

WHITEMAN AFB, MISSOURI JOINT LAND-USE STUDY



Whiteman Air Force Base Joint Land Use Study

Participating Communities:

Johnson County, Missouri
City of Knob Noster, Missouri
Whiteman Air Force Base, Missouri

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Prepared By:



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1.0 JOINT LAND USE STUDY PURPOSE

1.1 Introduction

When originally built, most major military installations were outside of urban centers. However, the spin-off economic effects of operations and the general trend toward growth in previously rural areas create new land use challenges for today's installations. Increases in population and economic activity draw more people toward the noise and accident risks generated by military bases. In turn, encroachment of civilian uses places pressure on bases to modify their procedures, possibly compromising the overall mission.

Whiteman Air Force Base (AFB) and the City of Knob Noster are located in a predominantly rural/agricultural area. Encroachment of Whiteman AFB has been fairly limited; however, not all land adjacent to the base is subject to land use regulations. Development could easily encroach on the base in unincorporated areas of Johnson County. This report is intended to provide a planning foundation to avoid future problems.



The Department of Defense (DoD) has two major programs designed to reduce conflicts between military and civilian land uses. In 1973, the DoD established the Air Installation Compatible Use Zones (AICUZ) program to provide information about installation activities and to encourage local communities to adopt land use patterns that are more compatible with base operations. In 1985, the DoD initiated the Joint Land Use Study (JLUS) program.

A JLUS is a cooperative land use planning effort between a military installation and its surrounding communities. The purpose of a JLUS is to develop a plan for implementing land use recommendations. The program is designed to promote community growth and development that is sustainable and compatible with the mission(s) of the military installation.

The objectives of the JLUS are two-fold:

1. To encourage cooperative land use planning between military installations and the surrounding community.
2. To seek ways to reduce the operational impacts of military bases on adjacent land.

The JLUS process encourages local residents, decision-makers, and installation representatives to study issues of compatibility in an open forum, balancing both military and civilian interests.

The resulting recommendations are intended to guide the local government in implementing appropriate land use controls around military installations. This report is also based on the current mission and the 2005 Whiteman AFB AICUZ. Future changes to the mission or the type of aircraft flown from Whiteman will require an update to the JLUS.



1.2 Study Goals

The Whiteman AFB JLUS is the outcome of the public, private, and military sectors acting together to achieve an ongoing partnership between the military and surrounding community that promotes development in Johnson County and the City of Knob Noster, while protecting the operational missions of Whiteman AFB and the vital economic role of the military in the area.

The primary objectives for the JLUS include the following:

- To encourage cooperative land use planning between Whiteman AFB and the surrounding areas so that future growth and development are compatible with the training and/or operational mission of the installation.
- To seek cooperative means to anticipate and minimize impacts of military operations on adjacent lands and the surrounding area.
- Protect and promote the present and future operational/mission capacity of Whiteman AFB.
- Promote the long-term health, safety, and welfare of the civilian and military community associated with and in proximity to Whiteman AFB.
- Promote and support the long-term viability of Whiteman AFB.

1.3 Stakeholder Expectations

Joint land use planning involves a range of private and public interests. The process will recommend regulatory actions that govern the use of land to protect public welfare; however, they take place losing sight of private property rights. The intent of the JLUS process is to strike a reasonable balance among diverse interests.

Community goals are to:

1. Protect the health, safety, and welfare of the City of Knob Noster and Johnson County residents and maintain quality of life.
2. Manage development in the vicinity of Whiteman AFB that would interfere with the continued operations of the base.
3. Allow for new growth in the City of Knob Noster and Johnson County in a way that is economically, environmentally, and socially sustainable.
4. Maintain the economic vitality of the City of Knob Noster and Johnson County.

Military goals are to:

1. Promote the health, safety, and welfare of military and civilian personnel living and working at or near Whiteman AFB.
2. Restrict land uses that are recognized as incompatible with current or future military operations, noise sensitive areas, and areas with recognized accident potential.

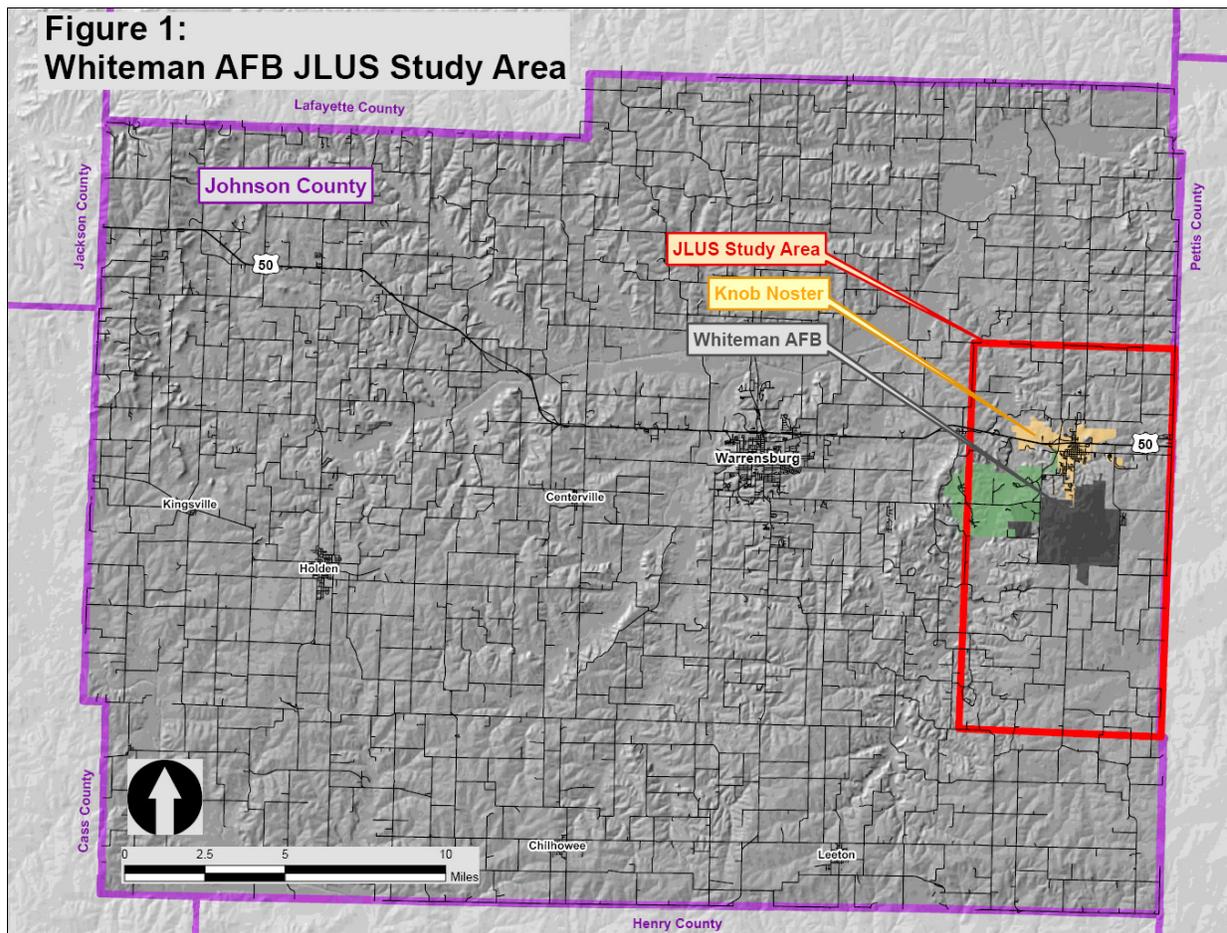


2.0 ORGANIZATION

2.1 Study Area

Whiteman AFB is located in west-central Missouri directly south of Knob Noster and 7 miles east of Warrensburg. Warrensburg is home to Central Missouri State University. 46 miles to the west is Kansas City, the largest city in the State of Missouri. 17 miles to the east is Sedalia, home of the Missouri State Fair.

The Whiteman AFB JLUS Study Area is approximately 48,500 acres (75 ¼ square miles) and is defined as all land west of the Pettis County line, south of County Road 400, north of County Road 800 and east of County Road 671. Figure 1 shows the location of Whiteman AFB and the JLUS study area in relation to the City of Knob Noster and Johnson County.



2.2 Participating Stakeholders

For the purpose of this JLUS, three committees assisted with various aspects of developing the study and overseeing the planning process. These are the Policy Committee, Steering Committee, and the Technical Committee.

Policy Committee: The Policy Committee is responsible for discussing information and findings, reviewing issues, and making the final endorsement of the completed report. This committee met with Woolpert at key stages throughout the project to receive, discuss, and provide input/feedback on draft chapters of the study as they were developed. The Policy Committee will also review and approve the final draft. The Policy Committee is set up as follows:

- Johnson County Commissioner
- Knob Noster City Administrator
- Whiteman AFB officials
- Knob Noster Citizen
- Local Realty Representative
- Whiteman Planning and Zoning Committee Representative
- Land Owner
- Knob Noster Planning and Zoning Representative
- Missouri 121st District, State Representative



Technical Committee: The Technical Committee provides direct assistance to Woolpert in the various tasks as outlined in the Scope of Work and assisted in developing the draft JLUS document. Key members participated in the process throughout the project; however, other members participated on an “as needed” basis to provide technical assistance particular to their areas of expertise. The Technical Committee is set up as follows:

- Four Whiteman AFB Officials
- Land Owner
- Knob Noster Building Inspector

Steering Committee: The Steering Committee is a sub-committee of the Policy Committee that served as key advisors in the decision making process. It is comprised of one key official from each of the JLUS partners. The Steering Committee’s key role was to facilitate two-way communication between the broader public and the consultant. They participate in the primary roles on the Policy Committee and Technical Committee. The Steering Committee is set up as follows:

- City of Knob Noster, City Administrator (Project Administrator and Grant Applicant)
- Johnson County, Johnson County Eastern Commissioner
- Whiteman AFB, Planning Department

2.3 Public Participation Opportunities

Opportunities were made available during the JLUS process to give residents and other interested parties the chance to contribute. Four public meetings were held on the following dates:

- **December 17, 2007**—Knob Noster Middle School, Project Kick-Off and Open House
- **February 14, 2008**—Knob Noster Middle School, Public Workshop on Issues and Existing Conditions
- **May 29, 2008**—Knob Noster Middle School, Public Workshop and Presentation of JLUS First Draft Recommendations
- **August 27, 2008**—Knob Noster Middle School, Open House and Presentation of JLUS Final Report



3.0 BACKGROUND INFORMATION

3.1 Chronology of Events

This JLUS document is part of a continuing planning effort to promote development compatibility near Whiteman AFB. The following timeline represents the collaborative efforts of the county, the Air Force, and the community to address land use conflicts and develop a framework for sound decision-making.

- **2004**—Whiteman Area Leadership Council established to address Base Realignment and Closure (BRAC) issues
- **2005**—Whiteman AFB AICUZ Study completed
- **February 2007**—City of Knob Noster adopts Comprehensive Plan Update
- **May 25, 2007**—Release of Whiteman AFB JLUS Request for Proposals
- **June 2007**—Creation of Whiteman AFB JLUS Policy, Technical, and Steering Committees
- **August 28, 2007**—State adopts MO Statute 41.655 Planning and zoning for unincorporated areas near military bases, requiring airport hazard area zoning
- **September 2007**—Airport Zoning Committee of Johnson County formed
- **December 17, 2007**—JLUS initiated

3.2 Economic Impact

Whiteman AFB publishes an annual Economic Impact Report. This report estimates the economic effect a military installation has on the local economy by summing military and civilian payrolls, total base expenditures, and the value of the indirect jobs created by the presence of a military installation. The economic impact of Whiteman AFB on the region is defined in Table 3-1.

Table 3-1: Summary of Whiteman AFB Economic Impact

Base Employment	
▪ Active Duty Military	3,553
▪ Reserve/Army National Guard	1,641
▪ Appropriated and Other Civilian	2,264
Total Base Employment	7,458
Base Payroll	
▪ Active Duty Military	\$160,701,758
▪ Reserve/Army National Guard	\$10,622,277
▪ Appropriated and Other Civilian	\$48,611,859
▪ Other Civilians	\$12,555,842
Total Base Payroll	\$232,491,736
Annual Retiree Payroll	\$67,464,000
Total Annual Base Expenditures	\$153,365,127
Estimated Annual Value of Jobs Created	\$78,765,576
Estimated Total Impact Within Economic Impact Region	\$532,086,439

Source: 2007 Economic Impact Report

3.3 Military Mission and History

Whiteman AFB dates back to 1942 when U.S. Army Air Force officials selected the site of the present-day base to be the home of Sedalia Army Air Field. During World War II the airfield was used a training base for WACO glider pilots. Pilots of one former unit assigned to the base—the 314th Troop Carrier Group—participated in the invasion of Sicily in July 1943 and the D-Day invasion of Normandy on June 6, 1944.

“Mission Statement: *Skilled and proud Airmen providing full spectrum, expeditionary, B-2 global strike and combat support capabilities to geographic commanders and the Commander, USSTRATCOM, while supporting Team Whiteman. We kick down doors and kill targets... Weapons on Target, On Time!*”

Following the end of the war, the airfield remained in service as an operational location for Army Air Force C-46 and C-47 transports. In December 1947, the base was deactivated.

With the birth of the U.S. Air Force as a separate, independent service in 1947, and the subsequent formation of Strategic Air Command (SAC), the site of the former airfield was considered for Air Force missions. There was even a time in the late 1940s that it was looked at as a possible site for the U.S. Air Force Academy.



In August 1951, SAC selected the base to be a site of one of its new bombardment wings, with both bombers and tankers assigned to the unit. Construction of facilities to support SAC's first all-jet bomber, the B-47, and the KC-97 aerial refueling tanker (the forerunner of SAC's all-jet tankers, the KC-135 and the KC-10) began in early 1952. In October 1952, SAC activated the 340th Bombardment Wing at the redesignated Sedalia Air Force Base.

In October 1955, Sedalia AFB was renamed Whiteman AFB in honor of 2nd Lt. George A. Whiteman, a Sedalia native. Whiteman was one of the first American airmen killed in combat during World War II, when his P-40 fighter, the "Lucky Me," was shot down as he attempted to take off during the attack on Pearl Harbor on December 7, 1941.

From 1955 to 1960, the 340th BMW played a key role in SAC's mission of strategic deterrence. As Whiteman entered the 1960s, its mission shifted from aircraft to SAC's newest weapon system, the Minuteman intercontinental ballistic missile. In June 1961, Air Force officials selected the base to be the location of SAC's fourth Minuteman missile wing—the 351st Strategic Missile Wing.

The new missile wing was activated in February 1962, and continued its deterrent mission until July 31, 1995, when the wing and its missiles were deactivated under provisions of the Strategic Arms Reduction Treaty.

Today, Whiteman is the home of the 509th Bomb Wing, which operates and maintains the Air Force's premier weapon system, the B-2 bomber. Construction to support the B-2 beddown began in 1988, resulting in a wave of demolition projects and new operations, maintenance, and support facilities. Flying operations returned to the base after 30 years on July 20, 1993, when the first permanently assigned T-38 landed at Whiteman. The flight mission was expanded on December 17, 1993, with the arrival of the first B-2 Stealth Bomber, the Spirit of Missouri. In addition to the B-2 beddown, the Reserve A-10 Thunderbolt II aircraft was transferred from Richards-Gebaur AFB, Missouri, in 1994, facilitated by the BRAC process.

3.4 Current Military Operations

The organizations at Whiteman AFB include the 509th Bomber Wing, the Air Force Reserve 442nd Fighter Wing, the Missouri Army National Guard 1-135th Aviation Battalion, and the Navy Reserve Mobile Inshore Undersea Warfare Unit 114.

The 509 BW is home to 20 B-2 bombers. Flown by members of the 13th and 393d Bomb squadrons, the B-2 uses stealth technology to penetrate air defenses undetected and attack enemy tactical and strategic targets with both conventional and nuclear ordnance.

The 394th Combat Training Squadron uses 14 T-38 aircraft to produce mission-ready B-2 crews, starting with initial B-2 qualification and continuing on to upgrade training.



The 442nd FW supports, maintains, and flies the A-10 and OA-10 Thunderbolt II for a total of 26 aircraft. The A-10, better known as the Warthog or "tank killer," employs numerous weapons, most notably a 30mm cannon to fend off attacking ground forces, specifically armored vehicles.



The 1st Battalion, 135th Aviation “First Attack Team,” is composed of a variety of units ready to respond to any emergency and to act in the defense of the nation. The unit supports, maintains, and flies 15 AH-64 Apaches.

The type of aircraft, number of aircraft, number of flying missions and amount of flying hours for each military unit at Whiteman AFB are listed in Tables 3-2 and 3-3.

3.5 Community Demographics and Growth Trends

Within the study area, as of the 2000 Census, the City of Knob Noster accounts for 2,462 persons and 3,836 live on Whiteman AFB. Using 2000 U.S. Census Block Group data to determine the population density of rural areas, it is estimated that 2,471 persons live in the unincorporated Johnson County portion of the study area. The total population of the study area is estimated to be 8,769.

The estimated population within the noise contours greater than 65 decibels is listed in Table 3-4 (see Section 4.1 for definitions of DNL, dB, and APZ).

Table 3-4: Area and Population Within DNL 65 dB and Greater Noise Exposure Area (Off-Installation)

DNL Noise Zone	Acres	Population
65-69	1,892	334
70-74	1,060	157
75-79	87	0
80+	0	0
Total	3,3039	491

Population growth within the JLUS study area is estimated to be slow. There are 224 vacant residential lots in existing subdivisions. Most of these lots have been vacant for multiple years, and the local real estate community does not foresee a short-term housing demand that would cause these lots to become developed. However, if all vacant lots in subdivisions were built out, the population increase is estimated at 578. Of the 224 lots, 25 are located in the 65-69 dB contour (two of which are in APZ II) and five are located in the 70-74 dB contour.

The City of Knob Noster shows an additional 1,038 acres of low density residential and 53 acres of higher density residential areas on the Future Land Use Map in the Comprehensive Plan. None of these are areas of concern because they do not fall within an APZ or a noise contour.

3.6 Environmental Resources

Whiteman AFB is located in a rural area. The JLUS study area is approximately 48,500 acres (75 ¾ square miles). Of that, 87 percent or 42,500 acres (66.5 square miles) is undeveloped. 39,000 acres (61 square miles) of the study area is used agriculturally. Knob Noster State Park, to the west of the Base, accounts for approximately 2,500 acres (four square miles) with an additional 360 acres leased to the Base for the golf course.

The majority of soils in the study area are varieties of loam, which is ideal for growing crops because of its ability to retain nutrients and water. However, due to topography and poorly drained creek basins, not all soils are prime for agriculture. Within the study area, 17,543 acres are prime farmland, 10,075 acres are prime if drained properly, and 20,712 acres are not prime farmland.

Typically, floodplains are defined as the elevation a river will reach during an event that has a certain percent chance of happening each year. The 100-year floodplain is the elevation a river will reach given a flood event that has a 1% chance of happening. The 500-year floodplain is the elevation a river will reach given a flood event that has a .2% chance of happening. The Federal Emergency Management Agency (FEMA) creates and maintains maps delineating floodplains. However, FEMA has not yet calculated flood heights for Johnson County. “Floodplains” identified in this report were estimated using topographic and soil data and represent areas adjacent to streams that are most probable to be inundated by water if the stream floods. There are 5,400 acres of “floodplain” in the study area along Clear Fork to the north and west and Long Branch and Muddy Creek to the east.



Table 3-2: Current Military Operations

Activity	Aircraft		Assigned	Flying Hours
509th Bomb Wing	B-2	Bomber	20	7,033
394th Combat Training Squadron/509th Bomb Wing	T-38	Companion Trainer	14	4,196
442d Fighter Wing	A/OA-10	Fighter	26	5,940
1-135th Aviation Battalion	AH-64A	Helicopter	15	1,625
Total Aircraft and Flying Hours			65	18,794

Table 3-3: Assigned Aircraft

Aircraft		Average Number of Operations (Daily)
T-38 Talon Jet Trainer		54
B-2 Spirit Stealth Bomber		41
AH-64A Apache Helicopter		41
A-10 Thunderbolt Flying Gun/Tankbuster		26
Other Transient Aircraft		94

Wetlands are defined by the U.S. Department of the Interior (DOI) as lands transitional between terrestrial and aquatic systems where the water table is at or near the surface or the land is covered by shallow water. The DOI publishes the National Wetlands Inventory (NWI) available in a Geographic Information System (GIS). The NWI GIS shows areas identified as potential wetlands. True wetlands are not identified in the GIS because all areas have not been surveyed to see if they meet the DOI definition of a wetland. Potential Wetlands as shown in the NWI GIS are those areas identified using United States Geological Survey (USGS) topographic maps and aerial photography as having wetland characteristics but is only probable of being a true wetland. There are 1,600 acres of potential wetlands identified in the study area.

Soil type by agriculture, floodplains, and wetlands are displayed in Figure 2.

Wildlife habitats are plentiful in the Whiteman AFB JLUS Study Area. Open agricultural fields, wooded slopes and ravines, and the State Park all provide habitat for common and rare wildlife. An inventory of species occurrence was not conducted as a part of this project, but Table 3-5 lists Special Status Species found in Johnson County.

Table 3-5: Species and Natural Communities of Conservation Concern in Johnson County

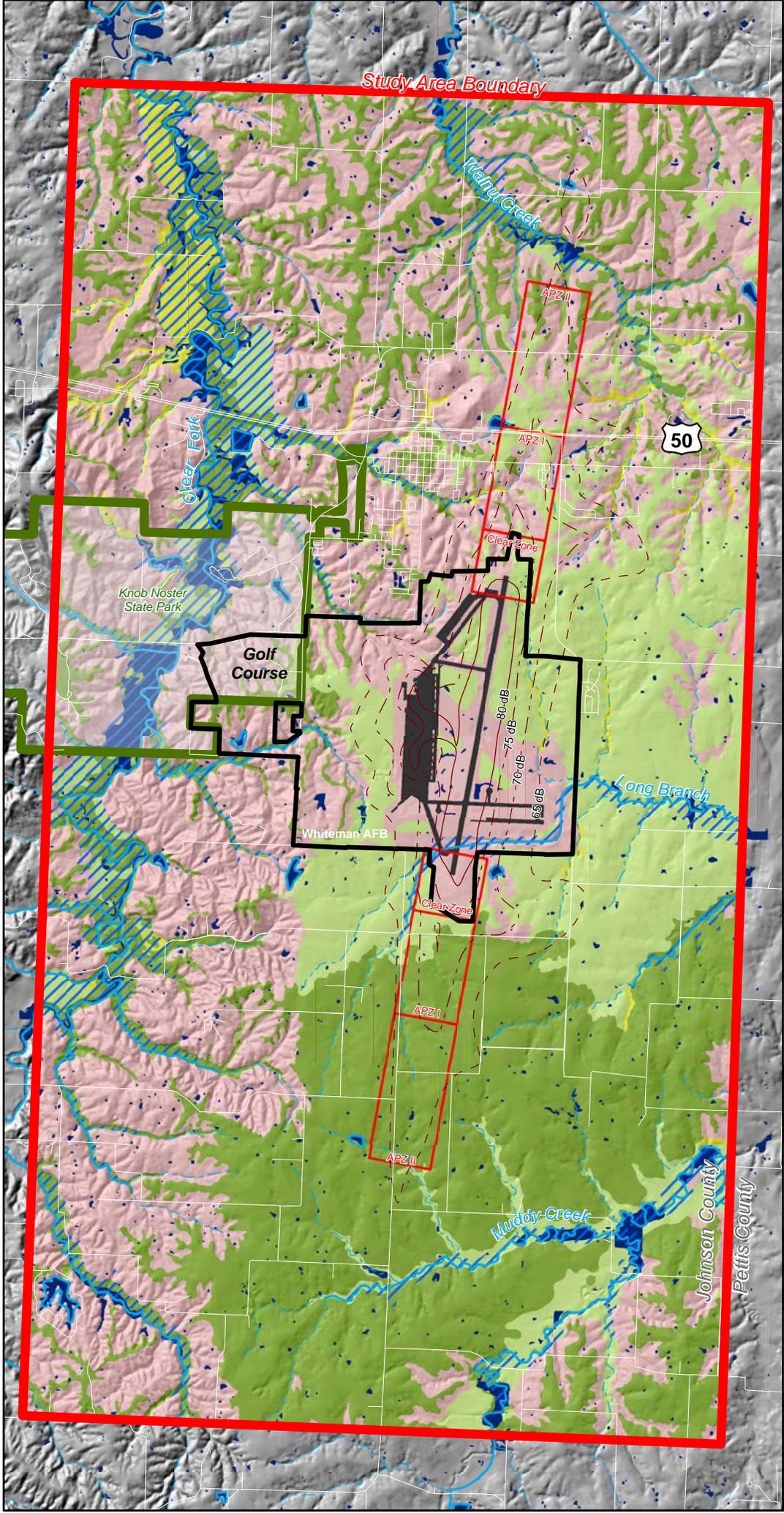
Scientific Name	Common Name	State Rank	Global Rank	State Status
<i>Creeks and small rivers (prairie region)</i>			Not Ranked	
<i>Dry-mesic limestone/dolomite prairie</i>		Imperiled	Not Ranked	
<i>Dry-mesic loess/glacial till woodland</i>		Vulnerable	Not Ranked	
<i>Limestone glade</i>		Imperiled	Not Ranked	
<i>Prairie swale</i>		Imperiled	Not Ranked	
<i>Riverfront fores</i>		Apparently Secure	Not Ranked	
<i>Wet bottomland forest</i>		Imperiled	Not Ranked	
<i>Bromus latiglumis</i>	A Brome	Vulnerable	Secure	
<i>Agalinis auriculata</i>	Auriculate False Foxglove	Vulnerable	Vulnerable	
<i>Juncus balticus var. littoralis</i>	Baltic Rush	Critically Imperiled	Secure	
<i>Tyto alba</i>	Barn Owl	Vulnerable	Secure	Endangered
<i>Wolffia columbiana</i>	Columbia Water-meal	Unrankable	Secure	
<i>Tympanuchus cupido</i>	Greater Prairie-chicken	Critically Imperiled	Apparently Secure	Endangered
<i>Mustela frenata</i>	Long-tailed Weasel	Imperiled	Secure	
<i>Rana areolata circulosa</i>	Northern Crawfish Frog	Vulnerable	Apparently Secure	
<i>Platanthera flava var. herbiola</i>	Northern Rein Orchid	Imperiled	Apparently Secure	
<i>Speyeria idalia</i>	Regal Fritillary	Vulnerable	Questionable Taxonomy	
<i>Symphyotrichum subulatum var. ligulatum</i>	Saltmarsh Aster	Vulnerable	Vulnerable	
<i>Oenothera perennis</i>	Saltmarsh Aster	Imperiled	Secure	
<i>Oenothera perennis</i>	Small Sundrops	Critically Imperiled	Secure	
<i>Descurainia pinnata ssp. pinnata</i>	Tansy Mustard	Imperiled	Secure	
		Vulnerable		

Source: Missouri Natural Heritage Database, <http://mdc.mo.gov/cgi-bin/heritage/search.cgi?county=Johnson>

Figure 2: Whiteman AFB JLUS Natural Resources

Legend

- Potential Wetlands
- Creek
- Intermittent
- Floodplains
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season



Source: City of Knob Noster
Whiteman AFB
Woolpert, Inc.
USGS
Map Date: 4/30/2008

4.0 TECHNICAL INFORMATION

4.1 AICUZ (Air Installation Compatible Use Zone)

The DoD developed the AICUZ program for military airfields. This program works to protect aircraft operational capabilities at its installations and to assist local government officials in protecting and promoting the public health, safety, and quality of life. The goal is to promote compatible land use development around military airfields by providing information on aircraft noise exposure and accident potential.

The AICUZ report describes three constraints to development that affect or result from flight operations. The first constraint involves areas that the Federal Aviation Administration (FAA) and DoD have identified for height limitations. The Air Force's obstruction criteria are based on the Federal Aviation Regulation (FAR) Part 77 under Subpart C. Recommended height restrictions for structures are described in Section 4.2 Imaginary Surfaces.

The second constraint involves noise zones produced by the Day-Night Average A-Weighted Sound Level (DNL) metric and the DoD NOISEMAP methodology. DNL is the average sound level for a 24 hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 p.m. to 7 am. The Air Force uses the DNL descriptor in assessing the amount of aircraft noise exposure, and as a metric for community response to the various levels of exposure.

Using the NOISEMAP computer program, which is similar to the FAA's Integrated Noise Model, DoD produces noise contours showing the noise levels generated by current aircraft operations according to decibel (dB) level. A decibel is a unit used to express the intensity of a sound wave based on the pressure produced by the sound wave. The AICUZ report contains noise contours plotted in increments of five dB, ranging from a DNL of 65 dB to 80+ dB.

The third constraint involves accident potential zones (APZ). These imaginary zones illustrate where aircraft accidents are most likely to occur. DoD analysis has confirmed that the areas immediately beyond the ends of runways and along the approach and departure flight paths are the most hazardous, and have divided the area into three zones, each having its own regulation or suggested regulation to development.

The Clear Zone (CZ), the area closest to the runway end, is the most hazardous. The overall risk is so high that DoD generally attempts to acquire the land through purchase or easement to prevent development. At Whiteman AFB, 41 percent of the CZ property is located off base and is subject to restrictive easements. APZ I is an area beyond the CZ that possesses a significant potential for accidents. APZ II is an area beyond APZ I having measurable potential for accidents. While aircraft accident potential in APZs I and II does not warrant acquisition by the Air Force, land-use planning and controls are strongly encouraged in these areas for the protection of the public. Whiteman AFB CZs are 3,000 feet wide by 3,000 feet long. APZ I is 3,000 feet wide by 5,000 feet long, and APZ II is 3,000 feet wide by 7,000 feet long. Figure 3 displays the APZs, CZ and noise contours associated with Whiteman AFB.

4.2 Imaginary Surfaces

Runway airspace imaginary surfaces, in graphical form, are the result of applying obstruction height criteria to Whiteman AFB. Imaginary surfaces are those in space around airfields in relation to runways. The surfaces are designed to define the obstacle-free airspace at and around the airfield. Refer to Unified Facilities Criteria (UFC) 3-260-01, *Airfield and Heliport Planning and Design*, for a more complete description of runway airspace imaginary surfaces for Class B runways. Air Force obstruction

Figure 3: Whiteman AFB JLUS

AICUZ Map

Legend

 Air Accident Zones

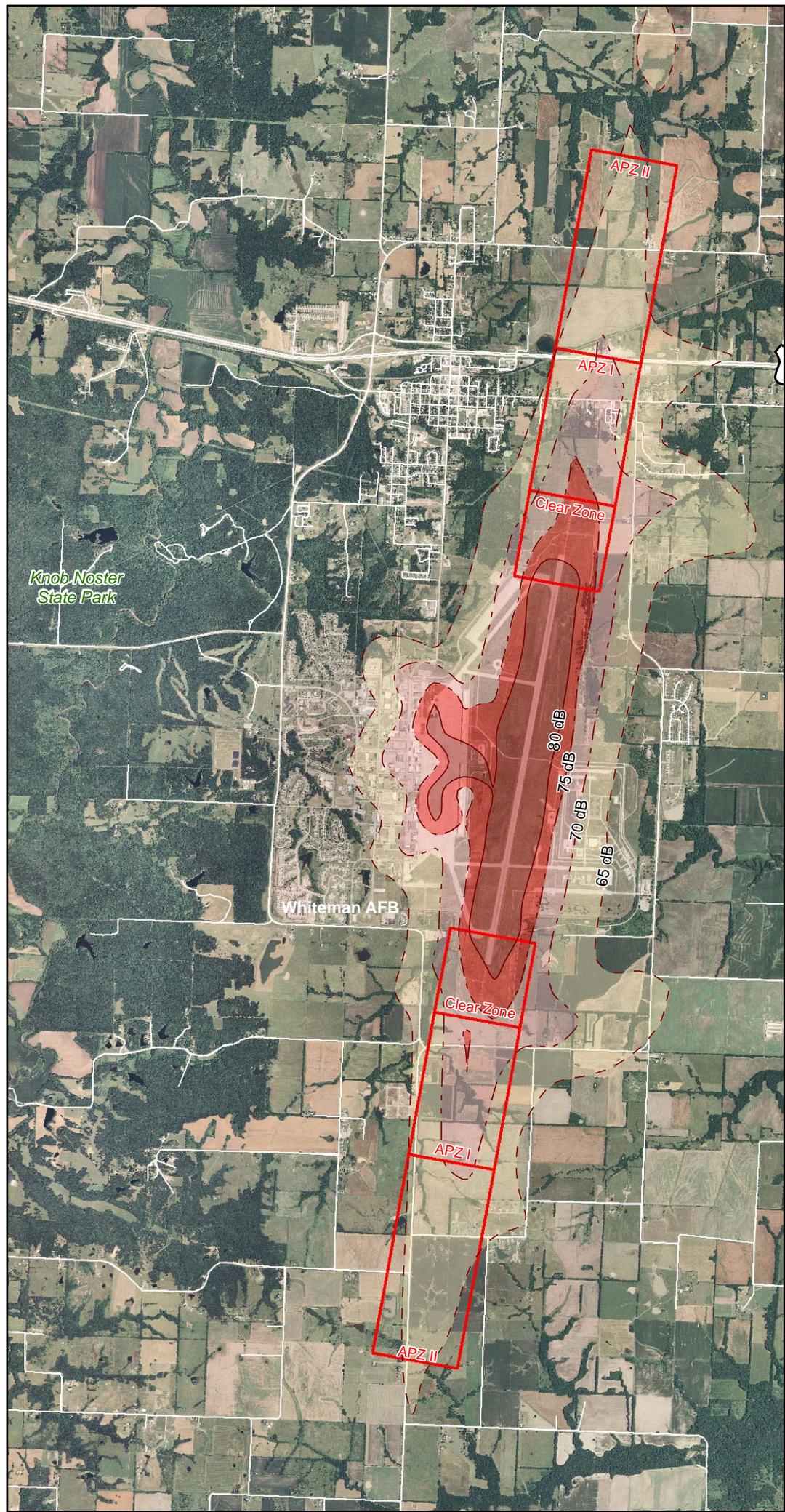
Noise Contours

 65 dB

 70 dB

 75 dB

 80 dB



Source: City of Knob Noster
Whiteman AFB
Map Date: 5/9/2008



criteria in UFC 3-260-01 are based on those contained in FAR Part 77, *Objects Affecting Navigable Airspace*, Subpart C. The following paragraphs contain definitions of the runway airspace imaginary surfaces for Air Force Class B runways. Figure 4 shows the location of the Imaginary Surfaces.

- **Primary Surface**—An imaginary surface symmetrically centered on the runway, extending 200 feet beyond each runway end that defines the limits of the obstruction clearance requirements in the vicinity of the landing area. The width of the primary surface is 2,000 feet, or 1,000 feet on each side of the runway centerline.
- **Clear Zone Surface**—An obstruction-free surface (except for features essential for aircraft operations) on the ground symmetrically centered on the extended runway centerline beginning at the end of the runway and extending outward 3,000 feet. The CZ width is 3,000 feet (1,500 feet to either side of runway centerline).
- **Accident Potential Zone Surfaces**—APZ I begins at the outer end of the CZ and is 5,000 feet long and 3,000 feet wide. APZ II begins at the outer end of APZ I and is 7,000 feet long and 3,000 feet wide.
- **Approach-Departure Clearance Surface**—This imaginary surface is symmetrically centered on the extended runway centerline, beginning as an inclined plane (glide angle) 200 feet beyond each end of the primary surface, and extending for 50,000 feet. The slope of the approach-departure clearance surface is 50:1 until it reaches an elevation of 500 feet above the established airfield elevation. It then continues horizontally at this elevation to a point 50,000 feet from the starting point. The width of this surface at the runway end is 2,000 feet, flaring uniformly to a width of 16,000 feet at the end point.
- **Inner Horizontal Surface**—This imaginary surface is an oval plane at a height of 150 feet above the established airfield elevation. The inner boundary intersects with the approach-departure clearance surface and the transitional surface. The outer boundary is formed by scribing arcs with a radius 7,500 feet from the centerline of each runway end and interconnecting these arcs with tangents.
- **Conical Surface**—This is an inclined imaginary surface extending outward and upward from the outer periphery of the inner horizontal surface for a horizontal distance of 7,000 feet to a height of 500 feet above the established airfield elevation. The slope of the conical surface is 20:1. The conical surface connects the inner and outer horizontal surfaces.
- **Outer Horizontal Surface**—This imaginary surface is located 500 feet above the established airfield elevation and extends outward from the outer periphery of the conical surface for a horizontal distance of 30,000 feet.
- **Transitional Surface**—This imaginary surface extends outward and upward at right angles to the runway centerline and extended runway centerline at a slope of 7:1. The transitional surface connects the primary and the approach-departure clearance surfaces to the inner horizontal, the conical, and the outer horizontal surfaces.

4.3 Analysis of Existing Land Uses

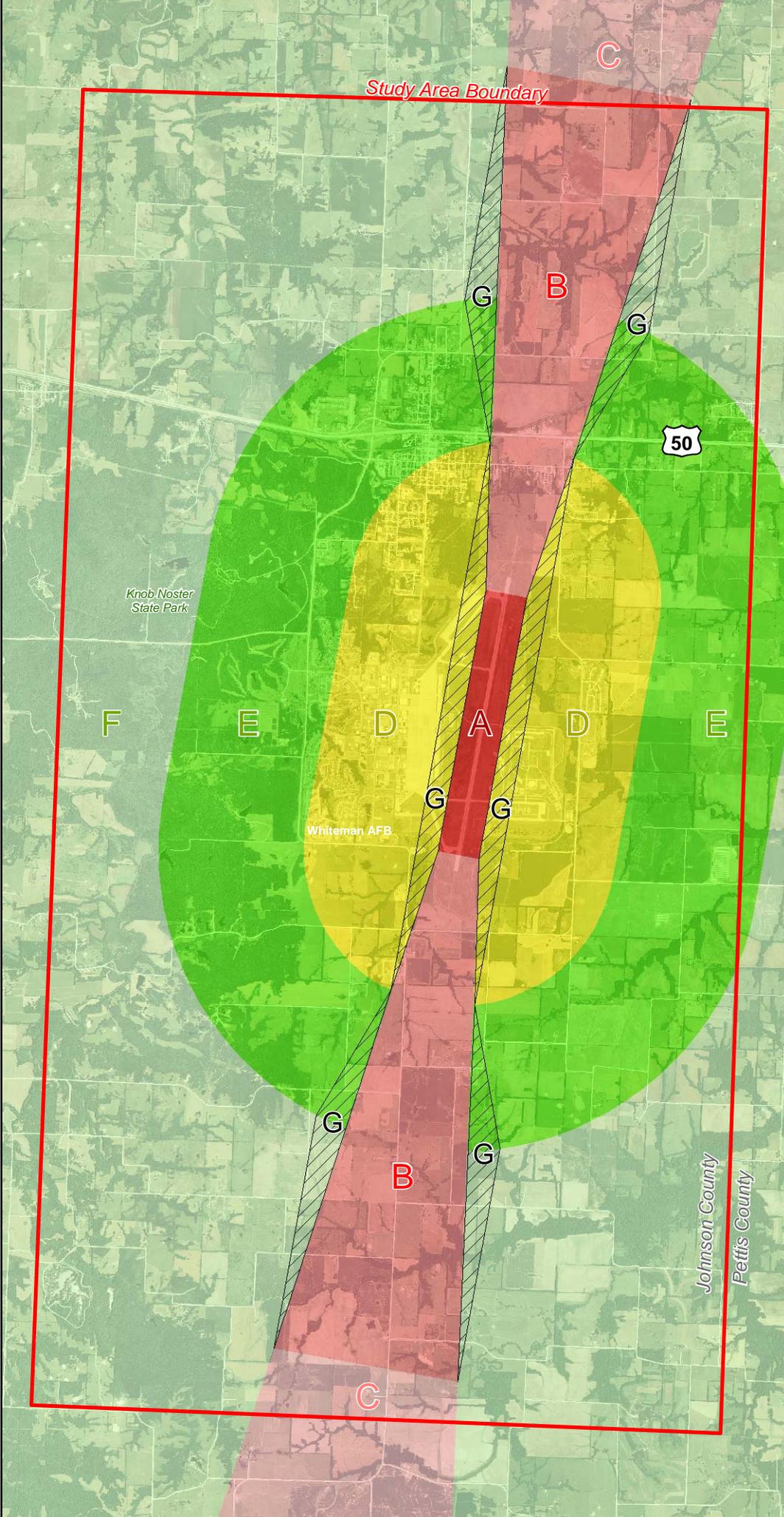
Existing land use within the JLUS study area was derived from ownership/parcel information, aerial photography, and visual surveys. A land use classification was assigned to real estate parcels and color coded using Land Based Classification Standards and Air Force Land Use Compatibility recommendations as a reference. Existing Land Use for the study area is shown in Figure 5.

Figure 4: Whiteman AFB JLUS

Airspace Imaginary Surfaces

Legend

- Zone**
- A - Primary Surface
 - B - Approach Departure Clearance Surface (50:1 Slope Ratio)
 - C - Approach-Departure Clearance Surface (Horizontal)
 - D - Inner Horizontal Surface (150' Elevation)
 - E - Conical Surface (20:1 Slope Ratio)
 - F - Outer Horizontal Surface (500' Elevation)
 - G - Transitional Surface



Source: Whiteman AFB
Map Date: 5/2/2008

Figure 5: Whiteman AFB JLUS

Existing Land Use

Legend

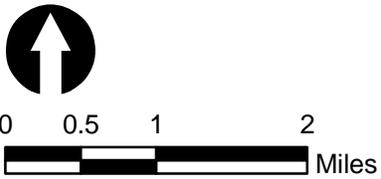
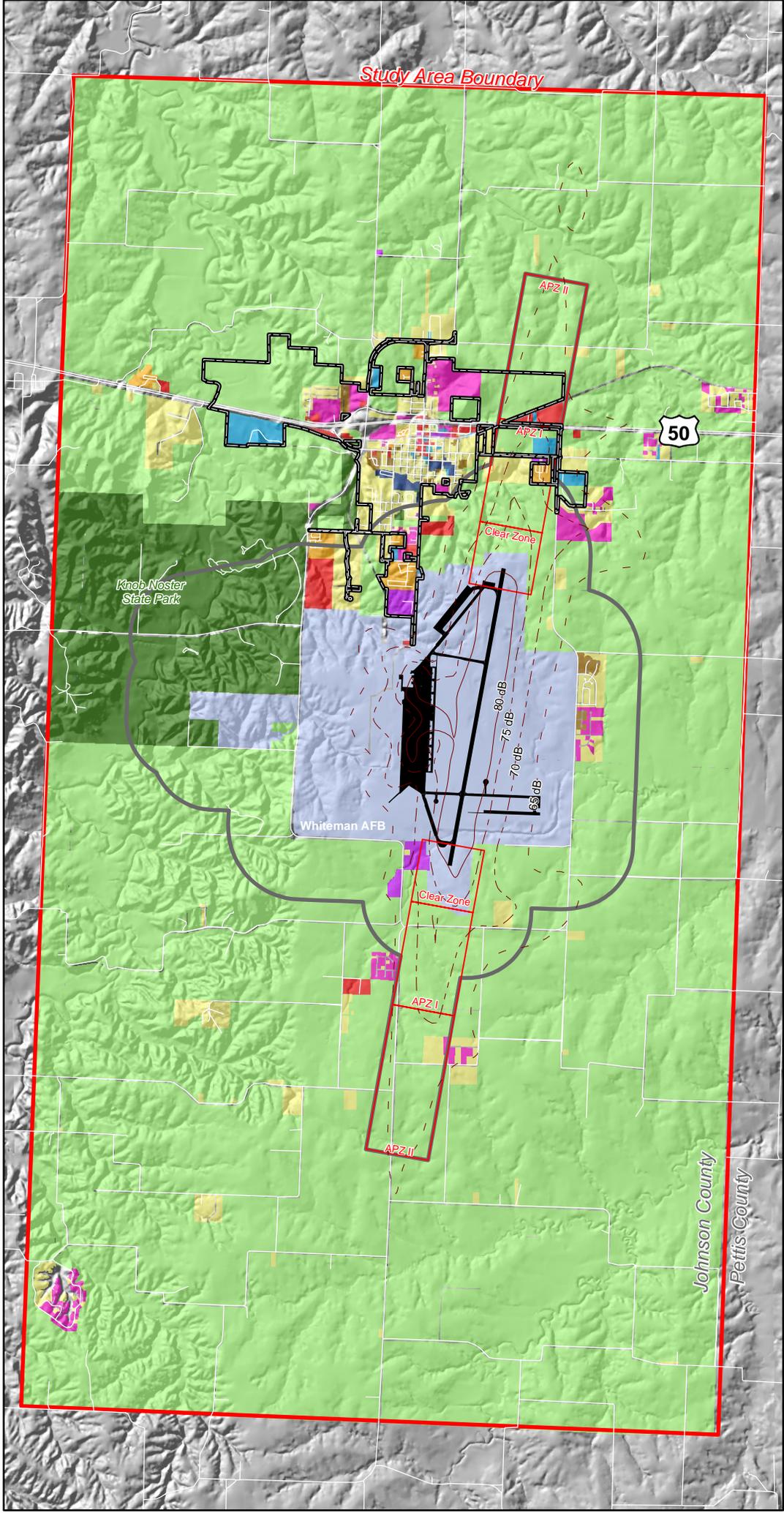
-  Whiteman Airport Zone
-  Accident Potential Zones
-  Knob Noster City Boundary

Noise Contours

-  65 dB
-  70 dB
-  75 dB
-  80 dB

Existing Land Use

-  Agriculture
-  Park
-  Residential (1 unit)
-  Mobile Home
-  Residential (2+ units)
-  Commercial
-  Industrial/Heavy Commercial/Utility
-  School
-  Municipal/Institution
-  Air Force
-  Vacant/Undeveloped



Source: City of Knob Noster
 Johnson County
 Whiteman AFB
 Woolpert, Inc.
 Map Date: 4/30/2008



Land use classifications within the study area are defined below:

- **Agriculture**—The use of land for crop or livestock farming or continuous maintenance of land in a rural, undeveloped state.
- **Park**—Land used for active recreation, passive recreation, or the preservation of a natural resource.
- **Residential (1 Unit)**—Areas containing permanent buildings with a foundation that contain one dwelling unit. Due to recommended Air Force safety and noise mitigation standards, mobile single family homes are identified separately.
- **Mobile Home**—A parcel containing, as a primary structure, one or more transportable units suitable and intended for year-round, single family occupancy.
- **Residential (2+ Units)**—Land containing structures with two or more dwelling units.
- **Commercial**—Areas including retail, office, and service business establishments.
- **Industrial/Heavy Commercial/Utility**—Land containing manufacturing businesses, warehousing structures, distribution facilities, utility infrastructure, or other activity that may generate fumes, loud noise, and/or heavy truck traffic.
- **School**—Land containing educational facilities.
- **Municipal/Institution**—Land owned and maintained by a local, state, or federal agency for a public purpose; land owned and used by a religious or fraternal organization and used as a gathering place or for the provision of a service.
- **Air Force**—Whiteman Air Force Base.
- **Vacant/Undeveloped**—Land that has been subdivided and/or purchased by a developer for use other than agriculture but has not yet been developed.



Air Force Handbook 32-7084 details types of land uses and recommendations concerning their compatibility within Noise Zones, CZs, and APZs. Tables 4-1 and 4-2 summarize the acreage of land use within these zones.

Table 4-1 shows the breakdown by acreage of the land uses located in Accident Potential Zones and Noise Zones. Table 4-2 breaks down the land uses and shows the acreage the Air Force would be considered incompatible when referring to the AICUZ. The Accident Potential Zones are 2,066 acres, of which, 300 acres are on base and 1,766 acres are off base. Of the total area of land off base in APZs, 85 acres (58 acres 1 Unit Residential, 27 acres Mobile Home) are considered incompatible. The Noise Zones are 5,577 acres, of which, 2,538 acres are on base and 3,039 acres are off base. Of the total area of land within Noise Zones and not in an APZ, 2 acres of land used for Mobile Homes is incompatible.

Table 4-1: Generalized Existing Land Use Within DNL 65 dB Noise Exposure Area (Off-Installation)

Category	Acreage in Noise Zones	Acreage in APZs
Agriculture	2,488	1,560
Park	0	0
Single Family Residential	303	98
Mobile Home	29	27
Multi-Family Residential	0	0
Commercial	38	31
Industrial/Heavy Commercial/Utility	44	18
School	0	0
Municipal/Institutional	44	27
Vacant/Undeveloped	93	5
Total	3,039	1,766

Table 4-2: Incompatible Land Uses

Category	Acreage Within CZs and APZs			Acreage Within Noise Zones, Not Included in CZs and APZs			
	Clear Zone	APZ I	APZ II	65-69	70-74	75-79	80+
Agriculture	•	•	•	•	•	•	•
Park	0	•	•	•	•	0	0
Single Family Residential	0	58	•	•	•	0	0
Mobile Home	0	27	0	2	0	0	0
Multi-Family Residential	0	0	0	•	0	0	0
Commercial	0	0	•	•	•	•	0
Industrial/Heavy Commercial/Utility	0	0	•	•	•	•	•
School	0	0	0	•	•	0	0
Municipal/Institutional	0	0	•	•	•	•	0
Vacant/Undeveloped	•	•	•	•	•	•	•
Total	0	85	0	2	0	0	0

• Represents compatible land use

4.4 Analysis of Future Land Uses

The City of Knob Noster adopted a Comprehensive Plan in 2007. The Future Land Use Plan in the Comprehensive Plan takes Air Force Land Use Compatibility into account and does not recommend any land uses that would be considered incompatible. No plan exists for land in unincorporated areas in the study area.

Future land use was created using the City of Knob Noster Comprehensive Plan and assuming that all vacant/undeveloped land will be developed. The result is an increase of five houses in the 70-74 dB noise zone and 26 houses in the 65-69 dB noise zone. The City of Knob Noster planned for an industrial park north of Hwy 50, of which approximately 224 acres is in the 65-69dB noise zone and 288 acres is in APZ II.

In unincorporated Johnson County, no plans or land use regulations exist that would influence development or direct it to occur in certain areas. Without such planning efforts it is difficult to determine where development will occur. However, given the current real estate market, it can be estimated that little to no development will occur in proximity to the base.

Figure 6 shows the potential future land use of the study area.

4.5 Analysis of Zoning

The City of Knob Noster adopted a zoning ordinance based on the 2006 *International Zoning Code* published by the International Code Council. Table 4-3 lists the zoning districts used by the city and defines other areas identified on the Zoning Map (see Figure 7). The Zoning Map

Table 4-3: Knob Noster Zoning in Study Area

District	Description
A-1	Agricultural Zone, one dwelling unit per 5 acres.
R-1	Residential Zone, six units per acre maximum density, 6,000 SF min. lot size.
R-2	Residential Zone, four units per acre maximum density, 5,000 SF minimum lot size.
R-3	Residential Zone, 12 units per acre maximum density, 2,500 SF minimum lot size.
MHP	Manufactured Home Park, eight units per acre maximum density, 4,000 SF minimum lot size.
C-2	Commercial Zone, light commercial including local retail, trade schools, and office/service uses.
C-4	Commercial Zone, heavier commercial including amusement centers, larger retail establishments, and light manufacturing/assembly/ warehousing.
I-1	Industrial Zone, light manufacturing, and industrial uses
City Owned	Not a regulated zone, includes land owned by the City of Knob Noster for municipal administration or the provision of a public service.
MODot	Not a regulated zone, includes land owned by the Missouri Department of Transportation for the storage of materials and equipment used for road repair.
State Park	Not a regulated zone, includes land owned by the State of Missouri for Knob Noster State Park.
USAF	Not a regulated zone, includes land owned by the United States Government for Whiteman AFB.
County, Unzoned	All parcels in unincorporated Johnson County, currently no zoning.
Military Airport Zone	The area covered by the Johnson County Military Airport Zoning Ordinance.

Figure 6: Whiteman AFB JLUS

Knob Noster Future Land Use

Legend

-  Military Airport Zone
-  Accident Potential Zones
-  Knob Noster City Boundary

Noise Contours

-  65 dB
-  70 dB
-  75 dB
-  80 dB

Future Land Use

-  Agriculture
-  Park
-  Residential (1 unit)
-  Mobile Home
-  Residential (2+ units)
-  Commercial
-  Industrial/Heavy Commercial/Utility
-  School
-  Municipal/Institution
-  Air Force
-  Vacant/Undeveloped



Source: City of Knob Noster
 Johnson County
 Whiteman AFB
 Woolpert, Inc,
 Map Date: 4/30/2008

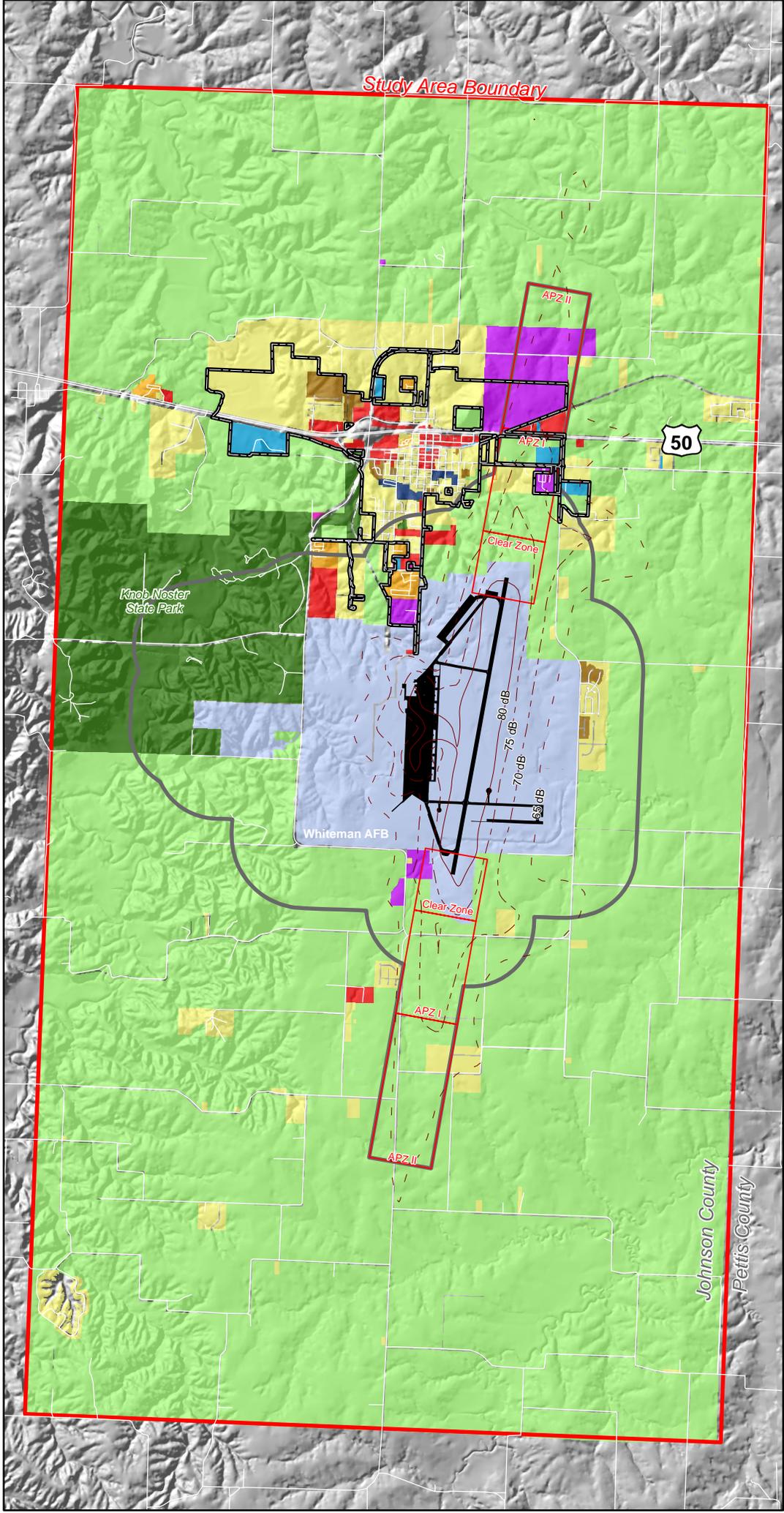


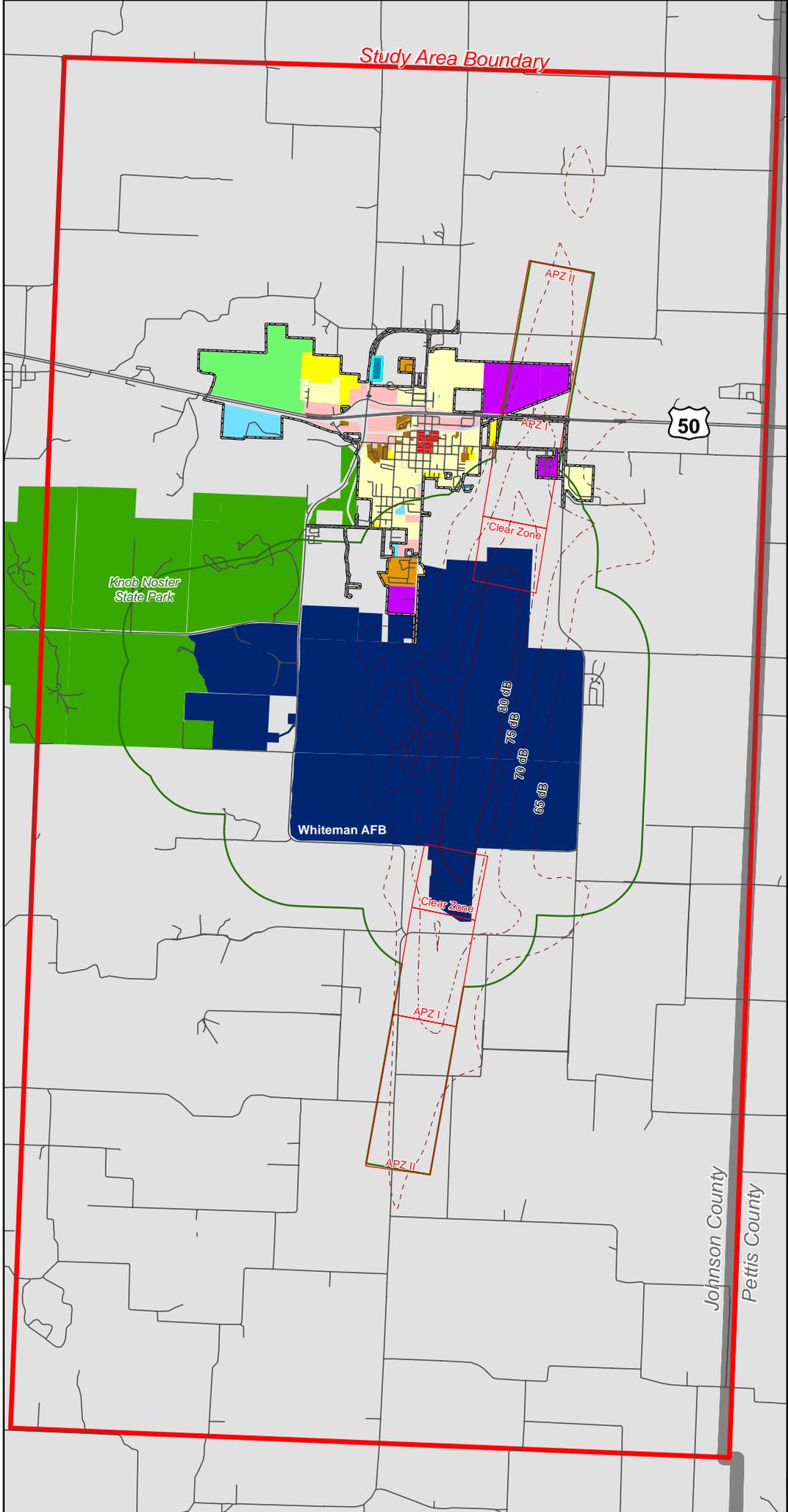
Figure 7: Whiteman AFB JLUS Zoning

Zoning Districts

- | | |
|---|---|
| A-1 | I-1 |
| R-1 | City Owned |
| R-2 | MODoT |
| R-3 | State Park |
| MHP | USAF |
| C-2 | County - Unzoned |
| C-4 | Military Airport Zone |

Noise Contours

- 65 dB
- 70 dB
- 75 dB
- 80 dB
- Accident Potential Zones
- Knob Noster City Boundary



Source: City of Knob Noster
Johnson County
Whiteman AFB
Map Date: 5/1/2008



shows two industrial areas in the north APZs. Based on AICUZ standards, only certain industrial activities are recommended for APZ I, and an industrial development is compatible in APZ II. An area of R-1 is located in the 65-69 dB noise contour.

Johnson County currently has no county-wide zoning or other land use controls. However, a State of Missouri statute (Revised Statute 41.655 and 67.1210) allows the county to zone an area within 3,000 feet of Whiteman AFB including the APZs. Under authority of the Missouri State statute, Johnson County adopted a Military Airport Zoning Ordinance (JC 67.1210) with the intention of regulating structures and land uses that would encroach upon Whiteman AFB. A map showing the location of zones has not been adopted. Further discussion regarding the Military Airport Zone can be found in Section 5.2.2.



4.6 Current Coordination Efforts

City of Knob Noster: The City of Knob Noster has taken steps to incorporate Air Force AICUZ land use recommendations into both their Comprehensive Plan and Zoning Ordinance. The city also adopted an Airport Overlay District with the expressed goal of protecting the health, safety, and welfare of persons and property in the vicinity of Whiteman AFB. The city uses the 2001 Whiteman AFB AICUZ report as the basis for the Overlay District.

Johnson County: Johnson County is undergoing an effort to zone unincorporated areas within 3,000 feet of the base and in the APZs, known as The 2008 Military Airport Zoning Ordinance for the Unincorporated Area of Johnson County, Missouri. Text for the ordinance has been drafted, but a map showing zoning district boundaries has not.

Whiteman AFB: Whiteman AFB follows Air Force standards for limiting the number of flight operations at night and specifying flight tracks over areas that have the lowest population densities. Easements have been purchased on all properties in the CZ and partially in APZ I. The Public Affairs Office answers questions and concerns from area residents.

Whiteman Area Leadership Council: The Whiteman Area Leadership Council (WALC) was formed as a proactive effort to prevent the closure of Whiteman AFB under the most recent BRAC effort. Its main focus is to aid in the retention and expansion of the missions and physical planning of Whiteman AFB. The WALC does not control land use and building code issues, but it does represent the spirit of cooperation between the Air Force base and the local community.

5.0 RECOMMENDATIONS

The growth rate for the study area is projected to be low and there are few parcels with development that conflict with Air Force land use compatibility guidelines. Because of these factors, the opportunity exists to “get ahead of the curve” and maintain a high—and safe—quality of life for city and county residents by ensuring that inappropriate development is not permitted in zones with accident potential or with zones where noise levels are high. This section presents the recommendations for maximizing regional and local coordination and minimizing the effects of airfield operations on landowners in proximity to Whiteman AFB. Figure 8 provides a summary of the recommendations graphically.

5.1 Cooperation/Partnerships

Critical components of managing land use compatibility in the vicinity of an airfield is to maximize the lines of effective communication between local governments and those local governments and the airfield operators, as well as establishing partnerships with agencies and organizations that can assist in maintaining a safe and high quality community. This section provides a strategy for establishing lines of communication and partnerships.

5.1.1 JLUS Implementation and Communication

Upon completion of the Whiteman AFB JLUS, the results and recommendations within this document should be shared with all local jurisdictions within Johnson County. Because the Whiteman AFB JLUS is not a legal document, there needs to be a champion within Johnson County to ensure ongoing implementation of the study’s recommendations.

The Whiteman AFB JLUS Policy Committee could be entrusted with the ongoing implementation of the Whiteman AFB JLUS, and it should meet on a regular basis to coordinate implementation efforts and publish an annual report that highlights the past year’s accomplishments. The committee should include representation from the installation; which will aid in monitoring any changes to airfield operations. The JLUS Policy Committee should meet on an annual basis with the Johnson County Commission, City of Knob Noster, and the Johnson County Airport Zoning Commission. This ongoing communication between local governments and the installation is critical to successful implementation of the Whiteman AFB JLUS. A specific point of contact should be established for each government body. An example follows:



- Chairman, Whiteman AFB JLUS Policy Committee
- Chairman, Johnson County Airport Zoning Commission
- City Administrator, City of Knob Noster
- Presiding Commissioner, Johnson County Commission
- Whiteman AFB Ex-Officio Member, Johnson County Airport Zoning Commission

Because the influence of airfield operations extend beyond the borders of Johnson County, a formal procedure for communication and coordination with neighboring counties should be established. The Whiteman AFB JLUS Policy Committee could also be instrumental in coordinating with the Missouri Military Preparedness and Enhancement Commission.

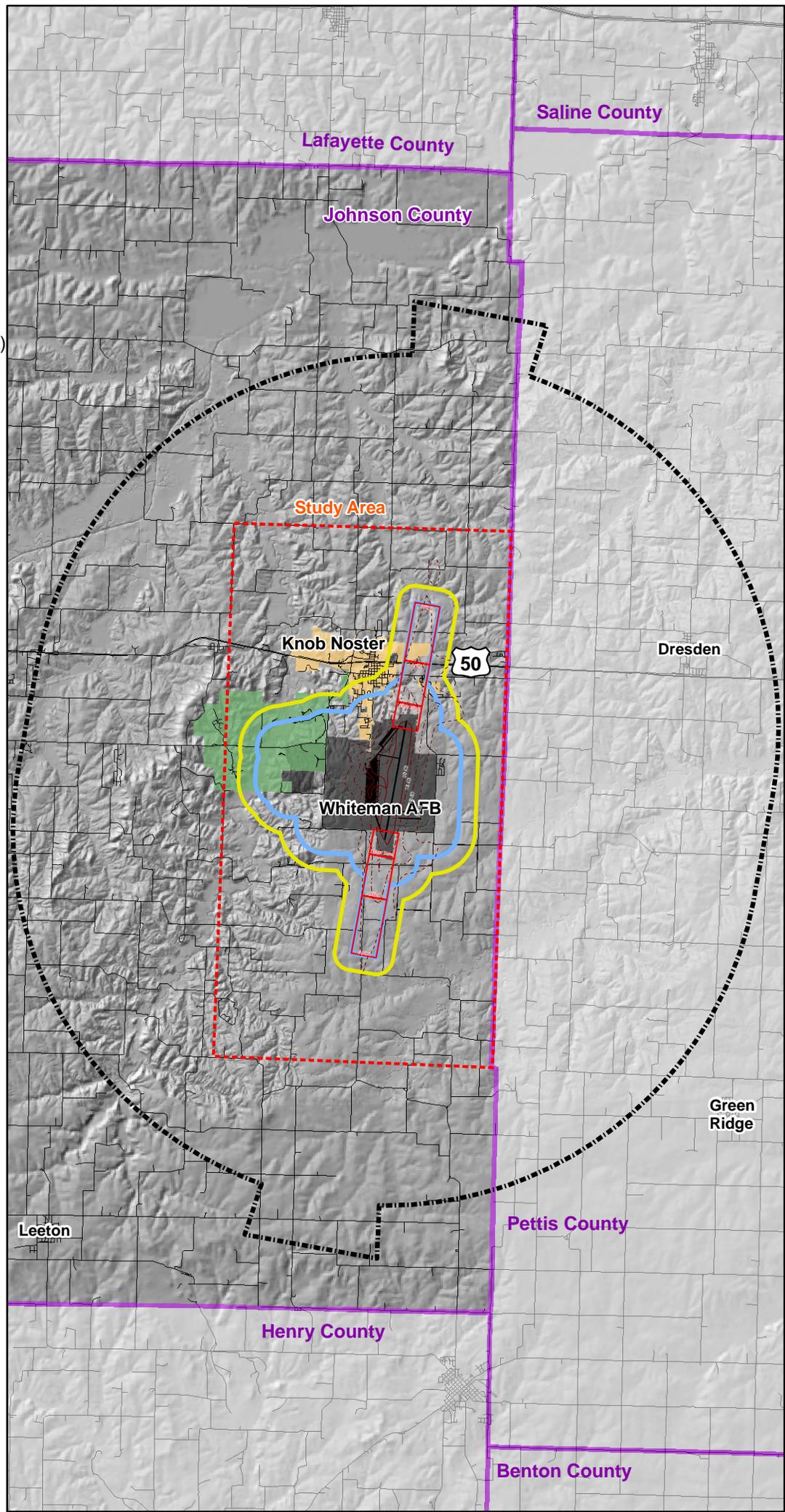
Figure 8

Whiteman AFB

JLUS

Recommendations

- Legend**
-  Military Airport Zone (MAZ)
 -  Military Airport Notification Zone (MANZ)
 -  Military Airport Safety Zone (MASZ)
 -  Accident Potential Zones
- Noise Contours**
-  65 dB
 -  70 dB
 -  75 dB
 -  80 dB





0 1 2 4
Miles

Source: City of Knob Noster
Whiteman AFB
August 2008



5.1.2 Coordination with the Missouri Military Preparedness and Enhancement Commission

The Missouri Military Preparedness and Enhancement Commission was established in 2005 to provide recommendations regarding community relations and interstate cooperation on issues related to the U.S. military. The commission also serves as an information clearinghouse on federal actions that would effect military installations and the potential impact military installations have on local communities. The commission has nine members. When this study was conducted, the Whiteman AFB region was represented on the commission and the commission's Education of Military Dependent's Task Force.

Ongoing participation on this commission by representatives of the Whiteman AFB region is critical to ensure that issues associated with Whiteman AFB airfield operations are brought to the attention of state officials.

5.1.3 Incorporate Whiteman AFB Early in the Development Review/Rezoning Process

Revised Missouri Statutes 41.655 and 67.1210 authorizes Johnson County to provide for zoning of unincorporated areas extending 3,000 feet from the installation boundary. The Missouri Statutes also allow for participation of a representative from the military installation as an Ex-Officio member of the Johnson County Airport Zoning Commission.

The Ex-Officio of Whiteman AFB is a non-voting member of the commission; however, this individual should be integrated into the Johnson County Airport Zoning Commission processes as all members of the commission. The Ex-Officio member will provide review and comment on all relevant actions brought to the airport zoning commission. The Ex-Officio member from Whiteman AFB should be provided the same packet that is provided to all members of the airport zoning commission regarding zoning amendments, Board of Adjustment applications, permits, and variance requests.

5.1.4 Partner with Land Conservation/Land Trust Organizations

Acquiring all land within safety hazard areas or high noise zones within the JLUS study area is not feasible, nor desirable. Minimizing incompatible land uses within safety hazard areas or high noise zones can be accomplished through partnerships with land conservation or land trust organizations. These organizations have the capacity to assist in establishing easements (described in Section 5.2) on land that has potential for incompatible land use development. No single organization is likely to fulfill the needs for minimizing incompatible land use; however, several national organizations should be contacted to assist in this effort. Appendix B provides a representative list of national organizations.

5.1.5 Partner with Federal Agencies

As noted above, there are other opportunities to address incompatible land use within safety hazard areas and high noise zones. Federal agencies have voluntary programs available that would result in compensation for keeping land in agriculture and programs that compensate willing landowners for establishing and maintaining natural resource habitat. Appendix B provides a representative list of federal agencies and easement programs.



5.2 Land Use Controls

The goals for land use controls in the area of Whiteman AFB are to protect the public health, safety, and welfare of city and county residents living and working near Whiteman AFB, as well as to protect the aviation assets of Whiteman AFB. Establishing land use controls for parcels within the vicinity of Whiteman AFB will ensure that these public health, safety, and welfare goals are accomplished. The primary land use control for land within 3,000 feet of the Whiteman AFB boundary will be the Military Airport Zoning Ordinance. Any of the land use controls presented in this section could be used to mitigate or eliminate potential safety and noise hazards; however, not every land use control is suitable for every parcel of land.

For land outside the designated 3,000 foot area to be zoned, the local community will have to make determinations regarding the appropriate measure to ensure compatible land use for any one parcel within the JLUS study area.

5.2.1 Prepare a County Comprehensive Plan

Although Missouri state statutes authorize the establishment and implementation of a zoning ordinance for the unincorporated area within 3,000 feet of the Whiteman AFB boundary, there is currently no underlying land use framework in that area, or throughout Johnson County. The county should advocate for the preparation of a county-wide comprehensive plan. This measure would be taken to a vote by county residents, and if approved, the County Commission should then prepare a plan that will provide guidance for land use decisions throughout the county. Land use recommendations should be consistent with the Johnson County Military Airport Zoning Ordinance, the Whiteman AFB AICUZ, and recommendations for the Military Airfield Safety Zone (MASZ).

5.2.2 Military Airport Zoning

At the time that this JLUS was prepared, there was no zoning in Johnson County; however, the county has been granted authority by the State of Missouri to prepare and implement a Military Airport Zoning (MAZ) Ordinance for an area of 3,000 feet extending from the Whiteman AFB boundary. In addition to the 3,000 foot zone, the MAZ will regulate land uses within the CZs and APZs for the airfield.

The MAZ was not finalized prior to the completion of this JLUS; therefore, the following recommendations should be considered for inclusion in the airport zoning ordinance.

Clustering Provision: Establish a clustering provision in the local ordinance to promote development away from the airfield and associated CZs and APZs. If an appropriate amount of acreage is available, developers or owners of parcels that are split by the MAZ boundary should be encouraged to cluster new development on the area of the parcel outside the MAZ.

Force Protection: Establish an overlay district on parcels adjacent to Whiteman AFB. This overlay district that would provide protection to installation personnel and property from potential terrorist activities. The overlay district should include the following:

- A height limit for construction of buildings. A maximum height of two stories (approximately 25 feet) should be considered.
- Permit low density development, agricultural zoning would be preferred. Construction of mobile home parks, multi-family residential, group homes, or hotels should not be permitted.
- Establish an open space buffer (setback) along the installation perimeter fence.



This overlay district would have minimal effect on any parcels zoned as agriculture. If a parcel was rezoned to a different land use, then this overlay district would result in continued encroachment management for Whiteman AFB.

Landfills: No new sanitary landfills, construction and debris, waste transfer stations, sewage lagoons, sewage sludge disposal facilities, or similar facilities should be permitted within the zoned area. Expansions of existing landfill or sewage treatment or disposal facilities within the MAZ should be permitted only upon demonstration that the facilities are designed and will operate so as not to increase the likelihood of bird/aircraft collisions or smoke.

Industrial Emissions/Prescribed Burns: No new industrial, or timber burning, or expansion of an existing industrial, or similar use, should, as part of its regular operations, cause emissions of smoke, dust, or steam that could obscure visibility within airfield approach/departure surfaces. The exception would be standard-based. Upon demonstration, supported by substantial evidence, that mitigation measures imposed as approval conditions will reduce the potential for safety risk or incompatibility with airport operations to an insignificant level. The review authority should impose such conditions as necessary to ensure that the use does not obscure visibility. Prescribed burns of agricultural or forest lands should require a permit process that would ensure coordination with airfield operations.



Outdoor Lighting and Glare: No new or expanded industrial, commercial, or recreational use should project lighting directly onto an existing runway or taxiway or into existing airport approach/departure surfaces except where necessary for aircraft safety. Lighting for these uses should incorporate shielding in their designs to reflect light away from airport approach/departure surfaces. No use should imitate airport lighting or impede the ability of pilots to distinguish between airport lighting and other lighting. Lighting plans should be submitted with a site plan or subdivision application for any non-residential use. At a minimum, all exterior material used in the construction of outdoor lighting poles and fixtures shall be made of non-reflective material. Luminaries should be International Dark-Sky Association-Approved™ Dark Sky Friendly as available (see <http://www.darksky.org/lighting/>). See Appendix C for additional lighting recommendations.

No glare producing material, including but not limited to unpainted metal or reflective glass, should be used on the exterior of structures located within an approach/departure surface or on nearby lands where glare could impede a pilot's vision. Glare reduction from parking areas shall be accomplished using shading and paving material. Glare shall be minimized by placing landscaping between the viewer and its sources. To minimize vertical glare, parking lots shall be designed with tree islands to break up and shade expanses of paving and automobiles and to create a canopy effect. Dark asphalt for pavement shall be used to reduce glare. The lighter the surface colors of pavement, the greater the potential for glare. Asphalt's dark surface absorbs light and reduces glare and reflection.

Electronic Interference: No land use should cause or create electrical interference with navigational signals or radio communications between an airport and aircraft. Proposals for the location of new or expanded radio, radiotelephone, and television transmission facilities and electrical transmission lines should be coordinated with Whiteman AFB and the FAA prior to approval.



5.2.3 Recommendations for CZs and APZs and High Noise Zones Within the MAZ

Clear Zones: Open space is the preferred “land use” for this zone. Above-ground structures (obstructions) and community infrastructure, such as roads and utilities, are severely restricted in a CZ. For the purposes of the Whiteman AFB JLUS, any above-ground structures listed above should not be permitted. As stated in the Whiteman AFB AICUZ and DoD guidelines, only agriculture practices are compatible uses in this zone. The definition of obstructions also includes trees, so agricultural practices should be limited to grazing. Although grazing is permitted, pasture fencing should be minimized. Research is being conducted on frangible fencing that could be used in this zone.

APZ I: Although AICUZ and DoD guidelines allow low employment density land uses such as manufacturing, industrial facilities, transportation, and agricultural practices, residential and other attractions that would result in a high concentration of people are not acceptable in this area. Facilities that would be occupied by people that would have limited resources to respond to emergency situations are not permitted. This category includes hospitals/clinics, nursing homes, child care centers, and places of worship. Facilities that would result in an increased safety risk, such as above-ground storage of flammable or other explosive materials or gases, are not permitted.

The southern APZ I is entirely agricultural lands with only one residence associated with the agricultural lands. The land within this APZ I should continue to be primarily used for agriculture.

The land within the northern APZ I has a combination of land uses including residential, industrial, and institutional. Although these land uses are “grandfathered,” there should be no expansion of residential in this area, because in addition to being in an area with a safety risk, many homes are within a high noise zone. Over time, residential density in the north APZ I should be reduced or eliminated, especially in the high noise zone. Land acquisition options are identified in Section 5.8.

If additional low density employment facilities (manufacturing, industrial, agricultural) are allowed in the northern APZ I, then the development density should not exceed 8,000 square foot building footprint per acre, or roughly 20 percent of an acre. Structures should not exceed one-story.

No new roads should be constructed in these zones. The exception would be internal roads associated with the low density employment facilities described above.

APZ II: Many of the same land use prohibitions for APZ I are also in effect for APZ II. Air Force AICUZ and DoD guidelines allow low employment density land uses and low density residential development. Other facilities or structures that would result in a high concentration of people are still not an acceptable land use. As noted in APZ I, facilities that would be occupied by people that would have limited resources to respond to emergency situations are not permitted. This category includes hospitals/clinics, nursing homes, child care centers, and places of worship. Facilities that would result in an increased safety risk such as above-ground storage of flammable or other explosive materials or gases are also not permitted.

The southern APZ II is primarily agricultural land. There is a small single family residential development that extends into the zone. Although low density employment is allowed in this zone, it is unlikely that this area would be attractive to this type of development, because there is limited transportation access. Low density residential can be developed; however, because there is not a strong demand for residential development, then it is reasonable to recommend that this zone remain agricultural. If single family residential were to be constructed, then the density should not exceed agricultural residential densities of one unit per 5 acres.



The northern APZ II is also primarily agricultural; however, there is an area of highway-oriented commercial development on the north side of U.S. 50. The same reasoning for residential land use in the southern APZ II is valid for the northern APZ II. Continued use as agricultural land would be consistent with historical land patterns as well as protecting the health, welfare, and safety of county residents; however, this area provides adequate access to U.S. 50 and will be more attractive to low employment density businesses. Development of low employment density businesses should not exceed 15,000 square feet, or approximately 35 percent of an acre. Noise attenuation would be required for building construction in high noise zones (65-80 DNL).

65-70 DNL Noise Zone: For land within this noise zone—and outside APZs—residential construction is allowed by DoD guidelines and the Whiteman AFB AICUZ. Residential construction would require noise attenuation, which is described in Section 5.9. Any residential development density should be limited to low density (Agricultural Residential). Although other noise sensitive land uses such as hospitals, churches and other types of public gathering spaces could be constructed in this zone with extensive noise attenuation, this JLUS recommends that these uses should not be permitted. Low density employment structures are allowed.

70-75 DNL Noise Zone: For land within this noise zone—and outside APZs—residential construction should not be allowed. Any existing (grandfathered) residential construction should be retrofitted to meet noise attenuation standards (see Section 5.9) Noise sensitive facilities should not be permitted. Low density employment facilities should be permitted.

75-80 DNL Noise Zone: Because there is limited growth projected for the study area and the excessive noise, this area should be limited to agriculture or open space land uses. No development should be permitted.

5.3 Establish Military Airport Influence Areas

Johnson County is establishing the MAZ, which regulates land use within 3,000 feet of the installation boundary, CZs, and APZs; however, the influence of airfield operations extends beyond these boundaries. Additional consideration should be given to land within the entire study area to minimize the potential negative effects of airfield operations to land owners and potential land development to airfield operations. Military Airport Influence Areas for Whiteman AFB should include the following:

5.3.1 Military Airfield Notification Zone

Because noise from airfield operations does not stop at the 65 DNL noise contour, the Military Airfield Notification Zone (MANZ) would be an area extending half mile from the Military Airfield Zoning District boundary and should be included in the Real Estate Disclosure process. Real estate disclosure would also be required within the MAZ.

5.3.2 Military Airfield Safety Zone

The portion of the Whiteman AFB JLUS study area that is within the extent of the Imaginary Surface criteria should be considered the Military Airfield Safety Zone (MASZ). Development in the MASZ outside of the MAZ (height requirements associated with airfield operations will be incorporated into the MAZ) should trigger a development review process that includes the Ex-Officio member from Whiteman AFB and the FAA. Development within the MASZ should be compatible with aircraft operations and associated Imaginary Surface criteria. The primary concern of land outside the MAZ would be height of constructing potential obstructions, such as cell towers or transmission lines. Other concerns could be landfills or facilities that would require significant lighting sources or industrial emissions. Prescribed



burns associated with agricultural practices or forest management should be coordinated with the Whiteman AFB Ex-Officio member of the Airport Zoning Commission.

5.4 Establish a Transfer of Development Rights Program

The use of Transfer of Development Rights (TDR) within the MAZ can reduce (or prevent) the density or intensity of incompatible development in areas around Whiteman AFB. This technique would allow a property owner/developer the opportunity to transfer the rights to develop a particular parcel to another parcel (receiving parcel) that would not be incompatible with airfield operations. The property owner is compensated for the transfer by having the opportunity to develop at a higher density at the receiving parcel. Participation in a TDR is voluntary on the part of the parcel owner(s).

5.5 Establish a Purchase of Development Rights Program

An alternative to fee-simple purchase of property is the purchase of development rights for a parcel under consideration. This process would require negotiations with the owner of the development rights to any parcel under consideration. Participation in the purchase of development rights would be voluntary and from willing sellers. This type of land acquisition could be effective in certain situations. An example could be a parcel with a proposed development density that exceeds the compatibility of that density. Purchase of development rights could result in a reduced density, different type of development, or no development at all on that parcel. When development rights are purchased, the landowner is paid fair market value for the purchased development rights. The value of the purchase is roughly equal to the value of the parcel without any special restrictions, less the value of the land with land use restrictions. This strategy could only be accomplished with the successful creation of a funding source.

5.6 Establish Land Easements

Minimization of the safety and noise effects from airfield operations and management of encroachment could be accomplished through measures that allow willing landowners the opportunity to utilize their land, albeit with some restrictions. Land easements provide that opportunity.

5.6.1 Avigation Easement

An avigation easement is for the right-of-way of unobstructed passage of aircraft above property. Avigation easements are acquired from a land owner that grants the right-of-flight; the right to cause noise, dust, etc., related to aircraft flight; the right to restrict or prohibit certain lights, electromagnetic signals, and bird-attracting land uses; the right to unobstructed airspace over the property above a specified height; and the right of ingress/egress upon the land to exercise those rights. Avigation easements would be required for new construction in the MAZ and MANZ.

The owners of properties requesting application for land use or limited land use decisions; for building permits for new residential, commercial, industrial, institutional or recreational buildings, or structures intended for inhabitation or occupancy by humans or animals; or for expansions of such buildings or structures by the lesser of 50 percent or 1,000 square feet, shall, as a condition of obtaining such approval or permits, dedicate an avigation easement. Such easement shall waive any right or cause of action from noise vibration, fumes, dust, fuel particles, and other effects caused by aircraft and airfield operations. See an example of an avigation easement in Appendix D.

5.6.2 Conservation Easement

Conservation easements are voluntary, legal agreements between a landowner (including companies/businesses) and a land trust that permanently limits a property's uses to preserve its conservation values. Conservation easements are permanent agreements, recorded by the county as an easement on the land, and applied to any subsequent land ownership. This type of easement preserves land for wildlife, recreation, cultural, historical, scenic, or other natural values. Easements can be donated or purchased.

- **Donated Easement**—The easement donation generally requires a maintenance endowment to provide ongoing monitoring and meet legal requirements of the easement. Johnson County could provide some funding assistance for the maintenance endowment.
- **Purchased Easement**—Examples of a purchased easement are the Natural Resources Conservation Service (NRCS) Wetland Reserve Program (WRP) and The Nature Conservancy's Conservation Buyer Program. The WRP may include the purchase of an easement from the existing property owner by the NRCS, generally based on the land's potential development value minus its undeveloped/conservation value. The Conservation Buyer Program matches conservation-minded buyers with landowners selling desirable open lands. Those individuals, organizations, or governmental entities interested in purchasing land and preserving it with a voluntary conservation easement are eligible for substantial federal tax deductions along with other tax benefits. Johnson County could provide funding assistance for the purchase of conservation easements through partner organizations or explore the option of establishing a county program.
- **Agricultural Easement**—An agricultural easement is also considered a conservation easement. This program can be classified as the NRCS Farm and Ranch Lands Protection Program, which preserves working landscapes such as farms or ranches. This voluntary easement purchase allows the continuation of working farm or ranch activities.

5.7 Parcel Covenants

Restrictive Covenants are legal obligations imposed in a deed requiring the owner of real estate to do or not to do something. These types of restrictions are usually (but not always) binding upon subsequent buyers of the property. Such a mechanism would be more relevant to properties in APZs as opposed to noise contour zones.

5.8 Land Acquisition

Land acquisition is one measure that could be utilized to ensure compatible a land use that is compatible with airfield operations; however, it is typically the most expensive option for ensuring compatible land uses. The following are options for land acquisition.

5.8.1 Land Purchase

Fee Title Acquisition: Fee title (also called "fee simple") is a real estate term that means the type of ownership giving the owner the maximum interest in the land, entitling the owner to use the property in any manner consistent with federal, state, and local laws and ordinances. The simplest tools for acquiring land in fee title are through donation, bargain sale, or outright purchase from willing sellers. The variety of donation methods includes the following:

- **Donation**—Landowners may simply donate land to a land conservation organization or governmental entity. Land donation typically provides the landowner an income tax deduction equal to the land's current fair market value.
- **Bequest**—Bequest provisions in a will and/or a revocable or irrevocable living trust allow the donor to control the distribution of his or her estate and to preserve as much of the estate as possible through judicious use of tax-saving opportunities.
- **Gifts of Land with Reserved Life Estates**—Landowners may donate land, but reserve for themselves and sometimes others the right to use and enjoy the property during their lifetimes.
- **Charitable Gift Annuity**—Partly a charitable gift and partly a purchase of an annuity contract. The donor transfers property to a steward. In return, the steward enters into a contract agreeing to pay the donor and, if desired, one other beneficiary a fixed annuity for life.

5.8.2 Land Banking

This real estate process is accomplished by a local community that acquires a substantial amount of land that would be available for development. Land banking prohibits the land being acquired from becoming committed to a specific use at the time of acquisition; in addition, the land must be large enough to have a substantial affect on urban growth patterns. Land banking differs from permanent acquisition in that it places the land in a temporary holding status to be turned over for development at a future date.

5.8.3 Leaseback

Leaseback is a financial arrangement in which the land is acquired and controlled, but not necessarily occupied, by the owner. The leaseback arrangement typically involves a two-step process. First, real estate is purchased by either a private firm or government entity. Second, the property is leased by the purchaser to a new tenant for specific uses in accordance with the approved plan for the area.

5.9 Noise Attenuation

Not all land uses are incompatible with airfield operations because of safety concerns. Noise is an ongoing issue to residents and other noise sensitive facilities such as churches or other public gathering facilities. These structures should be constructed or retrofitted with noise deadening measures.

5.9.1 Building Codes

Building codes define the minimum requirements for regulating construction of structures. A building code is adopted by a local governing body to ensure the protection of the health, safety, and general welfare of a structure's occupants. The City of Knob Noster administers the IBC 2006 and IRC 2006 building codes for new construction; however, the unincorporated areas of Johnson County do not administer any building codes for new construction. To ensure that indoor noise levels of structures meet established guidelines, the requirement for using IBC 2006 and IRC 2006 building codes should be extended to new construction within the MANZ. This requirement could be administered by Johnson County.

For 65 DNL to 70 DNL noise zone, new residential uses or other noise sensitive land uses permitted by the underlying zoning are to achieve an interior noise level reduction of 25 decibels. Although new construction is strongly discouraged by DoD guidelines, Whiteman AICUZ, and this JLUS, residential



construction in the 70 DNL to 75 DNL noise zone should achieve an interior noise level reduction of 30 decibels.

An acoustically well-insulated building with windows and doors kept closed can provide 30 dB of noise attenuation, whereas more typical unmodified buildings might provide 20-25 dB of noise-level reduction. Providing more than 40 dB of noise-level reduction is not usually practical for a typical building.

Guidelines and methods for reducing noise in residential structures can be found in *Builders Guide, Mitigating Aircraft Noise in New Residential Structures and Guidelines for Sound Insulation of Residences Exposed to Aircraft Operations, April 2005*, prepared for Naval Facilities Command and the FAA by Wyle Laboratories, Research and Consulting.

5.9.2 Establish a Noise Mitigation Program

Encourage home improvement centers to develop noise mitigation programs/classes, which could educate county and city residents about sound and vibration reduction measures. The county and city should send invitations to all landowners within high noise zones (65 DNL or above) to ensure that these landowners are aware of the noise mitigation programs/classes.

Examples of simple noise attenuation treatments include the following:

- Installation of double-paned windows
- Installation of storm windows
- Addition of building insulation
- Installation of storm doors
- Addition of glass doors on a fireplace
- Installation of weather stripping

The effectiveness of installing any or all of the above to achieve adequate noise attenuation would be reflected by the existing structural integrity of a building. It is accepted that very little can be done to attenuate noise in mobile homes.

5.10 Public Education

As noted in Section 5.1, Cooperation/Partnerships, communication is a critical component of mitigating the effects of airfield operations. This concept is just as important for communication with the people that live, work and play in the vicinity of Whiteman AFB. Effective communication will ensure that potential city and county residents will be able to make an informed decision regarding relocation to the area within the vicinity of the installation.

5.10.1 Require Real Estate Disclosure

Initiate a real estate disclosure process for all parcels within 5,500 feet (the area within the MANZ) of the Whiteman AFB boundary. A real estate disclosure will protect developers, land owners, and renters by informing them of potential hazards or nuisances associated with the proximity of their property to an active airfield. Although the real estate disclosure process will not prevent noise complaints, it will likely reduce/prevent the number of complaints received by the installation or local government.

The real estate disclosure should be required with all listing agreements, sales and rental contracts, subdivision plats, and real estate marketing materials. The real estate disclosure should be initiated early in the transaction process, well before executing the real estate contract. There should be a procedure that will result in a permanent recording of a real estate disclosure that has been signed by



the buyer/renter indicating that the notification has been provided. Johnson County holds parcel information and should be responsible for real estate disclosures.

5.10.2 Create a Searchable, Web Information System

Public education can be enhanced through the creation and ongoing maintenance of an interactive web page on the Johnson County website. The web page could allow anyone the opportunity to search for information on all parcels throughout the JLUS study area. Information displayed could include any land use controls and provide a link to the county's Military Airport Zoning Ordinance. The web page could also provide links to appropriate information that could include real estate disclosure forms, aviation easement forms, and background information on the AICUZ and JLUS programs.

The website could include an overview of airfield operations, such as typical hours of operation. If airfield operations will be conducted outside normal operating hours, provide a notice on the website. The website should also indicate that given the uncertainty of world events, there is the possibility that airfield operations could occur at any time.

5.10.3 Develop Public Education Materials

Develop a package of educational tools (much like what is done for AICUZ) to include presentation materials and associated handouts on the AFB missions. Information should include the following:

- The mission, typical operating hours of Whiteman AFB, and the importance of the training conducted and how it can affect the neighbors and how the neighbors can affect the mission.
- How the Air Force evaluates land use activities for compatibility with the mission and what types of surrounding land use activities are compatible with the Air Force mission.
- Explaining airfield vicinity regulations and sound attenuation measures for realtors, bankers, title companies, etc.
- How the local community and landowners benefit from conservation buffering.
- What actions can be taken for noise attenuation.

The program's focus should be directed towards landowners within the MANZ. This information exchange will facilitate a better understanding of the base's mission. It is important that the tools be presented using clear terminology. It is equally important that the education tools not be limited to government agencies, but should be provided to all community decision makers, adjacent landowners, general public, and other individuals who make land use decisions, as these choices and judgments can ultimately protect or threaten the airfield's mission. For example, individuals with large landholdings or farmland near the airfield that could be converted to other uses should be of particular interest to Whiteman AFB.

6.0 JLUS IMPLEMENTATION

Table 6-1 summarizes the implementation strategy for the Whiteman AFB JLUS. The JLUS strategies are identified with the approximate timeframe for implementation and the responsible parties for implementation. Short-Term actions would be initiated within 1-3 years; Mid-Term actions would be initiated within 3-5 years. Some Mid-Term actions could be initiated in the short-term if conditions allow.

Table 6-1: JLUS Implementation Strategy

JLUS Strategy	Responsible Party(ies)	Timeframe
Cooperation/Partnerships		
JLUS Implementation	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ JLUS Committees ▪ Whiteman AFB 	Short-Term
Coordination with the Missouri Military Preparedness and Enhancement Commission	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ JLUS Committees ▪ Whiteman AFB 	Short-Term
Incorporate Whiteman AFB Early in the Development Review/Rezoning Process	<ul style="list-style-type: none"> ▪ JLUS Committee ▪ Whiteman AFB 	Short-Term
Partner with Land Conservation/Land Trust Organizations	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ JLUS Committees 	Short-Term
Partner with Federal Agencies	<ul style="list-style-type: none"> ▪ Johnson County ▪ JLUS Committees 	Short-Term
Land Use Controls		
Military Airport Zoning	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Short-Term
Establish Military Airport Influence Areas	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Short-Term
Establish Transfer of Development Rights Program	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Establish Purchase of Development Rights Program	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Prepare County Comprehensive Plan	<ul style="list-style-type: none"> ▪ Johnson County 	Short-Term
Establish Land Easements	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ JLUS Committees 	Mid-Term
Parcel Covenants	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Land Acquisition		
Land Purchase	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ Whiteman AFB 	Mid-Term
Land Banking	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Leaseback	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Noise Attenuation		
Building Codes	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County 	Mid-Term
Establish Noise Mitigation Program	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ Commercial Home Improvement Centers/ Local Hardware Stores 	Short-Term
Public Education		
Require Real Estate Disclosure	<ul style="list-style-type: none"> ▪ Johnson County ▪ Real Estate Agencies 	Short-Term
Create Searchable, Web Information System	<ul style="list-style-type: none"> ▪ Johnson County 	Short-Term
Develop Public Education Materials	<ul style="list-style-type: none"> ▪ City of Knob Noster ▪ Johnson County ▪ JLUS Committees ▪ Whiteman AFB 	Short-Term

APPENDIX A: USAF AICUZ LAND USE COMPATIBILITY

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-70	70-75	75-80	80+
10	Residential							
11	Household units							
11.11	Single units; detached	N	N	Y ¹	A ¹¹	B ¹¹	N	N
11.12	Single units; semidetached	N	N	N	A ¹¹	B ¹¹	N	N
11.13	Single units; attached row	N	N	N	A ¹¹	B ¹¹	N	N
11.21	Two units; side-by-side	N	N	N	A ¹¹	B ¹¹	N	N
11.22	Two units; one above the other	N	N	N	A ¹¹	B ¹¹	N	N
11.31	Apartments; walk up	N	N	N	A ¹¹	B ¹¹	N	N
11.32	Apartments; elevator	N	N	N	A ¹¹	B ¹¹	N	N
12	Group quarters	N	N	N	A ¹¹	B ¹¹	N	N
13	Residential hotels	N	N	N	A ¹¹	B ¹¹	N	N
14	Mobile home parks or courts	N	N	N	N	N	N	N
15	Transient lodgings	N	N	N	A ¹¹	B ¹¹	C11	N
16	Other residential	N	N	N ¹	A ¹¹	B ¹¹	N	N
20	Manufacturing							
21	Food & kindred products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
22	Textile mill products; manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
23	Apparel and other finished products made from fabrics, leather and similar materials; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
	Leather and similar materials; manufacturing							
24	Lumber and wood products (except furniture); manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
25	Furniture and fixtures; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
26	Paper & allied products; manufacturing	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
27	Printing, publishing and allied industries	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
28	Chemicals and allied products; manufacturing	N	N	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
29	Petroleum refining and related industries	N	N	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
30	Manufacturing							
31	Rubber and misc. plastic products, manufacturing	N	N ²	N ²	Y	Y ¹²	Y ¹³	Y ¹⁴
32	Stone, clay and glass products manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
33	Primary metal industries	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
34	Fabricated metal products manufacturing	N	N ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
35	Professional, scientific and controlling instruments; photographic and optical goods; watches and clocks manufacturing	N	N	N ²	Y	A	B	N
39	Miscellaneous manufacturing	N	Y ²	Y ²	Y	Y ¹²	Y ¹³	Y ¹⁴
40	Transportation, communications and utilities							
41	Railroad, rapid rail transit and street railroad transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
42	Motor vehicle transportation	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
43	Aircraft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
44	Marine craft transportation	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
45	Highway & street right-of-way	N ³	Y	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
46	Automobile parking	N ³	Y ⁴	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
47	Communications	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
48	Utilities	N ³	Y ⁴	Y	Y	Y	Y ¹²	Y ¹³
49	Other transportation, communications and utilities	N ³	Y ⁴	Y	Y	A ¹⁵	B ¹⁵	N
50	Trade							
51	Wholesale trade	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
52	Retail trade—building materials, hardware and farm equipment	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
53	Retail trade—general merchandise	N	N ²	Y ²	Y	A	B	N
54	Retail trade—food	N	N ²	Y ²	Y	A	B	N
55	Retail trade—automotive, marine craft, aircraft and accessories	N	Y ²	Y ²	Y	A	B	N
56	Retail trade—apparel and accessories	N	N ²	Y ²	Y	A	B	N
57	Retail trade—furniture, home furnishings and equipment	N	N ²	Y ²	Y	A	B	N
58	Retail trade—eating and drinking establishments	N	N	N ²	Y	A	B	N
59	Other retail trade	N	N ²	Y ²	Y	A	B	N

Land Use		Accident Potential Zones			Noise Zones			
SLUCM No.	Name	Clear Zone	APZ I	APZ II	65-70	70-75	75-80	80+
60	Services							
61	Finance, insurance and real estate services	N	N	Y ⁶	Y	A	B	N
62	Personal services	N	N	Y ⁶	Y	A	B	N
62.4	Cemeteries	N	Y ⁷	Y ⁷	Y	Y ¹²	Y ¹³	Y ^{14/21}
63	Business services	N	Y ⁸	Y ⁸	Y	A	B	N
64	Repair services	N	Y ²	Y	Y	Y ¹²	Y ¹³	Y ¹⁴
65	Professional services	N	N	Y ⁶	Y	A	B	N
65.1	Hospitals, nursing homes	N	N	N	A*	B*	N	N
65.1	Other medical facilities	N	N	N	Y	A	B	N
66	Contract construction services	N	Y ⁶	Y	Y	A	B	N
67	Governmental services	N	N	Y ⁶	Y*	A*	B*	N
68	Educational services	N	N	N	A*	B*	N	N
69	Miscellaneous services	N	N ²	Y ²	Y	A	B	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	N	N	N ²	A*	B*	N	N
71.2	Nature exhibits	N	Y ²	Y	Y*	N	N	N
72	Public assembly	N	N	N	Y	N	N	N
72.1	Auditoriums, concert halls	N	N	N	A	B	N	N
72.11	Outdoor music shell, amphitheaters	N	N	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	N	N	N	Y ¹⁷	Y ¹⁷	N	N
73	Amusements	N	N	Y ³	Y	Y	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ^{8/9/10}	Y	Y*	A*	B*	N
75	Resorts and group camps	N	N	N	Y*	Y*	N	N
76	Parks	N	Y ⁸	Y ⁸	Y*	Y*	N	N
79	Other cultural, entertainment and recreation	N	Y ⁹	Y ⁹	Y*	Y*	N	N
80	Resources production and extraction							
81	Agriculture (except livestock)	Y ¹⁶	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20/21}
81.5 to 81.7	Livestock farming and animal breeding	Y ¹⁶	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20/21}
82	Agricultural related activities	N	Y ⁵	Y	Y ¹⁸	Y ¹⁹	N	N
83	Forestry activities and related services	N ⁵	Y	Y	Y ¹⁸	Y ¹⁹	Y ²⁰	Y ^{20/21}
84	Fishing activities and related services	N ⁵	Y ⁵	Y	Y	Y	Y	Y
85	Mining activities and related services	N	Y ⁵	Y	Y	Y	Y	Y
89	Other resources production and extraction	N	Y ⁵	Y	Y	Y	Y	Y

Legend:

- **SLUCM**—Standard Land Use Coding Manual, US Department of Transportation.
- **Y (Yes)**—Land use and related structures are compatible without restriction.
- **N (No)**—Land use and related structures are not compatible and should be prohibited.
- **Yx (yes with restrictions)**—Land use and related structures generally compatible; see notes 1-21.
- **Nx (no with exceptions)**—See notes 1-21.
- **NLR (Noise Level Reduction)**—NLR (outdoor to indoor) to be achieved by incorporating noise attenuation measures into the design and construction of the structures. See Appendix E, Vol II.
- **A, B, or C**—Land use and related structures generally compatible; measures to achieve NLR for A (DNL 66-70), B (DNL 71-75), or C (DNL 76-80) need to be incorporated into the design and construction of structures. See Appendix E, Vol II.
- **A*, B*, and C***—Land use generally compatible with NLR. However, measures to achieve an overall noise level reduction do not necessarily solve noise difficulties and additional evaluation is warranted. See appropriate footnotes.
- *****—The designation of these uses as "compatible" in this zone reflects individual federal agency and program consideration of general cost and feasibility factors, as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

Notes:

1. Suggested maximum density of 1-2 dwelling units per acre, possibly increased under a Planned Unit Development (PUD) where maximum lot coverage is less than 20 percent.
2. Within each land use category, uses exist where further definition may be needed due to the variation of densities in people and structures (See Vol 2, Appendix F).
3. The placing of structures, buildings, or above-ground utility lines in the CZ is subject to severe restrictions. In a majority of the CZs, these items are prohibited. See AFI 32-7063 and AFIMAN 32-3013 for specific guidance.
4. No passenger terminals and no major above-ground transmission lines in APZ I.
5. Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.
6. Low-intensity office uses only. Meeting places, auditoriums, etc., are not recommended.
7. Excludes chapels.
8. Facilities must be low intensity.
9. Clubhouses not recommended.
10. Areas for gatherings of people are not recommended.
11. (a) Although local conditions may require residential use, it is discouraged in DNL 66-70 dB and strongly discouraged in DNL 71-75 dB. An evaluation should be conducted prior to approvals, indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones, and that there are no viable alternative locations.
11. (b) Where the community determines the residential uses must be allowed, measures to achieve outdoor to indoor NLR for DNL 66-70 dB and DNL 71-75 dB should be incorporated into building codes and considered in individual approvals. See Appendix E for a reference to updated NLR procedures.
11. (c) NLR criteria will not eliminate outdoor noise problems. However, building location, site planning and design, and use of berms and barriers can help mitigate outdoor exposure, particularly from near-ground-level sources. Measures that reduce outdoor noise should be used whenever practical in preference to measures which only protect interior spaces.
12. Measures to achieve the same NLR as required for facilities in the DNL 66-70 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
13. Measures to achieve the same NLR as required for facilities in the DNL 71-75 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
14. Measures to achieve the same NLR as required for facilities in the DNL 76-80 dB range must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
15. If noise sensitive, use indicated NLR; if not, the use is compatible.
16. No buildings.
17. Land use is compatible provided special sound reinforcement systems are installed.
18. Residential buildings require the same NLR required for facilities in the DNL 66-70 dB range.
19. Residential buildings require the same NLR required for facilities in the DNL 71-75 dB range.
20. Residential buildings are not permitted.
21. Land use is not recommended. If the community decides the use is necessary, hearing protection devices should be worn by personnel.

APPENDIX B: POTENTIAL PARTNERSHIPS

B.1 Potential Partnerships with State and Federal Agencies

B.1.1 Natural Resources Conservation Service

Farm and Ranch Lands Protection Program: The Farm and Ranch Land Protection Program (FRPP) provides matching funds to help purchase development rights to keep productive farm and rangeland in agricultural uses. The FRPP works with State, tribal or local governments and non-governmental organizations to acquire conservation easements or other interests in land from landowners. United States Department of Agriculture provides up to 50 percent of the fair market easement value of the conservation easement.

Wetland Reserve Program: Administered by USDA Natural Resources Conservation Service, this program is a voluntary continuous sign-up program to restore and protect wetlands on private property. The program offers three options: permanent easements, 30-year easements, and restoration cost-share agreements with minimum 10-year duration. For the permanent easement option, landowners will receive the agricultural rental value of the land up to a specified maximum, and 100 percent of the cost of restoring the land. For the 30-year option, a landowner will receive 75 percent of the easement value and 75 percent cost-share on the restoration. A 10-year agreement is also available that will pay for 75 percent of the restoration cost. To be eligible, the land must be suitable for restoration or be connected to adjacent wetlands. The owner's access to land is maintained, and hunting and fishing activities are permitted.

Grassland Reserve Program: This voluntary program provides landowners the opportunity to conserve and protect grasslands on their property. This program emphasizes preservation and restoration of native and natural grasslands, and supports grazing operations and the maintenance and improvement of plant and animal diversity. Landowners can participate through easements or rental agreements. Easements would be either 30 years in duration or a permanent easement. Rental agreements would range from 10-30 year contracts.

Contact: Natural Resources Conservation Service (NRCS)
Warrensburg Service Center
727 PCA Road, Suite A
Warrensburg, Missouri 64093.7913
Phone: (660) 747-8400
Fax: (660) 747-5980

B.1.2 US Forest Service

Forest Legacy Program: The Forest Legacy Program (FLP), a Federal program in partnership with states, supports state efforts to protect environmentally sensitive forest lands. Designed to encourage the protection of privately owned forest lands, FLP is an entirely voluntary program. To maximize the public benefits it achieves, the program focuses on the acquisition of partial interests in privately owned forest lands. FLP helps the states develop and carry out their forest conservation plans. It encourages and supports acquisition of conservation easements, legally binding agreements transferring a negotiated set of property rights from one party to another, without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices, and protect other values.



Contact: Forest Legacy Program Coordinator for the State of Missouri:
Forestry Program Supervisor
Missouri Department of Conservation
PO Box 180
Jefferson City, Missouri 65102.0180
Phone: (573) 522-4115

B.1.3 US Fish and Wildlife Service

Partners for Fish and Wildlife: Partners for Fish and Wildlife, a national program implemented by the U.S. Fish and Wildlife Service to protect, enhance, and restore important fish and wildlife habitats on private lands through partnerships, offer a chance to regain some of America's most important natural resources. This voluntary cost-share program builds on the strength and interest of committed individuals and organizations to accomplish shared conservation goals.

Contact: Missouri Private Lands Office
101 Park DeVille Drive, Suite A
Columbia, Missouri 65203-0057
Phone: (573) 234-2132

B.2 Potential Partnerships with Non-Profit Conservation Organizations

B.2.1 The Nature Conservancy

The Nature Conservancy's (TNC) mission is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. TNC in Florida has been extremely active in land acquisition and development of conservation easements to manage encroachment of military installations in the state. TNC has also been actively involved in establishing greenway programs that would protect military air corridors and at the same time providing natural movement corridors for wildlife.

Contact: The Nature Conservancy
2800 South Brentwood Boulevard
Saint Louis, Missouri 63144
Phone: (314) 968-1105
Email: missouri@tnc.org

B.2.2 The Trust for Public Land

The Trust for Public Land (TPL) helps structure, negotiate, and complete land transactions that create parks and protected natural areas. TPL will serve as an independent agent, buying land from willing sellers then transferring it with a clean title to public agencies, land trusts, or other groups. On occasion, TPL will get involved in conservation easements. TPL can assist local communities develop a conservation vision, establish priorities, and identify appropriate lands for conservation. The TPL can also assist communities with designing and promoting public funding programs and public education programs.



Contact: Missouri Field Office
PO Box 1688
Jefferson City, Missouri 65102
Phone: (573) 636-3688
Fax: (573) 636-8144

B.2.3 The Conservation Fund

The Conservation Fund provides a comprehensive range of conservation services to a diverse clientele including government agencies, corporations, foundations, nonprofit organizations, and individuals. From land identification and acquisition to mitigation and disposition to land advisory and training, the Fund's services are designed to offer turnkey solutions to meet our partner's needs. The Conservation Fund works with local communities, land owners, and military installations in developing conservation easement programs that help manage encroachment challenges.

Contact: Midwest Regional Office
PO Box 506
Sawyer, Michigan 49125
Phone: (269) 426-8825
Fax: (269) 426-4067

B.2.4 American Land Conservancy

American Land Conservancy (ALC) is a private, not-for-profit land trust dedicated to conserving the landscapes that represent the very best of our ecological, scenic, recreational, cultural, and agricultural resources. ALC values collaboration and works in partnership with willing private landowners, communities, public resource agencies, foundations, industry groups, and not-for-profit organizations.

Contact: American Land Conservancy
Mississippi River Division
Route 1
PO Box 600C
Marble Hill, Missouri 63764
Phone: (573) 866-9989

APPENDIX C: DESIGN ELEMENTS

C.1 Outdoor Lighting

All exterior material used in the construction of outdoor lighting poles and fixtures shall be made of non-reflective material. Luminaries shall be International Dark-Sky Association-Approved™ Dark Sky Friendly as available (see: <http://www.darksky.org/lighting/>).

C.1.1 Parking Lots, Roadways, and Pedestrian Routes

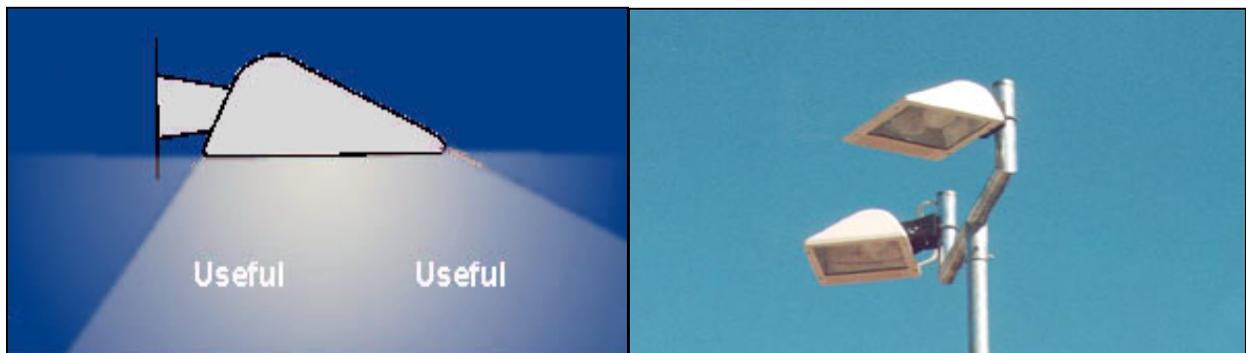
Full-cutoff luminary fixtures shall be use for parking lots, access roadways, and pedestrian routes as follows:

Full Cutoff	Zero candela intensity at, or above, horizontal (90° above nadir). Also, candela intensity at 80° above nadir not to exceed a value equal to 10% of lamp lumens. Sometimes called "fully shielded."	Limits spill light onto adjacent property, reduces glare. May reduce pole spacing and increase pole and luminary quantities.
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Full Cutoff Fixtures (Two Examples):



The above figure shows a flat-lens cobra head fixture that prevents light from scattering sideways and upward.



The above figures show a full cutoff fixture that is the preferred type of flood light fixture for large areas such as parking lots and event/sport fields.

C.1.2 Exterior Signs

All exterior flashing/twinkling and moving/rotating signs, traveling lights, or signs animated by lights of changing degrees of intensity or color are prohibited.

When signage is illuminated using an external illumination source, the sign lighting shall be shielded and concentrated and focused on the sign area and not diffused over the building or property. Ground-mounted lighting shall be screened or partially buried to minimize the view of the light source. Bare bulbs are not permitted. Top-mounted lighting fixtures shall be directed downwards in a manner that hides the light source. Up-lighting of signs shall not be used. Back-lighted solid lettered signs are permitted.

Internally lit signs should not become major sources of light in their own right. Internally illuminated signs, such as the type consisting of a large rectangle metal sign cabinet with large surface areas (whole panel) of illumination that produces glare and excessive light, should be prohibited. Internally lit signs that consist of internally lit lettering and/or symbols set against a dark background to minimize the amount of light emanating from the sign are permitted.

C.1.3 Buildings

Exterior lighting shall be fully shielded and designed to assist in locating building entrances, illuminating exterior pedestrian corridors, and highlighting building elements, signs, or other distinctive features, rather than attracting attention to the light fixture itself. Only portions of the building façade shall be lighted. Façade shall be lit from the top downward of the building to minimize light pollution.

C.1.4 Accent Lighting

Although discouraged, accent lighting can be used to highlight significant architectural, landscape features, and signage; however, washing a building in light should be avoided. All fixtures shall be shielded and carefully aimed to direct light only where needed.

C.1.5 Lighting Height

Lighting height shall not exceed that established by FAR part 77 surfaces for military airports.

C.2 Parking Lots

Glare reduction from parking areas shall be accomplished using shading and paving material.

C.2.1 Shading

Glare can come from primary sources, such as the sun or street lights, or from reflections from the surfaces of automobiles. Glare shall be minimized by placing landscaping between the viewer and its sources. To minimize vertical glare, parking lots shall be designed with tree islands to break up and shade expanses of paving and automobiles and to create a canopy effect.

Tree Shading: Trees shall be planted and maintained throughout the surface parking lot to ensure that, within 15 years of establishing the parking lot, at least 50 percent of the parking area will be shaded.

1. **Surface Parking Lot:** All surfacing on which a vehicle can drive is subject to shade calculation, including all parking stalls; all drives within the property, regardless of length, and including drive-through lanes; and all maneuvering area, regardless of depth.
2. **Shading:** Shading should be calculated using the diameter of the tree crown at 15 years. Each planting area shall be of adequate size for the landscaping approved and shall have adequate irrigation for that landscaping. It is recommended that larger contiguous islands rather than numerous small (9'x18') islands be used. Planting areas measuring 15'x18' at the end of islands should be used. Aisle should be split with 10' to 20' wide strip islands approximately every second or third aisle to achieve required shading coverage. This method gives the trees a larger contiguous rooting zone.
3. All landscaping (trees, shrubs, and turf) in these planting areas shall be properly maintained. The city/county shall provide a list of species appropriate for providing shade in parking lots, and shall review site plans of each parking lot to determine whether the lot complies with this article/chapter. The city/county landscape architect/planner shall have the discretion to modify tree shading requirements under power lines and other obstructions which prohibit strict compliance with shading requirement.

The city shall be responsible to ensure the following factors, which contribute to the failure of reaching the required shading, are addressed:

- Trees shown on plans were not planted or else were removed shortly after planting.
- Tree species planted in lots were not those shown on plans.
- Crown diameters listed for tree species in the supporting regulations were larger than trees would actually attain under parking lot conditions.
- There was no crown spread data in the supporting planning regulations for some of the species commonly planted in parking lots.
- Submitted parking lot plans used the wrong crown spreads for the trees in the plans and the errors were not caught during plan review.
- Tree shade was overestimated where overlapping shade from adjacent trees was counted twice.

The city/county shall provide a list of tree species to be used for parking lot shading that include the following characteristics:

- Use rounded, high-branched, dense, and relatively fast growing trees.
- Select trees that can withstand harsher conditions such as sun, glare, heat, and reduced water supply.
- Avoid trees with low-growing branches.
- Choose trees and shrubs that require minimum maintenance, do not have thorns, and will not litter the parking area with branches, fruit, or nuts.
- Consider daily and seasonal variations to obtain the desired results.
- Choose trees with a minimum 8-foot clearance from ground to canopy bottom.



C.2.2 Pavement

Dark asphalt for pavement shall be used to reduce glare. The lighter the surface colors of pavement, the greater the potential for glare. Asphalt's dark surface absorbs light and reduces glare and reflection.

An alternative to conventional asphalt to consider is open graded asphalt. Open graded asphalt is similar to conventional asphalt surface layer except it excludes smaller aggregate, and uses less tar to create a porous surface layer. The porous surface not only reduces glare, but also offers noise reduction, dispersion of rainwater, and improved wet weather safety.

APPENDIX D: SAMPLE AVIGATION EASEMENT

1. This easement is conveyed from the undersigned (hereinafter “Grantor”) to the XXXX,
2. Grantor is the owner in fee of the land and improvements thereto located at _____ Street in the City/County of _____, State of Missouri and described as follows:

Legal Description of Property Here

3. The XXXX is the proprietor of the _____ property name _____.
4. Grantor, Grantor’s heirs, executors, administrators, successors, and assigns, in consideration of the XXXX’s agreement to assist with certain modifications and installations on the Premises for noise-impact reduction purposes, conveys and warrants to the XXXX, its successors and assigns, a permanent, non-exclusive and perpetual easement for the free and unobstructed use, passage, operations, and effects thereof of all types of aircraft (as hereinafter defined) through the airspace over or in the vicinity of the Premises, with such use and passage to be unlimited as to frequency, type of aircraft, and proximity. Said easement shall be appurtenant to and for the benefit of the real property known as XXXX, including any additions thereto wherever located, hereafter made by the Navy or its successors and assigns and for the benefit of the XXXX, its successors, assigns, guests and invitees, including any and all persons, firms, or corporation operating aircraft to or from XXXX. As further provided in Paragraph 5 below, said easement and burden, together with the Easement level for day/night average sound level (DNL) at the parcel (as defined in Paragraph 5 below) and noise associated conditions, which may be alleged to be incident to or to result from flights of aircraft over or in the vicinity of the Premises or in landing at or taking off from the XXXX, shall constitute permanent burdens on the Premises. The burdens and conditions described within this easement shall run with the land and be binding upon and enforceable against all successors in right, title or interest to said real property. Grantor furthermore waives all damages and claims for damages caused or alleged to be caused by or incidental to such activities.
5. The Easement Level for DNL as that term is used in Paragraph 4 shall be determined by reference to the XXXX’s current Air Installations Compatible Use Zones accepted noise contour map showing noise contours at intervals of five decibels DNL, between 65 DNL and 80 DNL, with each five decibel increase constituting a new range. The base range for this parcel has been determined from the contour to be 65 DNL to 80 DNL. The Easement Level shall not be deemed to be exceeded unless Grantor, their assigns or successors, so claiming, establishes that the DNL as defined herein has increased by a DNL which causes a higher DNL range for the property. The provisions of this Easement shall not apply during any period of time in which the Easement Level exceeds 80 DNL. Any change in the DNL, as reported on a contour map, which reflects a change in DNL which results from the temporary increased use of certain runways, due to construction or repair of other runways, or due to any other cause or causes beyond the control of the XXXX (e.g. weather or wind conditions, but not flight pattern shifts authorized by the XXXX) shall not be used to compute the DNL imposed on Grantor’s property for the purposes of Paragraph 4, above.
6. Grantor releases and forever discharges all claims, suits and actions against the XXXX regarding aircraft noise and vibrations which interfere with use and enjoyment, and any consequent reduction in market value, all due to the operation of aircraft to and from the XXXX upon Grantor’s property. As used herein, the term “aircraft” shall mean any and all types of aircraft, whether now in existence or hereafter manufactured and developed, and shall include, but is not limited to, jet aircraft, propeller-driven aircraft, civil aircraft, or vehicles now in existence or hereafter developed for the purpose of transporting persons or property through the air.

