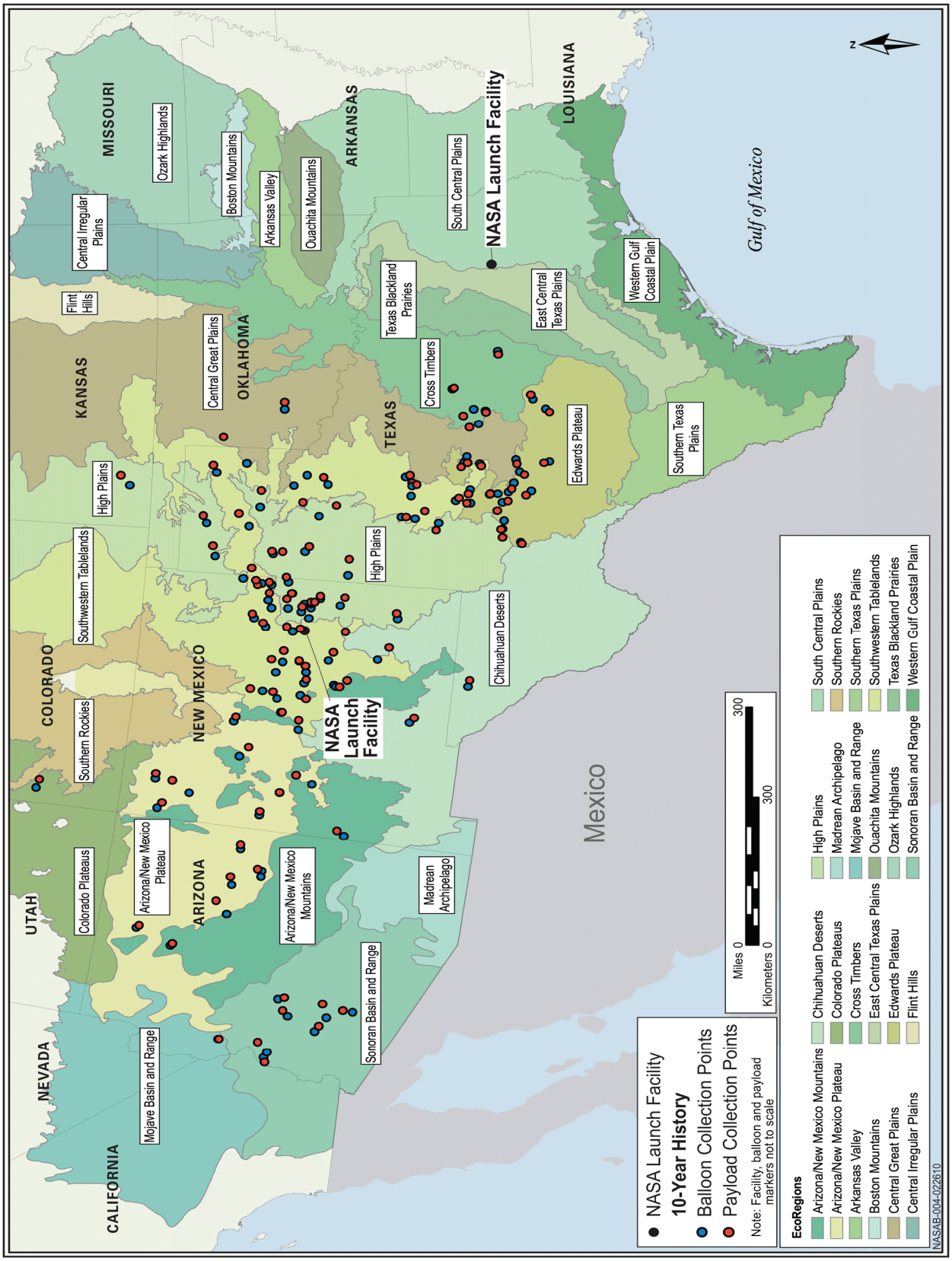



**Figure 3-2 Ecological Regions within the CSBF Operations Area**

| Table 3-6 Eco-Regions within the CSBF Operations Area | |
|---|---|
| **Name** | **General Description** |
| Mojave Basin and Range | Contains scattered mountains which are generally lower than those of the adjacent Central Basin and Range. Potential natural vegetation in this region is predominantly creosote bush, as compared to the mostly saltbush-greasewood and Great Basin sagebrush of the eco-region to the north, and creosote bush-bur sage with large patches of palo verde-cactus shrub and saguaro cactus in the Sonoran Basin and Range to the south. Most of this region is federally owned and there is relatively little grazing activity because of the lack of water and forage for livestock. General desert fauna are found here including pocket mice, kangaroo rats, a variety of desert reptiles, including the desert tortoise, and some larger mammals such as desert big horn sheep in mountainous areas. Heavy use of off-road vehicles and motorcycles in some areas has caused severe wind and water erosion problems. |
| Colorado Plateaus | Rugged tableland topography is typical of this eco-region. Canyons, mesas, plateaus, and mountains are common. Precipitous side-walls mark abrupt changes in local relief, often from 300 to 600 meters (1,000 to 2,000 feet). The region is more elevated than the Wyoming Basin to the north and therefore contains far greater extent of pinyon-juniper and Gambrel oak woodlands. The region also has large low lying areas containing salt-brush-greasewood (typical of hotter, drier areas), which are generally not found in the higher Arizona/New Mexico Plateau to the south where grasslands are common. |
| Southern Rockies | This eco-region is composed of high elevation, steep rugged mountains. Although coniferous forests cover much of the region, as in most of the mountainous regions in the western U.S., vegetation, as well as soil and land use follows a pattern of elevational banding. The lowest elevations are generally grass or shrub covered and heavily grazed. Low to middle elevations are also grazed and covered by a variety of vegetation types including Douglas fir, ponderosa pine, aspen, and juniper oak woodlands. Middle to high elevations are largely covered by coniferous forest and have little grazing activity. The highest elevations have alpine characteristics. Numerous perennial mountain streams with deciduous riparian vegetation support coldwater fisheries and serve as wildlife corridors. |
| Arizona/New Mexico Plateau | Represents a large transitional region between the semiarid grasslands and low relief tablelands of the Southwestern Tablelands in the east, the drier shrublands and woodland covered higher relief tablelands of the Colorado Plateau in the north, the lower, hotter, less vegetated Mojave Basin and Range in the west, and Chihuahuan Deserts in the south. Higher, more forest covered, mountainous eco-regions border the region on the northeast and southwest. Local relief in the region varies from a few meters on plains and mesa tops to well over 300 meters (1,000 feet) along tableland side slopes. Gunnison prairie dogs are a keystone species in many of the sage brush ecosystems, and their burrows provide habitat for many other wildlife species including burrowing owls, weasels, badgers, and snakes. |
| Arizona/New Mexico Mountains | This mountain eco-region is distinguished from neighboring mountainous eco-regions by its lower elevations and an associated vegetation indicative of drier warmer environments, which is also due in part to the region's more southerly location. Forests of spruce, fir, and Douglas fir, that are common in the Southern Rockies and the Uinta and Wasatch Mountains, are only found in a few high elevation parts of this region. Chaparral is common in the lower elevations, pinyon-juniper and oak woodlands are found on lower and middle elevations, and higher elevations are mostly covered with open to dense ponderosa pine forests. These mountains are the northern extent of some Mexican plant and animal species, and since they are surrounded by deserts or grasslands, can be considered biogeographical islands. |
| Chihuahuan Deserts | This desert eco-region extends from the Madrean Archipelago in southeastern Arizona to the Edwards Plateau in south-central Texas. The region comprises broad basins and valleys bordered by sloping alluvial fans and terraces. Isolated mesas and mountains are located in the central and western parts of the region. Outside the major river drainages, such as the Rio Grande and Pecos River, the landscape is largely internally drained. Vegetative cover is predominantly arid grass and shrubland, except on the higher mountains where oak-juniper woodlands occur. The extent of desert shrubland is increasing across lowlands and mountain foothills due to gradual desertification caused in part by historical grazing pressure. |

| Table 3-6 Eco-Regions within the CSBF Operations Area (cont.) | |
|---|---|
| **Name** | **General Description** |
| Western High Plains | Higher and drier than the Central Great Plains to the east, and in contrast to the irregular, mostly grassland or grazing land of the Northwestern Great Plains to the north, much of the Western High Plains comprises smooth to slightly irregular plains having a high percentage of cropland. Grama-buffalo grass is the potential natural vegetation in this region as compared to mostly wheatgrass-needlegrass to the north, and Trans-Pecos shrub savanna to the south, and taller grasses to the east. The northern boundary of this ecological region is also the approximate northern limit of winter wheat and sorghum and the southern limit of spring wheat. Thousands of playa lakes (seasonal depressional wetlands) occur in this area, many serving as recharge areas for the important Ogallala Aquifer. These playa lakes are essential for waterfowl during their yearly migration along the Central Flyway of North America. Oil and gas production occurs in parts of this region. |
| Southwestern Tablelands | Unlike most adjacent Great Plains ecological regions, little of the Southwestern Tablelands is in cropland. Much of this elevated tableland is in sub-humid grassland and semiarid range land. The potential natural vegetation in this region is grama-buffalo grass with some mesquite-buffalo grass in the southeast and shinnery (midgrass prairie with open areas and low shrubs) along the Canadian River. |
| Central Great Plains | This eco-region is slightly lower in elevation, receives more precipitation, and is somewhat more irregular than the Western High Plains to the west. Once grassland, with scattered low trees and shrubs in the south, much of this eco-region is now cropland. The eastern border of this region marks the eastern limits of the major winter wheat growing area of the US. |
| Central Oklahoma/Texas Plains (Cross Timbers) | This eco-region is a transition area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains of eastern Oklahoma. The region does not possess the arability and suitability for crops such as corn and soybeans that are common in the Central Irregular Plains to the northeast. Transitional "cross timbers" (little bluestem grassland with scattered blackjack oak and post oak trees) is native vegetation, and presently rangeland pastureland comprises the predominant land cover. Oil extraction has been a major activity in the region for over 80 years. |
| Edwards Plateau | The eco-region is largely a dissected plateau that is hillier in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. The region contains a sparse network of perennial streams, but they are relatively clear and cool compared to those of surrounding areas. Originally covered by juniper-oak savannas and mesquite-oak savanna, most of the region is used for grazing beef cattle, sheep, goats, and wildlife. Combined with topographic gradients, fire was once an important factor in controlling vegetation patterns here. Hunting leases are a major source of income. |
| Texas Blackland Prairies | Texas Blackland Prairies is a disjunct eco-region distinguished from surrounding regions by its fine textured clayey soils and predominantly prairie potential natural vegetation. This region now contains a higher percent of cropland than adjacent regions, although much of the land has been recently converted to urban and industrial uses. Dominant natural grasses included little bluestem, big bluestem, yellow Indian grass, and switchgrass. Typical game species include mourning dove and northern bobwhite quail on uplands and eastern fox squirrel along stream bottomlands. |
| East Central Texas Plains | Also called the Claypan Area, this region of irregular plains was originally covered by a post oak savanna vegetation, in contrast to the more open prairie-type regions to the north, south, and west and the piney woods to the east. Much of this area has dense underlying clay pan soil affecting water movement and water availability for plant growth. The bulk of this region is now used for pasture and range. |
| South Central Plains | Locally termed the "piney woods" this region of mostly irregular plains was once blanketed by oak-hickory-pine forests, but is now predominately loblolly and shortleaf pine. Only about one sixth of the region is in cropland, whereas about two thirds is in forests and woodland. Lumber and pulpwood production are major economic activities. |

| Table 3-6 Eco-Regions within the CSBF Operations Area (cont.) | |
|---|---|
| **Name** | **General Description** |
| Madrean Archipelago | Also known as the Sky Islands, this is a region of basins and ranges with medium to high local relief, typically 1000 to 1500 meters (3000 to 5000 feet). Native vegetation is mostly grama-tobosa shrubsteppe in the basins and oak-juniper woodlands on the ranges, except the higher elevation where ponderosa pine is predominant. This region is ecologically significant as a barrier and bridge between two major cordilleras of North America: the Rocky Mountains and the Sierra Madre Occidental. Animal species here would include those common to the Rocky Mountains, including large ungulate/ruminant mammals, large carnivorous mammals, as well as many smaller species adapted to the region. |
| Sonoran Basin and Range | Similar to the Mojave Basin and Range to the north, this eco-region contains scattered low mountains and has large tracts of federally owned land, most of which is used for military training. However, the Sonoran Basin and Range is slightly hotter than the Mojave and contains large areas of palo verde-cactus shrub and giant saguaro cactus, whereas the potential natural vegetation in the Mojave is largely creosote bush. |

*Source:* USEPA 2009

The eco-regional descriptions give a broad understanding of the types of land that make up the vast CSBF Operations Area, and the vast differences in landscape types that are available for vegetation and wildlife.

Due to the nature of operations at CSBF, there is a possibility for the payload to land within any of the above listed regions. However, some of these regions are of high topographical relief, making them unfavorable for payload landing and recovery. Before payload descent, the characteristics of the underlying ground are considered to ensure safety of the public and payload, and the ease of payload recovery. Much effort is made to ensure that recovery of the payload is as simple as possible by the recovery team. This means avoiding areas of heavy topographical relief, some of which were described in Table 3-6. For this reason, CSBF operations utilizing mountainous areas for payload landing and recovery would be extremely rare.

*Vegetation and Wildlife.* Vegetation and wildlife within the CSBF Operations Area is extensive. Typical vegetation descriptions were listed in the eco-regional descriptions above, but in general vegetation species composition is extremely diverse within the Operations Area, due to its large size. Species shift from oak savannas in central Texas to desert scrub in the southwestern Arizona. Likewise, wildlife species diversity follows the same trends. Many wildlife species, both game and non-game occur. As described in some of the eco-region summaries above, species diversity follows the suitability of habitat. Species common to oak savannas, short and tall grass prairie, western mountains, alpine meadows, and southwestern desert are all possible within the Operations Area. Therefore, an exhaustive list will not be provided for species that occur within the Operations Area. Important game species include white tail deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), elk (*Cervus Canadensis*), black bear (*Ursus americanus*), pronghorn antelope (*Antiocapra americana*), numerous migratory waterfowl, and upland game birds.

The CSBF Operations Area encompasses a large portion of the central North American Flyway used by migratory birds traveling seasonally from northern breeding grounds to southerly wintering grounds. Migratory birds are federally protected under the Migratory Bird Treaty Act, and are viewed as an internationally shared resource. As such, migratory birds are managed in cooperation with other nations.

Generally, consultation with USFWS is necessary if a Proposed Action may impact populations of migratory birds by removing suitable habitat, changing the landscape, or through direct mortality. Impacts to migratory bird populations from the Proposed Action would be very unlikely.

*Special Status Species.* There are many special status species within the CSBF Operations Area, both plants and animals. For the purposes of this PEA, species federally listed by USFWS as Threatened and Endangered that have designated Critical Habitat are discussed. A complete list of federally listed Threatened and Endangered Species can be found in Appendix E.

A Critical Habitat is defined by the ESA as:

1. Specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and
2. Specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Critical Habitat designations are based on the best scientific data available, in an open public process with specific timeframes, much like the NEPA process. Many factors are considered before any decisions are made concerning habitat designation, such as economic factors, national security, and any other relevant impact that may occur as a result of habitat designation. Under Section 7 of the ESA, all federal agencies must ensure that any actions they undertake, authorize, or fund would not be likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its designated Critical Habitat (NOAA 2009). For this reason, it is vitally important that for CSBF Operations, all the Critical Habitat locations within the Operations Area be known, so they can be avoided when landing and retrieving a payload.

Figure 3-3 shows all Critical Habitat for federally listed species within the CSBF Operations Area. Texas, Oklahoma, Kansas, Colorado, and eastern New Mexico have limited designated Critical Habitats. Central Arizona and a large block along the Arizona/New Mexico border contain Critical Habitat. All federally listed species with Critical Habitat within the CSBF Operations Area, along with a general habitat description are provided in Appendix F.

*Water Resources.* Within the CSBF Operations Area, surface waters include many large, important rivers, lakes, and wetlands. Eight major rivers and their tributaries drain much of the southwestern United States and an important natural resource in the generally dry, arid climate. These rivers include the: Colorado, Gila, Rio Grande, Pecos, Brazos, Canadian, Red, and the Arkansas rivers. These rivers provide water that is important for agriculture, recreation, and natural vegetation and wildlife within the region. Most lakes within the CSBF Operations Area are manmade reservoirs which provide public water supplies industry, agricultural, and residential use within the region. These lakes tend to be rather large, and would not be impacted by operations, as they would be avoided.

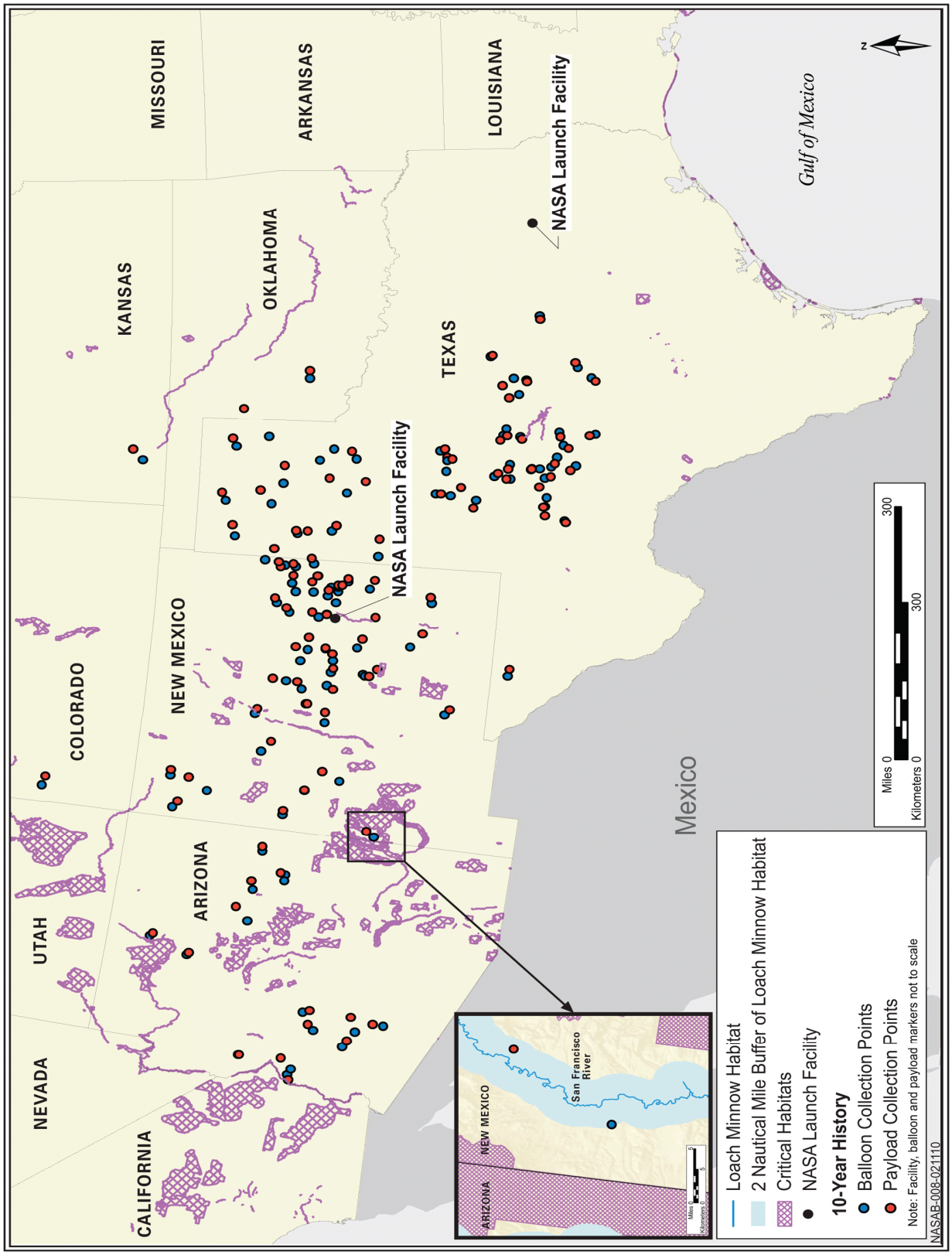



**Figure 3-3 Critical Habitats for Federally Listed Threatened and Endangered Species within the CSBF Operations Area**

Groundwater resources located within the Operations Area consists of many aquifer systems, which are collections of smaller aquifers defined by similar geology. The underground water resources are important for much of this region as it provides necessary water for agriculture, livestock, natural vegetation, and for human consumption. Groundwater recharge in this region is important because almost all the recharge comes from precipitation. In the arid, dry areas of the Operations Area much of the precipitation that falls is lost through evaporation or evapotranspiration, therefore never reaching the aquifer (USGS 2009a).

Wetlands are areas where water covers the soil, or is near or at the surface of the soil for varying portions of the year, including the growing season. Wetlands are an important natural resource, and as such are protected under Section 404 of the CWA. Within the CSBF Operations Area, wetlands are fairly limited in range, with most being located in proximity to rivers and streams. The western regions of the Operations Area are devoid of large wetland areas, with wetlands limited to stream/river basins. The Texas panhandle region is the only area that has a high density of small seasonal depressional wetlands, called playa lakes (USGS 2009b). Playa lakes are only flooded during a portion of the year, and provide important habitat for wildlife and migrating wildfowl. Wetlands provide many benefits to the environment such as flood attenuation, wildlife habitat, bank stabilization, and water quality maintenance functions.

### 3.7.2 Environmental Consequences

Determination of the significance of potential impacts to biological resources is based on: 1) the importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications. Impacts to biological resources would be considered significant if species or habitats of concern were substantially affected over relatively large areas or disturbances result in reductions in the population size or distribution of a special-status species.

**Proposed Action**

***CSBF Fort Sumner and CSBF Palestine***

The increase in operations would not affect biological resources at either of the launch facilities. No habitat would be lost and no direct impacts to either vegetation or wildlife would occur from the Proposed Action. No special-status species or water resources would be affected.

***CSBF Operations Area***

*Vegetation and Wildlife.* An increase in launch activities at CSBF would increase the number of times a payload would have to be landed and recovered within the Operations Area. This would therefore increase the human presence within the natural environment. For launches and flights at the Palestine, Texas facility, payloads have historically been recovered in the mostly flat topography of the Edwards Plateau, Western High Plains, and Cross Timbers eco-regions; whereas the Fort Sumner facility generally

recovers from High Plains, Southwestern Tablelands, Arizona/New Mexico Plateau, and Sonoran Basin and Range eco-regions. As explained in the eco-region descriptions, the lands impacted by landing and recovery may be very different, ranging from grassland to desert. Every effort is made to quickly recover the payload with minimal disturbance to the land. Recovery efforts would result in minor temporary impacts to vegetation. Vegetation would be trampled by vehicular and foot traffic. There may be a need to cut down woody vegetation if the payload and/or parachute were stuck in a tree, for example. If this occurs, the removal of several trees/shrubs is highly unlikely to alter the ecosystem as a whole. The extent of the impacts to vegetation would depend on how far from the nearest paved road the payload was landed, as well as the time required for complete payload extraction. Within grassland environments, even arid grasslands, disturbance is a natural phenomenon, and vegetation may benefit from small scale disturbances such as recovery efforts (Weston *et al* 2005; Horchstasser *et al*.2002; NRCS 2005; Guretzky and Anderson 2006). However, effects to vegetation whether beneficial or harmful would be on a very small scale and are highly unlikely to occur repeatedly in the same area. Similarly, wildlife impacts would be minimal, as mobile species would likely move away from the recovery area, and return once the recovery operations are complete. Direct mortality would be possible for some less mobile species, but this would not be expected to cause any population level impacts to any species as a whole.

*Special Status Species.* Increasing operations would result in no adverse impacts to any special status species, as no plans exist within the action to permanently alter any habitat or take any species. Many of the species listed are fish species. Operationally, landing the payload near a water body or within a stream/river is avoided, therefore reducing or eliminating any impacts to listed fish species. There are also several invertebrate species that are listed that are only located within caves in Bexar County, Texas. Risks to these cave dwelling species is also negligible due to their subterranean habitat.

Historically, CSBF has avoided habitat known to contain threatened and/or endangered species, and has done so with great success. Within the past 10 years, only one balloon and payload landing has occurred within 3.7 km (2 nautical miles) of designated Critical Habitat, with eight others have landing within 5 nautical miles of Critical Habitat. The landing within 3.7 km (2 nautical miles) occurred in June 2005, and was near what is now designated Critical Habitat for the Loach Minnow (see Appendix F). At the time of the landing the area had not officially been designated Critical Habitat, but was under consideration for such designation. The official designation did not occur until March 2007 (USFWS 2009a).

CSBF staff would continue to use up-to-date geospatial data to reflect changes to designated Critical Habitat areas; thus ensuring that landings within these ecologically sensitive areas would not occur, or be avoided to the extent practicable. Avoidance of designated Critical Habitat would occur with each flight, thereby all but eliminating the possibility for impact to federally-listed species. If unplanned circumstances resulted in the need to land a payload within a designated Critical Habitat, CSBF would initiate contact with USFWS to determine the best method for payload recovery, with the least amount of environmental impact. Staff currently utilizes geospatial data obtained from nationally recognized internet sources for balloon and payload landing purposes. Critical Habitat and Threatened and Endangered

Species geospatial data is obtained from USFWS. To ensure that balloons and payloads do not land in sensitive areas, geospatial data is updated semi-annually prior to each campaign period.

*Water Resources.* Impacts to water resources from increased CSBF operations would be negligible. As stated, landing a payload within a water body or wetland area is highly undesirable, and therefore is avoided to the greatest extent possible. No permanent alteration to any water body or wetland would occur. Ground water resources would also not be impacted due to operations increases. If the payload were landed within a wetland, efforts to minimize disturbance to the wetland would be made. Depending on circumstances, payload recovery may be done via helicopter, thereby reducing ground disturbance at the payload landing site. Since wetlands would not be drained or filled by the recovery action, no permitting would be required. Any disturbance occurring to any water resources from payload landing and recovery would likely be very minor, and effects would be short-lived, with the systems quickly returning back to their natural state.

**No Action Alternative**

Under the No Action alternative, operations would continue as normal at CSBF. Impacts would be similar to those described under the Proposed Action; however, there would be no increase in activity and therefore, no increased effects from payload landing and recovery operations. Avoidance efforts of sensitive areas and Critical Habitats would continue and impacts to biological resources would remain minor to non-existent.

## 3.8 CULTURAL RESOURCES

Cultural resources are defined as prehistoric or historic sites, buildings, structures, objects, or other physical evidence of human activity that are considered important to a culture or community for scientific, traditional, or religious reasons. Cultural resources are divided into three resource categories: archaeological, architectural, and traditional cultural resources or properties. Archaeological resources are places where people changed the ground surface or left artifacts or other physical remains (e.g., arrowheads or bottles). Archaeological resources can be classed as either sites or isolates and may be either prehistoric or historic in age. Isolates often contain only one or two artifacts, while sites are usually larger and contain more artifacts. Architectural resources are standing buildings, dams, canals, bridges, and other structures. Traditional cultural properties are resources associated with the cultural practices and beliefs of a living community that link that community to its past and help maintain its cultural identity. Traditional cultural properties may include archaeological resources, locations of historic events, sacred areas, sources of raw materials for making tools, sacred objects, or traditional hunting and gathering areas.

Section 106 of the National Historic Preservation Act of 1966, as amended, and as implemented by 36 CFR Part 800, requires federal agencies to consider the effects of their actions on historic properties before undertaking a project. An historic property is defined as any cultural resource that is included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). The NRHP, administered by the National Park Service, is the official inventory of cultural resources that are significant in American

history, prehistory, architecture, archaeology, engineering, and culture. The NRHP also includes National Historic Landmarks. In consideration of 36 CFR 800, federal agencies are required to initiate consultation with SHPOs and THPOs, informing them of the planned action and requesting their submittal of any comments or concerns. Individual SHPOs and THPOs may be responsible for determining federal compliance with Section 106. In addition, SHPOs and THPOs also prepare nominations for the NRHP.

Initial coordination letters were sent to regional offices of the Bureau of Indian Affairs and SHPO and THPO offices in the states affected by this proposal (refer to Section 2.5).

### 3.8.1 Affected Environment

***CSBF Fort Sumner and CSBF Palestine***

Search of the NRHP, Texas Historical Commission, and New Mexico Historical Preservation Division databases showed there are no listed cultural resources at the two CSBF launch facilities (National Park Service 2009c, Texas Historical Commission 2009, New Mexico Historical Preservation Division 2009). Even though CSBF Fort Sumner was originally an Army Air Corps training facility utilized during World War II, all of the buildings except for the hangar used by CSBF have been demolished. The hangar structure currently utilized by CSBF at the Fort Sumner launch facility has been heavily modified from its original condition, and though the structure is old enough (50 years or more) it would be an unlikely candidate for NRHP listing.

***CSBF Operations Area***

Search of the NRHP listings for the states within the CSBF Operations area resulted in many NRHP-listed sites and numerous Indian Reservations (Figure 3-4). For each NRHP-listed point in the figure the diameter of the point is 3.7 km (2 nautical miles). Two nautical miles is shown because it is described by NASA as the impact zone if a catastrophic failure of the balloon and payload system resulted in no control of the system and it simply fell from the sky. It must be noted that this type of failure has not occurred in the ten-year data period (i.e., 1999 to 2009) of CSBF operations, and is being used for this analysis as the most environmentally conservative scenario for environmental planning. Large portions of Arizona and western New Mexico are Indian Reservations. NRHP-listed sites and properties are generally widespread throughout the Operations Area, with some falling within Indian Reservations and within limits of population centers.

### 3.8.2 Environmental Consequences

Determination of significance for impacts on cultural resources for this assessment was established by comparing historical balloon and payload landing locations with known, protected historical and cultural resources. Even though planning efforts are made to avoid known culturally important structures and sites, there is always the possibility for the discovery of new, important sites. Throughout CSBF's operational history, there have been no adverse impacts to cultural resources.

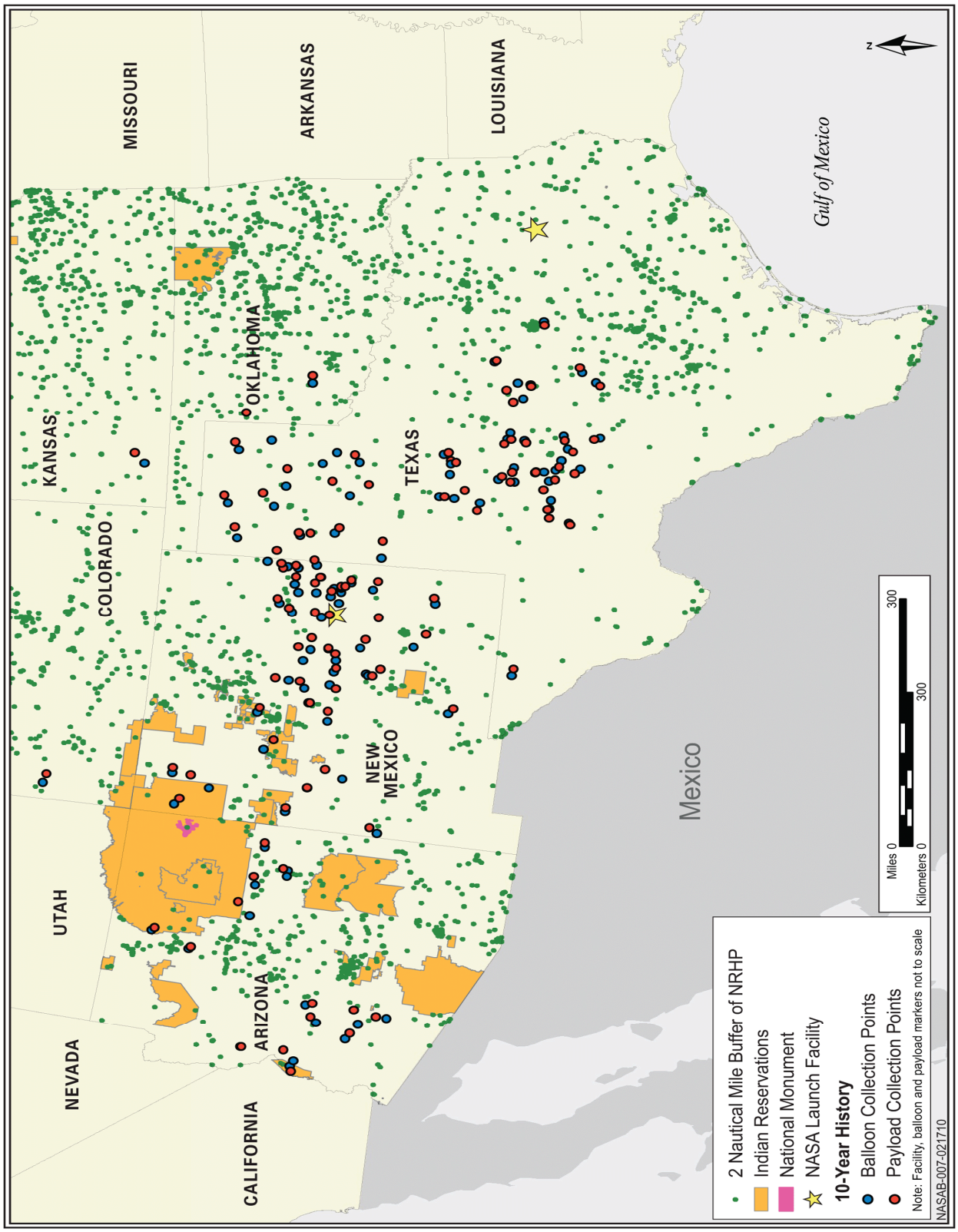



**Figure 3-4 Indian Reservations and Culturally Significant Sites within the CSBF Operations Area**

**Proposed Action**

***CSBF Fort Sumner and CSBF Palestine***

Multiple modifications to the World War II hangar at CSBF Fort Sumner, used for equipment and launch vehicle storage, have rendered it ineligible for NRHP; there are no known cultural resources at the Fort Sumner and Palestine facilities. Though there are listed properties near both facilities, these properties are located within the town centers of Fort Sumner Village and Palestine, and would not be impacted by operations at the CSBF launch facilities. As such, an increase in operations at these facilities would not affect cultural resources.

***CSBF Operations Area***

Increasing operations at CSBF would increase the possibility of a balloon/payload landing within a culturally significant site, or near a historic property. Though unlikely, the possibility of a payload landing directly on or within a historically significant structure, archeological site, or Native American spiritual site always exists. However, given the accuracy of the predictive landing model and the small risk factor involved for safety impacts to people (see Chapter 2), it is unlikely that a direct landing on or at any of these types of sites would occur; the predictive model used by CSBF for balloon and payload landings is very accurate, and though the payload may land anywhere within a 5-nautical mile radius of the predicted impact point, generally they land much closer.

Generally, many historically significant properties exist within or very near population centers, which for safety reasons are avoided by CSBF staff for balloon and payload landings, further reducing the probability for adverse effects to a culturally significant site. As a standard operating procedure, CSBF has made efforts to avoid landing balloons or payloads within the boundaries of federally recognized Indian Reservations, thereby, eliminating the potential for impacts to lands that may have cultural or spiritual significance to the people at the reservation.

Historically, balloon missions have never directly impacted or landed with a 3.7 km (2 nautical miles) radius of an NRHP-listed site, and have only landed on Indian Reservations five times (five balloons and five payloads as shown in Figure 3-4) within the period 1999 to 2009. The five occurrences affected four Indian Reservations: Santa Ann Indian Reservation, Canoncito Indian Reservation, Colorado River Indian Reservation, and Navajo Indian Reservation. The missions landing within Indian Reservation boundaries resulted in no reported adverse impacts or incidences and no indication was made that the landings posed any issue of concern at these Reservations. A total of nine payload landings and nine balloon landings have occurred within 9.25 km (5 nautical miles) of NRHP-listed properties over the ten-year study period.

Increasing operations would constitute an increased probability for adverse effects from off-highway vehicles used to access the recovery site; however, the probability of impacting a culturally significant resource would be extremely low as would the probability of the balloon and payload landing in the same location more than once. By utilizing the predictive model for landing, and accessing the most current geospatial information regarding culturally significant sites, CSBF would continue to avoid all known culturally significant areas, with landing and recovery efforts being cognizant that these resources could

always be discovered. If during recovery operations, indications of a culturally significant resource are discovered, CSBF would contact the appropriate historic preservation office (State or Tribal), or land management agency (e.g., federally managed lands) to alert them of the new site. CSBF standard procedure is to contact the tribal police and to notify a tribal representative for direction on recovery activities if landing a payload within an Indian Reservation boundary is unavoidable; adherence to this procedure would continue.

**No Action Alternative**

Under the No Action alternative, operations at CSBF would not increase, and there would be no increased possibility of adverse impacts to culturally significant places or properties. Impacts would be similar to those described under the Proposed Action with operations continuing as they have for the past 25 years. Avoidance techniques to limit potential impacts to culturally sensitive areas would remain constant.

## 3.9 HAZARDOUS MATERIALS AND SYSTEMS

Hazardous materials, listed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Emergency Planning and Community Right-to-Know Act, are defined as any substance that, due to quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health, welfare, or the environment. Hazardous materials are federally regulated by the USEPA, in accordance with the Federal Water Pollution Control Act; CWA; Toxic Substance Control Act; Resource Conservation and Recovery Act; CERCLA; and CAA. The federal government is required to comply with these acts and all applicable state regulations under EO 12088. Additionally, EO 12088, under the authority of the USEPA, ensures that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials.

### 3.9.1 Affected Environment

The affected environment for hazardous materials and systems consists of the CSBF launch sites and balloon Operations Area. There are a number of instances where hazardous materials, or hazardous systems, may be used during balloon preparation or flight operations. A description of the categories of such hazardous materials and systems is provided below.

- *Radioactive sources.* Small amounts of radioactive materials may be required in the calibration of scientific or balloon system instruments. To accommodate its use, CSBF maintains a Texas Department of Health Radioactive Materials License (Texas Department of State Health Services 2008) and Notice of Reciprocal Recognition of License in New Mexico (New Mexico Environmental Health Division 2009). The total activity of all sources at the CSBF is limited to 100 millicuries. No less than six months prior to a balloon flight, the CSBF is responsible to provide notice to the NASA BPO of any intent to fly radiological sources. All operations must conform to the standards of the Nuclear Regulatory Commission Regulations and Chapter 6 of NASA Procedural Requirement (NPR) 8715.3C *NASA General Safety Program, Nuclear Safety*

*for Launching of Radioactive Materials* (March 2008). A nuclear launch safety approval is required from the NASA Nuclear Flight Safety Assurance Manager prior to any radiological source used in flight (NASA CSBF 2006a; NASA CSBF 2006b).

- *Lasers*. Lasers may be used as sensors or for taking scientific measurements. All operations involving the use of lasers must comply with the standards and regulations of American National Standards Institute (ANSI) Z136.1, *Safe Use of Lasers*. Access and laser illumination levels are controlled to ensure that no personnel are present within the ocular and skin hazard areas of the laser unless suitable protection is provided (GSFC 2008).
- *Chemical materials.* Small quantities of various types of chemicals may be present in scientific apparatus. These are materials (solids, liquids, or gases) that present a health risk or physical hazard to personnel, property, or the environment. For any of these materials, a Material Safety Data Sheet (MSDS) must be provided to CSBF staff and be available during all parts of balloon operations (GSFC WFF 2008). The MSDS is a standard form used to provide workers and emergency personnel with procedures for handling or working with substances in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), storage, disposal, protective equipment, and spill handling procedures.
- *Cryogens.* Cryogens (i.e., liquid helium or liquid nitrogen) are used to cool the wire coils of superconducting magnets thus reducing electrical resistance. Approximately 400 to 500 liters (100 to 130 gallons) would be used, if needed, for specific research activities. Cryogens are capable of producing extremely cold temperatures (<-150˚C [-300˚F]) and have the potential for human hazard if mishandled. Hazards when dealing with cryogens include extreme cold, asphyxiation when used in confined space, and explosion due to rapid expansion. However, when properly stored the cryogens used by CSBF do not present a hazard to people or the environment, the container (pressure vessel) in which the gas is stored does present a hazard.
- *Pressure vessels.* At balloon float altitudes many scientific instruments will not function properly in the near vacuum conditions. For these cases, a pressure vessel is required that can provide both a pressurized operating environment as well as assist in thermal control. While these vessels would not necessarily contain hazardous material, they do present a hazard. To prevent impacts to individuals on the ground, a number of safeguards are required when handling pressure vessels. Safeguards to assure the integrity of pressure vessels would include but not be limited to: verifying that all the pressure system's fittings and seals are properly installed, periodic leak checking, examining test data showing design and pressure analysis, and pressure test dates with methodology and test results. CSBF has a certification and approval process for gondola/payloads that have pressure systems. Any pressure vessels systems shall be designed to a standard agreed upon by CSBF, such as American Institute of Aeronautics and Astronautics S-080 or S-081 (NASA CSBF 2006b).

- *Pyrotechnics.* A small explosive device is activated by CSBF personnel to separate the balloon from the parachute/payload during termination/descent. All CSBF pyrotechnics are rated Class 1.4S explosives and are self-contained. All personnel who store, handle, or install pyrotechnics are required to have approved training. Explosive devices must be 1-amp, 1-watt, and no-fire (meaning that 1-amp of current will not cause the pyrotechnic to fire). Prior to any experimenter using pyrotechnics, the hazard is identified and procedures for installing pyrotechnics must be developed and approved by CSBF for reliability, safety, and quality assurance (NASA CSBF 2006b).
- *Petroleum products*. In addition to hazardous materials used in association with balloon operations, there is also the limited use of motorized equipment. All petroleum products such as fuels, motor oils, and hydraulic fluids would be handled in accordance with prescribed procedures. CSBF staff is responsible for oil spill prevention and response and hazardous waste management (GSFC 2007).

To ensure that all of these materials are handled in a safe and secure manner, The *Balloon Flight Application Procedures User Handbook* requires all science groups to submit special ground and flight safety plans to address hazards associated with their gondola/payload. For each potential hazardous material proposed to be used, the user must provide an MSDS. The Balloon Pre-flight Requirements Data Sheet (Appendix A) provides the type of hazardous material, if present, for a particular balloon system. Also, hazardous material(s) must be packaged to conform to applicable Department of Transportation regulations (GSFC 2007). There has been no documented incidence of any hazardous material related spills involving CSBF operations within the last 10 years (i.e., 1999 to 2009).

### 3.9.2 Environmental Consequences

The qualitative and quantitative assessment of impacts from hazardous materials or hazardous systems focuses on how and to what degree the Proposed Action would affect their use, management, and disposal. A substantial increase in the quantity or toxicity of hazardous substances or hazardous systems used or generated is considered a potentially significant impact. Significant impacts could result if there would be a substantial increase in human health risk or environmental exposure at a level that could not be mitigated to acceptable levels. A reduction in the quantity and types of hazardous substances would be considered a beneficial impact. Handling or using any hazardous material by definition could be hazardous to either individuals or the environment and result in environmental consequences. The MSDS outlines safety procedures to be undertaken when handling hazardous materials used in a balloon system. CSBF personnel are informed of the presence of any hazardous materials present at the launch site; CSBF personnel involved in balloon system launch and recovery operations are provided with the MSDS.

**Proposed Action**

The use of hazardous material would be expected to increase under this proposal to increase balloon missions. Generally there are two circumstances when hazardous materials present potential consequences to people on the ground. One is during payload preparation activities for operations and the

other is during flight termination activities. Prior to launching a balloon system, the gondola must be NASA-certified; the gondola must sufficiently hold the scientific instrumentation, ensure survivability of the scientific instrumentation during landing, and maintain integrity of the CSBF electronic equipment.

***CSBF Fort Sumner and CSBF Palestine***

Precautions as discussed above are taken to assure proper handling by qualified CSBF personnel is undertaken when using hazardous material. This includes providing detailed plans for the use and handling of the material. There are procedures in place to contain any spills and to store, handle and dispose of hazardous material in accordance with all applicable federal and state regulations. Adequate measures to ensure the safety of people and the environment are in place and would be instituted in the event that hazardous materials were used during payload preparation activities. An increase in balloon operations at these facilities would not be expected to adversely impact the storage or use of these materials.

***CSBF Operations Area***

Personnel in a recovery truck track the balloon's descent at all times. Trucks used for tracking and recovery operations would comply with applicable Department of Transportation regulations (NASA CSBF 2006b).

Scientific users are required to submit a payload recovery plan which identifies specific hazards and procedures associated with pick-up, disassembly, and transportation of the payload back to the launch site. This plan must be approved by the Flight Director, and is provided to the payload recovery team (NASA CSBF 2007). The payload recovery team brings the essential equipment to the recovery site specific to the type of hazardous material present should clean up of a spill be required. In the event lithium batteries are used, they would be disconnected and stored in approved shipping containers prior to transport back to the launch site (NASA CSBF 2006b).

Adequate measures to ensure the safety of people and the environment have been established and would be instituted in the event hazardous materials were used during operations and flight termination activities. Increasing operations and use of hazardous materials would not affect the CSBF Operations Area.

**No Action Alternative**

Implementing the No Action alternative would not be expected to have an adverse impact on the human or natural environment. Under this alternative, the balloon flights would continue at the current rate. Potential impacts as a result of on-going balloon launches and operations would not be expected to result in an adverse impact to the human or natural environment.

## 3.10 TRANSPORTATION

Transportation refers to the movement of vehicles on roadway systems. Air, rail, and water transportation were not analyzed in detail because the proposed action would have little to no impacts to these modes of

transportation. For a discussion of balloon impacts to airspace used for air travel, please refer back to Section 3.2. The primary means for moving personnel and equipment into and out of both CSBF facilities would be by way of vehicular traffic.

### 3.10.1 Affected Environment

The affected environment for this transportation analysis includes the CSBF launch sites within Fort Sumner Village and the City of Palestine.

***CSBF Fort Sumner***

SBF Fort Sumner is located at the Fort Sumner Municipal Airport, approximately 4.8 km (3 mi) northeast of the town center. The main roads servicing the area are U.S. Route 60 (Sumner Avenue) to the south and U.S. Route 84 (4$^{th}$ Street) to the west. Interstate 40 lies approximately 72.4 km (45 mi) to the south. With a total land area of 8.7 square kilometers (3.3 square miles) and a population of approximately 1,250 residents, transportation and/or traffic issues are currently nonexistent (USCB 2000).

***CSBF Palestine***

CSBF Palestine is located adjacent to the Palestine Municipal Airport, approximately 11.3 km (7 mi) west of the town center. The main roads servicing the area are U.S. Route 287 to the north and U.S. Route 79/84 and Farm to Market Road 320 to the south. Interstate 45 lies approximately 61.2 km (38 mi) to the west. Palestine has a total land area of 46.3 square kilometers (17.9 square miles) and a population of approximately 17,600 (USCB 2000). Conditions for transportation and traffic in the region are generally very favorable.

***CSBF Operations Area***

Vehicles that are used in the recovery activities in the CSBF Operations Area include the payload recovery truck (refer to Section 2.1) and 1 to 2 personal vehicles. These vehicles travel from the launch site, are used in recovery of the balloon system, and return to the launch site.

### 3.10.2 Environmental Consequences

Thresholds for significant impacts to transportation are specific to the capacity of the affected area to accommodate and respond to change. The primary focus for the transportation analysis is related to the influx of CSBF staff and privately owned vehicles during seasonal balloon mission campaigns at CSBF Fort Sumner and annual balloon launches at CSBF Palestine.

**Proposed Action**

***CSBF Fort Sumner***

Under the Proposed Action, the local traffic would be expected to increase during campaigns as staff and research scientists/students travel to and from the launch site, area hotels, restaurants, and other service providers. However, due to the remote nature of the site, small population of Fort Sumner Village, and lack of existing congestion, additional traffic during the campaign periods would not be expected to impact transportation and/or traffic conditions.

***CSBF Palestine***

During the annual campaign at CSBF Palestine, the local traffic would be expected to increase as research scientists/students travel to and from the launch site, area hotels, restaurants, and other service providers. The additional traffic during the campaign period would not be expected to impact transportation and/or traffic conditions. CSBF Palestine staff are permanent residents of the region resulting in no additional roadway traffic.

Under the Proposed Action, balloons launched from CSBF Palestine would remain at 6 launches annually; therefore, traffic levels and impacts to local transportation resources are not anticipated.

***CSBF Operations Area***

The recovery vehicles travel primarily on highways and maintained roads. In the event of a balloon and payload landing on private property, the local law enforcement office would be contacted to determine land ownership and to accompany CSBF recovery personnel to the landing site, if required. Off-highway vehicular travel would occur as necessary. The potential for the recovery vehicles to impact transportation resources is extremely small.

**No Action Alternative**

Transportation and/or traffic conditions in and around Fort Sumner Village and the City of Palestine would not be affected by implementation of the No Action alternative. Impacts to this resource would be similar to the Proposed Action but slightly less due to fewer balloon launch missions. Baseline conditions would remain the same in each location.

## 3.11 PERMITS, LICENSES, AND APPROVALS

NASA's NEPA policy requires that an EA contain a list of known approvals, licenses, or permits that would be required to implement a Proposed Action. No licenses are required are anticipated for implementing this Proposed Action; however, the retrieval of balloons and payloads would require approval either granted by the landowner or coordinated through the local law enforcement agency.

# CHAPTER 4

# CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

# CHAPTER 4
# CUMULATIVE EFFECTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

## 4.1 CUMULATIVE EFFECTS

CEQ regulations stipulate that the cumulative effects analysis within an EA should consider the potential environmental impacts resulting from "the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (40 CFR Part 1508.7). Assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the Proposed Action and alternatives, if they overlap in space and time.

Cumulative effects are most likely to arise when a Proposed Action is related to other actions that occur in the same location or at a similar time. Actions geographically overlapping or close to the Proposed Action and alternatives would likely have more potential for a relationship than those farther away. Similarly, actions coinciding in time with the Proposed Action and alternatives would have a higher potential for cumulative effects.

To identify cumulative effects, three fundamental questions need to be addressed:

1. Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?
2. If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
3. If such a relationship exists, then does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

## 4.2 SCOPE OF CUMULATIVE EFFECTS ANALYSIS

The scope of the cumulative effects analysis involves both the geographic extent of the effects and the time in which the effects could occur. Potential impacts of the Proposed Action are generally considered minor, and temporary in nature, and would only occur at the two CSBF launch facilities, and within the large CSBF Operations Area. For this reason, cumulative impacts are only considered for impacts that would occur within these three general locations. Currently there are no ongoing or future plans to expand or alter the existing CSBF launch facilities at Fort Sumner, New Mexico or Palestine, Texas.

Increased launch activities at either CSBF increases the potential to have environmental impacts on the various resources areas discussed in this PEA. Analysis from this PEA has determined that the environmental impacts to these resources would be minor or nonexistent, but there could be some very minor adverse additive impacts from any ongoing or concurrent activity within the local surrounding communities or within the CSBF Operations Area. The following describes potential additive impacts to each resource analyzed in this PEA. A summary of impact potential and the type of impacts are listed in Table 4-1.

| Table 4-1 Potential Cumulative Impacts to Resources from Implementation of the Proposed Action | | |
|---|---|---|
| **Resource** | **Cumulative Impact Potential** | **Type of Impact** |
| Airspace | Minor | Increase in the total amount of time airspace will be utilized by CSBF |
| Safety | Minor | Increase in potential for general safety hazards at launch facilities; adherence to safety procedures and plans would continue making adverse impacts unlikely |
| Air Quality | Imperceptible | Even with increased vehicle emissions, there would be no perceptible increase in impacts to air quality |
| Socioeconomics | Minor | Increasing number of personnel for spring/fall campaigns would positively impact local economies; potential for over taxing local restaurants and hotels exists, but is unlikely |
| Land Use | Very Minor | Potential exists for some impacts, but all would be temporary in nature and would not be significant |
| Biological Resources | Very Minor | Potential exists for affecting federally listed species, but efforts to avoid known habitats have been successful in the past; impacts to the natural environment would be very minor and temporary in nature |
| Cultural Resources | Very Minor | Avoidance of culturally sensitive areas would continue; no adverse impacts are foreseen |
| Hazardous Materials and Systems | Minor | General increase in all hazardous materials necessary for launch operations, however, standard safety procedures would continue to be followed, making adverse impacts unlikely |
| Transportation | Minor | Increase in traffic from increasing facilities personnel is minimal; adverse impacts are unlikely |

***Airspace and Balloon Operations.*** Increasing balloon launches at CSBF Fort Sumner from 15 to 25 each year would require increased coordination with the FAA ARTCCs who would need to clear a 130 km (70-nautical mile) radius around the launch site and predicted landing areas of the balloon and payload/parachute to ensure flight safety in the region to prevent mishaps from occurring with commercial, civilian, and military aircraft operations. There are no initiatives (i.e., airspace expansion or modification) by the FAA that would be anticipated to occur within the CSBF Operations Area that could be impacted by this proposal (personal communication, Harper 2010a). Cannon AFB has indicated that current notification procedures and issuance of NOTAMs are sufficient; no impacts to Cannon AFB special use airspace would be anticipated (personal communication, Harper 2010b). Overall, the small total number of annual balloon flights would not have an adverse impact to airspace utilization within the CSBF Operations Area; it is unlikely that any additive impacts would occur from implementation of the Proposed Action.

***Safety.*** Increasing launch operations increases the potential for adverse impacts to safety at either CSBF, and within the Operations Area once the balloon and payload have landed. Though this potential exists, strict adherence to the safety plans required by NASA would continue, ensuring that a substantial increase in safety risk would not occur.

***Air Quality.*** The air quality at CSBF launch sites Fort Sumner and Palestine is very good. Emissions from increased vehicle utilization would occur, but given the minimal traffic, periodic nature of events, and fairly remote nature of the launch facilities, no additive adverse impacts would occur.

***Socioeconomics.*** Minor economic impacts would occur to the local communities surrounding the two CSBFs launch campaigns. The impacts would be generally beneficial, though some potential exists for overcrowding of community resources, such as hotels and restaurants. However, given the minimal number of personnel involved, and periodic nature of events, it is unlikely that any lasting impacts from increased operations would occur.

***Land Use.*** Increasing balloon landings and payload recovery would lead to an increased human presence in the environment, and may cause impacts to land use/land management if the payload was landed within one of the SULMAs described in this PEA. Disturbance to the immediate site from landing and recovery operations would also increase. CSBF recovery operations are carried out with the intention of retrieving all traces of the payload and balloon, leaving nothing behind. Management strategies for lands at either CSBF launch site or within the Operations Area would not change.

***Biological Resources.*** While there would be some minor damage to vegetation and possibly to less mobile wildlife, the disturbances are minor and not permanent. It is unlikely that increasing operations would lead to any additive, negative impacts to biological resources that occur at the launch facilities or within the CSBF Operations Area. CSBF routinely gathers the most current data for critical habitat from federal and state databases so as to avoid these areas.

***Cultural Resources.*** As with the other resources, cultural resources could be potentially impacted from increased balloon operations as this would increase the potential for disturbing a culturally significant site. CSBF staff is aware of the possibilities of impacting culturally significant resources and avoid known sites when choosing landing locations for the balloon and payload/parachute. Predictive modeling used by CSBF for balloon/payload landing would continue to be used for avoidance of all known culturally significant areas. Within the past decade, no culturally significant sites have been disturbed by CSBF activities, and it is unlikely that increasing operations will cause any additive adverse impacts to cultural resources within the CSBF Operations Area. CSBF routinely gathers the most current data for cultural resources from federal and state databases so as to avoid known culturally significant sites.

***Hazardous Materials and Systems.*** Like safety, use of hazardous materials and systems, requires strict adherence to procedures and plans approved by NASA. With increased operations, these procedures and plans would continue to be followed and updated as necessary. Additive impacts with respect to hazardous materials and systems are unlikely.

***Transportation.*** Increased balloon launches from CSBF Fort Sumner would result in a minor increase in traffic; however, due to the remote location of the sites and lack of existing traffic issues, adverse cumulative impacts to transportation resources are unlikely.

## 4.3 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of any irreversible and irretrievable commitment of resources which would be involved in the Proposed Action should it be implemented. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects this use could have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species or the disturbance of a cultural resource).

For the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most environmental consequences are short-term and temporary, such as minor disturbance to the natural environment from landing and recovery activities.

Helium, a non-renewable resource, exists in small quantities within the earth's atmosphere and is mined from underground pools where it accumulates as a by-product of the earth's production of natural gas. The gas is non-toxic, non-flammable, and has no harmful effects on the earth's environment. In 2006, the total helium reserves and resources of the U.S. were estimated to be 20.6 billion cubic meters (744 billion cubic feet).

In 2009, estimated consumption of helium in the U.S. was 52.1 million cubic meters (1.88 billion cubic feet) (USGS 2010). Inflation of a CSBF scientific balloon in preparation for launch requires approximately 3,507 cubic meters (124,000 cubic feet) of gaseous helium. Under this proposal, CSBF would conduct 31 balloon flights each year using approximately 108,700 cubic meters (3,844,000 cubic feet) of gaseous helium. Applying the 2009 annual consumption totals to this proposal, helium usage for CSBF conventional balloon launches would represent approximately 0.2 percent of the U.S. total consumption each year.

Petroleum products such as diesel fuel, gasoline, oils and lubricants, and plastics would also be depleted by increasing operations. These are finite resources, like helium; however, the minor increase in the necessary volumes of these substances would not represent a major adverse impact on these resources.

# CHAPTER 5

# REFERENCES CITED

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# CHAPTER 6

# AGENCIES AND PERSONS CONSULTED

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# AGENCIES AND PERSONS CONSULTED

Table 6-1 provides the recipients of the initial coordination letter and draft PEA and draft FONSI. On October 9, 2009, initial coordination letters were sent to federal, state, and regional government agencies in the states where the NASA BPO has operated conventional balloon missions in the past 10 years (i.e., 1999-2009). On October 27, 2009, the same coordination letter was sent to the affected states' regional Bureau of Indian Affairs offices. To ensure a more comprehensive coverage of scoping had been conducted, a coordination letter was sent to Tribal Historic Preservation Offices on March 22, 2010. Additional Tribal Historic Preservation Offices were provided the coordination letter on April 13, 2010. Copies of the Draft PEA were mailed directly to the agencies and organizations listed in Table 6-1. Appendix C provides the coordination letter and the responses that were received.

**Table 6-1 Recipients of Initial Coordination Letter and Draft PEA**

| Point of Contact | Agency | Address | Letter | Draft PEA / FONSI |
|---|---|---|---|---|
| ***Federal Agencies*** | | | | |
| **Bureau of Indian Affairs** | | | | |
| | Bureau of Indian Affairs<br>National Office | 1849 C Street N.W.<br>Washington, DC 20240 | ✓ | ✓ |
| Jeanette Hanna | Bureau of Indian Affairs<br>Eastern Oklahoma Regional Office | PO Box 8002<br>Muskogee, OK 74402-8002 | ✓ | ✓ |
| Omar Bradley | Bureau of Indian Affairs<br>Navajo Regional Office | PO Box 1060<br>Gallup, NM 87305 | ✓ | ✓ |
| Dan Deerinwater | Bureau of Indian Affairs<br>Southern Plains Regional Office | 316 N 26th Street<br>Billings, MT 59101 | ✓ | ✓ |
| Bill Walker | Bureau of Indian Affairs<br>Southwest Regional Office | 1001 Indian School Road, NW<br>PO Box 26567<br>Albuquerque, NM 87104 | ✓ | ✓ |
| Allen Anspach | Bureau of Indian Affairs<br>Western Regional Office | 2600 N. Central Avenue, 4th Floor<br>Phoenix, AZ 85004 | ✓ | ✓ |
| **Bureau of Land Management** | | | | |
| Jim Kenna | Bureau of Land Management<br>Arizona State Office | One North Central Avenue, Suite 800<br>Phoenix, AZ 85004-4427 | ✓ | ✓ |
| Dave Hunsaker | Bureau of Land Management<br>Colorado State Office | 2850 Youngfield Street<br>Lakewood, CO 80215-7093 | ✓ | ✓ |
| Bob Abbey | Bureau of Land Management<br>National Office | 1849 C Street NW, Rm 5665<br>Washington, DC 20240 | ✓ | ✓ |
| Linda Rundell | Bureau of Land Management<br>New Mexico State Office | PO Box 27115<br>Santa Fe, NM 87502-0115 | ✓ | ✓ |
| | Bureau of Land Management<br>Tulsa Office | 7906 East 33rd Street, Suite 101<br>Tulsa, OK 74145-1352 | ✓ | ✓ |
| | Bureau of Land Management<br>Amarillo Field Office | 801 South Filmore Street, Suite 500<br>Amarillo, TX 79101-3545 | ✓ | ✓ |
| **Federal Aviation Administration** | | | | |
| Teresa Bruner | Federal Aviation Administration<br>(Southwest Region) | 2601 Meacham Boulevard<br>Fort Worth, TX 76137-4298 | ✓ | ✓ |

| Table 6-1 Recipients of Initial Coordination Letter and Draft PEA (cont.) | | | | |
|---|---|---|---|---|
| **Point of Contact** | **Agency** | **Address** | **Letter** | **Draft PEA / FONSI** |
| **National Park Service** | | | | |
| | National Park Service | 1849 C Street N.W.<br>Washington, DC 20240 | ✓ | ✓ |
| **U.S. Forest Service** | | | | |
| | USDA Forest Service (Region 2)<br>Rocky Mountain Region | 740 Simms Street<br>Golden, CO 80401 | ✓ | ✓ |
| | USDA Forest Service (Region 3)<br>Southwestern Region | 333 Broadway SE<br>Albuquerque, NM 87102 | ✓ | ✓ |
| Elizabeth Agpaoa | USDA Forest Service (Region 8)<br>Southern Region | 1720 Peachtree Road NW<br>Atlanta, GA 30309 | ✓ | ✓ |
| **U.S. Fish and Wildlife Service** | | | | |
| Dr. Benjamin Tuggle | U.S. Fish and Wildlife Service<br>(Region 6 Office) | PO Box 25486<br>Denver, CO 80225 | ✓ | ✓ |
| | U.S. Fish and Wildlife Service<br>(Region 2 Office) | PO Box 1306<br>Albuquerque, NM 87103-1306 | ✓ | ✓ |
| ***State Agencies*** | | | | |
| **Arizona** | | | | |
| Benjamin Grumbles | Arizona Department of<br>Environmental Quality | 1110 West Washington Street<br>Phoenix, AZ 85007 | ✓ | ✓ |
| James Garrison | Arizona State Historic Preservation<br>Office | 1300 West Washington Street<br>Phoenix, AZ 85007 | ✓ | ✓ |
| Maria Baier | Arizona State Land Department | 1616 West Adams Street<br>Phoenix, AZ 85007 | ✓ | ✓ |
| **Colorado** | | | | |
| Brownwell Bailey | Colorado State Land Board | 1127 Sherman Street Suite 300<br>Denver, CO 80203 | ✓ | ✓ |
| | Colorado Department of Public<br>Health<br>and Environment | 4300 Cherry Creek Drive South<br>Denver, CO 80246-1530 | ✓ | ✓ |
| | Colorado Office of Archaeology<br>and Historic Preservation | 225 East 16th Avenue, Suite 950<br>Denver, CO 80203 | ✓ | ✓ |
| **Kansas** | | | | |
| John Mitchell | Kansas Department of Health and<br>Environment, The Division of<br>Environment | 1000 SW Jackson, Suite 400<br>Topeka, KS 66612-1367 | ✓ | ✓ |
| | Kansas State Historical Society,<br>Cultural Resources Division | 6425 SW 6th Avenue<br>Topeka, KS 66615-1099 | ✓ | ✓ |
| **New Mexico** | | | | |
| Ron Curry | New Mexico Environment<br>Department | PO Box 5469<br>Santa Fe, NM87502-5469 | ✓ | ✓ |
| Katherine Slick | New Mexico Historic Preservation<br>Division, Department of Cultural<br>Affairs | Bataan Memorial Building<br>407 Galisteo Street, Suite 236<br>Santa Fe, NM 87501 | ✓ | ✓ |
| | New Mexico State Land Office | 310 Old Santa Fe Trail<br>Santa Fe, NM 87504 | ✓ | ✓ |

| Table 6-1 Recipients of Initial Coordination Letter and Draft PEA (cont.) | | | | |
|---|---|---|---|---|
| **Point of Contact** | **Agency** | **Address** | **Letter** | **Draft PEA / FONSI** |
| **Oklahoma** | | | | |
| Dave Shipman | Oklahoma Commissioners of Land Office | PO Box 26910<br>Oklahoma City, OK 73126-0910 | ✓ | ✓ |
| Melvena Heisch | Oklahoma State Historic Preservation Office | 2401 North Laird Avenue<br>Oklahoma City, OK 73105 | ✓ | ✓ |
| | Oklahoma Department of Environmental Quality | PO Box 1677<br>Oklahoma City, OK 73101-1677 | ✓ | ✓ |
| **Texas** | | | | |
| Tony Walker | Texas Commission on Environmental Quality (Dallas/Fort Worth Region) | 2309 Gravel Drive<br>Fort Worth, TX 76118-6951 | ✓ | ✓ |
| Denise Francis | Texas Governor's Office of Budget and Planning (Texas SPOC) | P.O. Box 12428<br>Austin, TX 78711 | ✓ | ✓ |
| | Texas General Land Office | 1700 North Congress Avenue<br>Suite 935<br>Austin, TX 78701-1495 | ✓ | ✓ |
| | Texas Historical Commission | PO Box 12276<br>Austin, TX 78711-2276 | ✓ | ✓ |
| ***Tribal Historic Preservation Offices*** | | | | |
| **Arizona** | | | | |
| Dr. Alan S. Downer | The Navajo Nation | PO Box 4950<br>Window Rock, AZ 86515 | ✓ | ✓ |
| Mr. Barnaby V. Lewis | Gila River Indian Community | PO Box 2140<br>Sacaton, AZ 85147 | ✓ | ✓ |
| Ms. Loretta Jackson-Kelly | Hualapai Tribe | PO Box 310<br>Peach Springs, AZ 86434 | ✓ | ✓ |
| Ms. Vernelda Grant | San Carlos Apache Tribe | PO Box 0<br>San Carlos, AZ 85550 | ✓ | ✓ |
| Mr. Peter L. Steere | Tohono O'odham Nation | PO Box 837<br>Sells, AZ 85634 | ✓ | ✓ |
| Mr. Mark Altaha | White Mountain Apache Tribe | PO Box 507<br>Fort Apache, AZ 85926 | ✓ | ✓ |
| **New Mexico** | | | | |
| Dr. Jeffrey Blythe | Jicarilla Apache Nation | PO Box 507<br>Dulce, NM, 87528-0507 | ✓ | ✓ |
| Ms. Holly Houghten | Mescalero Apache Tribe | PO Box 227<br>Mescalero, NM, 88340 | ✓ | ✓ |
| Mr. Vernon Lujan | Pueblo of Pojoaque | c/o Poeh Cultural Center and Museum, Inc.<br>78 Cities of Gold Road<br>Sante Fe, NM 87506-0918 | ✓ | ✓ |
| Mark Mitchell | Pueblo of Tesuque | Route 42, Box 360-T<br>Sante Fe, NM 87506 | ✓ | ✓ |
| Mr. Kurt Dongoske | Zuni Pueblo | PO Box 1149<br>Zuni, NM 87327 | ✓ | ✓ |

| Table 6-1 Recipients of Initial Coordination Letter and Draft PEA (cont.) | | | | |
|---|---|---|---|---|
| **Point of Contact** | **Agency** | **Address** | **Letter** | **Draft PEA / FONSI** |
| **Oklahoma** | | | | |
| Ms. Karen Kaniatobe | Absentee Shawnee Tribe of Oklahoma | 2025 S Gordon Cooper Drive<br>Shawnee, OK 74801 | ✓ | ✓ |
| Mr. Robert Cast | Caddo Nation | PO Box 487<br>Binger, OK 73009 | ✓ | ✓ |
| Mr. Terry Cole | Choctaw Nation of Oklahoma | PO Box 1210<br>Durant, OK 74702-1210 | ✓ | ✓ |
| Tribal Historic Preservation Officer | Citizen Potawatomi Nation | 1601 S. Gordon Cooper Drive<br>Shawnee, OK 74801 | ✓ | ✓ |

# CHAPTER 7

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