

# **FORT McCOY INSTALLATION COMPATIBLE USE ZONE STUDY**



**May 2016**



**Operational Noise Program  
Army Public Health Center**

# Fort McCoy

## INSTALLATION COMPATIBLE USE ZONE STUDY

May 2016



Prepared by:  
Operational Noise Program  
Directorate of Environmental Health Engineering  
Army Public Health Center

5158 Blackhawk Road  
Aberdeen Proving Ground  
Maryland, 21010-5403

# EXECUTIVE SUMMARY

## OVERVIEW

One of the goals of the Department of the Army is to plan, initiate, and carry out actions and programs designed to minimize adverse impacts upon the quality of the human environment without impairing the Army's mission. The Installation Compatible Use Zone (ICUZ) Program implements Army policy for such planning. The ICUZ program promotes land use that is compatible with the military noise environment through communication, cooperation and collaboration between Fort McCoy and the surrounding community.

The ICUZ study quantifies the noise environment from military training sources and recommends the most appropriate uses of noise-impacted areas. This study replaces the February 2008 Fort McCoy Installation Operational Noise Management Plan and provides information that reflects the most accurate account of activities as of 2015.

Army Regulation (AR) 200-1 lists housing, schools, and medical facilities as examples of noise-sensitive land uses. Regulation guidelines state for land use planning purposes, noise-sensitive land uses are acceptable within the Noise Zone I, generally not compatible in Noise Zone II, and not recommended (incompatible) in Noise Zone III. Army Regulation 200-1 offers land use recommendations, which if adopted both on and off the installation, would facilitate future development that is unaffected by military noise. These guidelines are applied throughout the ICUZ document as individual training operations are analyzed.

In general, military training at many Army installations tends to have a natural ebb and flow, with periods of relaxed operations tempo giving way to periods of rapid operations tempo. As an Army Reserve Training Center, Fort McCoy experiences significant increases in training operations throughout the spring and summer months, scaling back in the fall and decreasing throughout winter. This seasonal training cycle is common for most National Guard and Reserve locations. Thus, the operational noise generated at the installation is also cyclical, ranging from noisy to relative quiet outside the fence line.

The principle noise sources at Fort McCoy are small and large caliber weapons firing, including demolitions and aircraft bombing, and aircraft training. The Noise Zones for all operations clearly show the greatest annual impact outside the installation boundary is concentrated geographically west of the installation. This is primarily due to the proximity of the North Impact Area to the installation boundary. Population centers around Fort McCoy are located to the southwest (Sparta) and southeast (Tomah). There are several other small towns located adjacent to the installation boundary in both Monroe and Jackson Counties. County lands outside these communities are rural in nature.

## CONCLUSIONS

### SMALL ARMS WEAPONS

#### Small Arms Ranges

According to Army guidelines, the majority of surrounding land use is compatible with the small arms weapons Noise Zones. Zone II extends beyond the boundary to the west from North Post activities and west and south from South Post activities. Zone III extends beyond the boundary west in one area from North Post activities and north from South Post firing. The majority of land use within these areas is forest land and agricultural /open space. The largest concentration of residential use within the Zone II is southeast of Range 105 in South Post, although the population in this area is relatively low. There is no residential land use contained within a Zone III, and the family housing area on-post is outside the Noise Zones.

#### Non-Fixed Firing Ranges

The majority of the collective training facilities are far enough from the installation boundary that small arms operations would not extend beyond the boundary at Zone II or Zone III noise levels. Similar firing activity in authorized training areas is generally not considered a noise issue, due to the type of simunitions fired and the land use immediately beyond the installation boundary.

### LARGE ARMS WEAPONS AND EXPLOSIVES

#### Range Land Use Compatibility

Cumulative large arms weapons operations at Fort McCoy create substantial Noise Zones, which extend beyond the installation boundary west, north, and east. Although the Land Use Planning Zone (LUPZ) is expansive, covering several communities, as well as the family housing area on-post, noise-sensitive land uses within the LUPZ are considered compatible per Army guidelines. The greatest impact to noise-sensitive land use from the Zone II and Zone III occurs west of the installation boundary. Zone II encompasses the community of New Lyme as well as several other residential properties. On-post, the Zone II contains the majority of the cantonment area. Zone III is limited to just a couple residential properties. The current landscape surrounding North Post is dominated by forest land and agricultural/open space. Despite the size of the Noise Zones, the affected population within them remains relatively low. The rural nature of these areas lends themselves to the type of annual large caliber training that occurs on Fort McCoy.

#### Range Single Event Levels

Peak levels correlate with the receiver's perception of noise levels and can be a good predictor of complaints. People in an area experiencing peak sound pressure levels between 115 and 130 dB may describe events as noticeable and distinct. Peak sound pressure levels above 130 dB are generally objectionable, and are often described as very loud and startling.

Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary to the north, east and west. Again, these areas are abundant with forest land and agricultural land use. The communities of New Lyme and Grant are contained within the 115-

130dB contour along with the cantonment area and a large portion of the family housing area on-post. Peak sound levels above 130 dB extend beyond the boundary in a similar fashion north, east and west, but to a much lesser degree.

During neutral weather conditions, peak sound levels between 115 and 130 dB also extend beyond the boundary north, east, and west. On-post the northern portion of the cantonment area is contained within the 115-130 dB contours. Peak sound levels above 130 dB are mostly contained to the installation boundary. Under both scenarios the largest concentration of residential uses occurs west and northeast. Although, very few complaints have been lodged due to any single loud training event over the last several years.

#### Aerial Bomb Single Event Sound Levels

Aircraft bombing events at Fort McCoy are undoubtedly the loudest single operation that occurs. However, due to the relative infrequency when compared to artillery training and the inconsistency in events from year to year, complaint risk for bombing was separated from other range operations.

Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary north, and to a considerable distance west and east. These areas contain several small towns and scattered residential uses throughout. Peak sound levels above 130 dB remain contained to the Fort McCoy boundary.

The influence of wind propagation in the neutral weather scenario has a dramatic effect on the single event contours. The overall footprint is considerably smaller, where peak sound levels between 115 and 130 dB extend beyond the boundary just to the west. There is minimal residential use in this area. Peak sound levels above 130 dB remain well within the Fort McCoy boundary.

#### AVIATION ACTIVITY

Cumulative aircraft operations at the Sparta-Fort McCoy Airport are a combination of military and civilian. Military helicopters however, account for the bulk of annual operations at the airfield.

The LUPZ extends beyond the installation boundary west and south and encompasses part of the family housing area to the north. Zone II extends beyond the boundary west, while Zone III remains contained to the installation boundary. Agricultural, open space, and forest lands again dominate the land usage in this area; however, residential use is more common and occurs at greater density than in areas north.

Aircraft operating outside Fort McCoy, either in or out of designated flight corridors, have the potential to cause annoyance and possibly generate noise complaints. Measures are in place to mitigate the effects of aircraft noise including minimum flight altitudes and slant distances per Fort McCoy Regulation 95-1.

## RECOMMENDATIONS

The ICUZ is a proactive planning tool, which can help guide future development in surrounding communities. At a minimum, local municipal governments are encouraged to support public disclosure of all Noise Zones and supplemental metrics which may convey how military training operations affect the noise environment. The recent completion of the Joint Land Use Study (JLUS) demonstrates the strong relationship Fort McCoy has with surrounding local communities. It is recommended that all parties involved continue to pursue the recommendations made within the JLUS, contributing to the program's success.

The ICUZ study describes the noise characteristics of a specific operational environment, and as such, will change if a significant operational change is made. Therefore, if Fort McCoy's mission, training, or training facilities undergo changes, the ICUZ should be reviewed to determine if the current noise assessment is sufficient. At a minimum, it is recommended that every five years the ICUZ and/or Noise Zones be updated to incorporate pertinent changes to the noise environment.

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**ACRONYMS AND ABBREVIATIONS**

AAD	Average Annual Day
ACUB	Army Compatible Use Buffer
ADNL	A-Weighted Day-Night Average Sound Level
AGL	Above Ground Level
ANG	Air National Guard
AR	Army Regulation
CDNL	C-Weighted Day-Night Average Sound Level
CY	Calendar Year
dB	Decibel(s)
dBA	Decibels, A-Weighted
dBC	Decibels, C-Weighted
dBp	Decibels, Unweighted Peak
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DODI	Department of Defense Instruction
DPTMS	Directorate of Plans, Training, Mobilization and Security
DZ	Drop Zone
ERG	Explosives Research Group
FICUN	Federal Interagency Committee on Urban Noise
FY	Fiscal Year
GIS	Geographic Information Systems
HE	High Explosive
HSTC	Home Station Training Complex
ICUZ	Installation Compatible Use Zone
IED	Improvised Explosive Device
JLUS	Joint Land Use Study
LEQ	Equivalent Sound Level
LUPZ	Land Use Planning Zone
MOUT	Military Operations in Urban Terrain
NLR	Noise Level Reduction
NOTAM	Notice to Airmen
OEA	Office of Economic Adjustment
PAO	Public Affairs Office
POC	Point of Contact
ROZ	Restricted Operating Zone
SARNAM	Small Arms Range Noise Assessment Model
SEL	Sound Exposure Level
TA	Training Area
UAC	Urban Assault Course
UAS	Unmanned Aerial System
USACHPPM	U. S. Army Center for Health Promotion and Preventive Medicine
USAPHC	U.S. Army Public Health Command
YAAS	Young Air Assault Strip

# 1 INTRODUCTION

## 1.1 GENERAL

The Installation Compatible Use Zone (ICUZ) study provides a strategy for noise management in the areas surrounding Fort McCoy. Elements of the ICUZ program include noise analysis, education about noise and Army noise metrics, complaint management, and when necessary, noise abatement procedures.

The report is provided to assist both installation personnel and local community officials. Specifically, the ICUZ provides a methodology for analyzing noise exposure associated with military operations and provides land use guidelines for achieving compatibility between the noise generated by the Army and the surrounding communities.

As local communities prepare and modify comprehensive development plans, it is recommended that the conclusions from this study be considered in the planning process with a goal to encourage compatible land use.

## 1.2 PURPOSE AND NEED

The Army has an obligation to U.S. citizens to recommend land use around its installations which will: (a) protect citizens from noise and other hazards; and (b) protect the public's investment in these training facilities. To meet these obligations, the Army will recommend land uses that are compatible with military operations while allowing maximum beneficial use of adjacent properties. The U.S. Department of Defense (DoD) and component Services have published guidelines that reflect these land use recommendations.

Through Army Regulation (AR) 200-1, noise exposure on communities is translated into Noise Zones. Regulation guidelines state that for land use planning purposes, noise-sensitive land uses range from acceptable to not compatible within the Noise Zones. These guidelines are applied throughout the ICUZ as individual or combined training operations are analyzed. The program defines the following four Noise Zones:

- Zone III - Noise-sensitive land uses are not recommended (incompatible).
- Zone II - Although local conditions such as availability of developable land or cost may require noise-sensitive land uses in Zone II, this type of land use is generally not compatible and is strongly discouraged on the installation and in surrounding communities. All viable alternatives should be considered to limit development in Zone II to non-sensitive activities such as industry, manufacturing, transportation and agriculture.
- Zone I - Noise-sensitive land uses are acceptable within the Zone I. However, though an area may only receive Zone I levels, military operations may be loud enough to be heard - or even judged loud on occasion. Zone I is not one of the contours shown on the map; rather it is the entire area outside of the Zone II contour.

- The Land Use Planning Zone (LUPZ) is a subdivision or upper limit of Zone I. The LUPZ represents an area starting at the lower limit of Zone II and extends outward to a distance significant enough to allow for a 5 decibel (dB) reduction in sound level for large caliber and aircraft noise (There is no LUPZ for small arms activity Noise Zones). Within this area, noise-sensitive land uses are generally acceptable. However, communities and individuals often have different views regarding what level of noise is acceptable or desirable. To address this, some local governments have implemented land use planning measures out beyond the Zone II limits. Additionally, implementing planning controls within the LUPZ can develop a buffer to avert future noise conflicts.

The need for noise compatibility assessments in the Army is a greater challenge today than at any point in the past. Rapid population growth has brought land development directly adjacent to many Army installations, which were at one point relatively remote locations. This development, often referred to as encroachment, has brought military installations and civilian communities in much closer proximity, leading to issues of incompatibility.

To prevent incompatibilities between military operations and civilian land use from reaching a significant level, the Army must take reasonable steps to protect the community from training noise, and it must work with the local governments and land owners to make sure that adjoining lands are developed in ways compatible with the noise environment. Of particular concern are areas within the aforementioned Noise Zones, as well as areas that may occasionally be subjected to noise levels that the local community may find objectionable.

### **1.3 PROCESS AND PROCEDURE**

#### **1.3.1 REGULATORY REQUIREMENTS**

This assessment has been conducted in accordance with the DoD Instruction Directive 4715.13 *subject: DoD Noise Program* (DoD 2005) and Army Regulation (AR) 200-1, *Environmental Protection and Enhancement*, Chapter 14, *Operational Noise* (U.S. Army 2007).

#### **1.3.2 NOISE EXPOSURE MODELS**

Operational data includes the types of weapons and ammunitions fired, number of rounds fired, time of day in which rounds are fired, and the location of firing areas and targets. The data were input into computer software models which calculate noise exposure levels associated with the multiple types of military operations ongoing at Fort McCoy. A summary of the computer models is provided below:

- The computer model used to create the noise contours for small arms (.50 caliber and below) ranges is the Small Arms Range Noise Assessment Model (SARNAM). SARNAM incorporates the latest available information on weapons noise source models, directivity, sound propagation, and the effects of noise mitigation and safety structures such as berms, wall, and ricochet barriers. The SARNAM calculation algorithms assume weather conditions or wind direction that favors sound propagation. Small caliber weapons noise is addressed utilizing peak levels and therefore has no assessment period.

- The BNOISE2 modeling program calculates noise levels generated by firing large arms (20mm and greater) and high-explosive charges. The sounds from large arms, demolitions, and other impulsive sounds generally create the largest complaint issues because the sound can travel far, is difficult to mitigate and can be accompanied by vibration that may increase the public's annoyance. The C-weighted Day-Night average sound Level (CDNL) contours in this study were developed based on an assessment period of 104 days. This is the Army standard assessment period for all National Guard and Reserve training centers, sites and ranges per AR 200-1 guidance.
- NOISEMAP is a suite of computer programs and components developed by the Air Force to predict noise exposure in the vicinity of an airfield due to aircraft flight, maintenance, and ground run-up operations. Aircraft flight data were obtained to derive average daily operations by runway and type of aircraft. Analysis of Fort McCoy's aircraft operations included the types of aircraft, flight patterns, variations in altitude, number of operations, ground run-up information, and hours of operations. The data were input into NOISEMAP, to produce a map of noise levels.

## 1.4 NOISE BASICS

Sound is defined as a physical disturbance in a medium (i.e. gas, liquid, or solid) that is capable of being detected by the human ear. Sound waves in air are caused by variations in pressure above and below an even (static) value in atmospheric pressure. These changes in atmospheric pressure as they relate to human hearing can have great variance, for example a whisper at two meters would be as low as 0.0006 Pascals, whereas an M16 rifle fired at the shooter's ear would be 1,000 Pascals.

Due to this large range of sound pressures and that the human ear responds more closely to a logarithmic scale (rather than a linear), the decibel (dB) system was developed to quantify sound energy (loudness) into a meaningful and manageable scale. On this scale, the range of average human hearing runs from approximately zero (threshold of hearing) to 140. Using the example above, the whisper at two meters would register 29.5 dB and the M16 rifle shot at the shooters ear would be 154 dB.

### 1.4.1 NOISE METRICS

When measuring sound, the levels are often filtered (i.e. frequency weighted) to accommodate how the human ear functions. This process is known as "A-weighting" and can be assumed for all sound levels in this report unless otherwise specified. Military impulsive sounds (e.g., explosions, artillery blasts) can be felt as well as heard and utilize "C-Weighting" where the low-frequency components of these sounds are not de-emphasized to the same extent as A-weighting. Explanations of the noise metrics that are used in this assessment are listed below.

- **Day-Night Average Sound Level (DNL).** DNL is a noise metric describing the average noise level over the course of a 24-hour period. A 10 dB adjustment is applied to operations that happen during night time hours (10 p.m. through 7 a.m.) because noise

tends to be more intrusive at night than during the day. DNL accounts for the total or cumulative noise level at a given location over a specified assessment (time) period. In the case of large caliber and aircraft noise the assessment period is an annual average.

- **Maximum Sound Level** ( $L_{max}$ ). The highest sound level measured during a single event in which the sound level changes value with time (e.g., an aircraft overflight) is called the maximum sound level, or  $L_{max}$ . The maximum sound level is important in judging the interference caused by a noise event with conversation, television or radio listening, sleeping, or other common activities.
- **Peak (dBp)**. Peak is a single-event sound level without frequency weighting. There is no time component or assessment period with Peak such as with DNL. The peak level is the same day or night. It's also the same whether one round is fired or a thousand rounds fired at a given range. It is a singular measure of the peak sound produced at that instance.
- **PK15(met)**. PK15(met) is a single-event peak noise level used in noise modeling analysis which represents the Peak noise level with a downwind propagation applied in all directions (360°) from the noise source. This adjustment accounts for variations caused by meteorological conditions that favor noise propagation and is expected to be exceeded only 15 percent of the time by the loudest munitions. In other words, 85 percent of the time the sound level produced will be within the PK15(met) noise contours presented on the map.
- **PK50(met)**. PK50(met) is also a single-event peak noise level used in noise modeling analysis, however, it represents the peak noise level that is exceeded or captured 50 percent of the time. Thus, 50 percent of the time the sound level produced will be within the PK50(met) noise contours presented on the map. This metric also accounts for weather but assumes conditions which are not favorable for noise propagation, rather average or neutral weather conditions with regards to noise.

#### 1.4.2 SOUND PROPAGATION

One of the principle effects on sound propagation is the day-to-day weather conditions. Wind and temperature significantly influence how far sound travels from a source and how loud it will be at the receiver's location. As sound travels through air, a receiver downwind of the source will be subjected to higher sound levels than a receiver upwind; in effect the wind is actually helping move the sound to the downwind receiver, while upwind the sound must "swim against the current."

Combine wind direction with temperature variation (as a rule, sound usually travels further in cold temperatures) and one may observe the phenomena of *atmospheric refraction*. This is the process by which atmospheric conditions actually bend and/or focus sound waves toward some areas and away from others.

When a temperature inversion is present, military operations may sound much louder than normal, or be heard at greater distances. The inversion layer acts as a boundary for the sound, trapping it close to the ground. This can create areas of high intensity sound far from the sound's source. As a result, on most days it may be possible to detonate 10 pounds of explosives without

disturbing a community (neutral weather conditions), while on another day with a temperature inversion, the detonation of 1 pound at the same location may be disruptive (unfavorable weather conditions).

Figure 1-1 illustrates how temperature inversions bend (refraction) the sound created by a typical explosion. The sound waves from the explosion initially travel upward, but the inversion reflects the sound back downward toward the ground, generating high noise levels many miles away. Under normal conditions, the noise levels at that distance would otherwise be much lower.

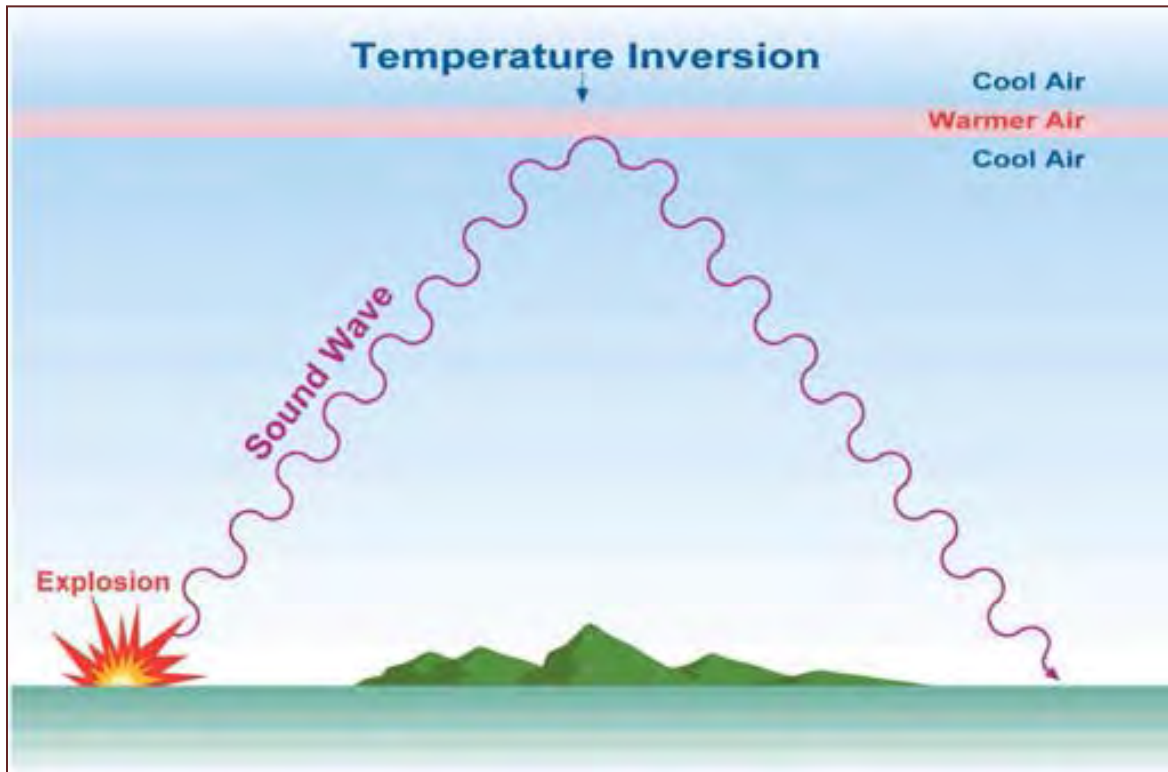


Figure 1-1. Example of a Temperature Inversion

Based on these phenomenon it's easy to see how predicting sound travel can be very difficult, but the Explosives Research Group (ERG) and the University of Utah developed guidelines to help determine what would be “good” or “bad” firing times. These guidelines are summarized in Table 1.1.

Another factor in sound propagation can be the natural topography of the land in and around the firing ranges and impact areas, as well as outside the installation. Naturally occurring terrain features have an effect on blast noise sound waves (air-blast) through both reflection and diffraction. To account for terrain effects the BNOISE2 model uses algorithms in the calculation engine along with USGS Digital elevation Model (DEM) data. DEM data are available for all contiguous United States, Hawaii and most of Alaska. It should be noted that the mitigation effects of topography on blast noise are highly dependent upon the terrain features location and size.

Table 1-1. University of Utah Criteria for "Good" and "Bad" Firing Conditions

“Good” Firing Conditions	“Bad” Firing Conditions
<p>Clear skies with billowy cloud formations, especially during warm periods of the year.</p> <p>A rising barometer immediately following a storm.</p>	<p>Days of steady winds (5-10 mph) with gusts of greater velocities (above 20 mph) in the direction of nearby residences.</p> <p>Clear days on which “layering” of smoke or fog are observed.</p> <p>Cold, hazy, or foggy mornings.</p> <p>Days following a day when large extremes of temperature (about 36°F) between day and night are observed.</p> <p>Generally high barometer readings with low temperatures.</p>

Source: University of Utah, 1958

### 1.5 NOISE MANAGEMENT PROGRAM

In accordance with AR 200-1, Army installations are responsible for maintaining a Noise Management Program. The program includes two main components:

- (1). *Evaluate and document the impact of noise produced by ongoing and proposed actions/activities.*
- (2). *Monitor, record, archive and address operational noise complaints.*

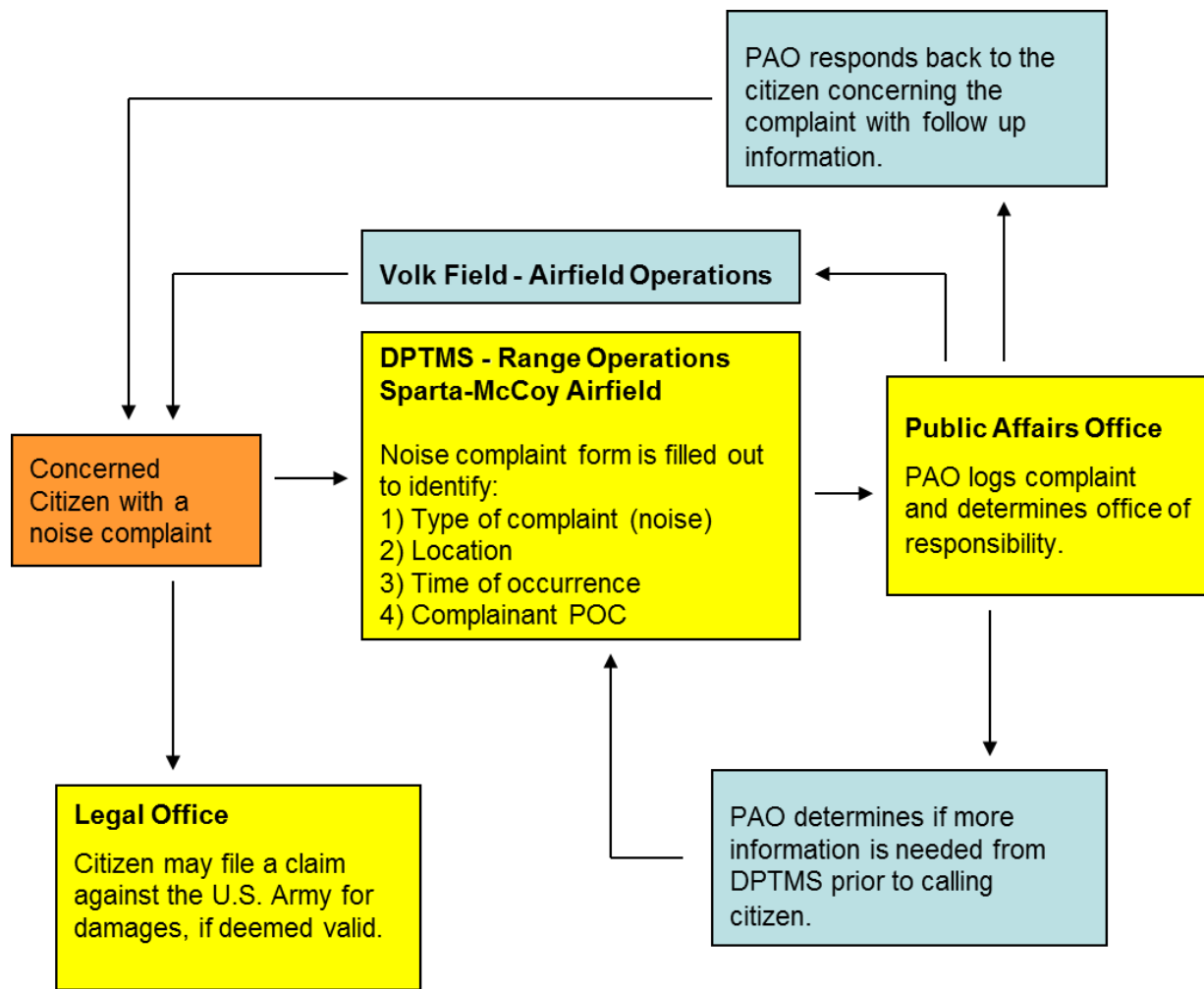
The ICUZ study is generally the center of the noise management program. As previously mentioned, the ICUZ is designed to provide needed information so installations can work with communities to solve noise incompatibility issues. The ICUZ study along with an effective noise complaint procedure will help installations address complaints, advise local planning commissions, and be instrumental in developing action plans which may limit future encroachment threats.



### 1.5.1 NOISE COMPLAINT MANAGEMENT

The goal of a complaint procedure is to reduce the potential for noise complaints by keeping the public informed about what is happening and to satisfy the complainants so that noise complaints do not escalate. A proactive noise complaint program will help prevent the degradation of the mission due to controversy over noise impacts, while at the same time protecting the health and safety of the local community, both civilian and military, on and off the installation.

The proponent agency for addressing noise complaints at Fort McCoy is the Directorate of Plans, Training, Mobilization and Security (DPTMS). DPTMS and /or Airfield Operations (depending on activity) fields and investigates all complaints. The Public Affairs Office (PAO) is responsible for recording complaints and when necessary following up with the complainant. The basic process is illustrated below:



## **2 FORT MCCOY**

### **2.1 LOCATION**

Fort McCoy is located in Monroe County between the cities of Sparta and Tomah and roughly 30 miles east of La Crosse in west-central Wisconsin (Figure 3-1). The installation, which occupies a land area of approximately 60,000 acres, is divided by State Highway 21 south of the cantonment area, which in effect creates a North and South Post. The Black River State Forest, Necedah National Wildlife Refuge, Meadow Valley and Sandhill State Wildlife Areas, and various county forests, comprise about 460,000 acres of public lands within a 30-mile radius of Fort McCoy. The Black River State Forest, just north of Fort McCoy is available on a limited basis as a leased training area.

### **2.2 HISTORY**

Colonel Robert Bruce McCoy, the installation's namesake, started buying land in the Sparta area for the purpose of eventually becoming an Army installation. By 1905, he had acquired approximately 4,000 acres of land that was sold as part of a 14,000 acre purchase by the Army in 1909 and made into two camps, Camp Emory Upton and Camp Robinson. Field artillery and some infantry units were trained there during World War I through 1918. In 1926, the name was changed to Camp McCoy. In the 1930's, the camp served as a Quartermaster Supply Base for the Civilian Conservation Corps.

Between 1938 and 1942, Camp McCoy added 46,900 acres in preparation for World War II (WWII). Construction for the new Cantonment Area began in 1942 and was completed in the same year. The first unit to train at "new" Camp McCoy was the 100<sup>th</sup> Infantry Battalion, composed of Hawaiian National Guardsmen. The 100<sup>th</sup> Infantry battalion fought with distinction up the "boot" of Italy while suffering extremely high casualties. Both Japanese and European prisoners of war were interred at Camp McCoy during WWII. At the end of the war, 247,779 soldiers were processed through the Reception and Separation Center at Camp McCoy.

From 1951 to 1953, Camp McCoy was activated to train soldiers for the Korean conflict. In 1974, the installation was designated as Fort McCoy. During the 1980's the Reserve and National Guard mission of Fort McCoy continued to grow, reaching a milestone of training 100,000 soldiers. In 1985, increases in the number of units and soldiers scheduled to mobilize at Fort McCoy gave the post the distinction of being the largest single reserve component center in the U.S. Army. Today, Fort McCoy serves in its capacity as one of the Army's 15 Power Projection Platforms (US Army 2008).

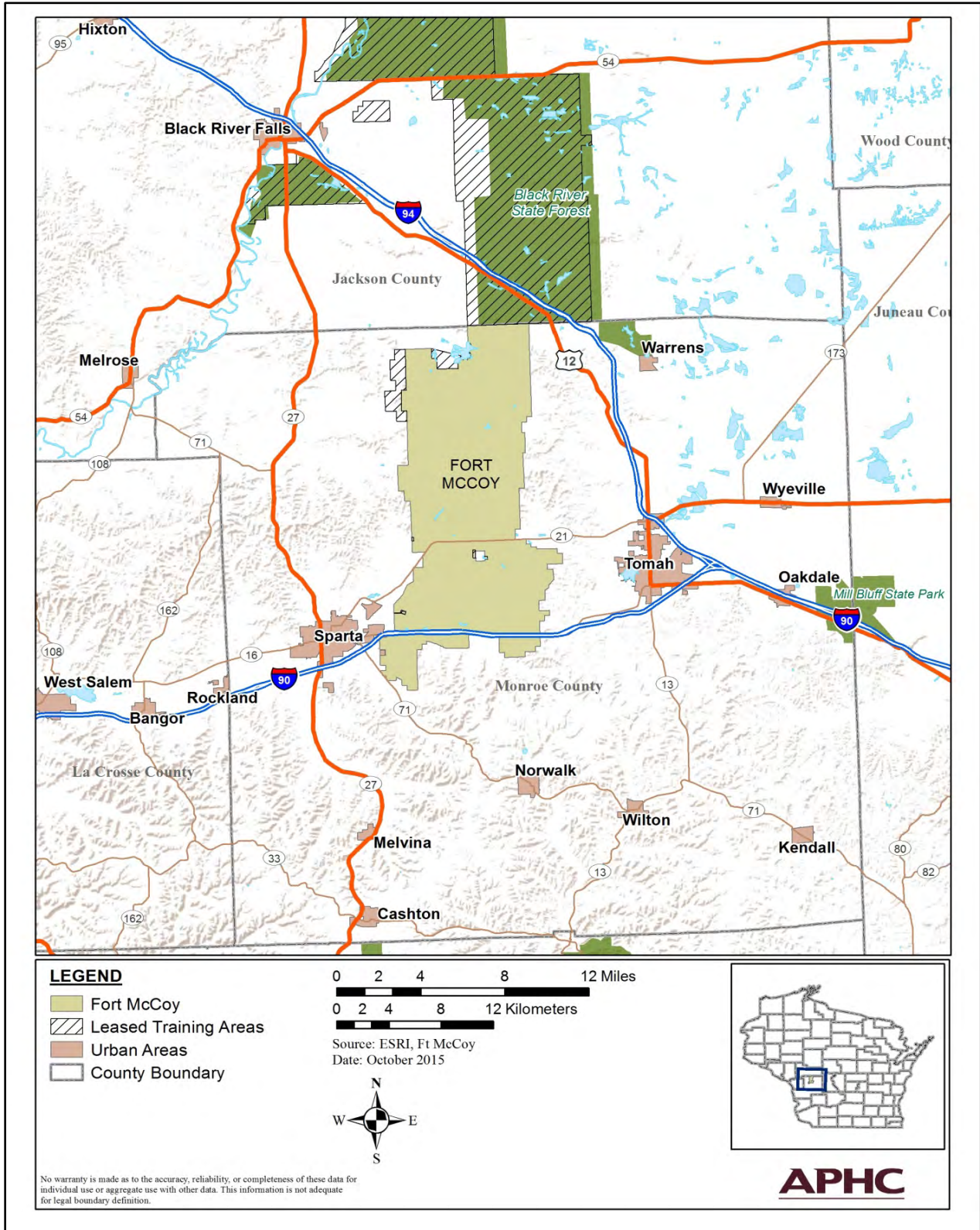


Figure 2-1. Fort McCoy General Location

## 2.3 ORGANIZATION AND MISSION

Fort McCoy serves as a Total Force Training Center that supports the year round training of Reserve, National Guard and active component U.S. military personnel from all branches of the armed services. It is a Power Projection Platform, responsible for deploying Reserve and National Guard component forces in support of contingency operations. Fort McCoy is the only U.S. Army installation in Wisconsin, as well as the only Army facility in the upper Midwest that is capable of providing the full spectrum of individual and collective training for combat, combat service, and combat service support personnel (US Army 2008). The principal tenant units at Fort McCoy that have a training mission are as follows:

- 11th Battalion, Military Intelligence /100th Training Division
- 13th/100th Battalion (Ordnance)
- 86th Training Division
- 88th Regional Support Command Head Quarters
- 181st Infantry Brigade, First Army
- 426th Regiment (Regional Training Institute) & Wisconsin Military Academy
- 871st Engineer Detachment
- B Company, 6th/52nd Aviation Regiment
- C Company, 3rd, 399th, 800th Logistics Support Brigade, 80th Training Command
- Detachment 1, 1152nd Transportation Company

Additional tenant organizations with training missions are as follows:

- Information Assurance Training Center
- Equipment Concentration Site 67
- Maneuver Area Training Equipment Site
- Medical Simulation Training Center
- Naval Mobile Construction Battalion-25
- NCO Academy
- Reconfigurable Vehicle Tactical Trainer
- Regional Training Site-Maintenance
- Regional Training Site-Medical
- Wisconsin State Patrol Academy

## 2.4 TRAINING FACILITIES AND RANGES

Fort McCoy encompasses almost 60,000 acres of land, of which approximately 4,609 acres of land are considered nonoperational and 55,051 acres are considered operational area for military training. Operational lands provide for a wide range of training opportunities and a full spectrum of facilities such as; ranges, maneuverable training areas, artillery firing points, land navigation courses, an air-to-ground impact area, airborne drop zones, and a tactical landing site (Fort McCoy 2014). As previously mentioned, additional training areas up to 70,827 acres are available through land-use agreements. When available, these lands include approximately

67,800 acres of the Black River State Forest, as well as approximately 1,400 acres in Monroe County and approximately 1,000 acres in Jackson County.

The majority of ranges on Fort McCoy are clustered around the North Impact Area, with Artillery Firing Points scattered throughout North Post. Mortar firing may be conducted from any of 12 established mortar points or from nonstandard firing points with prior approval. The majority of Collective Training Facilities are located south-southeast of the cantonment area. South Post contains four small arms ranges located west in Training Areas A-1 and A-2. Tables 2-1 through 2-4 list the ranges and training facilities and the activity. Some ranges are listed in multiple tables as they have multiple uses. Figure 2-2 shows the training area and range locations.

Table 2-1. Small Arms Ranges on North and South Post

This table was removed for physical security concerns.

Table 2-2. Large Caliber Weapons and Demolition Ranges

This table was removed for physical security concerns.

Table 2-3. Large Caliber Weapons and Demolition Ranges Continued

This table was removed for physical security concerns.

Table 2-4. Collective Training Facilities

This table was removed for physical security concerns.

Aircraft activity takes place at the Sparta-Fort McCoy Airport, a joint-use, military/civilian facility, the Young Air Assault Strip (YAAS), a tactical landing site which can accommodate aircraft as large as the C-17 and the Unmanned Aerial System (UAS) Airstrip. Fort McCoy contains five airborne Drop Zones (DZ). The Badger DZ can support drops of personnel, bundles and all types of equipment; Warrens DZ can support personnel and bundle drops; and YAAS is used for low-altitude parachute extraction. The Cranberry DZ is used for special operations. The airfield itself is the fifth DZ (Fort McCoy 2012). Fort McCoy controls the airspace in two restricted areas, Restricted Area R6901A includes all air space over the installation north of Highway 21 (North Post), and Restricted Area R6901B includes all air space over the installation south of Highway 21 (South Post).

Figure 2-2. Fort McCoy Ranges and Training Areas

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## 2.5 LOCAL COMMUNITIES

Fort McCoy is in Monroe County and borders Jackson County. The population density of this region is low, and predominantly rural. The areas surrounding the Fort are mainly open lands, forests, and agricultural lands. The closest major population center is La Crosse, with a population of about 50,000, and is located 30 miles west of Fort McCoy. The incorporated towns of Sparta and Tomah are approximately 3 miles to the west and east of Fort McCoy, respectively.

In addition, Fort McCoy is bounded by six small unincorporated towns in Monroe County: New Lyme, Lafayette, and Angelo on the west, and Grant, Greenfield, and Adrian on the east. The unincorporated towns of Manchester and Millston in Jackson County form the northern boundary with Fort McCoy. Those Jackson County towns, however, are almost completely comprised of state forest land, and are sparsely populated. As previously mentioned, state forest and wildlife areas are abundant in the vicinity.

As seen in Table 2-4, Monroe County experienced steady growth from 2000-2010 at over 9 percent. The Wisconsin state average during this same time period was 6 percent. However, since 2010 growth has slowed significantly to 1.6 percent with a total numerical increase of only 706 people in the last four years. The cities of Sparta and Tomah follow this trend with growth rates slowing to 1.5 and 2.6 percent respectively from 2010-2014. Jackson County also saw modest growth during the years 2000-2010, but the population has seen little change from 2010 at under 1 percent.

Table 2-5. Population Surrounding Fort McCoy

	2000	2010	2014 Est.
Tomah	8,440	9,093	9,328
Sparta	8,706	9,522	9,667
Jackson County	19,100	20,449	20,652
Monroe County	40,899	44,673	45,379
Wisconsin	5,363,673	5,686,986	5,757,564

Source: U.S. Census Bureau

Figure 2-3 compares the population density (per square mile) for U.S. Census years 2010 and 2013 surrounding Fort McCoy. As expected, there have been few changes since 2010, with the majority of areas east, west, and north remaining exceedingly low density (<50 persons per square mile). The highest densities are within the city limits of Sparta and Tomah and along Interstate 90 oriented east-west. By population Monroe County ranks 31<sup>st</sup> out of 72 Wisconsin counties. However, Monroe County is the 19<sup>th</sup> largest county by land area at nearly 901 square miles.

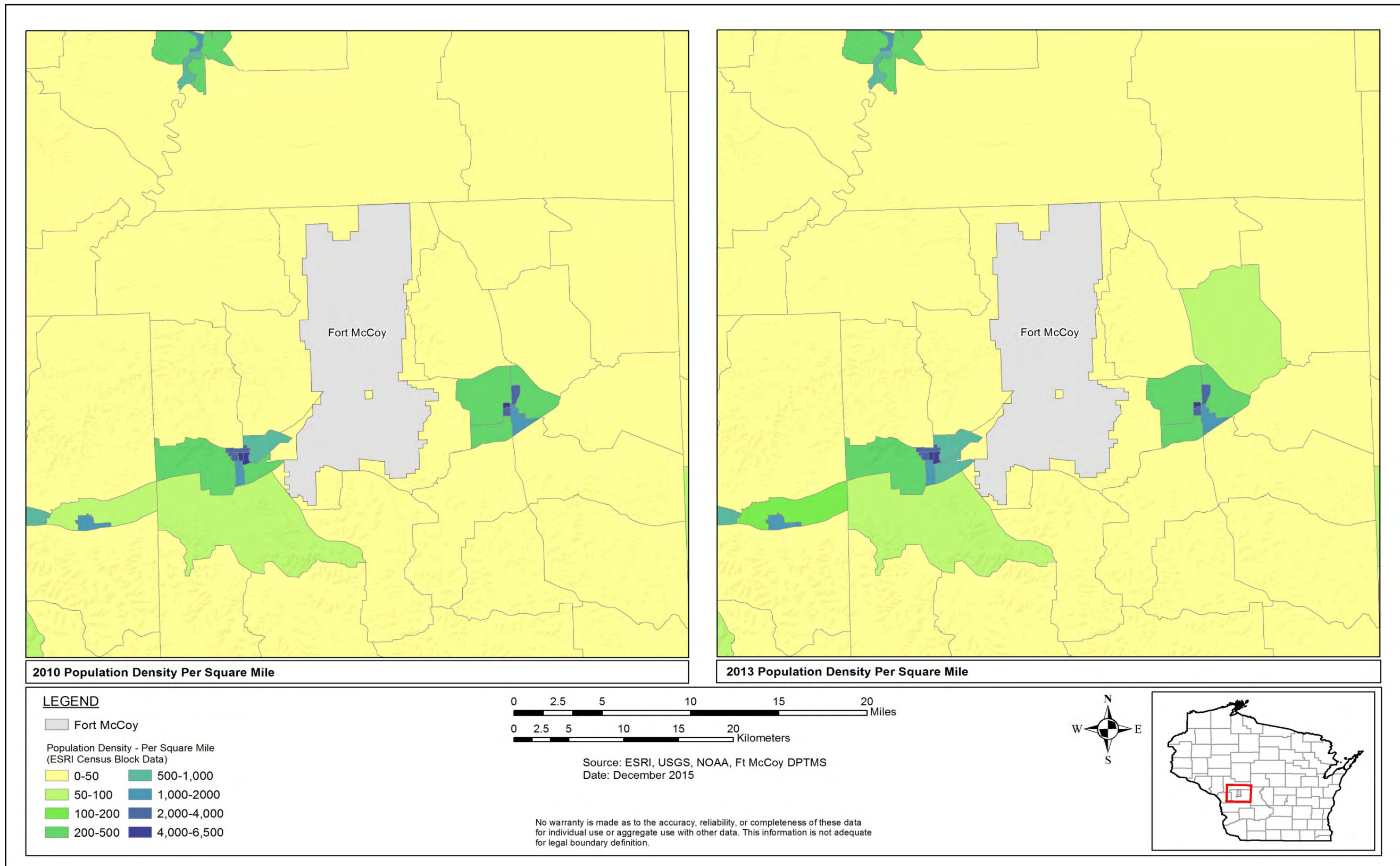


Figure 2-3. Population Density Change for Census Year 2010 to 2013



## 2.6 ECONOMIC IMPACT

The operations at Fort McCoy generate substantial revenues to local economies through military and civilian wages, equipment rentals, utilities, telephone, office supplies, as well as construction contractor payments and other prime contract awards. As one of Monroe County's largest employers, the economic impact of Fort McCoy on the local economy cannot be understated. According to Fort McCoy records, expenditures since Fiscal Year (FY) 2009 have totaled nearly \$2.2 billion dollars. In FY 2014 alone, Fort McCoy's expenditures were \$295.2 million. An accounting of the FY 2014 expenditures is listed in Table 2-5. The largest annual expenditure at Fort McCoy is the payroll, which accounts for approximately 45.5 percent of the total yearly expenditures. Using the total in Table 2-5 and a Gross Multiplier Index (average dollar turnover) of 3.2, Fort McCoy estimates its total economic impact in the surrounding region for FY 2014 was approximately \$944.7 million dollars.

Table 2-6. Fort McCoy Fiscal Year 2014 Expenditures and Economic Impact

<b>Expenditure</b>	<b>In Millions</b>
<b>Workforce Payroll</b>	<b>\$125,644,288</b>
Military Pay	\$87,275,122
Civilian Pay	\$38,369,166
<b>Operating Costs</b> <i>(Includes costs for utilities; physical plant maintenance; repair and improvements; new construction projects, and purchases of supplies and services.)</i>	<b>\$154,808,319</b>
<b>Other Expenditures</b>	<b>\$14,764,213</b>
Revenue to Local Governments <i>(Includes land-permit agreements, payments in lieu of taxes and school district impact aid.)</i>	\$247,113
Soldier Discretionary Spending	\$14,517,100
<b>Total</b>	<b>\$295.2 Million</b>

(Source: Fort McCoy's Economic Impact – Fiscal Year 2014)

Another measure of Fort McCoy's impact upon the economies of the surrounding communities is the number of jobs that are induced in the private sector as a direct result of troop levels and civilian workers at Fort McCoy. Induced employment related to military installations has been addressed in a number of studies which can be used to estimate the number of jobs created based upon an installation's population. Conservative estimates often put these multipliers at a one to one, or one to two ratio. At Fort McCoy, local businesses have been started to serve the installations needs for repair technicians, delivery drivers, plumbers, carpenters, and various other contracting work. Some technical, military-specific companies have also found business serving Fort McCoy's unique needs in logistics, communications, and other support services (Fort McCoy Joint Land Use Study 2013).

### 3 NOISE ASSESSMENT GUIDELINES

The APHC recommends land use options based on the type of noise source. The original Federal Interagency Committee on Urban Noise (FICUN, 1980) guidelines are applicable to A-weighted noise sources such as aircraft and ground vehicles. Using the FICUN guidelines, the Army in conjunction with recommendations of the National Academy of Sciences Committee on Hearing, Bioacoustics and Biomechanics (CHABA 1981), developed Noise Zone limits and land use recommendations for property within the weapons and explosive Noise Zones (U.S. Army 2007, U.S. Air Force 2015). Table 3-1 lists the noise limits as shown in Army Regulation (AR) 200-1. Tables B-1 through B-3 (Appendix B) contain the land use recommendations.

Table 3-1. Noise Limits for Noise Zones

Noise Zone	Noise Limits			Noise-Sensitive Land Use
	Aviation ADNL (dB)	Impulsive CDNL (dB)	Small Arms dBP	
LUPZ	60 – 65	57 – 62	n/a	Generally Compatible
I	< 65	< 62	< 87	Generally Compatible
II	65 – 75	62 – 70	87 – 104	Generally Not Compatible
III	> 75	> 70	> 104	Not Compatible

Source: AR 200-1

Notes:

dB = decibel, ADNL = A-weighted Day-Night Level, CDNL = C-weighted Day-Night Level, P = Peak

There are often existing “noise-sensitive” land uses defined as non-conforming within a Noise Zone. In most cases this is not a risk to community quality of life or mission sustainment. Average noise levels may be the best tool for long-term land use planning, but they may not adequately assess the probability of community noise complaints.

As recommended in AR 200-1, this assessment includes supplemental metrics to identify where noise from aviation overflights, demolition activity, and large caliber weapons may periodically reach levels high enough to generate complaints. In many instances Noise Zones will indicate land use compatibility; however, noise complaints from impulsive events typically are attributable to a specific event rather than annual average noise levels. Peak levels are useful for estimating the risk of receiving a noise complaint from impulsive events, as they correlate with the receiver’s perception of noise levels. Table 3-2 lists the Army’s Complaint Risk Guidelines.

Table 3-2. Complaint Risk Guidelines

Perceptibility	dB Peak	Risk of Receiving Noise Complaints
May be Audible	< 115	Low
Noticeable, Distinct	115 - 130	Moderate
Very Loud, May Startle	> 130	High
*Perceptibility is subjective. The classifications are based on how a typical person might describe the event.		

- People in an area experiencing peak sound pressure levels between 115 and 130 dB may describe events as noticeable and distinct. From within this area, the installation has a moderate risk of receiving noise complaints. The magnitude of the complaint risk is dependent upon frequency of occurrence in addition to factors such as time of day activity occurs, propagation conditions under which activity takes place, and noise sensitivity of individuals in these areas.
- Peak sound pressure levels above 130 dB are generally objectionable, and are often described as very loud and startling. These levels correlate with a high risk of noise complaints.
- If the operations which generate high peak sound pressure levels in the community are very infrequent, land use controls may not be warranted. However, prior public notification is important for mitigating complaint risk, and also an important role of being good neighbors.
- Peak sound pressure levels directly correlate with airborne vibration which is the dominant cause of structural response from military training. Peak sound pressure levels above 120 dB may rattle windows or loose ornaments (e.g. pictures on walls) and annoy occupants but will not cause structural damage. It is widely recognized that structural damage is improbable when peak sound pressure levels do not exceed 140 dB.

Peak levels can vary significantly for the same activity dependent on weather conditions.

- Unfavorable Weather Conditions: PK15(met) is the peak sound level, factoring in the statistical variations caused by weather, that is likely to be exceeded only 15 percent of the time (i.e., 85 percent certainty that sound will be within this range). This “85 percent solution” gives the installation and the community a means to consider the areas that at times may be impacted by training noise. PK15(met) levels would occur under unfavorable weather conditions that enhance sound propagation.
- Neutral Weather Conditions: PK50(met) is the Peak level that is likely to be exceeded 50 percent of the time (i.e., 50 percent certainty that sound will be within this range). These levels would be seen during neutral weather conditions. It should be noted that if activities take place under favorable weather conditions, such as the wind blowing away from the receiver, noise levels would be lower.

The unfavorable weather conditions PK15(met) metric is a good tool to indicate areas that may periodically be exposed to high noise levels. When land use planning programs such as real estate disclosure, a Joint Land Use Study or the Army Compatible Use Buffer are implemented, the PK15(met) complaint risk areas can and should be used to delineate areas of focus. However, since the complaint risk areas are based on individual event levels and are not dependent on the number of events, planners should also consider frequency of operations when making land use decisions.

## 4 RANGE NOISE ASSESSMENT

### 4.1 SMALL ARMS NOISE

The small arms designation includes weapons of .50 caliber or less. The most common small arms ammunition used on Fort McCoy Ranges are fired from 5.56 mm and .30 caliber rifles, 7.62 mm and .50 caliber machine guns, 9 mm, .40 and .45 caliber pistols, and 12 gauge shotguns. Each of these weapons produces a distinct noise signature when fired. Small arms noise within the ICUZ is divided into subsections based on the type of range facility:

- Small Arms Ranges - a defined area or range with fixed firing points and/or targets.
- Non-fixed Firing Point Areas - area or range with non-fixed firing points and/or targets.

The SARNAM model was used to calculate and plot the peak noise levels based on the loudest weapon at each fixed firing point range from the operations data described in Appendix C. To generate noise contours using SARNAM, specific firing point and target point locations must be entered into the program. Therefore, facilities without set firing points or target point locations such as firing within a Training Area or facilities such as a Military Operations in Urban Terrain (MOUT) are addressed via predicted peak noise levels.

#### 4.1.1 SMALL ARMS NOISE ZONES

The small arms ranges at Fort McCoy are utilized year round depending upon training mission requirements, such as the type of training to be completed; the unit being trained; and deployment status. However, the primary training months at Fort McCoy tend to be April to October. Total small arms expenditures at Fort McCoy in FY 2015 were 9.2 million rounds.

Noise Zones for small arms firing activity are illustrated in Figures 4-1 (North) and Figure 4-2 (South). The noise represents a maximum small caliber training scenario (all ranges actively firing). All ranges represent live-fire operations and are assessed using the Peak noise metric. Thus, only Noise Zones II and III are depicted in the map figures. Note: Zone I includes all areas outside the Zone II noise limit of 87 dBP.

In North Post, Zone II extends approximately 1.3 kilometers (km) (.8 miles) beyond the western boundary crossing County Highway-I and into a portion of the leased training area in the northwest. Zone II also extends into the cantonment area as far south as East P Street and West G Street. Zone III extends beyond the western boundary in one area less than 100 meters, just outside Range 17 (Squad Defense Range).

In South Post, Zone II extends beyond the installation boundary in three separate places; northwest approximately 550 meters, crossing Interstate 90; west approximately 250 meters; and east-southeast approximately 700 meters. Zone III extends beyond the boundary just slightly north of Range 102 (100 meters) onto Interstate 90.

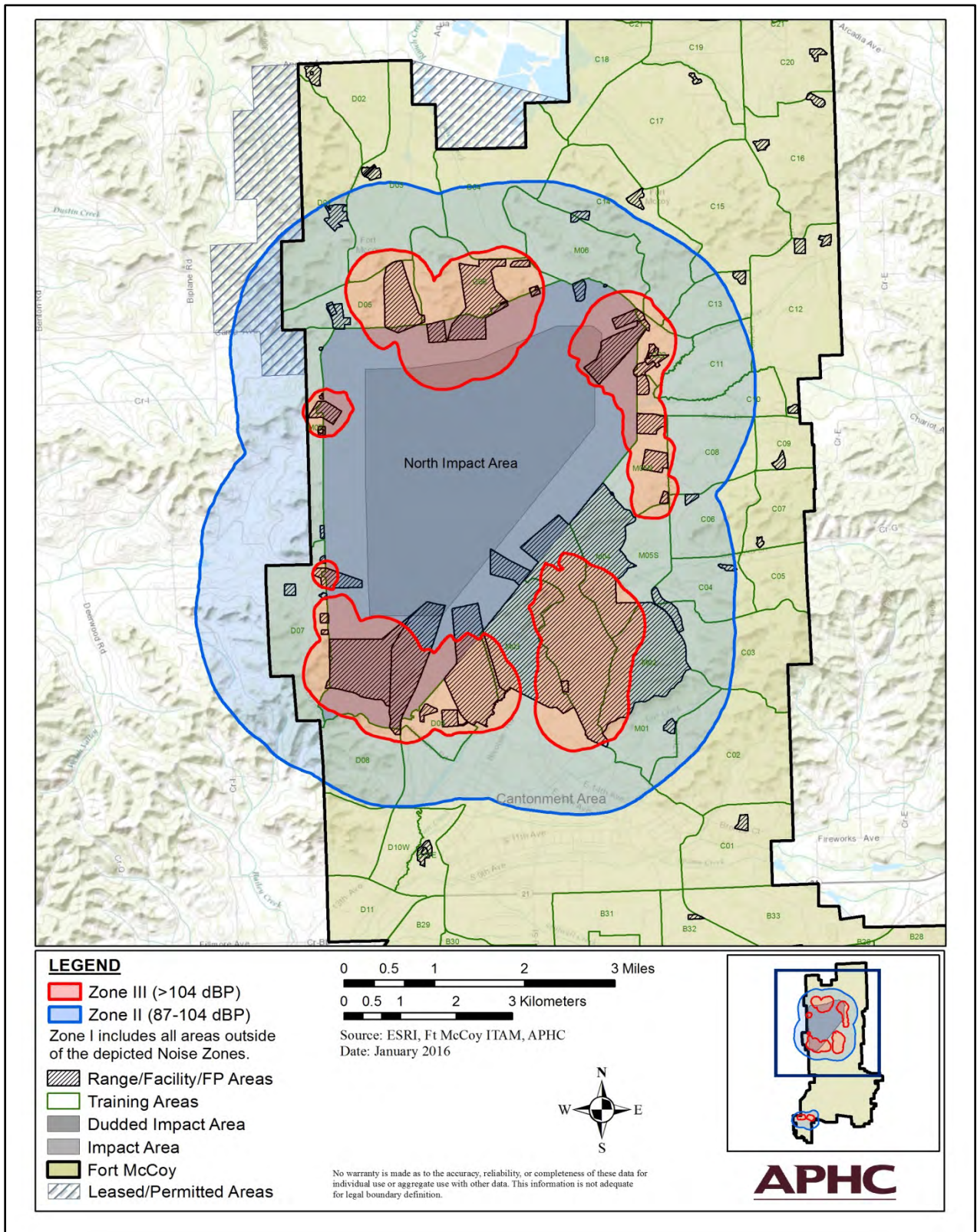


Figure 4-1. Noise Zones for Small Arms Range Operations in North Post

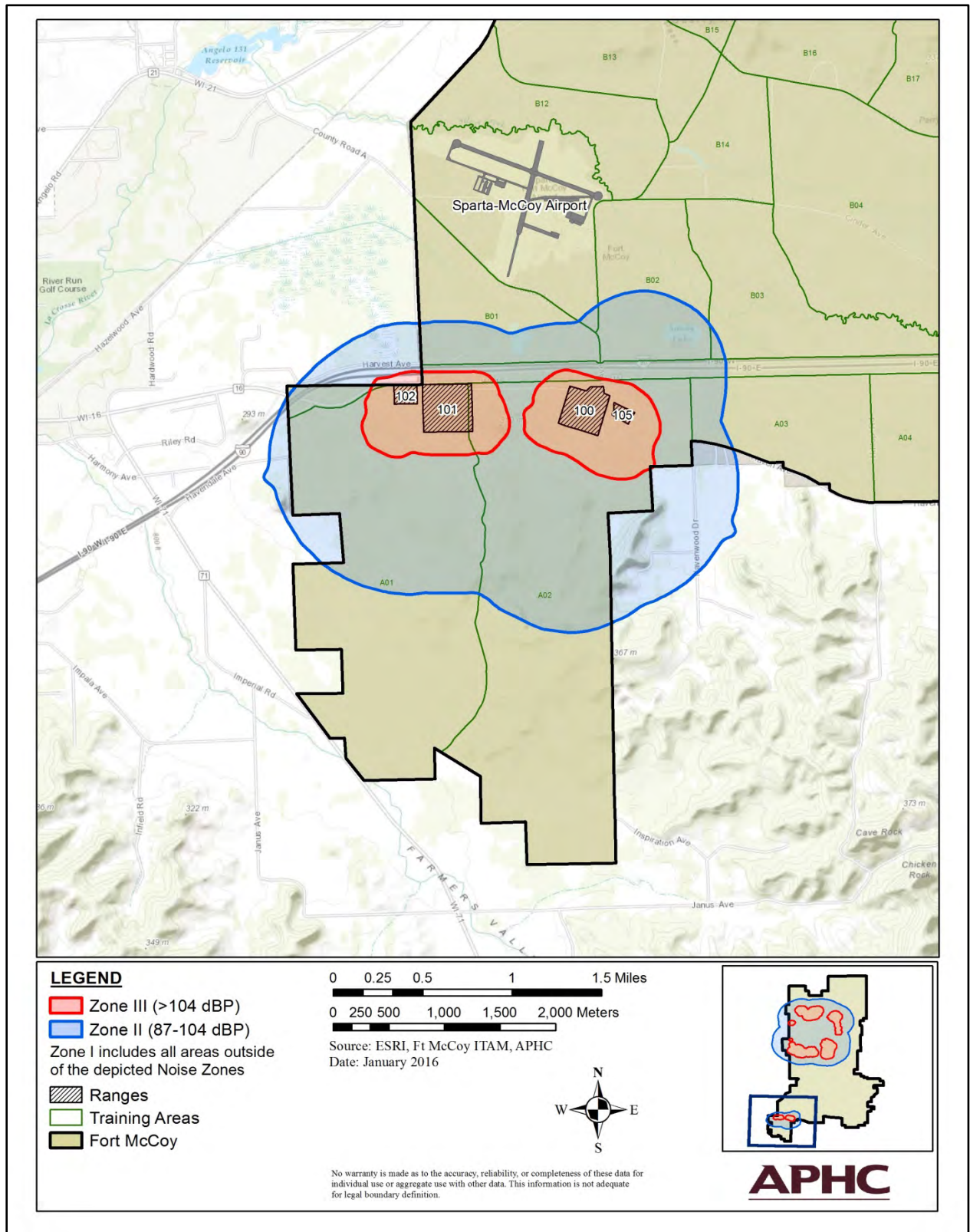


Figure 4-2. Noise Zones for Small Arms Operations in South Post

#### 4.1.2 NON-FIXED FIRING POINT AREAS

As briefly mentioned in the previous section, troops at Fort McCoy conduct training at multiple special use or collective training facilities as well as within the maneuver and training areas. These activities produce training which replicates real-world environments and scenarios. With the absence of specific firing and target point locations, noise contours for small arms firing in the training areas and collective training facilities cannot be modeled. However, by looking at predicted peak levels, we can attempt to assess the noise exposure from these training activities.

According to range expenditure records, the most common ammunition or simunition in this case is the 5.56mm blank. Table 4-1 lists the predicted peak levels for the 5.56mm blank. In each column, the upper limit levels would occur under weather conditions that enhance sound propagation (unfavorable), such as the wind blowing toward the receiver. The lower limit levels occur under favorable weather conditions, such as the wind blowing away from the receiver. The azimuth angle can be defined as the direction of fire, i.e. 0 degrees is directly in front of the weapon and 180 degrees is directly behind the weapon.

When combining these two variables, the highest peak levels occur when rounds are fired in the direction of the receiver (0 degree azimuth) and under unfavorable weather conditions. As an example, Table 4-1 indicates that under unfavorable weather conditions, a Zone II noise level [87 dBP] extends approximately 200 meters for the 5.56mm blank round at all three given azimuth angles.

Table 4-1. Predicted Peak Levels for 5.56mm Blank Round

Distance, meters	Predicted Level, dBP Azimuth		
	0°	90°	180°
100	87-97	86-96	87-97
200	80-90	79-89	80-90
400	69-79	68-78	69-79

Note: the 0° is directly in front of the weapon and the 180° azimuth is directly behind the weapon.  
Blank is defined as any round that contains propellant but no bullet.

Based on collective training facility and HSTC Lane locations, firing activity producing peak noise levels at or above the Zone II limit of 87 dBP would not extend beyond the Fort McCoy boundary, or would be contained within the existing small arms Noise Zones. Although less common, firing within an approved TA which borders the installation boundary is a possibility. Shots fired directly along the installation or training area boundaries would be expected to drop below the Zone III level (104 dBP) at 50 meters, and below the Zone II level (87 dBP) at 200 meters. Figure 4-3 illustrates a 200-meter buffer beyond the training areas for 5.56mm blank ammunition activities. The impacts from these activities are likely to be limited as land use within 200 meters of the installation boundary does not currently contain noise-sensitive land uses.

Figure 4-3. Small Arms (5.56mm) Non-fixed Firing Point 200 Meter Buffer

This map was removed for physical security concerns.



## 4.2 LARGE CALIBER AND DEMOLITION NOISE

The large caliber designation includes weapons 20mm or greater and any weapon that contains explosive charges. This designation also includes all demolition charges. At Fort McCoy, training is conducted with a multitude of large caliber weapons including artillery, mortars, aerial gunnery, mines, rockets, grenade launchers, and explosive demolition charges. Training at Fort McCoy can occur year round, although as previously mentioned the majority of training takes place seasonally between April and October. Appendix C lists the large caliber ammunition and explosive detonations expenditures by range and type for FY 2015 (1 October 2014 through 30 September 2015). Fort McCoy DPTMS provided the range operations data.

In addition to the firing points and ranges assessed in the Noise Zones, training at Fort McCoy also includes utilization of simulators (pyrotechnic and non-pyrotechnic). Simulators are used to provide soldiers with the most realistic training experience possible while keeping soldier safety a priority. Simulator noise levels are much lower than noise levels generated by the munitions they replicate. Simulators are not included in the Noise Zones and are addressed separately via peak noise levels in Section 4.2.2.1. Appendix C contains the simulator expenditure from for reference.

### 4.2.1 LARGE CALIBER AND DEMOLITION NOISE ZONES

Figure 4-4 depicts the CDNL Noise Zones for Fort McCoy. These Noise Zones were modeled using the FY 2015 ammunition expenditure data with a terrain function and an assessment period of 104 days to account for the seasonal nature of Reserve and ARNG training. The 104 day assessment period is the Army standard for Reserve and National Guard training centers per AR 200-1. A large factor in the size of the Noise Zones is the relatively high percentage of nighttime training at Fort McCoy. According to the FY 2015 facility utilization report, roughly 57 percent of training occurred at night, including Artillery firing. The FY 2014 facility utilization report was also used to verify that the high percentage of night fire was in fact the norm at Fort McCoy.

The LUPZ extends up to 9.7 km (6 miles) beyond the western boundary, 3.4 km (2.1 miles) to the north and 5.2 km (3.2 miles) east. On-post the family housing area is contained within the LUPZ. Zone II extends beyond the boundary west approximately 4.9 km (3 miles); to the north approximately 1.3 km (.8 miles); and to a much lesser degree east approximately 891 meters. Zone III extends beyond the boundary to the north in one area approximately 300 meters, north of Firing Point (FP) 401, and to the east, just beyond FP 414 less than 20 meters. Zone III extends beyond the west boundary up to 1.4 km (.9 miles), following the north impact area crossing County Highway-I. A portion of the Zone III to the west is contained within the leased training area adjacent to the northwest corner of the installation boundary. Further analysis of the CDNL Noise Zones are discussed Section 6.

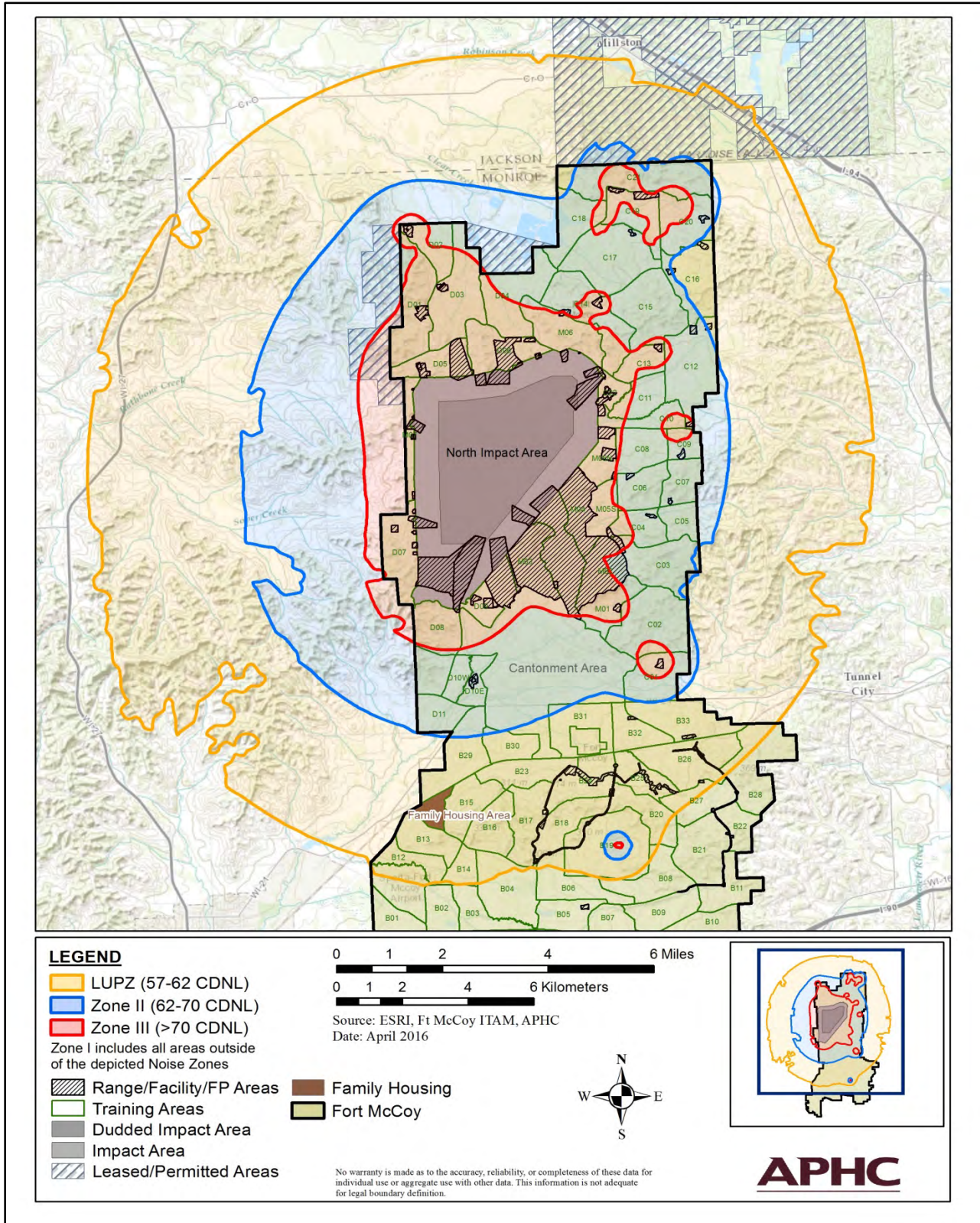


Figure 4-4. Large Caliber and Demolition Operations CDNL Noise Zones

#### 4.2.2 LARGE CALIBER AND DEMOLITION SINGLE EVENT PEAK LEVELS

Annual average noise levels are the most suitable for long-term land use planning. However, individual training events can be audible outside of a Noise Zone and in some cases objectionable to the surrounding community. Using Peak level assessments can forecast where sound may be audible or loud from singular events. Table 3-2 (Section 3) listed the perceptibility of Peak noise levels. It's worth noting that vibration that often accompanies low-frequency noise from large caliber weapons is almost always air-borne (not ground-borne). Neighbors located near the "loud" area on the map may occasionally notice picture or window rattling from air-borne vibration; however, this rattling does not indicate damage, and usually occurs at levels well below those required to cause structural damage (>140 dBP).

Figure 4-5 depicts the single event Peak sound level contours for large caliber weapons operations at Fort McCoy. The map figure to the left illustrates weather conditions that enhance sound propagation (unfavorable weather) and the map on the right illustrates more favorable propagation conditions (neutral weather). The contours are presented side-by-side at the same scale to demonstrate the influence of meteorological conditions on propagation. Appendix C (Table C-3) lists the large caliber ammunition and explosive detonations used to create the Peak noise contours. Due to the relative infrequency of aircraft bombing when compared to other range operations, these activities were separated out as an individual Peak metric scenario. Thus, the operations modeled in Figure 4-5 include all large arms weapons and demolition charges with the exception of aerial bombing.

Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary north approximately 3.8 km (2.4 miles); east 2.6 km (1.6 miles); and west as far as 6.3 km (3.9 miles). The area north (Jackson County) is primarily state forest property and cranberry marsh, however residential uses in the town of Millston and along County Road-O are included. The area east contains part of the small town of Grant (northeast), along with a few scattered residences in the southeast. The majority of land use in this area however remains forest and agriculture land. This is also the pattern to the west, where forest land and agricultural/open space are the dominant land use. Scattered residential use also occurs in the areas west, which is low density in nature. On-post, the 115-130 dB contour contains the cantonment area and a large portion of the family housing area. Peak sound levels above 130 dB extend beyond the boundary in a similar fashion north, east and west; however, all of these areas remain roughly 1,000 meters of the installation boundary. Portions of the contour north and west are contained within leased training areas. Several residences northeast are contained within the 130 dB contour along Arcadia Avenue, Bittersweet Avenue, and County Highway E.

Under neutral weather conditions, peak sound levels between 115 and 130 dB extend beyond the boundary north approximately 1.4 km (.9 miles); east 1.4 km (.9 miles); and west 2 km (1.2 miles). The largest concentration of residential uses occurs in the northeast. On-post the northern portion of the cantonment area is contained within the 115-130 dB contours. Peak sound levels above 130 dB extend beyond the boundary in several small areas north, east and west (<400 meters). There appears to be one residential property located within the peak sound level 130 dB and above contour, just east of Artillery FP 412 off of Bittersweet Avenue.

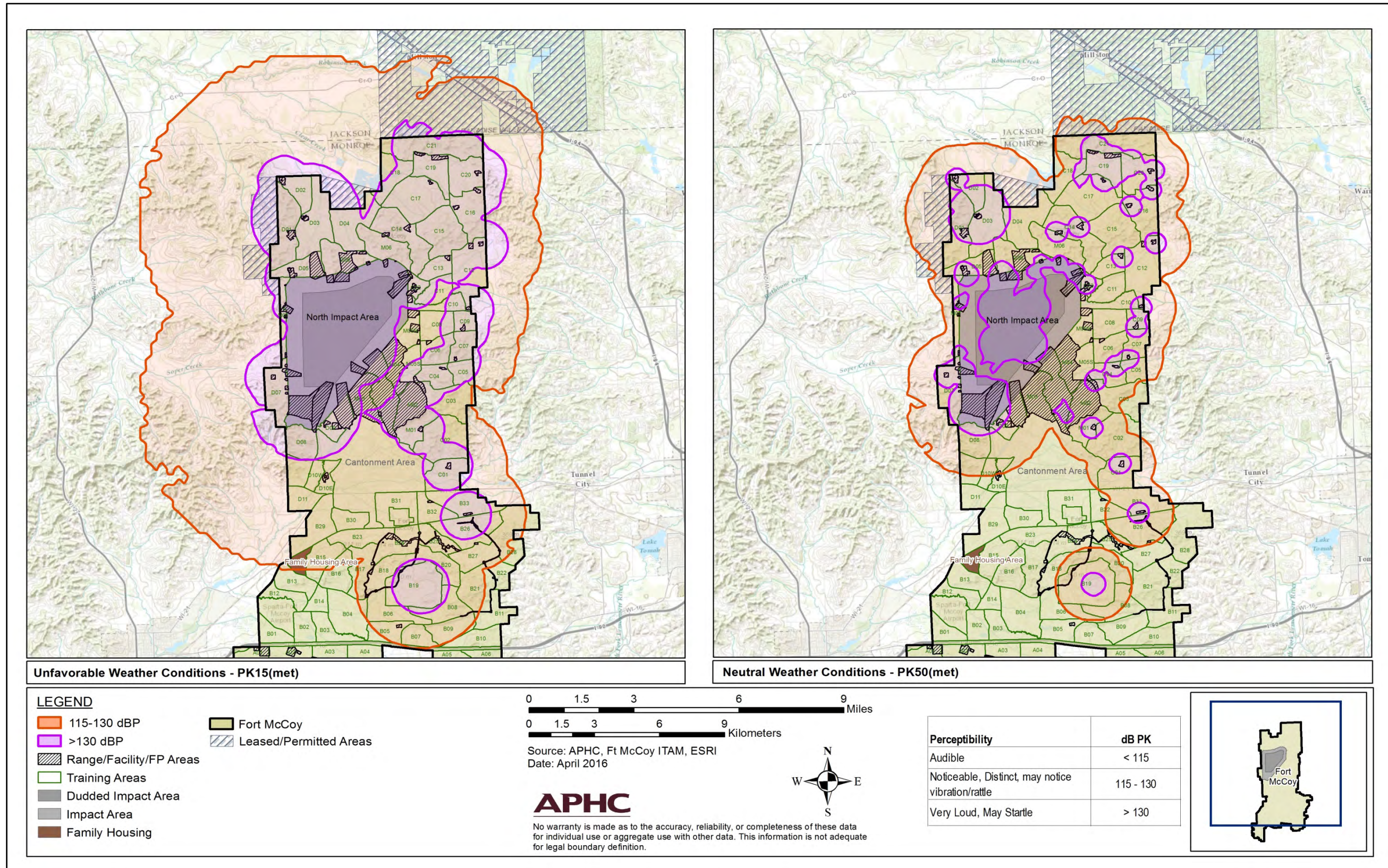


Figure 4-5. Large Caliber and Demolition Operations Single Event Peak Sound Levels

Aircraft bombing events at Fort McCoy include medium and high-altitude inert and live bombing runs. DPTMS personnel indicate that live 500-pound bombs are dropped in the North Impact Area (duded), east and west of the La Crosse River. Aerial bomb sorties are primarily performed by Air National Guard (ANG) 115th Fighter-Wing F-16 aircraft, departing from Truax Field in Madison Wisconsin. Aircraft generally fly a north-northeast to southwest pattern during bombing runs. All aerial bombing sorties at Fort McCoy are restricted to daytime hours between 9:00am to 2:00pm.

Figure 4-6 depicts the single event Peak sound level contours from live 500-pound bombing activity. The map figure to the left illustrates weather conditions that enhance sound propagation (unfavorable weather) and the map on the right illustrates more favorable propagation conditions (neutral weather). The centroid used to plot the Peak sound level contours is 15TXJ8505983118 (MGRS). Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary north approximately 4.2 km (2.6 miles); east 5.3 km (3.3 miles); and west 7.1 km (4.4 miles). The area east contains the small unincorporated towns of Grant and Greenfield. The area west contains the unincorporated towns of New Lyme and Lafayette. Individual residential uses are scattered throughout these areas as well, but as previously mentioned the density is fairly low. The area north encompasses mostly state forest land and agricultural uses. The largest concentration of sensitive use in the north occurs along Bacon Road in Jackson County. On-post, the 115-130 dB Peak contour encompasses the cantonment area and a small portion of the Family Housing Area. Peak sound levels above 130 dB are contained within the installation boundary.

Under neutral weather conditions, the Peak sound level contours see a dramatic reduction in size. Peak sound levels between 115 and 130 dB extend beyond the boundary in one area west, less than 700 meters. There appears to be one private residence inside this area just off of County Highway-I. Peak sound levels above 130 dB are contained within the installation boundary.

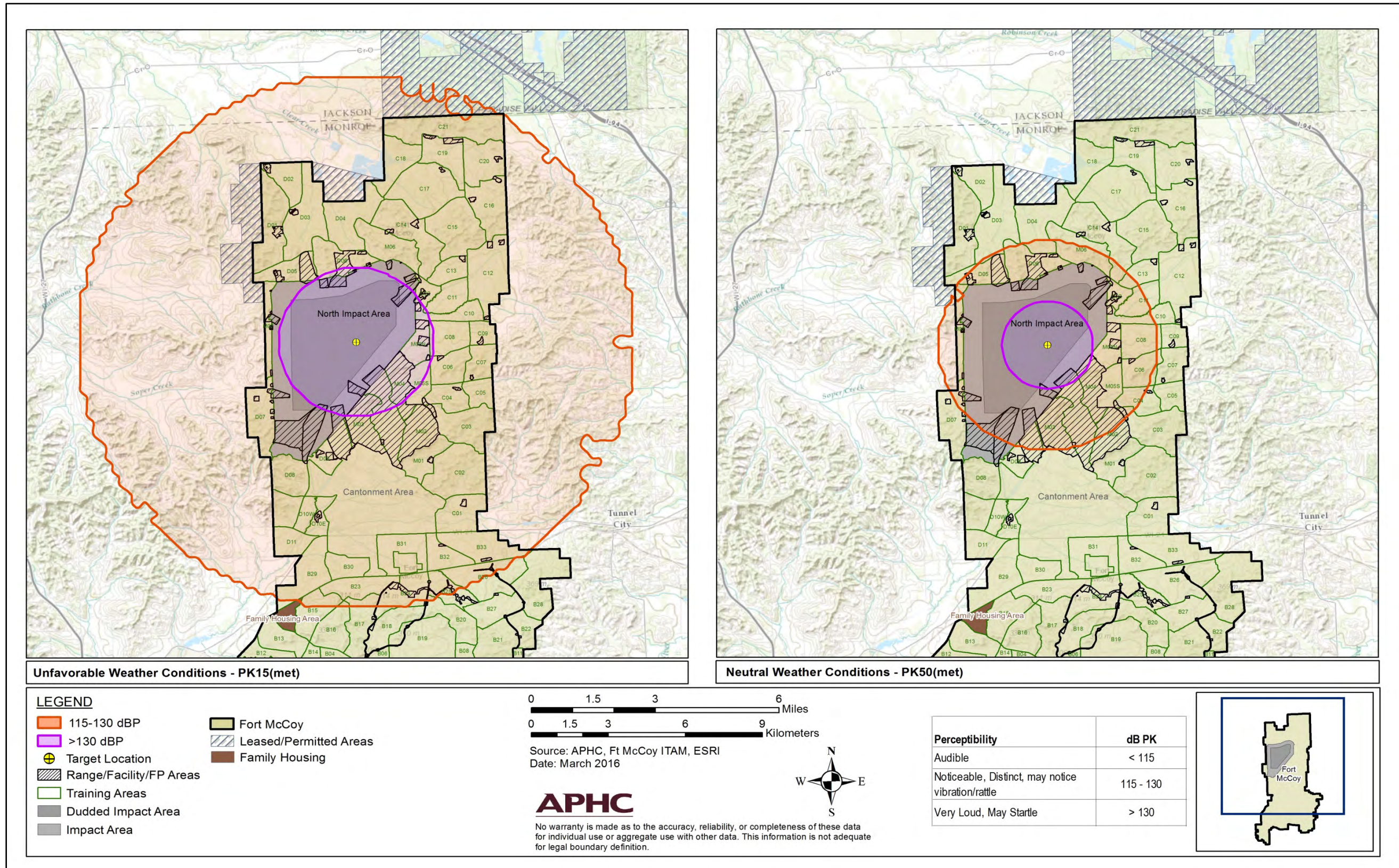


Figure 4-6. Aircraft 500-Pound Bomb Single Event Peak Sound Levels

#### 4.2.2.1 SIMULATOR NOISE

Simulator noise levels vary depending on the type (i.e., artillery, ground burst, grenade, IED) but typically, the variation will be limited to a few decibels. Table 4-2 gives an approximation of anticipated noise levels under neutral and unfavorable weather conditions. The levels were generated using the BNOISE2 computer program, and then verified by comparing the levels with results from noise monitoring studies (U.S. Army 1983, U.S. Army 1984, U.S. Army 1989).

Based on Table 4-2, under neutral weather conditions, the risk of complaints will be low beyond 500 meters as the Peak level would not exceed 115 dBP. Under unfavorable weather conditions, such as during a temperature inversion, or when there is a strong wind blowing in the direction of the receiver, the distance to a 115 dBP level increases to approximately 800 meters.

Table 4-2. Predicted Peak Noise Levels for Typical Army Simulators

Distance from source (meters)	Neutral Weather Conditions PK50(met) dBP	Unfavorable Weather Conditions PK15(met) dBP
100	134	136
200	125	130
300	120	127
400	117	123
500	114	121
600	111	118
700	109	116
800	107	114

Simulators on Fort McCoy are authorized and used in multiple Collective Training Facilities, training areas and ranges that can accommodate the 40mm grenade launcher practice ammunition. As was the case with non-fixed small arms training, simulators may be deployed during exercises in locations near the installation boundary. However, when compared to the high explosive (HE) large arms and demolition activities that take place at Fort McCoy, in most cases, the noise from simulator training is not expected to create incompatibilities or create a high risk of complaints.

## **5 AIRCRAFT NOISE ASSESSMENT**

### **5.1 GENERAL**

Fort McCoy accommodates a broad spectrum of aviation training, the majority of which originates at the Sparta-Fort McCoy Airport, located in the southwest corner of the installation. The airport operates as a joint use airfield with the City of Sparta. The Army leases a portion of the airfield/airport to the city and subsequently allows civilian aircraft to utilize the airfield; however, there is no scheduled civilian air service available. The City of Sparta's exclusive use area encompasses 19 acres on the southwest side of the airport.

In addition to aircraft arriving and departing the airport, Fort McCoy supports training for large cargo fixed-wing aircraft and small fighter jet aerial bombing operations, as well as Unmanned Aerial System (UAS) activities. Helicopter aircraft make use of five helipads, ten Landing Zones (LZ), air corridors, and air space within the installation boundary. There are no permanently assigned Army aviation units at the airfield, thus visiting units are the primary users of the airspace in and around Fort McCoy. Fixed-wing military operations primarily originate from Truax Field in Madison, Wisconsin or Volk Field Combat Readiness Training Center in Camp Douglas, Wisconsin. Fort McCoy airspace is managed and regulated through a coordinated effort involving the McCoy Tower, airfield Base Ops and the DPTMS Fire Desk.

#### **5.1.1 SPARTA-FORT MCCOY AIRPORT**

Sparta-Fort McCoy airport has two runways designated 1/19 (4,114 ft.) and 11/29 (4,697 ft.), oriented north-to-south and east-to-west respectively. Airfield services include base flight operations and control tower which are open Monday through Friday, air space management and air safety, refueling and aircraft rescue firefighting.

Representative arrival and departure flight tracks (including closed loop) used by aircraft operating at the airport are shown in Figure 5-1. Figure 5-1 also illustrates aircraft air corridors, drop zones, and airstrip locations. The location of each flight track and corridor is approximate since the precise flight path may vary due to air traffic control, weather, and other reasons (e.g., one pilot may fly the corridor on one side of the depicted track, while another pilot may fly the corridor slightly to the other side).



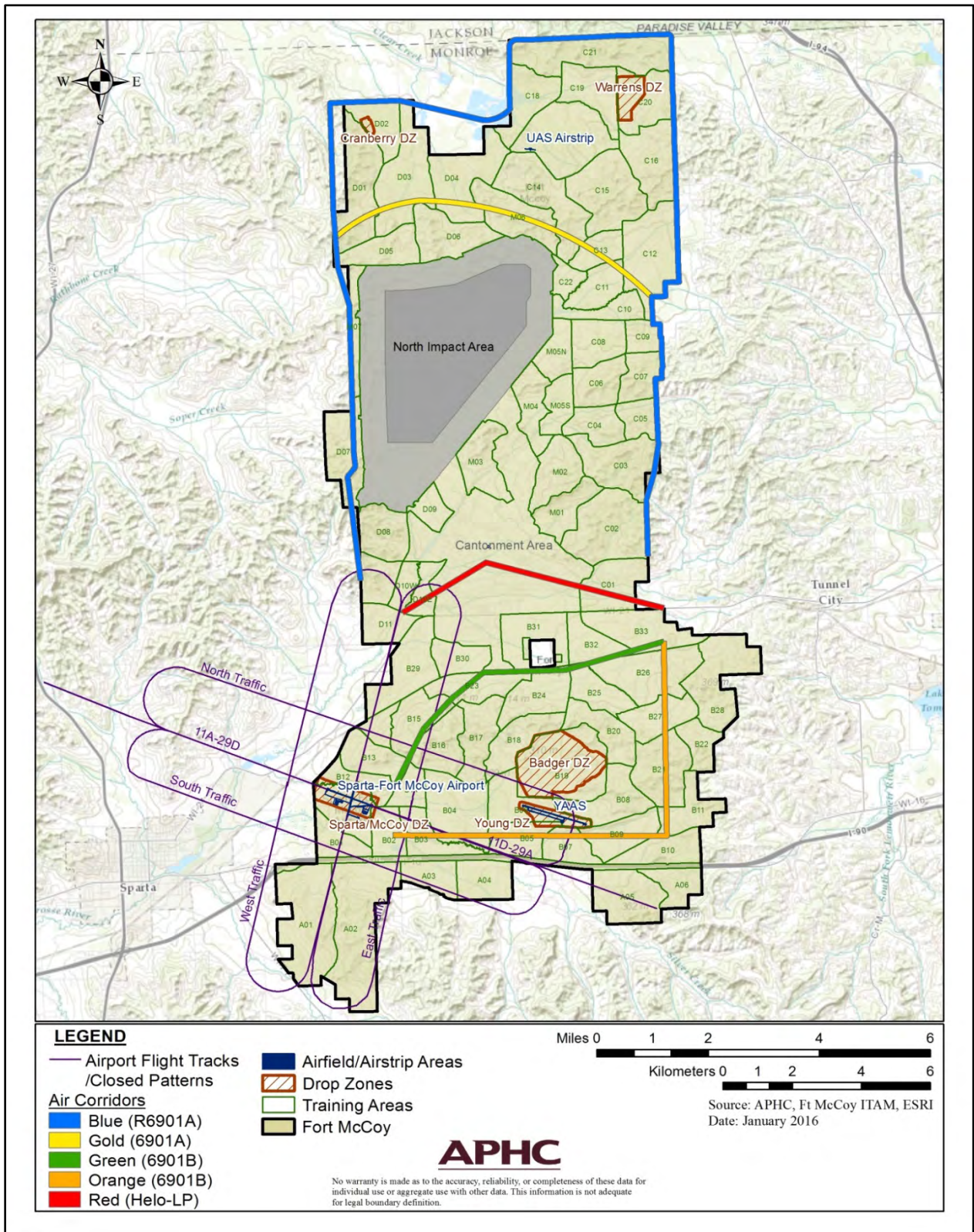


Figure 5-1. Sparta-Fort McCoy Airport Flight Tracks and Air Corridors

### 5.1.2 AIRCRAFT NOISE ZONES

Although the number of military and civil aircraft operations at an installation usually varies from day to day, NOISEMAP requires input of the specific numbers of daily flight and aircraft maintenance engine run-up operations. For this assessment, operations are calculated for an average annual day (AAD), meaning that operations are averaged across all 365 days of the year. DoD Instruction 4165.57 (DoD May 2011) states that airfield noise will use AAD to calculate noise contours, unless the Services determine an extenuating circumstance.

Airfield division personnel provided aircraft operation data for the 12-month period of October 2014 through September 2015. The number of flight operations was removed for physical security concerns. This number is based upon actual aircraft that utilized the airfield. Thus, aircraft simply passing through the airspace are not included. The log is separated by military/civilian aircraft and generally grouped by aircraft model. As the traffic control tower logs do not completely separate activity by type or model of aircraft the following assumptions were made:

- The distribution of some fixed-wing aircraft activity is not available therefore the operations are grouped by aircraft size/type.
- The distribution of military helicopter flights is split evenly among the airframes included in the log (AH-64s, CH-47s, and UH-60s).

Table 5-1 summarizes the annual operations for Sparta-Fort McCoy Airport. Taking into account the assumptions made above these operations were used to generate the Noise Zones. Although the number and type of aircraft varies both daily and seasonally, land use compatibility noise contours are based on an annual average (average daily number of flights is 26). The intent is to depict average noise levels over the course of a year rather than to depict the day-to-day noise exposure.

Table 5-1. Sparta-Fort McCoy Airport Annual Traffic Count Summary

This table was removed for physical security concerns.

*Note: An operation is defined as either an arrival or a departure or one closed traffic pattern.*

As seen in the table, military activity accounts for roughly 64 percent of the total operations. Military helicopters account for 66 percent the military total. Thus, helicopter operations are the primary noise producing aircraft with regards to day to day activities. Approximately 95 percent of all operations, both civilian and military, take place during daytime hours (7am-10pm).

Figure 5-2. Sparta-Fort McCoy Aircraft ADNL Noise Zones illustrates the Noise Zones for Sparta-Fort McCoy operations. The LUPZ extends beyond the installation boundary west approximately 5.9 km (3.7 miles), just north of the City of Sparta and south approximately 1.4 km (.9 miles), crossing Interstate 90. Zone II extends beyond the boundary west 3.6 km (2.2

miles). Zone III remains contained to the installation boundary. Further analysis of the ADNL Noise Zones are discussed Section 6.

Figure 5-2. Sparta-Fort McCoy Aircraft ADNL Noise Zones

This map was removed for physical security concerns.

### 5.1.3 ANNOYANCE POTENTIAL FROM SINGULAR OVERFLIGHT

Although the aircraft Noise Zones address the annual impact of noise at Sparta-McCoy Airport, there are many instances where individual aircraft overflights, operating in the airspace beyond the airport, can generate noise levels that some individuals might find disruptive and/or annoying. This can be particularly true for military aircraft which tend to perform training activities which are repetitive and low altitude. One example at Fort McCoy would be C-130 fixed-wing aircraft that enter an approach pattern from the southwest utilizing the Young DZ. Aircraft remain anywhere from 300 to 500 feet AGL and fly a double loop crossing the installation boundary or the tactical Abeam approach crossing the airfield and then landing (See Figure 5-3). As is the case with range noise, singular aircraft overflight is often the culprit of noise complaints received by an installation.

Scandinavian Studies (Rylander 1974) found that a good predictor of annoyance at airfields with 50 to 200 operations per day is the maximum level of the 3 loudest events. While annoyance levels may be lower along less-frequented flight routes and corridors, the Rylander study serves as an indicator for annoyance potential from intermittent overflights. The maximum levels from rotary-wing aircraft are listed in Table 5-2 and fixed-wing aircraft in Table 5-3. These levels are compared against the levels listed in Table 5-4 to determine the percent of the population that would consider itself highly annoyed from overflight.

Table 5-2. Maximum A-Weighted Sound Levels for Rotary-Wing Aircraft

Slant Distance (feet)	Maximum Sound Level, dBA			
	AH-64 <sup>2</sup> 70 KIAS	CH-47 <sup>2</sup> Light <sup>^</sup> 130 KIAS	CH-47 <sup>2</sup> Heavy* <sup>^</sup> 120 KIAS	UH-60 <sup>2</sup> 70 KIAS
200	90	101	98	86
500	82	93	89	77
800	77	89	85	73
1,000	75	87	83	71
1,200	73	85	81	69
1,500	71	83	79	67
2,000	68	80	76	64
2,500	65	78	74	61

<sup>1</sup> During flyover at constant airspeed.

<sup>2</sup> Obtained via AAM Program (Wyle 2013)

<sup>3</sup> Obtained via SelCalc Program (U.S. Air Force 2005)

<sup>^</sup> Only KIAS available in single track mode

\* Heavy = sling load

KIAS = Knots Indicated Air Speed

Figure 5-3. Young Air Assault Strip (YAAS) Flight Tracks and Abeam Approach Pattern

This map was removed for physical security concerns.

Table 5-3. Maximum A-Weighted Sound Levels for Fixed-Wing Aircraft

Slant Distance (Feet)	Maximum Sound Level (dBA) <sup>1</sup>		
	C-130 970 C TIT 170 kts	C-17 90% NC 250 kts	C-12 90% RPM 160 kts
500	92	97	79
1,000	85	89	73
1,500	80	84	69
2,000	77	79	67
2,500	75	76	65
5,000	66	73	57

<sup>1</sup> Obtained via SelCalc Program (U.S. Air Force 2005)

Table 5-4. Percentage of Population Highly Annoyed from Aircraft Noise

Maximum, dBA	Highly Annoyed
90	35%
85	28%
80	20%
75	13%
70	5%

Taking the Rylander correlation one step further, the SelCalc Program (U.S. Air Force 2005) was used to calculate the distance in ground track from zero to where the maximum A-weighted noise level would decay to 70 dBA or below (threshold for annoyance). This takes into account not only those directly under a flight path but those to the side of a passing aircraft, where noise levels may remain high enough to cause annoyance up to one-half mile away.

Tables 5-5 and 5-6 are based on typical altitudes (AGL) for rotary-wing and fixed wing aircraft and list the ground track distance, maximum sound level, and subsequent annoyance potential. These tables represent the best strategy for predicting areas that may impact sensitive land uses based on annoyance potential from singular overflight. Current flight routes can be amended or future routes can be delineated based on the distances in the Tables, to further avoid the overflight of noise-sensitive areas. As an example, Figure 5-3 illustrates the overflight annoyance potential for the UH-60 at 500 feet AGL.

Table 5-5. Rotary-Wing Overflight Annoyance Potential<sup>1</sup>

Source	Ground Track Distance <sup>2</sup>	dBA Maximum <sup>3</sup>	Population Highly Annoyed <sup>4</sup>
AH-64 – 500' AGL 70 KIAS	0'	82	23%
	1320' (1/4 mile)	73	10%
	1760' (1/3 mile)	69	4%
	2640' (1/2 mile)	65	<1%
AH-64 – 1000' AGL 70 KIAS	0'	75	13%
	1320' (1/4 mile)	71	7%
	1760' (1/3 mile)	69	4%
	2640' (1/2 mile)	65	<1%
CH-47 Light – 500' AGL 130 KIAS	0'	93	+35%
	1320' (1/4 mile)	94	+35%
	1760' (1/3 mile)	93	+35%
	2640' (1/2 mile)	90	+35%
	5280' (1 mile)	70	5%
CH-47 Light – 1000' AGL 130 KIAS	0'	87	31%
	1320' (1/4 mile)	85	28%
	1760' (1/3 mile)	84	26%
	2640' (1/2 mile)	83	25%
	5280' (1 mile)	81	22%
CH-47 Heavy* – 500' AGL 120 KIAS	0'	89	34%
	1320' (1/4 mile)	77	16%
	1760' (1/3 mile)	74	11%
	2640' (1/2 mile)	70	5%
	5280' (1 mile)	63	<1%
CH-47 Heavy* – 1000' AGL 120 KIAS	0'	83	25%
	1320' (1/4 mile)	77	16%
	1760' (1/3 mile)	75	13%
	2640' (1/2 mile)	70	5%
	5280' (1 mile)	63	<1%
UH-60 – 500' AGL 70 KIAS	0'	77	16%
	1320' (1/4 mile)	68	2%
	1760' (1/3 mile)	64	<1%
UH-60 – 1000' AGL 70 KIAS	0'	71	7%
	1320' (1/4 mile)	67	1%
	1760' (1/3 mile)	65	<1%

<sup>1</sup> Percent annoyance shown is based upon 50 to 200 overflights per day. (Rylander 1974)

<sup>2</sup> Distance between receiver and the point on Earth at which the aircraft is directly overhead.

<sup>3</sup> Obtained via AAM Program (Wyle 2013)

<sup>4</sup> Calculated percentage based upon regression using the known values in Table 5-4.

+35% The Rylander studies did not include sampling in excess of 90 dBA.

\* Heavy = sling load



Table 5-6. Fixed-Wing Overflight Annoyance Potential<sup>1</sup>

Source	Ground Track Distance <sup>2</sup>	dBA Maximum <sup>3</sup>	Population Highly Annoyed <sup>4</sup>
C-130 – 500' AGL	0'	92	+35%
	1320' (1/4 mile)	80	20%
	1760' (1/3 mile)	77	16%
	2640' (1/2 mile)	72	8%
	5280' (1 mile)	62	<1%
C-130 – 1000' AGL	0'	85	28%
	1320' (1/4 mile)	79	19%
	1760' (1/3 mile)	77	16%
	2640' (1/2 mile)	72	8%
	5280' (1 mile)	64	<1%
C-130 – 2000' AGL	0'	77	16%
	1320' (1/4 mile)	75	13%
	1760' (1/3 mile)	74	11%
	2640' (1/2 mile)	71	7%
	5280' (1 mile)	64	<1%
C-17 – 500' AGL	0'	97	+35%
	1320' (1/4 mile)	84	26%
	1760' (1/3 mile)	80	20%
	2640' (1/2 mile)	73	10%
	5280' (1 mile)	62	<1%
C-17 – 1000' AGL	0'	89	34%
	1320' (1/4 mile)	82	23%
	1760' (1/3 mile)	79	19%
	2640' (1/2 mile)	74	11%
	5280' (1 mile)	63	<1%
C-17 – 2000' AGL	0'	79	19%
	1320' (1/4 mile)	77	16%
	1760' (1/3 mile)	75	13%
	2640' (1/2 mile)	72	8%
	5280' (1 mile)	64	<1%

<sup>1</sup> Percent annoyance shown is based upon 50 to 200 overflights per day. (Rylander 1974)

<sup>2</sup> Distance between receiver and the point on Earth at which the aircraft is directly overhead.

<sup>3</sup> Obtained via SelCalc Program (U.S. Air Force 2005)

<sup>4</sup> Calculated percentage based upon regression using the known values in Table 5-4.

+35% The Rylander studies did not include sampling in excess of 90 dBA.

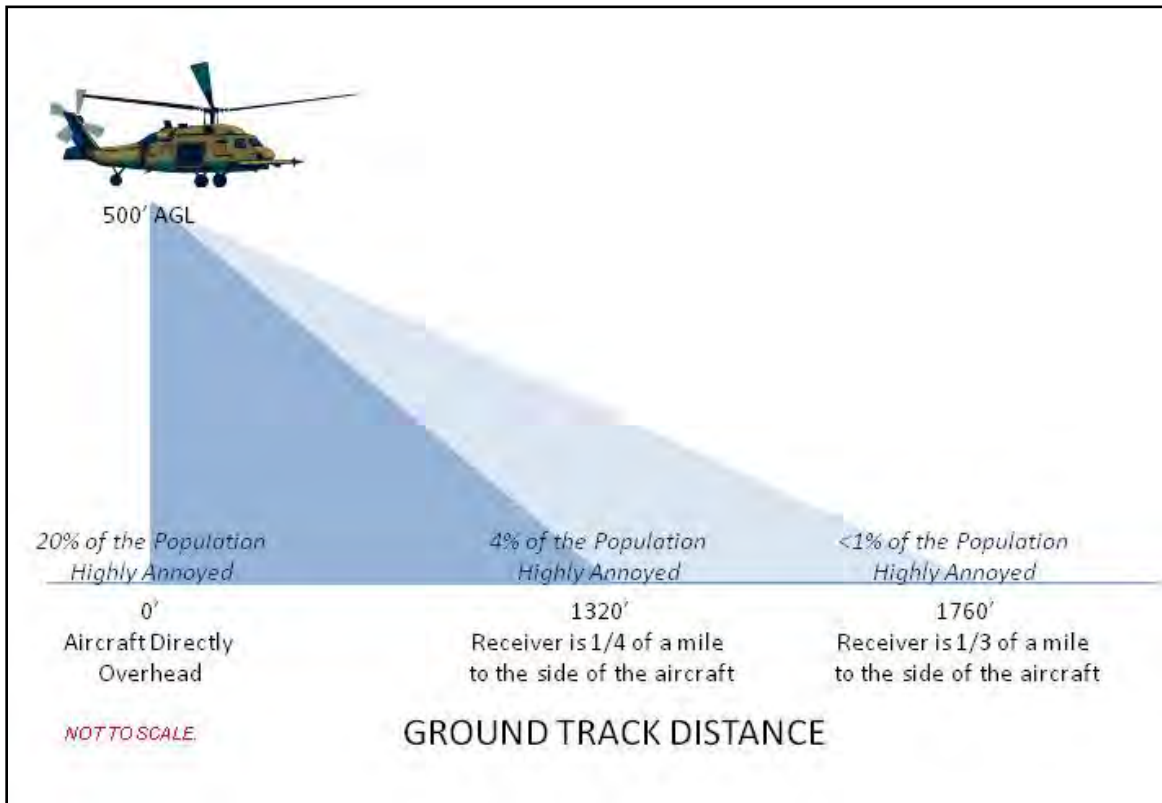


Figure 5-4. UH-60 Overflight Annoyance Potential Illustrated

### 5.1.3.1 UNMANNED AERIAL SYSTEM AIRCRAFT

Unmanned Aerial System (UAS) operations take place within two permanent Restricted Operating Zones (ROZ) and/or within approved training areas based upon training mission. Permanent ROZ locations include 1.3 km from the ends of the UAS landing Strip (TA C-17) and 1.3 km from the center of YAAS.

UAS aircraft are limited to the Shadow and Raven. Currently, UAS sorties are limited; however, DPTMS personnel indicate that increases to UAS sorties are expected in the near future. Despite the increase, noise levels of UAS aircraft are considerably lower than the current helicopter and fixed-wing aircraft operating in the same airspace. In general, based on UAS operation locations and altitudes, the risk of annoyance or potential to generate complaints outside the installation boundary remains low.

#### **5.1.4 NOISE ABATEMENT AND NO FLY AREAS**

Fort McCoy Regulation 95-1 defines the procedures, minimum flight altitudes and No-Fly Areas for which safety and noise impacts are the primary considerations. Base Operations maintains a map and list of all noise sensitive areas.

No-fly areas are coordinated with Air Traffic and Airspace Officer and listed in Regulation 95-1. Aircraft will not overfly the following areas at low level (Below 500' AGL):

- Areas restricted by NOTAM or L-NOTAM
- Ammunition storage areas

Seasonal restrictions include:

- Whitetail Ski Lodge – November through April
- Pine View Campground – May through October after 1100L.

In addition, Fort McCoy's Impact area is a permanent No-Fly area when Restricted Area R 6901A is active. When the restricted area is cold (not firing) it is still advised not to over-fly unless the crew is capable of landing outside the Impact buffer area.

## **6 LAND USE COMPATIBILITY GUIDELINES AND ASSESSMENT**

### **6.1 INTRODUCTION**

Land use planning and control is a dynamic, rather than a static process. The specific characteristics of land use determinants will always reflect, to some degree, the changing conditions of the economic, social, and physical environment of a community, as well as changing public concern. The planning process accommodates this fluidity in which decisions are normally not based on boundary lines, but rather on more generalized areas.

### **6.2 LAND USE AND ZONING**

The land use figures presented in this Section were developed using data obtained from the Monroe County Land Information Office and the Jackson County Land Record Services Office (GIS Department). Zoning data was unavailable from Jackson County in digital format. Thus, land use data was used. Land use designations included in a Comprehensive Plan are generally plans for current and future use. Whereas zoning designations more specifically define what use is currently allowed on a specific parcel, and outline design and development guidelines for those intended uses such as setbacks, minimum lot sizes, and buffering. In other words, Zoning designations are what you can legally do with a parcel today; the Land Use designation, in conjunction with development guidelines, details how land is being used and may be used in the future.

Both county datasets include land use for incorporated and unincorporated municipalities within their respective county. For the purpose of noise assessment, some categories are grouped into one to maintain a consistency. Note: All acreage calculations are rounded to the nearest whole number.

#### **6.2.1 SMALL ARMS OPERATIONS**

As previously described, the small arms Noise Zones are split into two areas; one centered on the North Impact Area in North Post and the other from a cluster of four ranges in South Post. Firing in North Post produces a Zone II which extends beyond the boundary west outside TA D-1 down to TA D-8. A portion of the Zone II off-post is contained within leased training area. Zone III from firing in North Post extends beyond the western boundary in one small area.

In South Post, Zone II extends beyond the installation boundary to the east and west. Zone III extends beyond the boundary just slightly north of Range 102.

Table 6-1 lists the total acreage for each Noise Zone, as well as the acreage of those portions extending off the installation boundary. Table 6-2 lists the daytime and nighttime ambient population exposure within the Noise Zones off-post, based on an analysis using the LandScan™ dataset. It is assumed that the majority of these population numbers occur within the Noise Zones from South Post firing. Although these Noise Zones are substantially smaller than North Post, the amount of residential land use is far greater than in the north. The daytime

Zone III population numbers are suspected to include transient vehicles traveling along Interstate 90. As a whole the affected population in all small arms Noise Zones is low, particularly during the daytime when the majority of small arms live-fire activity takes place.

Table 6-1. Small Arms Noise Zones Acreage

Noise Zone	Total Acreage	Off-Post Acreage
Zone II	19,794	3,374
Zone III	6,385	14

Table 6-2. Population Exposure in Small Arms Noise Zones

Noise Zone	Daytime Population Off-Post	Nighttime Population Off-Post
Zone II	33	101
Zone III	52	0

Note:

Land Analysis Ambient Population Exposure: The LandScan™ ambient population estimates used in this plan are based on the 2013 annual mid-year national population estimates from the Geographic Studies Branch, U.S. Bureau of Census.<sup>1</sup> The daytime and nighttime LandScan™ data were derived based on the habits and movements of people over a day. Whereas a national census only measures the population based on residences, the LandScan™ dataset measures areas where people tend to be during a typical day. For instance, traveling along roadways to get to a destination or where they may work.<sup>2</sup> Nighttime estimates are representative of residential figures.

A second analysis was performed overlaying the Noise Zones on the current land use plan. The off-post noise impact from small arms activity is limited to Monroe County. The land use within those portions of the Noise Zones beyond the boundary is predominately forest, open space and agricultural lands. Figures 6-1 and 6-2 show the small arms Noise Zones for North and South Post overlaid on the Monroe County land use layer.

Table 6-3 provides a break-out of acreage by land use category within the off-post portions of the Noise Zones. Forest or wooded lands account for nearly 57 percent of the total acreage, while agricultural and open spaces comprise roughly 35 percent. Noise-sensitive land use is limited to residential use which accounts for just 1.5 percent. There is no residential land use contained within a Zone III (incompatible).

<sup>1</sup> This product was made utilizing the LandScan (2012)™ High Resolution global Population Data Set copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory under Contract No. DE-AC05-00OR22725 with the United States Department of Energy. The United States Government has certain rights in this Data Set. Neither UT-BATTELLE, LLC NOR THE UNITED STATES DEPARTMENT OF ENERGY, NOR ANY OF THEIR EMPLOYEES, MAKES ANY WARRANTY, EXPRESS OR IMPLIED, OR ASSUMES ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, OR USEFULNESS OF THE DATA SET.

<sup>2</sup> <http://www.personal.psu.edu/ddj118/Geog482/Project3.html>

Table 6-3. Land Use Acreage in Small Arms Noise Zones Off-Post

Category	Acreage Within Noise Zones		
	Zone II	Zone III	Total
Residential	53	0	53
Commercial	0	0	0
Industrial	0	0	0
Agricultural / Open Space	1,200	0	1,200
Government / Recreational / Public Land	184	9	193
Farmstead	0	0	0
Forest / Wooded	1,925	5	1,930
Platted Land	0	0	0
Water /Wetlands	12	0	12
<b>Total</b>	<b>3,374</b>	<b>14</b>	<b>3,388</b>

According to Army guidelines, the majority of county land use within the Noise Zones is considered compatible small caliber weapons noise. On-post, the family housing area is located outside the Noise Zones.

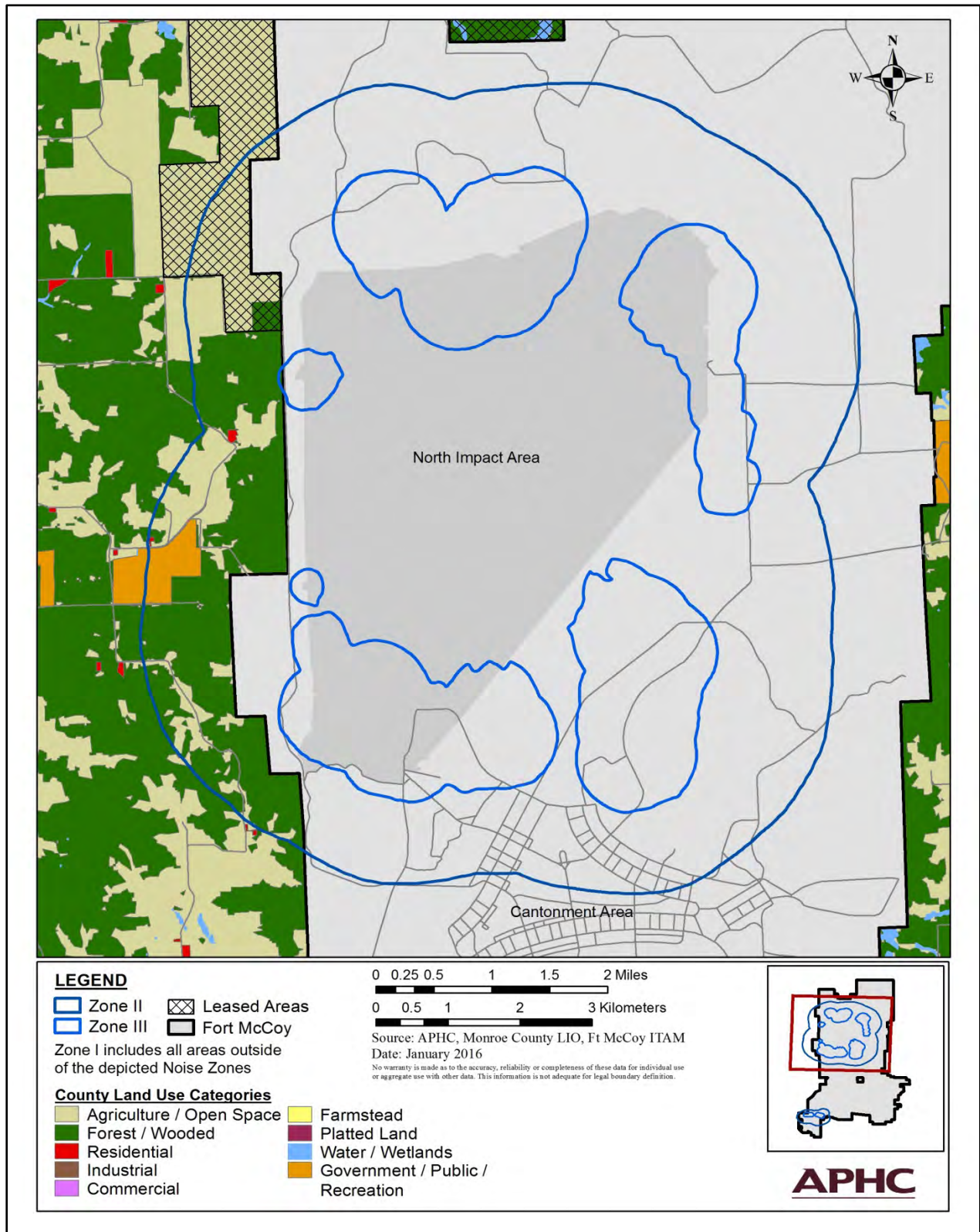


Figure 6-1. North Post Small Arms Noise Zones with Surrounding Land Use

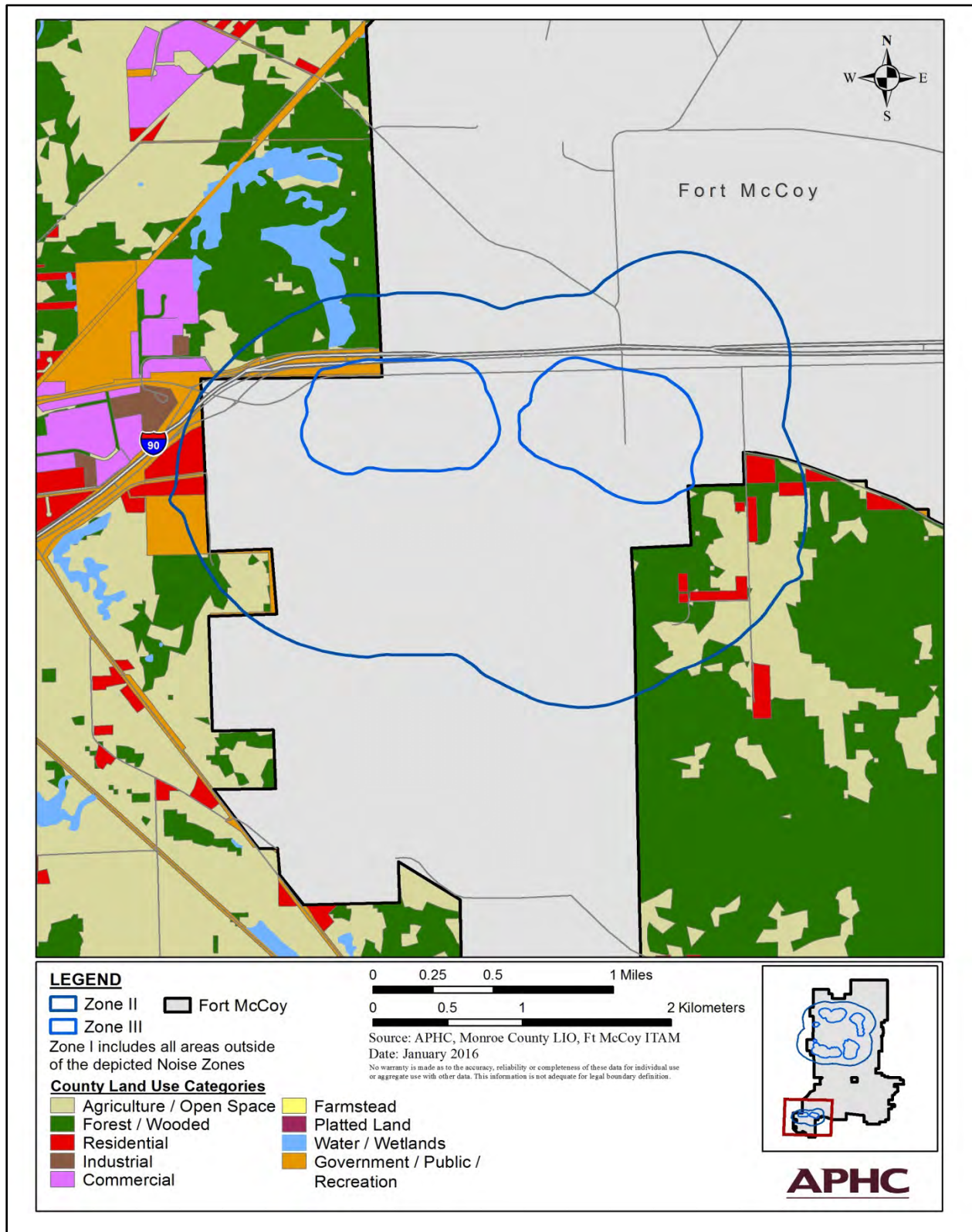


Figure 6-2. South Post Small Arms Noise Zones with Surrounding Land Use



## 6.2.2 LARGE CALIBER AND DEMOLITION OPERATIONS

The LUPZ contains the small towns of Greenfield and Grant (East), Lafayette (Southwest) and Millston (North), as well as the Census Designated Place (CDP) of Cataract (Northwest). Given the size of the LUPZ (extends 6 miles from the boundary) it is expected to contain noise-sensitive land uses. However, the larger cities of Sparta and Tomah remain outside the LUPZ. On-post, the family housing area south of the cantonment area is wholly contained within the LUPZ. Zone II extends beyond the boundary to the west, north, and east, containing the leased training area directly adjacent to the northwest corner of the installation. The small town of New Lyme is also contained within the Zone II just northwest of the installation. Zone III extends beyond boundary to the greatest degree west, following the north impact area crossing County Highway-I. Two other small areas of Zone III extend just beyond the boundary north and east.

Table 6-4 lists the total acreage for each Noise Zone, as well as the acreage of those portions extending off the installation boundary. Table 6-5 lists the daytime and nighttime ambient population exposure within the off-post Noise Zones, based the LandScan™ dataset. As previously mentioned the areas outside of North Post are rural in nature with exceeding low population density. This is evidenced in the tables as the off-post Noise Zones comprise roughly 73,090 acres, with a nighttime population of just 2,072 people. That equates to less than 19 people per square mile within the Noise Zones off-post. Nevertheless, despite the rural nature of the landscape, noise-sensitive land uses; primarily single family residences, are common in these areas and occur within all Noise Zones, including the incompatible Zone III.

Table 6-4. Large Caliber and Demolition Noise Zones Acreage

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	66,545	54,891
Zone II	31,521	15,883
Zone III	22,179	2,316

Table 6-5. Population Exposure in Large Caliber and Demolition Noise Zones

Noise Zone	Daytime Population Off-Post	Nighttime Population Off-Post
LUPZ	529	1,783
Zone II	170	262
Zone III	3	27

Figure 6-3 shows the CDNL Noise Zones overlaid on the current land use plans for Monroe and Jackson Counties. Figure 6-4 shows the Zone III extension beyond the Fort McCoy boundary at a larger map scale.

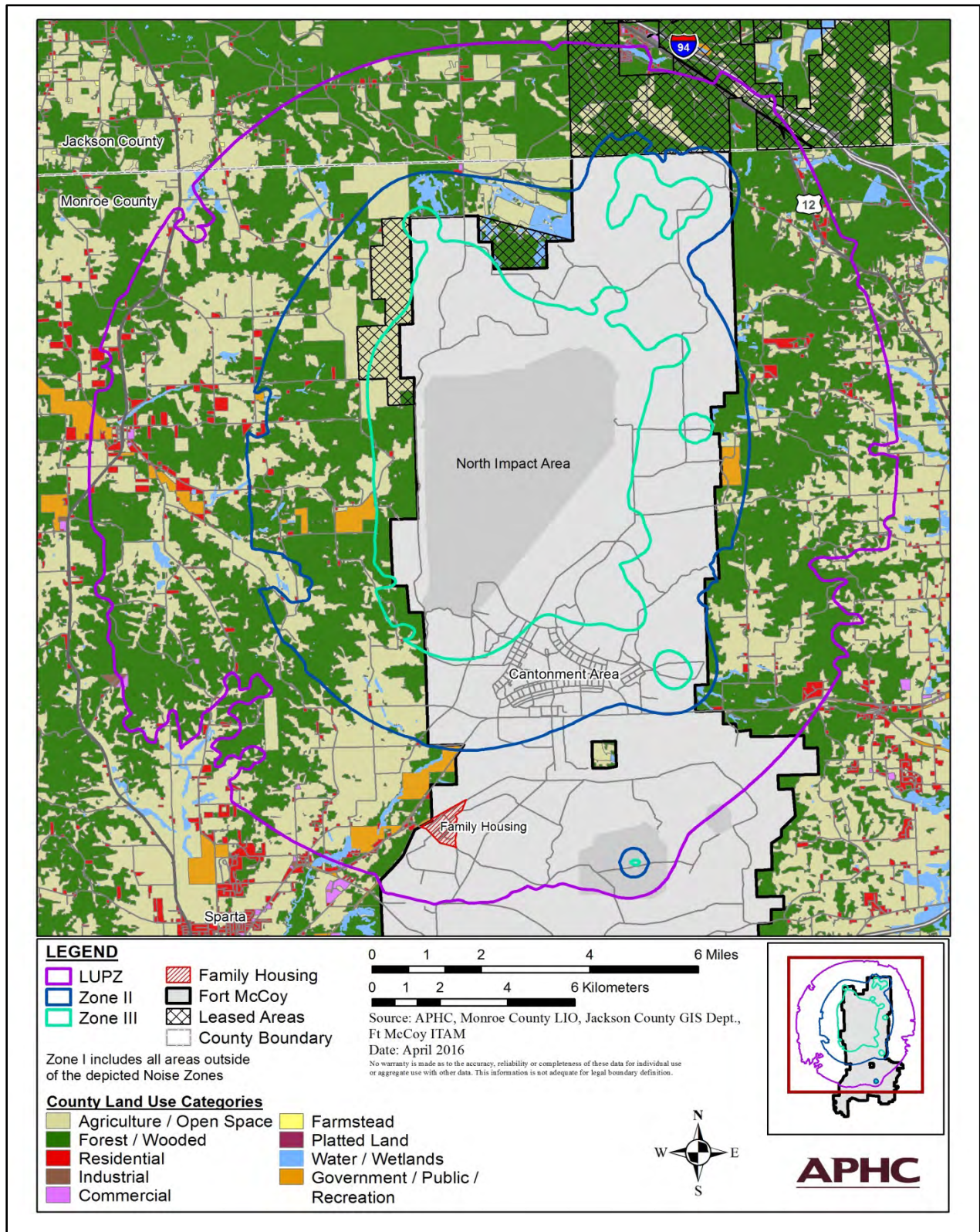


Figure 6-3. Large Caliber and Demolition Noise Zones with Surrounding Land Use

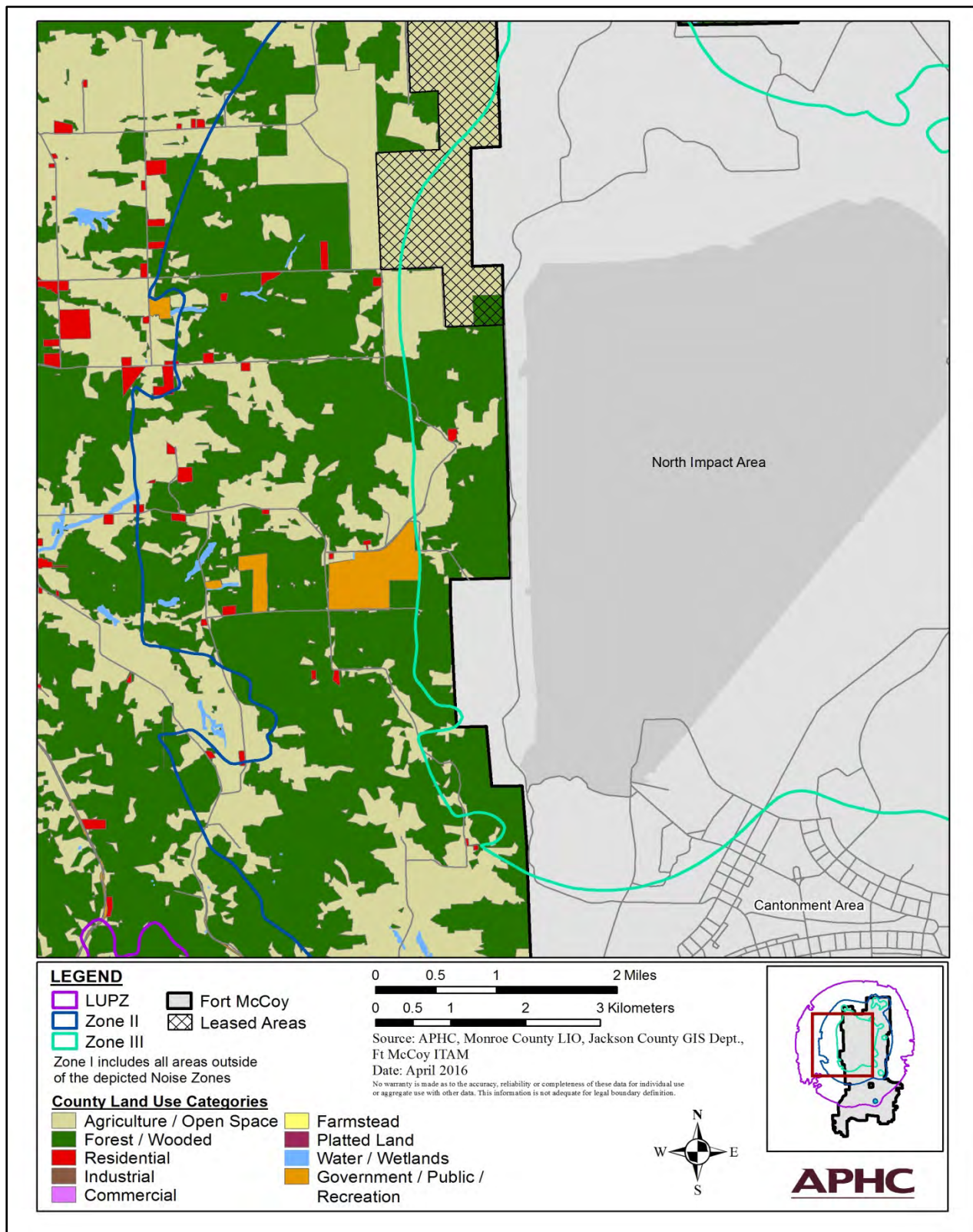


Figure 6-4. Large Caliber and Demolition Zone III Off-Post with Surrounding Land Use

Table 6-6 provides a break-out of acreage by land use category within the CDNL Noise Zones off-post. As expected, forest land and agricultural/open space are the dominant categories within all Noise Zones. In fact these two categories combined comprise 94 percent of the total. The largest concentration of residential land use (1,429 acres) occurs in the LUPZ (normally compatible). These areas are primarily distributed east and west of the North Impact Area. Residential use within the Zone III is limited to five acres (see Figure 6-4).

Table 6-6. Land Use Acreage in Large Caliber and Demolition Noise Zones Off-Post

Category	Acreage Within Noise Zones			
	LUPZ	Zone II	Zone III	Total
Residential	1,429	105	5	1,539
Commercial	51	0	0	51
Industrial	12	0	0	12
Agricultural / Open Space	20,154	6,376	954	27,484
Government / Recreational / Public Land	1,049	459	1	1,509
Farmstead	4	0	0	4
Forest / Wooded	31,602	8,320	1,355	41,277
Platted Land	18	0	0	18
Water /Wetlands	572	623	1	1,196
<b>Total</b>	<b>54,891</b>	<b>15,883</b>	<b>2,316</b>	<b>73,090</b>

### 6.2.3 AIRCRAFT OPERATIONS

The LUPZ extends beyond the installation boundary west and south, following both the approach/departure flight tracks and the closed loop pattern in the Sparta-Fort McCoy airspace. Zone II extends beyond the boundary west in a similar fashion, following the straight in and straight out approach/departure flight tracks of runway 11-29. Zone III is contained to the installation boundary. On-post, roughly half of the Family Housing Area located north of the airport/airfield is contained within the LUPZ. Table 6-7 lists the total acreage for each Noise Zone, as well as the acreage of those portions extending off the installation boundary.

Table 6-7. Aircraft Noise Zones Acreage

Noise Zone	Total Acreage	Off-Post Acreage
LUPZ	11,397	5,706
Zone II	860	305
Zone III	89	0

Table 6-8 lists the daytime and nighttime ambient population exposure within the Noise Zones, based the LandScan™ dataset. As seen in the table the majority of the population exposed resides within the normally compatible LUPZ. In fact the population numbers within the Zone

II and Zone III are extremely low, particularly during the daytime when 95 percent of airfield operations (military and civilian) take place.

Table 6-8. Population Exposure in Aircraft Noise Zones

Noise Zone	Daytime Population Off-Post	Nighttime Population Off-Post
LUPZ	541	1,090
Zone II	17	66
Zone III	0	0

Figure 6-5 shows the aircraft ADNL Noise Zones overlaid on the current Monroe County land use plan. Table 6-9 below provides a break-out of acreage by land use category within the Noise Zones extending off the installation boundary.

The presence of Sparta (Population: 9,522) just west-southwest of the airfield, as well as Interstate 90 lends itself to greater overall development in the areas surrounding South Post. While more concentrated, residential land use still only accounts for 8 percent of the total acreage within the aircraft Noise Zones. Agricultural and open spaces is the dominant land use comprising 51 percent and forest lands make up roughly 26 percent. Residential use within the Zone II is limited to single family dwellings located in Angelo between State Highway 21 and County Highway-Q. Scattered residential use occurs throughout the LUPZ, however, the greatest concentration seems to be west in a cluster of homes between Gardner Avenue and General Avenue and to the south along Hassock Avenue, south of State Highway 16.

Table 6-9. Land use Acreage in Aircraft Noise Zones Off-Post

Category	Acreage Within Noise Zones			
	LUPZ	Zone II	Zone III	Total
Residential	556	30	0	586
Commercial	89	5	0	94
Industrial	5	0	0	5
Agricultural / Open Space	2,919	147	0	3,066
Government / Recreational / Public Land	465	10	0	470
Farmstead	0	0	0	0
Forest / Wooded	1,473	81	0	1,548
Platted Land	0	0	0	0
Water /Wetlands	199	32	0	231
<b>Total</b>	<b>5,706</b>	<b>305</b>	<b>0</b>	<b>6,011</b>

Figure 6-5. Sparta-Fort McCoy Airport Noise Zones with Surrounding Land Use

This map was removed for physical security concerns.

## 7 NOISE RELATED LAND USE POLICY AND CONTROL

### 7.1 INTRODUCTION

Implementation of the ICUZ program is intended be a joint effort between Fort McCoy and the adjacent communities. The role of Fort McCoy is to minimize noise impacts on the surrounding local communities by operational activities on the installation. The role of the communities is to ensure that development in the surrounding area is compatible with accepted planning, zoning, and development principles and practices to protect the installation's mission.

Sensible, proactive land use planning outside the installation's boundary can create a win-win situation for both the military and its neighboring civilian communities.

### 7.2 ACHIEVING LAND USE COMPATIBILITY

Achieving land use compatibility requires both flexibility and creativity from land use planners, installation commanders, and the citizenry. The previous sections of this document detailed the operational noise impacts. The following sections detail land use planning tools which are available to both the installation and local communities.

### 7.3 LAND USE PLANNING OPTIONS

The following land use planning tools are available to help local governments create areas of compatible use around military installations. Many on the list are already in use; however, the installation and local governments are strongly encouraged to revisit and/or update any of these options to find the equitable solutions that best work for their situation. These planning tools may be used individually or in combination.

Zoning. The most common method of land use control is *zoning*, or the partitioning of areas into sections reserved for different purposes. This method is an exercise of the police powers of state and local governments that designates the uses permitted in each parcel of land. It normally consists of a zoning ordinance that delineates the various use districts and a zoning map based on the land use element of the community's comprehensive general plan.

Easements. Easements can be an effective and permanent form of land use control; in many instances, better than zoning when trying to resolve an installation's compatibility issues. Easements are permanent (with the title held by the purchaser until sold or released), work equally well within different jurisdictions, are enforceable through civil courts, and may be acquired often at a fraction of the cost of the land value. Another consideration may be that the land is left free for full development with noise-compatible uses.

Subdivision Regulations. Subdivision regulations are a means by which local governments can ensure that proper lot layout, design, and improvements are included in new residential or commercial developments. These requirements may be anything from dictating the width of the roads to placement of the water and/or sewer systems. Since most local governments require

some type of public dedication of open space when approving development plans, the installation may lobby to have a provision added to the subdivision regulations that requires this open space to be located nearest the installation boundary to create a buffer.

Disclosure of Noise Levels. Since noise levels in a community can be effectively modeled, as well as measured and recorded, making noise level information readily available can sometimes be all it takes to discourage incompatible land uses. These noise levels can be disclosed in several ways, including ordinances (or amendments to existing ordinances), deeds, posting noise levels on any sale/lease/rent sign, and initiating voluntary programs among local realtors to provide potential buyers with installation-provided information and noise level/contour mapping.

Deed Restrictions/Covenants. A deed is a document conveying ownership of land from one party to another, and restrictions called *covenants* can be added to the deed to specify restrictions on the use of the land. These covenants are on top of the restrictions already imposed by the current zoning of the property and in many instances may supersede zoning by prohibiting specified uses that would otherwise be allowed. Restrictive covenants “run with the land;” that is, no matter how often the land is resold, these covenants remain in effect until the specified length of the covenant has expired (usually 20-30 years).

In order to utilize this option, the installation must already own or must acquire the property. Then, when reselling the property, the installation specifies which uses are permitted on the land thereby preventing incompatible uses (such as residential housing) for as long as the restrictions remain in effect.

#### **7.4 THE ARMY COMPATIBLE USE BUFFER (ACUB) PROGRAM**

Along with the aforementioned Noise Zones, the Army has a specific program designed to limit the effects of encroachment. The ACUB program was borne out of a 2002 expansion of the Private Lands Initiative (10 USC §2684a) allowing military departments to partner with private organizations to establish conservation easements or buffer areas around active installations. These partnerships are beneficial in a number of ways:

- To Fort McCoy:
  - Manages development adjacent to and near Fort McCoy
  - Protects effective training space to the installation boundaries
  - Averts training restrictions
  - Mitigates against noise and smoke complaints
  
- To Fort McCoy’s Community Partners:
  - Protects Fort McCoy’s mission and strength
  - Does not remove lands from tax base
  - Maintains local agricultural and wild lands



- To Landowners:
  - Maintains current, compatible land uses
  - Provides cash in hand
  - Retain rights to ownership and management of land

## 7.5 JOINT LAND USE STUDY (JLUS)

The JLUS is a collaborative land use planning effort involving the military installation and adjacent local governments that evaluates the planning rationale necessary to support and encourage compatible development of land surrounding the installation. Stated another way, it is a means for the installation and local governments to develop a land use plan that effectively addresses the long-term land use needs of the of the surrounding communities, yet still provides the military with the mission flexibility it needs to meet training doctrine.

The JLUS program is sponsored by the Department of Defense Office of Economic Adjustment (OEA) (DODI, 2004), and it provides technical and financial assistance to the planning agencies for developing master plans that are consistent, when economically feasible, with the noise, accident potential, and safety concerns from an installation's training and operations. The cost of the plan is split between the OEA and the jurisdictions involved.

The scope of the program is divided into three major tasks:

1. Impact Analysis. Impact analysis provides an in-depth review of existing and proposed land use patterns; drainage (as it effects land use designations); mission encroachment (particularly noise); transportation improvements, existing and proposed routes; and noise/vibration.
2. Land Use and Mission Compatibility Plan. Examines the above findings to identify conflicts in land use and provide alternative land use solutions; to project the impact on growth potential for adjacent areas; and to project the impact of military missions on the surrounding jurisdictions.
3. Implementation. Lists a series of actions and proposals for adoption by local jurisdictions to resolve land use conflicts and move toward a compatible land use plan for the installation, the adjacent counties, and the communities therein.

While the study report makes certain recommendations, each participating jurisdiction must decide which recommendations are best suited to their particular needs. Implementation follows the final recommendations at the discretion of elected officials in each jurisdiction and the installation military command.

Fort McCoy completed a JLUS in conjunction with Monroe County in February 2013. The study was prepared by the Mississippi River Regional Planning Commission, which services nine counties in west-central Wisconsin. Funding was provided by OEA, the Mississippi River Regional Planning Commission, and Xcel Energy. The study includes an analysis of land use compatibility, compatibility tools and implementation strategies to improve compatibility.

Within the study, towns are ranked based upon incompatibility concerns using population, housing units, septic system permits, zoning and noise. The large caliber and demolition CDNL Noise Zones from the 2008 IONMP were used in the analysis. Five specific recommendations are made in the JLUS centered around maintaining the rural character of Monroe County, joint planning efforts and increased communication, offsetting property tax revenue and the adoption of land use controls.

## 8 SUMMARY

The primary focus of the ICUZ study is to quantify the noise environment from military training sources and define the most appropriate uses of noise-impacted areas. The principle noise sources at Fort McCoy are small and large caliber weapons firing, including demolitions and aircraft bombing, and aircraft training. The Noise Zones for all operations clearly show the greatest annual impact outside the installation boundary is concentrated geographically west of the installation. This is primarily due to the proximity of the North Impact Area to the installation boundary.

Population centers around Fort McCoy are located to the southwest (Sparta) and southeast (Tomah). There are several other small towns located adjacent to the installation boundary in both Monroe and Jackson Counties. County lands outside these communities are rural in nature.

### 8.1 SMALL ARMS WEAPONS

#### Small Arms Ranges

According to Army guidelines, the majority of surrounding land use is compatible with the small arms weapons Noise Zones. Zone II extends beyond the boundary to the west from North Post activities and west and south from South Post activities. Zone III extends beyond the boundary west in one area from North Post activities and north from South Post firing. The majority of land use within these areas is forest land and agricultural /open space. The largest concentration of residential use within the Zone II is southeast of Range 105 in South Post, although the population in this area is relatively low. There is no residential land use contained within a Zone III, and the family housing area on-post is outside the Noise Zones.

#### Non-Fixed Firing Ranges

The majority of the collective training facilities are far enough from the installation boundary that small arms operations would not extend beyond the boundary at Zone II or Zone III noise levels. Similar firing activity in authorized training areas is generally not considered a noise issue, due to the type of simunitions fired and the land use immediately beyond the installation boundary.

### 8.2 LARGE CALIBER WEAPONS AND EXPLOSIVES

#### Range Land Use Compatibility

Cumulative large arms weapons operations at Fort McCoy create substantial Noise Zones, which extend beyond the installation boundary west, north, and east. Although the LUPZ is expansive, covering several communities, as well as the family housing area on-post, noise-sensitive land uses within the LUPZ are considered compatible per Army guidelines. The greatest impact to noise-sensitive land use from the Zone II and Zone III occurs west. Zone II encompasses the community of New Lyme as well as several other residential properties. On-post, the Zone II contains the majority of the cantonment area. Zone III is limited to just a couple residential properties. The current landscape surrounding North Post is dominated by forest land and agricultural/open space. Despite the size of the Noise Zones, the affected population within them

remains relatively low. The rural nature of these areas lends themselves to the type of annual large caliber training that occurs on Fort McCoy.

#### Range Single Event Levels

Peak levels correlate with the receiver's perception of noise levels. People in an area experiencing peak sound pressure levels between 115 and 130 dB may describe events as noticeable and distinct. Peak sound pressure levels above 130 dB are generally objectionable, and are often described as very loud and startling.

Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary to the north, east and west. Again, these areas are abundant with forest land and agricultural land use. The communities of New Lyme and Grant are contained within the 115-130 dB contour along with the cantonment area and a large portion of the family housing area on-post. Peak sound levels above 130 dB also extend beyond the boundary north, east and west, but to a much lesser degree.

During neutral weather conditions, peak sound levels between 115 and 130 dB also extend beyond the boundary north, east, and west. On-post the northern portion of the cantonment area is contained within the 115-130 dB contours. Peak sound levels above 130 dB are mostly contained to the installation boundary. Under both scenarios the largest concentration of residential uses occurs west and northeast. Although, very few complaints have been lodged due to any single loud training event over the last several years.

#### Aerial Bomb Single Event Levels

Aircraft bombing events at Fort McCoy are undoubtedly the loudest single operation that occurs. However, due to the relative infrequency when compared to artillery training and the inconsistency in events from year to year, complaint risk for bombing was separated from other range operations.

Under unfavorable weather, peak sound levels between 115 and 130 dB extend beyond the boundary north, and to a considerable distance west and east. These areas contain several small towns and scattered residential uses throughout. Peak sound levels above 130 dB remain contained to the Fort McCoy boundary.

The influence of wind propagation in the neutral weather scenario has a dramatic effect on the single event contours. The overall footprint is considerably smaller, where peak sound levels between 115 and 130 dB extend beyond the boundary just to the west. There is minimal residential use in this area. Peak sound levels above 130 dB remain well within the Fort McCoy boundary in this scenario.

### **8.3 AVIATION ACTIVITY**

Cumulative aircraft operations at the Sparta-Fort McCoy Airport are a combination of military and civilian. Military helicopters however, account for the bulk of annual operations at the airfield.

The LUPZ extends beyond the installation boundary west and south and encompasses part of the family housing area to the north. Zone II extends beyond the boundary west, while Zone III remains contained to the installation boundary. Agricultural, open space, and forest lands again dominant the land usage in this area; however, residential use is more common and occurs at greater density than in areas north.

Aircraft operating outside Fort McCoy, either in or out of designated flight corridors, have the potential to cause annoyance and possibly generate noise complaints. Measures are in place to mitigate the effects of aircraft noise including minimum flight altitudes and slant distances per Fort McCoy Regulation 95-1.

## **8.4 RECOMMENDATIONS**

The ICUZ is a proactive planning tool, which can help guide future development in surrounding communities. At a minimum, local municipal governments are encouraged to support public disclosure of all Noise Zones and supplemental metrics which may convey how military training operations affect the noise environment. The recent completion of the JLUS demonstrates the strong relationship Fort McCoy has with surrounding local communities. It is recommended that all parties involved continue to pursue the recommendations made within the JLUS, contributing to the program's success.

The ICUZ study describes the noise characteristics of a specific operational environment, and as such, will change if a significant operational change is made. Therefore, if Fort McCoy's mission, training, or training facilities undergo changes, the ICUZ should be reviewed to determine if the current noise assessment is sufficient. At a minimum, it is recommended that every five years the ICUZ and/or Noise Zones be updated to incorporate pertinent changes to the noise environment.

## A GLOSSARY OF TERMS

**A-Weighted Sound Level** – a sound level (in decibels) that has been weighted to correspond with the non-linear sensitivity of the human ear. A-weighting discriminates against the lower frequencies and is used to measure most common military sounds such as transportation and small-arms fire.

**Ambient Noise** – the background noise that is usually present at a particular location; anything from cars on a highway, to insects in the woods.

**Atmospheric Refraction** – the bending and/or focusing of sound waves by the varying layers and densities of the earth’s atmosphere.

**C-Weighted Sound Level** – like A-weighting, this is another sound level weighting technique that is used to normalize the low, impulsive sounds to the range of human hearing. It is used when measuring low frequency sound such as those from large arms, demolitions, and sonic booms.

**Community** – those individuals, organizations, or special interest groups affected by or interested in decisions affecting towns, cities, or unincorporated areas near or adjoining a military installation, and officials of local, state, and Federal governments, and Native American tribal councils responsible for the decision making and administration of programs affecting those communities.

**Day-Night Average Sound Level (DNL)** – the 24-hour average frequency-weighted sound level, in decibels, from midnight to midnight, obtained after the addition of 10 decibel “penalties” to sound levels between midnight and 7 a.m. and 10 p.m. to midnight (0000 to 0700 hours and 2200 to 2400 hours). A-weighting (ADNL) is understood unless otherwise specified, but C-weighting (CDNL) is also common.

**Decibels (dB)** – a logarithmic sound pressure unit of measure.

**Encroachment** – use or development of the land around a military installation that is incompatible with the operations of that installation.

**Equivalent Sound Level (LEQ)** – the level of a constant sound which, in a given situation and time period, has the same energy as does a time varying sound. For noise sources which are not in continuous operation, the equivalent sound level may be obtained by summing individual sound exposure level (SEL) values and normalizing them over the appropriate time period.

**Frequency** – the number of complete oscillation cycles per unit of time. The unit of frequency is the Hertz.

**Frequency Weighting** – the process of factoring in certain frequencies more or less heavily in order to bring the sound measurement more in line with the characteristics of the receiver (and thus make the numbers more meaningful to the task at hand). Example: A- or C-weighting to specifically parallel the sensitivity of the human ear.

**Hertz** – the unit of frequency equal to once cycle per second.

**Impulse (or Impulsive) Noise** – noise of short duration (typically less than one second), high intensity, abrupt onset and rapid decay, and often rapidly changing spectral composition. Impulsive noise is characteristically associated with such sources as explosions, impacts, the discharge of firearms, the passage of supersonic aircraft (creating sonic booms), and many industrial processes.

**Land Use Planning Zone (LUPZ)** – The Land Use Planning Zone (LUPZ) is a subdivision of Zone I. The LUPZ is 5 dB lower than the Zone II.

**Medium/Large Arms** – conventional military weapons over 20 millimeters in diameter.

**Noise** – any sound without value or unwanted sound.

**Noise Level Reduction** – the difference, in decibels, between the sound level outside a building and the sound level inside a designated room in the building (usually A-weighted). The NLR is dependent upon the transmission loss characteristics of the building surfaces exposed to an exterior noise source, the particular noise characteristics of the exterior noise source, and the acoustic properties of the designated room in the building.

**Noise Zone III** – the area around a noise source in which the C-weighted day-night sound level (CDNL) is greater than 70 dB (demolition and large caliber weapons), the A-weighted day-night level (ADNL) is greater than 75 dB (aviation), or the dB Peak is greater than 104 (small caliber weapons).

**Noise Zone II** – the area around a noise source in which the CDNL is 62-70 dB (demolition and large caliber weapons), the ADNL is 65-75 dB (aviation), or the dB Peak is 87-104 (small caliber weapons).

**Noise Zone I** – included all areas around a noise source in which the CDNL is less than 62 dB (demolition and large caliber weapons), the ADNL is less than 65 dB (aviation), or the dB Peak is less than 87 (small caliber weapons). This area is usually suited for all types of land use activities.

**Peak** – Peak is a single-event sound level without weighting.

**PK15(Met)** – peak sound level, without frequency weighting and accounting for the statistical variation cause by weather, expected to be exceeded by 15% of all events that might occur. A PK15(met) level of greater than 130 dB has a high risk of complaints, 115-130 dB has a moderate risk of complaints, and below 115 dB has a low risk of complaints.

**PK50(Met)** - is similar to the PK15(met) except that it represents the peak noise level that is exceeded 50 percent of the time. This metric also accounts for weather but assumes conditions which are not favorable for noise propagation.

**Propagation** – the process by which sound travels through space or material; may be affected by such things as weather, terrain, and barriers.

**Slant Distance** – the straight-line distance between two points not at the same elevation as contrasted with ground distance. Also known as slant range.

**Small Arms** – conventional military weapons .50 caliber and below in diameter.

**Sound Exposure Level (SEL)** – the total energy of a sound event normalized to a specific amount of time (e.g., one second) so that sounds of different durations may be compared directly.

**Sound Level Meter** – an instrument consisting of an amplifier, microphone, and a graduated readout that provides a direct reading of the sound pressure level at a particular location. Sound may be measured in a variety of metrics (e.g., ADNL, CDNL, Peak, etc.) and they must satisfy the requirements of the American National Standards Institute Standard for Sound Level Meters (S1.4-1983).

**Unweighted Peak Sound Level** – the peak, single event sound level without weighting, without taking into account berms or other attenuation, and without any particular certainty.



## **B LAND USE GUIDELINES**

Land use recommendations vary based on the type of noise source. The Federal Interagency Committee on Urban Noise (FICUN, 1980) guidelines in Table B-1 are applicable to A-weighted noise sources such as aircraft and traffic. Using the FICUN guidelines, the Army in conjunction with recommendations of the National Academy of Sciences Committee on Hearing, Bioacoustics and Biomechanics (CHABA 1981), developed Noise Zone limits for weapons and explosive noise. Tables B-2 and B-3 contain land use recommendations for land within the weapons and explosive Noise Zones.

TABLE B-1. FICUN GUIDELINES

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		85+
		0-55	55-65	65-70	70-75	75-80	80-85	
<b>10</b>	<b>Residential</b>							
11	Household Units	Yes	Yes*	25 <sup>1</sup>	30 <sup>1</sup>	No	No	No
12	Group Quarters	Yes	Yes*	25 <sup>1</sup>	30 <sup>1</sup>	No	No	No
13	Residential Hotels	Yes	Yes*	25 <sup>1</sup>	30 <sup>1</sup>	No	No	No
14	Mobile Home Parks or Courts	Yes	Yes*	No	No	No	No	No
15	Transient Lodgings	Yes	Yes*	25 <sup>1</sup>	30 <sup>1</sup>	35 <sup>1</sup>	No	No
16	Other Residential	Yes	Yes*	25 <sup>1</sup>	30 <sup>1</sup>	No	No	No
<b>20, 30</b>	<b>Manufacturing</b>							
21	Food & Kindred Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
22	Textile Mill Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
23	Apparel/Other Finished Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
24	Lumber & Wood Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
25	Furniture & Fixtures	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
26	Paper & Allied Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
27	Printing, Publishing & Allied Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
28	Chemicals & Allied Products	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
29	Petroleum Refining & Related Industries	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
31	Rubber & Misc Plastic Products - Manufacturing	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
32	Stone, Clay & Glass Products Manufacturing	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
33	Primary Metal Industries	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
34	Fabricated Metal Products - Manufacturing	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
25	Professional, Scientific & Controls	Yes	Yes	Yes	25	30	No	No
39	Miscellaneous Manufacturing	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
<b>40</b>	<b>Transportation Communication &amp; Utilities</b>							
41	Railroad, Rapid Rail Transit & Street Rail	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
42	Motor Vehicle Transportation	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
43	Aircraft Transportation	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
44	Marine Craft Transportation	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
45	Highway & Street Right-of-Way	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
46	Automobile Parking	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
47	Communications	Yes	Yes	Yes	25 <sup>5</sup>	30 <sup>5</sup>	No	No
48	Utilities	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>4</sup>
49	Other Transportation, Communication & Utilities	Yes	Yes	Yes	25 <sup>5</sup>	30 <sup>5</sup>	No	No

TABLE B-1. FICUN GUIDELINES, cont'd

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		85+
		0-55	55-65	65-70	70-75	75-80	80-85	
<b>50</b>	<b>Trade</b>							
51	Wholesale Trade	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
52	Retail - Building Materials, Hardware/Farm	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
53	Retail - General Merchandise	Yes	Yes	Yes	25	30	No	No
54	Retail - Food	Yes	Yes	Yes	25	30	No	No
55	Retail - Auto, Marine, Aircraft & Parts	Yes	Yes	Yes	25	30	No	No
56	Retail - Apparel & Accessories	Yes	Yes	Yes	25	30	No	No
57	Retail - Furniture, Furnishings & Equipment	Yes	Yes	Yes	25	30	No	No
58	Retail - Eating & Drinking Facilities	Yes	Yes	Yes	25	30	No	No
59	Other Retail Trade	Yes	Yes	Yes	25	30	No	No
<b>60</b>	<b>Services</b>							
61	Finance, Insurance & Real Estate Services	Yes	Yes	Yes	25	30	No	No
62	Personal Services	Yes	Yes	Yes	25	30	No	No
62.4		Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	Yes <sup>6</sup>
63	Business Services	Yes	Yes	Yes	25	30	No	No
64	Repair Services	Yes	Yes	Yes	Yes <sup>2</sup>	Yes <sup>3</sup>	Yes <sup>4</sup>	No
65	Professional Services	Yes	Yes	Yes	25	30	No	No
65.1	Hospitals, Nursing Homes	Yes	Yes*	25*	30*	No	No	No
65.1	Other Medical Facilities	Yes	Yes	Yes	25	30	No	No
66	Contract Construction Services	Yes	Yes	Yes	25	30	No	No
67	Government Services	Yes	Yes*	Yes*	25*	30*	No	No
68	Educational Services	Yes	Yes*	25*	30*	No	No	No
69	Miscellaneous Services	Yes	Yes	Yes	25	30	No	No
<b>70</b>	<b>Cultural Entertainment &amp; Recreational</b>							
71	Cultural Activities, Including Churches	Yes	Yes*	25*	30*	No	No	No
71.2	Nature Exhibits	Yes	Yes*	Yes*	No	No	No	No
72	Public Assembly	Yes	Yes	Yes	No	No	No	No
72.1	Auditoriums, Concert Halls	Yes	Yes	25	30	No	No	No
72.11	Outdoor Music Shells, Amphitheaters	Yes	Yes*	No	No	No	No	No
72.2	Outdoor Sports Arenas, Spectator Sports	Yes	Yes	Yes <sup>7</sup>	Yes <sup>7</sup>	No	No	No
73	Amusements	Yes	Yes	Yes	Yes	No	No	No
74	Recreational Activities	Yes	Yes*	Yes*	25*	30*	No	No
75	Resorts, Groups & Camps	Yes	Yes*	Yes*	Yes*	No	No	No
76	Parks	Yes	Yes*	Yes*	Yes*	No	No	No
79	Other Cultural, Entertainment & Recreation	Yes	Yes*	Yes*	Yes*	No	No	No

TABLE B-1. FICUN GUIDELINES, cont'd

SLUCM No.	LAND USE	NOISE ZONES AND ADNL LEVELS (dBA)						
		Noise Zone I		Noise Zone II		Noise Zone III		
		0-55	55-65	65-70	70-75	75-80	80-85	85+
<b>80</b>	<b>Resource Product &amp; Extract</b>							
81	Agriculture (Except Livestock) <sup>11</sup>	Yes	Yes	Yes <sup>8</sup>	Yes <sup>9</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>
81.5 to 81.7	Livestock Framing & Animal Breeding	Yes	Yes	Yes <sup>8</sup>	Yes <sup>9</sup>	No	No	No
82	Agricultural Related Activities	Yes	Yes	Yes <sup>8</sup>	Yes <sup>9</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>
83	Forestry Activities & Related Services	Yes	Yes	Yes <sup>8</sup>	Yes <sup>9</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>	Yes <sup>10</sup>
84	Fishing Activities & Related Services	Yes	Yes	Yes	Yes	Yes	Yes	Yes
85	Mining Activities & Related Services	Yes	Yes	Yes	Yes	Yes	Yes	Yes
89	Other Resource Production & Extraction	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes:

- SLCUM Standard Land Use Coding Manual
- Yes Land use and related structures compatible without restrictions.
- No Land use and related structures are not compatible and should be prohibited.
- ADNL A-weighted day-night sound level
- Yes<sup>x</sup> “Yes” but with restrictions. Land use and related structures generally compatible; see footnotes.
- 25, 30, 35 Land use and related structures generally compatible; measures to achieve noise level reduction (NLR) of 25, 30 or 35 must be incorporated into design and construction of structure.
- 25\*, 30\*, 35\* Land use generally compatible with NLR; however, measures to achieve an overall NLR do not necessarily solve noise difficulties and additional evaluation is warranted.
- NLR Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

Footnotes:

- \* The designation of these uses as "compatible" in this zone reflects individual Federal agencies' 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.
  - a) Although local conditions may require residential use, it is discouraged in 65-70 ADNL and strongly discouraged in 70-75 ADNL. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approval.
  - b) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor NLR of at least 25 dB (65-70 ADNL) and 30 dB (70-75 ADNL) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.
  - c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level transportation sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.
- x<sup>2</sup> Measures to achieve NLR of 25 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.
- x<sup>3</sup> Measures to achieve NLR of 30 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.
- x<sup>4</sup> Measures to achieve NLR of 35 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.
- x<sup>5</sup> If noise-sensitive, use indicated NLR; if not, use is compatible.
- x<sup>6</sup> No buildings.
- x<sup>7</sup> Land use compatible provided special sound reinforcement systems are installed.
- x<sup>8</sup> Residential buildings require a NLR of 25.
- x<sup>9</sup> Residential buildings require a NLR of 30.
- x<sup>10</sup> Residential buildings not permitted.
- x<sup>11</sup> In areas with ADNL greater than 80, land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

TABLE B-2. LAND USE COMPATIBILITY FOR SMALL ARMS NOISE

LAND USE		SUGGESTED LAND USE COMPATIBILITY	
SLUCM NO.	LAND USE NAME	Noise Zone II 87-104 dBP	Noise Zone III >104 dBP
10	Residential		
11	Household units	N <sup>1</sup>	N
11.11	Single units: detached	N <sup>1</sup>	N
11.12	Single units: semidetached	N <sup>1</sup>	N
11.13	Single units: attached row	N <sup>1</sup>	N
11.21	Two units: side-by-side	N <sup>1</sup>	N
11.22	Two units: one above the other	N <sup>1</sup>	N
11.31	Apartments: walk-up	N <sup>1</sup>	N
11.32	Apartment: elevator	N <sup>1</sup>	N
12	Group quarters	N <sup>1</sup>	N
13	Residential hotels	N <sup>1</sup>	N
14	Mobile home parks or courts	N <sup>1</sup>	N
15	Transient lodgings	25	N
16	Other residential	N <sup>1</sup>	N
20	Manufacturing		
21	Food and kindred products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
22	Textile mill products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
23	Apparel and other finished products; products made from fabrics, leather, and similar materials; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
24	Lumber and wood products (except furniture); manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
25	Furniture and fixtures; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
26	Paper and allied products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
27	Printing, publishing, and allied industries	Y <sup>2</sup>	Y <sup>3</sup>
28	Chemicals and allied products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
29	Petroleum refining and related industries	Y <sup>2</sup>	Y <sup>3</sup>
30	Manufacturing (continued)		
31	Rubber and misc. plastic products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
32	Stone, clay and glass products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
33	Primary metal products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
34	Fabricated metal products; manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	25	35
39	Miscellaneous manufacturing	Y <sup>2</sup>	Y <sup>3</sup>
40	Transportation, communication and utilities		
41	Railroad, rapid rail transit, and street railway transportation	Y <sup>2</sup>	Y <sup>3</sup>
42	Motor vehicle transportation	Y <sup>2</sup>	Y <sup>3</sup>
43	Aircraft transportation	Y <sup>2</sup>	Y <sup>3</sup>
44	Marine craft transportation	Y <sup>2</sup>	Y <sup>3</sup>
45	Highway and street right-of-way	Y <sup>2</sup>	Y <sup>3</sup>
46	Automobile parking	Y <sup>2</sup>	Y <sup>3</sup>
47	Communication	25	35
48	Utilities	Y <sup>2</sup>	Y
49	Other transportation, communication and utilities	25	35

TABLE B-2. LAND USE COMPATIBILITY FOR SMALL ARMS NOISE, cont'd

LAND USE		SUGGESTED LAND USE COMPATIBILITY	
SLUCM NO.	LAND USE NAME	Noise Zone II 87-104 dBP	Noise Zone III >104 dBP
50	Trade		
51	Wholesale trade	Y <sup>2</sup>	Y <sup>3</sup>
52	Retail trade – building materials, hardware and farm equipment	25	35
53	Retail trade – including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	25	35
54	Retail trade – food	25	35
55	Retail trade – automotive, marine craft, aircraft and accessories	25	35
56	Retail trade – apparel and accessories	25	35
57	Retail trade – furniture, home, furnishings and equipment	25	35
58	Retail trade – eating and drinking establishments	25	35
59	Other retail trade	25	35
60	Services		
61	Finance, insurance and real estate services	25	35
62	Personal services	25	35
62.4	Cemeteries	Y <sup>2</sup>	Y <sup>3</sup>
63	Business services	25	35
63.7	Warehousing and storage	Y <sup>2</sup>	Y <sup>3</sup>
64	Repair services	Y <sup>2</sup>	Y <sup>3</sup>
65	Professional services	25	N
65.1	Hospitals, other medical facilities	N	N
65.16	Nursing homes	N	N
66	Contract construction services	25	35
67	Government services	25	35
68	Educational services	35	N
68.1	Child care services, child development centers, and nurseries	35	N
69	Miscellaneous		
69.1	Religious activities	35	N
70	Cultural, entertainment and recreational		
71	Cultural activities (& churches)	35	N
71.2	Nature exhibits	N	N
72	Public assembly	N	N
72.1	Auditoriums, concert halls	35	N
72.11	Outdoor music shells, amphitheaters	N	N
72.2	Outdoor sports arenas, spectator sports	N	N
73	Amusements	Y	N
74	Recreational activities (including golf courses, riding stables, water recreation)	N	N
75	Resorts and group camps	N	N
76	Parks	N	N
79	Other cultural, entertainment and recreation	N	N

TABLE B-2. LAND USE COMPATIBILITY FOR SMALL ARMS NOISE, cont'd

LAND USE		SUGGESTED LAND USE COMPATIBILITY	
SLUCM NO.	LAND USE NAME	Noise Zone II 87-104 dBP	Noise Zone III >104 dBP
80	Resource production and extraction		
81	Agriculture (except live- stock)	Y <sup>4</sup>	Y <sup>5</sup>
81.5	Livestock farming	Y <sup>4</sup>	N
81.7	Animal breeding	Y <sup>4</sup>	N
82	Agriculture related activities	Y <sup>4</sup>	Y <sup>5</sup>
83	Forestry activities	Y <sup>4</sup>	Y <sup>5</sup>
84	Fishing activities	Y	Y
85	Mining activities	Y	Y
89	Other resource production or extraction	Y	Y

Notes:

SLUCM – Standard Land Use Coding Manual, U.S. Department of Transportation

dBP- unweighted Peak decibel level

Y (Yes) – Land use and related structures compatible without restrictions.

N (No) – Land use and related structures are not compatible and should be prohibited.

Y<sup>x</sup> – Yes with restrictions. The land use and related structures generally are compatible. However, see note(s) indicated by the superscript.

N<sup>x</sup> – No with exceptions. The land use and related structures are generally incompatible. However, see note(s) indicated by the superscript.

25, 30, or 35 – The numbers refer to noise level reduction (NLR) levels. NLR (outdoor to indoor) is achieved through the incorporation of noise attenuation into the design and construction of a structure. Land use and related

Note 1:

a. Although local requirements for on- or off-base housing may require noise-sensitive land uses within Noise Zone II, such land use is generally not recommended. The absence of viable alternative development options should be determined and an evaluation should be conducted locally prior to local approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these zones. Existing residential development is considered as pre-existing, non-conforming land uses.

b. Where the community determines that these uses must be allowed, measures to achieve outdoor to indoor NLR of at least 30 decibels (dB) in Noise Zone II should be incorporated into building codes and be considered in individual approvals.

c. Normal permanent construction can be expected to provide an NLR of 20 dB, thus the reduction requirements are often stated as 10 dB over standard construction and normally assume mechanical ventilation, upgraded sound transmission class ratings in windows and doors, and closed windows year round.

d. NLR criteria will not eliminate outdoor noise problems. However, building location, site planning, design, and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.

Note 2. Measures to achieve NLR of 25 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.

Note 3. Measures to achieve NLR of 30 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.

Note 4. Residential buildings require an NLR of 30.

Note 5. Residential buildings are not permitted.



TABLE B-3. LAND USE COMPATIBILITY: DEMOLITION AND LARGE ARMS NOISE

LAND USE		SUGGESTED LAND USE COMPATIBILITY		
SLUCM NO.	LAND USE NAME	LUPZ CDNL or CNEL 57-62	Noise Zone II CDNL or CNEL 62-70	Noise Zone III CDNL or CNEL 70+
10	Residential	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11	Household units	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.11	Single units: detached	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.12	Single units: semidetached	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.13	Single units: attached row	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.21	Two units: side-by-side	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.22	Two units: one above the other	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.31	Apartments: walk-up	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
11.32	Apartment: elevator	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
12	Group quarters	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
13	Residential hotels	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
14	Mobile home parks or courts	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
15	Transient lodgings	Y	Y	N
16	Other residential	Y <sup>1</sup>	N <sup>2,3</sup>	N <sup>3</sup>
20	Manufacturing			
21	Food and kindred products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
22	Textile mill products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
23	Apparel and other finished products; products made from fabrics, leather, and similar materials; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
24	Lumber and wood products (except furniture); manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
25	Furniture and fixtures; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
26	Paper and allied products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
27	Printing, publishing, and allied industries	Y	Y <sup>4</sup>	Y <sup>4</sup>
28	Chemicals and allied products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
29	Petroleum refining and related industries	Y	Y <sup>4</sup>	Y <sup>4</sup>
30	Manufacturing (continued)			
31	Rubber and misc. plastic products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
32	Stone, clay and glass products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
33	Primary metal products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
34	Fabricated metal products; manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	Y	N	N
39	Miscellaneous manufacturing	Y	Y <sup>4</sup>	Y <sup>4</sup>

TABLE B-3. LAND USE COMPATIBILITY: DEMOLITION AND LARGE ARMS NOISE, cont'd

LAND USE		SUGGESTED LAND USE COMPATIBILITY		
SLUCM NO.	LAND USE NAME	LUPZ CDNL or CNEL 57-62	Noise Zone II CDNL or CNEL 62-70	Noise Zone III CDNL or CNEL 70+
40	Transportation, communication and utilities			
41	Railroad, rapid rail transit, and street railway transportation	Y	Y	Y
42	Motor vehicle transportation	Y	Y	Y
43	Aircraft transportation	Y	Y	Y
44	Marine craft transportation	Y	Y	Y
45	Highway and street right-of-way	Y	Y	Y
46	Automobile parking	Y	Y	Y
47	Communication	Y	N	N
48	Utilities	Y	Y	Y
49	Other transportation, communication and utilities	Y	Y	N
50	Trade			
51	Wholesale trade	Y	Y	N
52	Retail trade – building materials, hardware and farm equipment	Y	Y	N
53	Retail trade – including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	Y	Y	N
54	Retail trade – food	Y	Y	N
55	Retail trade – automotive, marine craft, aircraft and accessories	Y	Y	N
56	Retail trade – apparel and accessories	Y	Y	N
57	Retail trade – furniture, home, furnishings and equipment	Y	Y	N
58	Retail trade – eating and drinking establishments	Y	Y	N
59	Other retail trade	Y	Y	N
60	Services			
61	Finance, insurance and real estate services	Y	Y	N
62	Personal services	Y	Y	N
62.4	Cemeteries	Y	Y	Y
63	Business services	Y	Y	N
63.7	Warehousing and storage	Y	Y <sup>4</sup>	Y <sup>4</sup>
64	Repair services	Y	Y	N
65	Professional services	Y	Y	N
65.1	Hospitals, other medical facilities	Y <sup>1</sup>	N	N
65.16	Nursing homes	Y <sup>1</sup>	N	N
66	Contract construction services	Y	Y	N
67	Government services	Y	Y	N
68	Educational services	Y <sup>1</sup>	N	N
68.1	Child care services, child development centers, and nurseries	Y <sup>1</sup>	N	N

TABLE B-3. LAND USE COMPATIBILITY: DEMOLITION AND LARGE ARMS NOISE, cont'd

LAND USE		SUGGESTED LAND USE COMPATIBILITY		
SLUCM NO.	LAND USE NAME	LUPZ CDNL or CNEL 57-62	Noise Zone II CDNL or CNEL 62-70	Noise Zone III CDNL or CNEL 70+
69	Miscellaneous			
69.1	Religious activities	Y <sup>1</sup>	N	N
70	Cultural, entertainment and recreational			
71	Cultural activities (& churches)	Y <sup>1</sup>	N	N
71.2	Nature exhibits	Y <sup>1</sup>	N	N
72	Public assembly	Y <sup>1</sup>	N	N
72.1	Auditoriums, concert halls	Y <sup>1</sup>	N	N
72.11	Outdoor music shells, amphitheaters	Y <sup>1</sup>	N	N
72.2	Outdoor sports arenas, spectator sports	Y	N	N
73	Amusements	Y	Y	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	N	N
75	Resorts and group camps	Y	N	N
76	Parks	Y	N	N
79	Other cultural, entertainment and recreation	Y	N	N
80	Resource production and extraction			
81	Agriculture (except live- stock)	Y	Y	Y
81.5	Livestock farming	Y	N	N
81.7	Animal breeding	Y	N	N
82	Agriculture related activities	Y	Y	Y
83	Forestry activities	Y	Y	Y
84	Fishing activities	Y	Y	Y
85	Mining activities	Y	Y	Y
89	Other resource production or extraction	Y	Y	Y

Note 1: LUPZ- Land Use Planning Zone is a subdivision of Land Use Zone I and functions as a buffer for Noise Zone II. Communities and individuals often have different views regarding acceptable or desirable levels of noise. To address this, some local governments have implemented land use planning measures beyond Noise Zone II limits. In addition to mitigating current noise impacts, implementing such controls within the LUPZ can create a buffer to prevent the possibility of future noise conflicts.

Note 2: Although local requirements for on- or off-base housing may require noise-sensitive land uses within Noise Zone II, such land use is generally not compatible within Noise Zone II. Measures to achieve overall noise level reduction inside structures do not solve noise difficulties outside the structure. Barriers are not effective reducing the noise from artillery and armor, the detonation of either large caliber military munitions or a large quantity of explosives. Additionally, noise level reduction inside structures does not mitigate the vibration generated by the low-frequency energy of large caliber weapons firing and detonations.

Note 3: Within Zones, existing “noise sensitive land uses are considered as pre-existing incompatible land uses. In most cases these uses are not a risk to either mission sustainment or a community’s quality of life. Most long-term members near Army installations or activities acknowledge hearing military operations and activities but they are usually not alarmed or bothered by the noise.

Note 4: Although noise levels may be compatible, caution should be exercised in siting any activity which may be sensitive to vibration.

## **C DATA USED TO GENERATE NOISE ZONES**

### **C.1 SMALL ARMS RANGE NOISE ZONES**

Source: Small arms range utilization extracted from FY 2015 (1 Oct 2014 – 30 Sept 2015) RFMSS Report. RFMSS provided by Fort McCoy DPTMS Fire Desk

#### **TABLE C-1. SMALL ARMS AMMUNITION UTILIZATION**

This table was removed for physical security concerns.

## **C.2 LARGE CALIBER AND DEMOLITION NOISE ZONES (CDNL)**

Source: Large caliber and demolition range expenditures extracted from FY 2015 (1 Oct 2014 – 30 Sept 2015) RFMSS Report. RFMSS provided by Fort McCoy DPTMS Fire Desk. CDNL Noise Zones are computed by averaging the acoustical energy from all operations listed in Table C-2 over an assessment period of 104 days, which represents a full training year (all training days) at Fort McCoy. The 104 day assessment period is the Army standard for Reserve and National Guard training centers per AR 200-1.

### **TABLE C-2. LARGE CALIBER AND DEMOLITION AMMUNITION EXPENDITURE**

This table was removed for physical security concerns.

**C-3. LARGE CALIBER AND DEMOLITION PEAK CONTOURS UTILIZATION**

Source: Large caliber and demolition range expenditures extracted from FY 2015 (1 Oct 2014 – 30 Sept 2015) RFMSS Report. RFMSS provided by Fort McCoy DPTMS Fire Desk. Peak contours (i.e. PK15(met) and PK50(met)) represent the loudest weapon at each individual range and/or Firing Point for training year FY 2015. Note: If different weapons, ammunition or charge weights are utilized at any given range the contours may change in shape and size. All artillery FPs were run with the largest ammunition (155mm) authorized.

**TABLE C-3. LARGE CALIBER AND DEMOLITION PEAK CONTOURS UTILIZATION**

This table was removed for physical security concerns.

#### **C.4 AIRCRAFT NOISE ZONES**

Source: Sparta-Fort McCoy Airport traffic counts from FY 2015 (1 Oct 2014 – 30 Sept 2015). Aircraft traffic counts provided by DPTMS Airfield Division.

##### **TABLE C-4. SPARTA-FORT MCCOY AIRPORT AIRCRAFT OPERATIONS**

This table was removed for physical security concerns.

*Note: An operation is defined as either an arrival or a departure or one closed traffic pattern.*

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