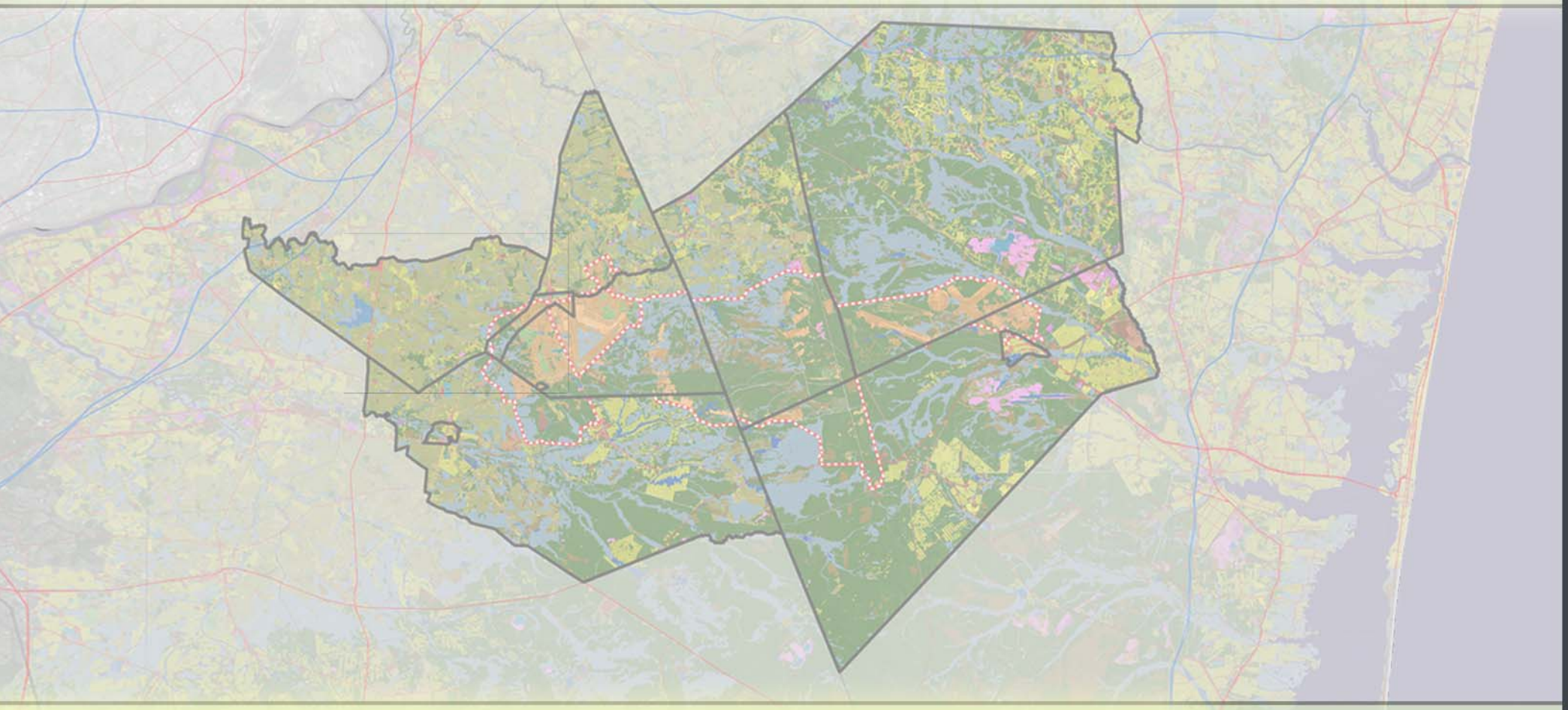
Joint Base McGuire-Dix-Lakehurst
Joint Land Use Study for Counties of Ocean and Burlington



Section 6 - Technical Information Noise and Safety Zones

Technical information on base operational noise, aircraft noise, and air operations safety is presented in this section. This section forms the basis of the JLUS noise and safety analysis and presents military installation operations after the proposed BRAC action mission changes (post-2008).

BRAC actions associated with Joint Base have the potential to create different operational impacts related to noise and air safety. This JLUS provides guidance and recommendations to both the military installation and local municipalities to identify incompatibilities between potential operational impacts associated with the Joint Base installation and the land use decisions of neighboring municipalities.

Ongoing DoD programs provide for studies to assess potential noise levels generated and air safety concerns associated with various training operations and to identify off-base land areas around military installations (i.e., airfields, ranges), with zoning and/or land use that may be incompatible with the noise levels and aircraft accident potential. This information provides a basis to develop recommendations for the land lying within these areas that are compatible with the needs of the community and the Joint Base missions.

This technical analysis is based on the following data sources:

- 2005 Department of the Army, Fort Dix Installation Operational Noise Management Report,
- 2005 Department of the Air Force Air Mobility Command Environmental Assessment East Coast Basing of C-17 Aircraft,
- 2008 Department of the Air Force Air Mobility Command Environmental Assessment Addressing BRAC 2005 Actions at McGuire Air Force Base and Fort Dix, New Jersey,
- 1986 baseline AICUZ noise source data from NAES Lakehurst, and;
- information compiled by the Department of the Navy at NAES Lakehurst.

Noise

The terms “sound” and “noise” are often used synonymously. Noise is unwanted sound usually composed of a spectrum of many single frequency components, each having its own amplitude. The disturbing effects of noise depend both on the intensity and the frequency of the tones. Noise can be intermittent or continuous, steady or impulsive, and can involve any number of sources and frequencies. Noise is defined as any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying.

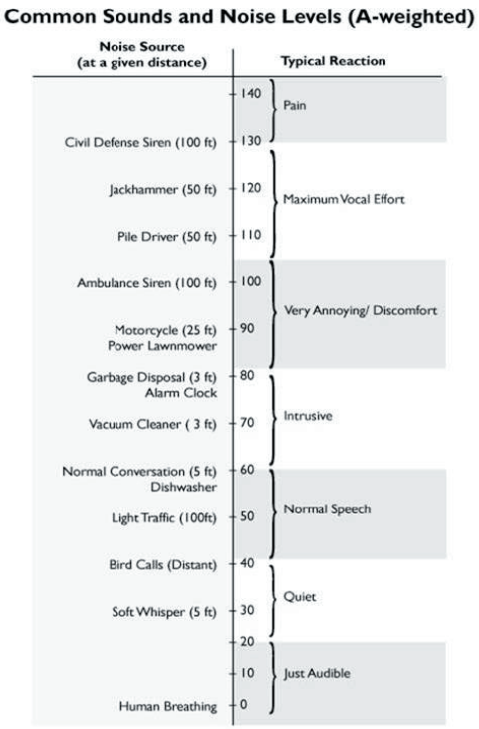
Noise can have negative affects upon an individual or community in a variety of ways. Noise can cause stress on the human body and affect ones health (i.e., produce elevated blood pressure). Noise can affect the quantity and quality of sleep that a person may get which in turn can affect an individual’s work efficiency. Noise can disrupt the educational process in schools near excessive noise sources. Noise can interfere with conversation and disrupt the peaceable enjoyment of one’s private property. Nuisance noise is usually defined as a loud, unnecessary or unusual noise, or a noise which either annoys, disturbs, injures, or endangers the comfort, repose, health, peace or safety of others.

The standard metric for noise is the decibel (dB). The decibel is used as a unit of sound amplitude or loudness and is derived from a comparison sound pressure, in air, with a reference pressure. Broadband sound covers the whole of the audible frequency range and is made up of many tones. Figure 6.1 displays general guidelines of common sounds and noise levels by decibel ranges.

The following are common noise level measurement parameters:

A-Weighting (dBA) - Noise measurements are often taken using the “A-weighted” frequency response function. The A-weighted frequency or dBA scale simulates the response of the human ear to sound levels (particularly low-level sound) and has been given prominence as a means for estimating annoyance caused by noise, for estimating the magnitude of noise-induced hearing damage, in hearing conservation criteria, for speech interference measurements, and in procedures for estimating community reaction to (general broad band) noise (Clayton, et al. 1978; Cheremisinoff, et al. 1977). Sound measurements are often made using the “A” frequency weighting when assessing environmental noise. A-weighting measures noise that

Figure 6.1 Common Sounds and Noise Levels, A-Weighted



closely resembles the frequency response of human hearing, including response to high-frequency noise. A-weighting, expressed as dBA, is a good descriptor of higher frequency noise caused by small arms firing, aircraft use, and vehicle operations. Further, small arms are also characterized in terms of peak un-weighted dB level.

C-Weighting (dBC) - C-weighting measures the low-frequency component of noise. C-weighted sound level measurement (dBC) correlates well with physical vibration response of buildings and other structures to airborne sound. Impulsive noises resulting from armor, artillery, and demolition activities are assessed in terms of dBC; C-weighting represents the low frequency noise and vibration associated with the firing of larger weapons systems. When measuring sound with a large low-frequency component, values measured using the C-scale are usually higher than values measured using the A-scale.

Day/Night Equivalent Sound Level (DNL) - The day/night equivalent sound level (DNL) or (Ldn) is the equivalent energy-averaged sound level for a 24-hour period (U.S. EPA 1974). The Ldn is estimated from the equivalent daytime Ld (7:00 a.m. to 10:00 p.m.) and nighttime Ln (10:00 p.m. and 7:00 a.m.) levels with an additional 10 dBA weighting imposed on the equivalent sound levels occurring during nighttime (10:00 p.m. and 7:00 a.m.). The 10-decibel increase at night is because people are more sensitive to noise during normal sleeping hours, when ambient noise levels are lower. The DNL provides a single measure of overall noise impact and represents total sound exposure. Although DNL does provide a single measure of overall noise impact, it does not provide specific information on the number of noise events or specific individual sound levels that occur. For example, a DNL of 65 dB could result from a small number of very loud events or from a large number of quieter events. Although it does not represent the sound level heard at any one particular time, it does represent total sound exposure. Scientific studies and social surveys have found DNL to be the best measure for assessing levels of annoyance associated with all types of environmental noise. Therefore, the scientific community and governmental agencies, such as US EPA, the Federal Interagency Committee on Urban Noise (FICUN), and the Federal Interagency Committee on Noise (FICON), endorse its use. DNL is the preferred noise metric of the US EPA, HUD, FAA, and DoD. DNL can be assessed using the A-weighted scale or C-weighted scale. The A-weighted Day-Night Average Sound Level (ADNL) noise descriptor is used to describe the noise environment around airfields; DNL has been determined to be a reliable measure of community sensitivity to aircraft noise and has become the standard metric used in the U.S. to quantify aircraft noise. The C-weighted Day-Night Average Sound Level (CDNL) is used for intense noise containing low frequency sound energy (near or below the threshold of human hearing) like that from large gun blasts and sonic booms that tend to elicit annoyance through building rattles.

Federal, State and local governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and from various other adverse physiological, psychological, and social effects associated with noise.

Please see Appendix13.4 for more detail on the basics of sound/noise, statistical descriptors (A-weighting, Equivalent Sound Level, and Residual Sound Level), noise guidelines and standards, regulations and sensitive receptors.

Noise Compatibility Criteria

This section presents information on the use of noise zones and noise compatibility criteria. A discussion of the studies used to identify potential off-base noise associated with military operations is presented in Appendix 13.4. Noise levels are taken into account in the form of noise zone contour maps to provide guidance on noise-sensitive land uses. Noise contours are developed to reflect the normalized operating conditions of any new rotary and fixed-wing aircraft to accommodate the safe co-location of the military installation and the surrounding community development. Noise contours are developed by a computerized simulation model of munitions and/or aircraft activity at an installation that reflects noise from site-specific operational data. Noise levels from various operations are represented by noise contours.

The contours around the installation reflect either the peak sound level, or an average day-night sound level (DNL) that converts noise varying from peak bursts to relative quiet into a steady measure of acoustic energy over a 24 hour period. The DNL can be assessed using the A-weighted scale or C-weighted scale. The A-weighted Day-Night Average Sound Level (ADNL) noise descriptor is used to describe the noise environment around airfields or for small arms munitions use. The C-weighted Day-Night Average Sound Level (CDNL) is used for intense noise containing low frequency sound energy like that from large arms munitions use.

Noise levels (Peak or DNL) are depicted as contours connecting points of equal value, usually in 5-decibel increments. Calculated noise contours do not represent exact scientific noise measurements; noise levels inside a contour may be similar to those outside a contour line. The area between two specific sets of contours is known as a noise zone. Contours that define noise zones should be viewed as a planning tool, not as a series of discrete lines that sharply divide noise-affected land from non-noise affected areas.

This information provides criteria to identify and assess the compatibility of land use and zoning of surrounding communities with operations associated with the primary missions of the Joint Base.

Noise Zones The Federal Interagency Committee on Urban Noise developed guidelines for considering noise in land use planning in terms of a DNL sound level (FICUN, 1980). These guidelines provide for assessing land uses related to noise zones based on USAF, FAA and HUD criteria.

The guidelines set forth by FICUN for considering noise in land use planning provide for assessing land uses related to noise zones. There are three noise zones, Noise Zone III (NZ III), Noise Zone II (NZ II) and Noise Zone I (NZ I), and a Land Use Planning Zone (LUPZ). The zones are developed using computer models.

The operational data used as input to these computer models is discussed in the referenced reports used as a basis for this study. Noise-sensitive land uses include, but are not limited to, residences, schools, medical facilities, and churches.

The noise zones and compatibility guidelines are presented in Table 6.1. The following provides a description of each noise zone (as set forth in AR 200-1, Section 7-3):

Noise Zone I – All areas around a noise source where the ADNL is less than 65 dBA, the C-weighted average Day/Night sound Level (CDNL) is less than 62 decibels C-weighted (dBC), or the un-weighted peak sound level (Peak) is less than 87 decibels un-weighted (dBP). Residential and other noise sensitive land uses are often considered “compatible” with the noise environment in this zone. Typically, less than 15% of the population is expected to be “highly annoyed” by the noise in this zone. Since the noise exposure in this zone is low enough that it does not trigger incompatibility with FICUN guidelines for sensitive land uses, NZ I contours are not discussed in this analysis.

Noise Zone II – An area where the DNL is between 65 and 75 dBA and between 62 and 70 dBC, or where the Peak is between 87 and 104 dBP. Guidance deems noise exposure within this NZ area to be significant and recommends limiting use of land to non-sensitive activities. Development within this noise zone should be normally limited to activities such as industrial, manufacturing, transportation, agriculture and resource production. Residential and other noise-sensitive land uses are considered “normally incompatible” with the noise environment in this zone; and between 15% and 39% of the affected population is typically expected to be “highly annoyed.” However, if the community determines that land in NZ II areas must be used for residential purposes, guidance suggests that the design and construction of the buildings incorporate noise level reduction (NLR) features to minimize the annoyance experienced by residents.

Noise Zone III – An area around a noise source where the DNL is greater than 75 dBA or 70 dBC, or where the Peak is greater than 104 dBP. Residential and other noise-sensitive land uses are deemed "incompatible" with the noise environment in Noise Zone III, and noise-sensitive activities should not be conducted therein. Guidance indicates that noise in this zone is severe enough to cause conflicts with almost all activities, particularly sensitive land uses, such as housing, schools, medical facilities, and places of worship. Typically, more than 39% of the population in this zone is expected to be "highly annoyed" by the noise.

The noise zones, presented in Table 6.1, provide guidance on whether noise-sensitive land uses, such as residential housing, schools, hospitals, and churches, would be "compatible" or "incompatible" land uses in those areas considering the levels of noise. Noise zones also provide a useful framework for identifying those off-base areas in which noise exposure may be high enough to generate annoyance among a certain percentage of people and provide general guidance on what proportion of the existing population in that zone might be "highly annoyed" by the noise generated.

Table 6.1 Noise Zone Guidelines

Noise Zone	Population Highly Annoyed	Acceptability for Noise Sensitive Land Use	Small Arms and Transportation ADNL (dBA)	Large Arms CDNL (dBC)	Small Arms Peak (dBP)
Zone I	<15%	Acceptable	<65	<62	<87
Zone II	15%-39%	Normally Unacceptable	65-75	63-70	87-104
Zone III	>39%	Unacceptable	>75	>70	>104
LUPZ	9%-15%	N/A	60-65	57-62	N/A

The Land Use Planning Zone (LUPZ) is the area where the DNL is between 60 and 65 dBA and between 57 and 62 dBC; the LUPZ separates Noise Zone II, which has compatibility issues, from the compatible NZ I.

Because the noise environment at each installation varies daily and seasonally, the Land Use Planning Zone (LUPZ) contour more broadly encompasses off-post lands, where on particularly active days, noise and the resulting community annoyance can approach levels typically associated with Noise Zone II. In order to provide a planning tool that can offer a better prediction of noise conditions/impacts during periods of heightened activity, the Land Use Planning Zone (LUPZ) contour is being included within the noise assessment.

It should be noted that there is no LUPZ associated with peak sound levels. The peak (un-weighted) sound level metric represents the instantaneous peak sound of an activity and does not take into account the duration or frequency associated with that activity (e.g., it is not averaged). In contrast with the DNL, peak sound levels are not increased by periods of heightened activity. Therefore, no LUPZ contour is associated with Peak sound levels.

The noise contours, 65 ADNL and 62 CDNL, represent an annual average that separates the Noise Zone II, which has compatibility issues, from the fully compatible NZ I. Boundaries of AICUZ studies are usually based on the existing community planning or jurisdictional boundaries of local municipalities located nearby. The study area has been defined to reflect those areas identified within surrounding communities affected by military operations.

These compatibility zones are used for land use planning to prevent conflicts with noise-sensitive land uses, such as housing, schools, and medical facilities. As listed above, noise-sensitive land uses are "compatible" with the noise environment in Noise Zone I, "normally incompatible" with the environment in Noise Zone II, and "incompatible" with Noise Zone III. Sensitive land use areas within Noise Zone II are considered normally incompatible. While the incompatibility can be reviewed on a case by case basis, no new incompatible land use areas should be constructed within Noise Zone II. Land uses such as commercial (except hotels and motels), industrial, and agricultural (except livestock), are compatible with most noise environments.

Joint Base Operational Considerations

Analyses of current and future military operational impacts were performed including review of previous studies related to operations and analyses of potential environmental impact assessments compiled for the three military installations. The technical information presented in this section has been compiled, reviewed, extracted, summarized and otherwise utilized from available previously prepared documents, and other available information as identified in the list of references.

Operational-related impacts considered in this study are focused on operations that have potential for noise and air safety issues in adjoining communities. These operational-related impacts include those of aircraft operations from McGuire AFB and Lakehurst NAES, and artillery training at Fort Dix. These potential operational impacts associated with the individual bases are all elements of the combined Joint Base operations.

Fort Dix Military Installation Noise Sources Major noise-producing activities that take place at Fort Dix include tracked vehicles, rotary-wing aircraft, trucks, small arms, and large arms. The training areas, located throughout the installation, are equally divided between range areas and other training areas. The ranges are designed to accommodate small arms (pistol and shoulder-fired weapons), artillery, armor, and rotary-wing (helicopter) aircraft. The other training areas are used for tracked vehicle (armor) training, bivouac (temporary camp) areas and training exercises of various kinds.

Most of the noise associated with Fort Dix results from the following activities:

- Small arms weapon firing
  - M-16 rifle, the M-60 machine gun, the 9-mm/.45-caliber pistol, and the .50-caliber machine gun
- Large arms weapons firing
  - Mortars, howitzers, Tank Cannons, Multi-Launch Rocket System, rockets and missiles
- Demolitions
- Rotary-wing aircraft
  - UH-1, UH-60, and OH-58, and, to a lesser extent, CH-46 and CH-47 rotary-wing aircraft use range facilities
  - Rotary-wing aircraft access to the Fort Dix Aviation Ramp occurs directly by air via McGuire AFB runways
  - Rotary-wing aircraft aviation units across the northeastern United States
    - utilize aviation support functions at Fort Dix
    - utilize ranges for aerial gunnery training
- Vehicles (Tracked vehicles and Trucks)
  - Passenger vehicles, delivery trucks (tractor semi-trailers)
  - Military off- and on-road vehicles (wheeled and tracked troop transport, fighting vehicles, and tanks)

McGuire Air Force Base (AFB) Noise Sources McGuire AFB has two runways, designated 06/24 and 18/36, which are located near the southern end of the base. Runway 06/24 is 10,000 feet long and 200 feet wide, while Runway 18/36 is 7,140 feet long and 150 feet wide. Traffic patterns are flown to the north of Runway 06/24 and the west of Runway 18/36.

Noise-producing activities that take place at McGuire AFB include fixed-wing and rotary-wing aircraft operations. The primary source of noise associated with McGuire AFB is airfield operations. The majority of these operations occur as training operations at McGuire AFB.

McGuire AFB's two active runways, 06/24 and 18/36, support approximately 60,000 annual aircraft operations. McGuire AFB operated approximately 32 'KC-10', 20 'KC-135' and 12 'C-17' aircraft at the base prior to the BRAC action. Under the BRAC action, 29 additional aircraft were stationed at McGuire AFB. The number of sorties flown with the aircraft previously stationed at the base did not increase. The BRAC action resulted in a decrease in KC-135 aircraft and related daily sorties, and resulted in the addition of C-12, C130T, C-9, CH-53, UH-1 and AH-1W aircraft and related daily sorties. The additional aircraft and helicopters increased the number of daily sorties.

There was also a change in aircraft operations allocated on two runways, 06/24 and 18/36, to an increase in use of runway 06/24 (aligned SW to NE) and a reduction in operations on runway 18/36 (aligned NNW to SSE). This has a significant impact on the post-2008 noise contours presented in this analysis.

Naval Air Engineering Station (NAES) Lakehurst Noise Sources The primary source of noise in the vicinity of NAES Lakehurst is airfield operations. Major noise-producing activities that take place at NAES Lakehurst include fixed-wing and rotary-wing aircraft. Aviation related noise includes noise from take-offs, landings, landing zone training and flyovers.

NAES Lakehurst facilities include two 5,000-foot operational runways, a 12,000-foot Test and Evaluation runway equipped with catapult and arresting gear and five test tracks. Aircraft operations at NAES Lakehurst are generated by Army, Army National Guard, and Department of Justice aircraft based at NAES and from transient aircraft, and aircraft from USAF installations, including McGuire AFB, that use the airfield for practice approaches and landings.

Prior to the BRAC action, fixed-wing aircraft at NAES Lakehurst included approximately one 'C-12', two 'C-130', an occasional C-17 and ten turboprops (SH-33 Sherpa, Carravan, Aerostar, Cessna). Current operations include the Assault Landing Zone (ALZ) for C-17 training operations, additional aircraft operations (total operations are approximately double), additional fixed-wing aircraft operations, increased nighttime operations, and additional rotary-wing aircraft operations (eleven CH-53, eleven UH-60A Blackhawk, five US-1H Huey and eleven OH-58A/C Kiowa helicopters). The nature of air operations has changed from an airfield that served predominantly helicopters to one with both fixed wing and helicopter operations. The Army National Guard Aviation projections will not be realized until the aircraft are reassigned in 2009-2010. The current state of NAES Lakehurst has not reached full projected operational capacity as predicted in the September 2005 EA. At present there has been a significant increase in C-17 aircraft operations, and future aircraft operations are anticipated to increase from current conditions. Based on 2008 data, NAES Lakehurst is currently at 12,000 annual operations and at a fully operational tempo is anticipated to reach 80,000 yearly operations.

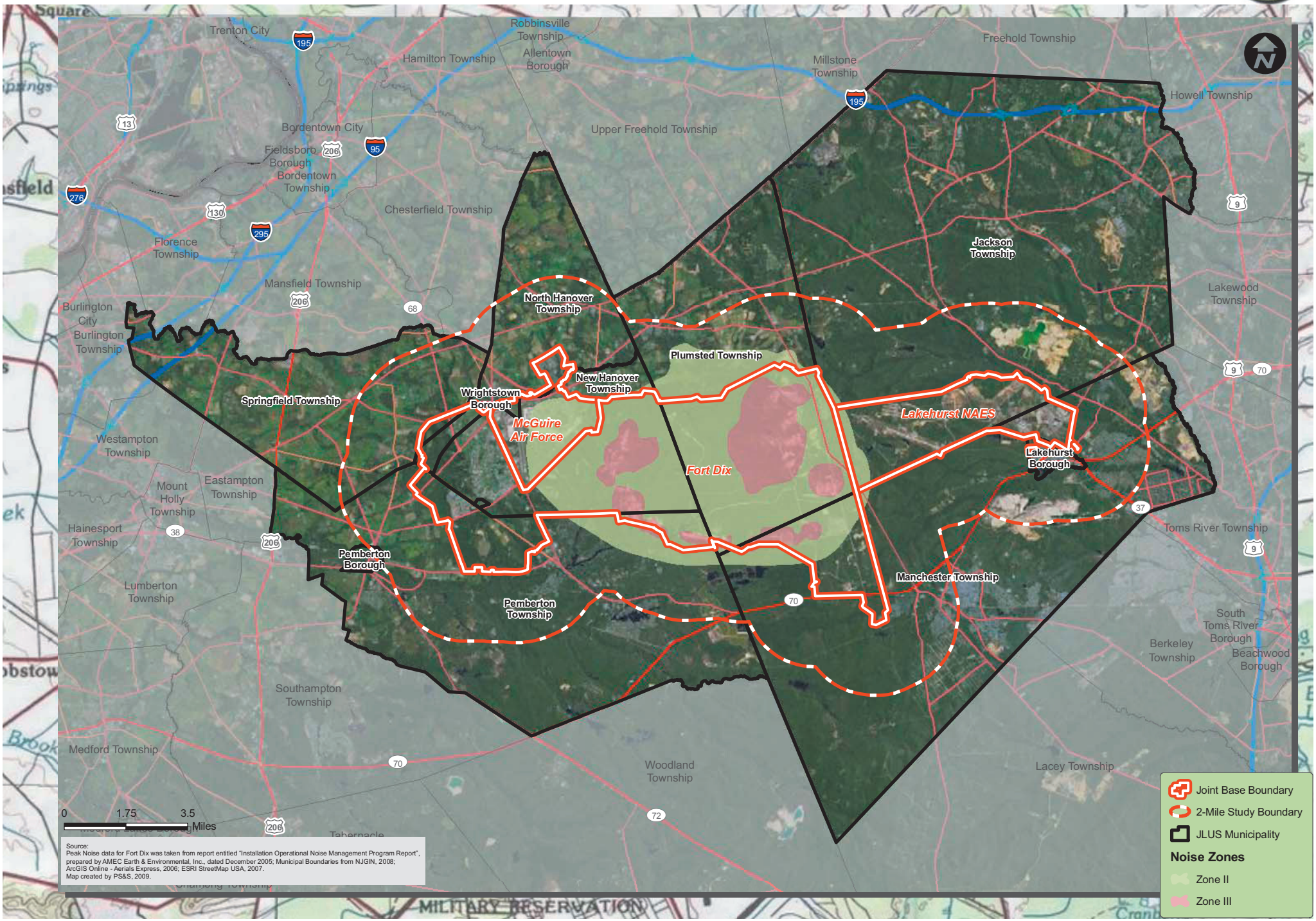
Baseline Noise Conditions (Pre-2008)

Analyses of the military baseline operational impacts were performed including review of previous studies related to operations and analyses of potential environmental impact assessments compiled for the three military installations. The technical information presented in this JLUS has been compiled, reviewed, extracted, summarized and otherwise utilized from available previously prepared documents, and other available information as identified in the list of references. The baseline condition is represented by information from previous studies (AICUZ, ICUZ, etc.) that describe noise levels associated with base operations prior to 2008.

The baseline noise contours are presented in the following Figures for the three military bases:

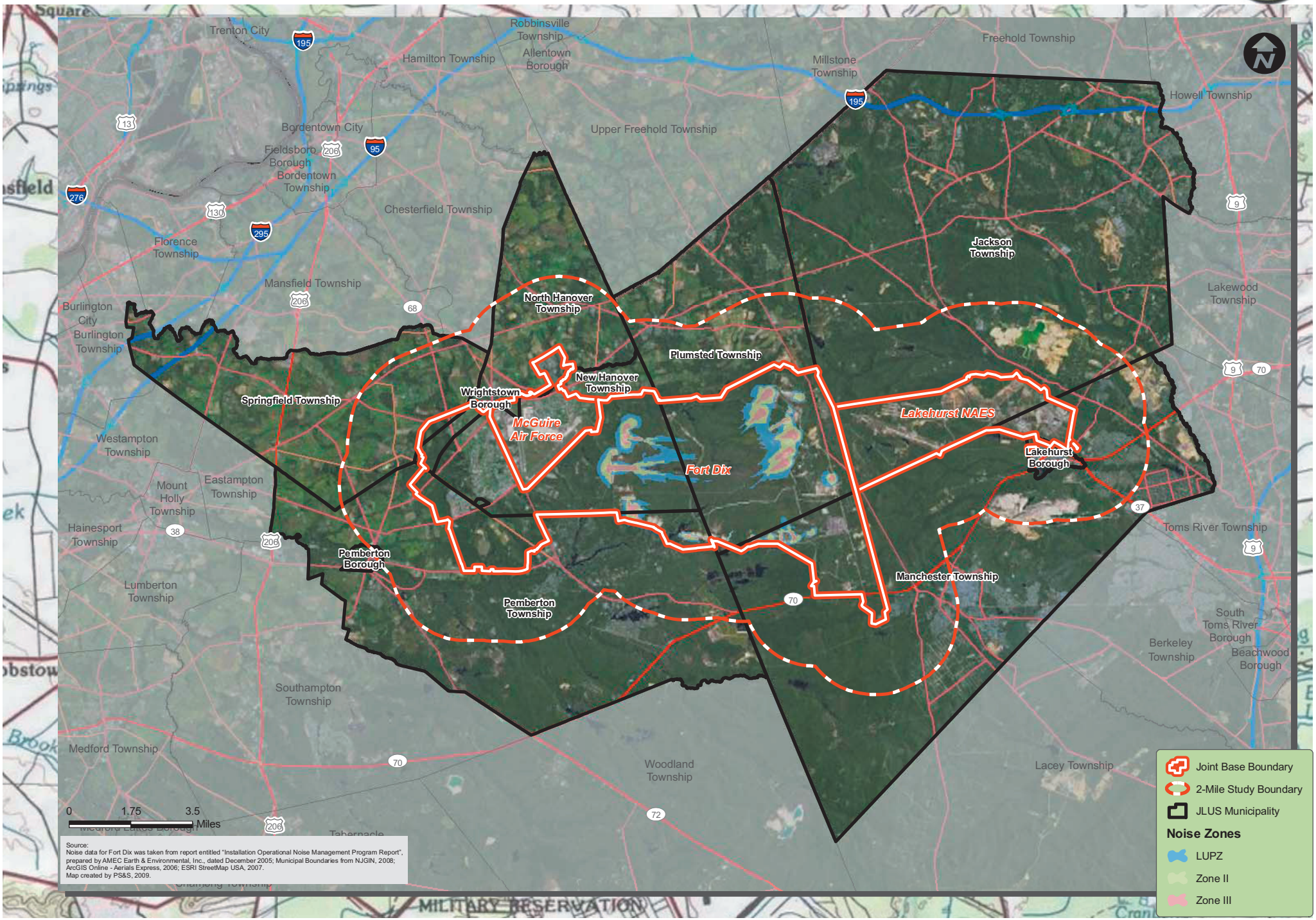
- Figure 6.2 - Baseline Noise Conditions: Small Arms Peak (No Aviation)
- Figure 6.3 - Baseline Noise Conditions: Small Arms ADNL (No Aviation)
- Figure 6.4 - Baseline Noise Conditions: Large Arms CDNL (No Aviation)
- Figure 6.5 - Baseline Noise Conditions: Small Arms ADNL, Large Arms CDNL and Aviation

Figure 6.2 - Baseline Noise Conditions: Small Arms Peak (No Aviation)



Source:
Peak Noise data for Fort Dix was taken from report entitled "Installation Operational Noise Management Program Report", prepared by AMEC Earth & Environmental, Inc., dated December 2005; Municipal Boundaries from NJGIN, 2008; ArcGIS Online - Aerials Express, 2006; ESRI StreetMap USA, 2007.
Map created by PS&S, 2009.

Figure 6.3 - Baseline Noise Conditions: Small Arms ADNL (No Aviation)



Source:
Noise data for Fort Dix was taken from report entitled "Installation Operational Noise Management Program Report", prepared by AMEC Earth & Environmental, Inc., dated December 2005; Municipal Boundaries from NJGIN, 2008; ArcGIS Online - Aerials Express, 2006; ESRI StreetMap USA, 2007.
Map created by PS&S, 2009.

Figure 6.4 - Baseline Noise Conditions: Large Arms CDNL (No Aviation)

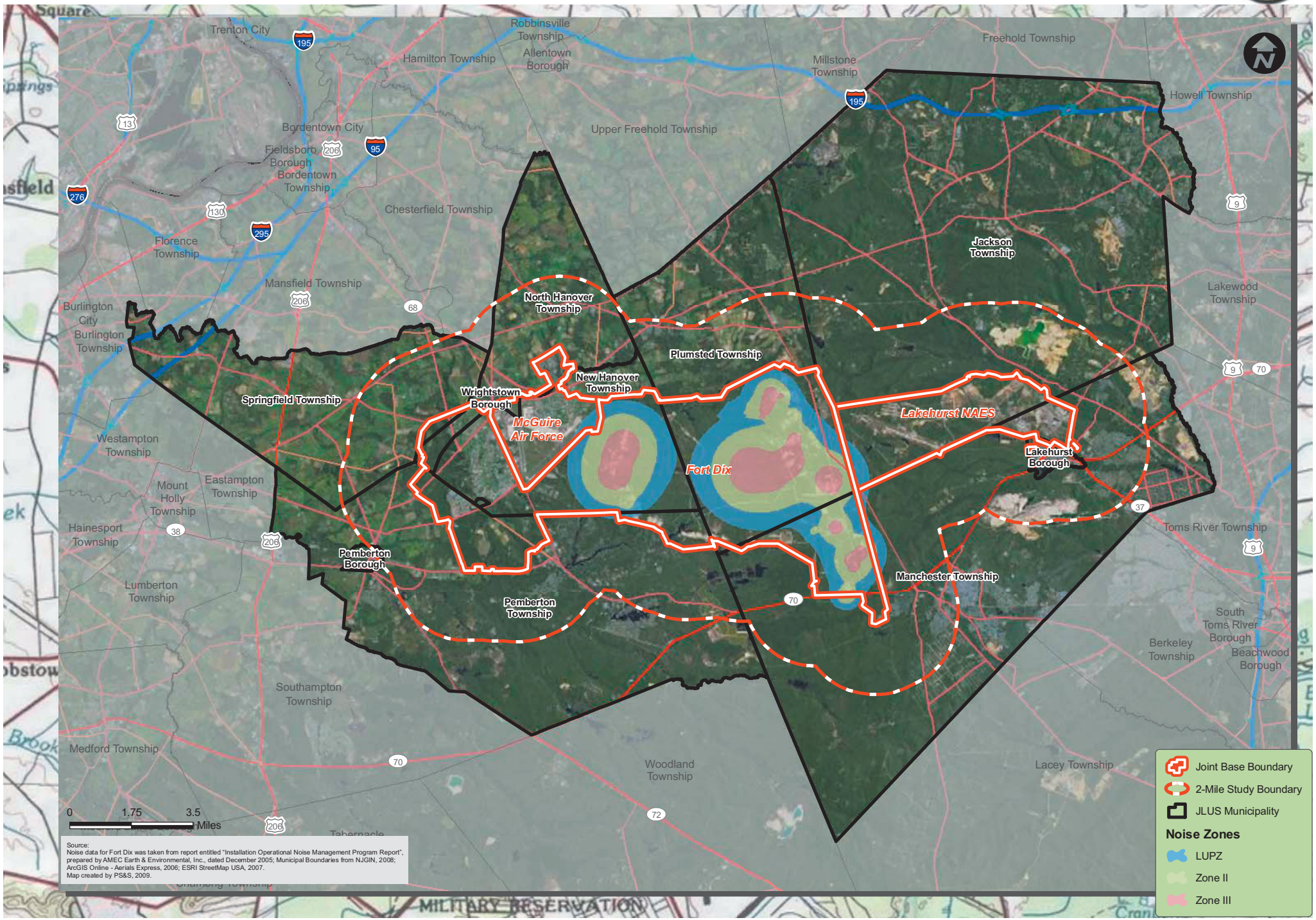
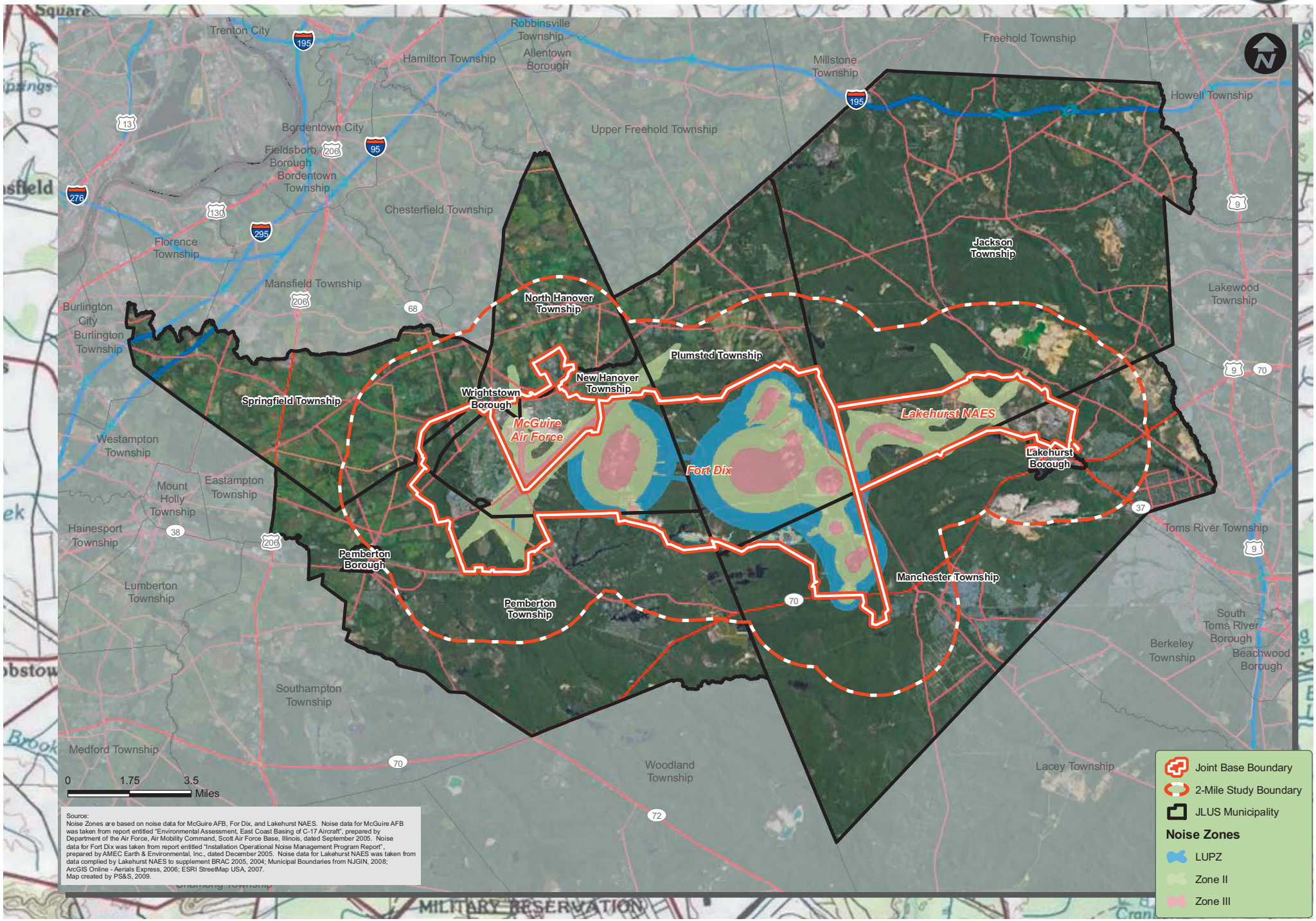


Figure 6.5 - Baseline Noise Conditions: Small Arms ADNL, Large Arms CDNL, and Aviation



Source:
Noise Zones are based on noise data for McGuire AFB, For Dix, and Lakehurst NAES. Noise data for McGuire AFB was taken from report entitled "Environmental Assessment, East Coast Basing of C-17 Aircraft", prepared by Department of the Air Force, Air Mobility Command, Scott Air Force Base, Illinois, dated September 2005. Noise data for Fort Dix was taken from report entitled "Installation Operational Noise Management Program Report", prepared by AMEC Earth & Environmental, Inc., dated December 2005. Noise data for Lakehurst NAES was taken from data complied by Lakehurst NAES to supplement BRAC 2005, 2004; Municipal Boundaries from NJGIN, 2008; ArcGIS Online - Aerials Express, 2006; ESRI StreetMap USA, 2007.
Map created by PS&S, 2009.

Post-2008 Noise Conditions

The post-2008 operations at the three military installations have increased from the baseline conditions. The Fort Dix "Installation Operational Noise Management Program" report, the "Environmental Assessment addressing BRAC 2005 actions at McGuire AFB and Fort Dix, New Jersey" and the "Environmental Assessment East Coast Basing of C-17 Aircraft" reports addressed potential noise associated with post BRAC operations and post-2008 conditions. The post-2008 operations included increases in small and large arms training, basing of C-17 aircraft, increased rotary aircraft activity and increased aircraft operations. This data is the most up-to-date information currently available and forms the basis of this study. Analyses of the post-2008 military operational impacts were performed including review of previous studies related to operations and analyses of potential environmental impact assessments compiled for the three military installations. The technical information presented in this JLUS has been compiled, reviewed, extracted, summarized and otherwise utilized from available previously prepared documents, and other available information as identified in the list of references. Further information is not anticipated to be available until the completion of the Joint Base AICUZ study, anticipated in 2011.

Table 6.2 Land Area and Zoning Outside of Joint Base Boundary Exposed to Noise Zones from Projected (2008 Peak) Small Arms Munitions Use at Fort Dix (Area in Acres)

Municipality	Zoning Categories	Zone II	Zone III	Grand Total
Jackson Township	Preservation	40.2		40.2
Jackson Township Total		**40.2**		**40.2**
Manchester Township	Preservation	705.7	18.7	724.5
Manchester Township Total		**705.7**	**18.7**	**724.5**
New Hanover Township	Agriculture	93.7		93.7
	Medium Density Residential (1-4 units per acre)	78.6		78.6
New Hanover Township Total		**172.3**		**172.3**
Pemberton Township	High Density Residential (more than 4 units per acre)	805.1		805.1
	Low Density Residential (less than 1 unit per acre)	98.1		98.1
	Medium Density Residential (1-4 units per acre)	541.2	93.5	634.7
	Preservation	332.0		332.0
Pemberton Township Total		**1,776.4**	**93.5**	**1,869.9**
Plumsted Township	Agriculture	2,001.8		2,001.8
	Low Density Residential (less than 1 unit per acre)	29.5		29.5
	Preservation	379.0		379.0
Plumsted Township Total		**2,410.3**		**2,410.3**
		Zone II	**Zone III**	**Grand Total**
Total Area (acreage) Outside of Joint Base Boundary:		**5,105**	**112**	**5,217**

Table 6.3 Estimated Population in Fort Dix Small Arms Peak Noise Zones for Projected Condition (Outside of Joint Base Boundary)

Municipality	Noise Zones		
	Zone II Population	Zone III Population	Pop Total
Jackson Township	-	-	-
Manchester Township	-	-	-
New Hanover Township	72	-	72
Pemberton Township	3,312	112	3,424
Plumsted Township	805	-	805
Total Population	**4,189**	**112**	**4,301**

Source: Census 2004 Projected Population by Block Group

Peak Noise Levels

Fort Dix Small Arms Peak The peak sound level is the maximum instantaneous sound level of an event measured with a sound level meter or analyzer set for un-weighted (or linear weighting). Time integrating is not used when peak levels are measured.

The acreage associated with small-arm munitions projected peak noise levels outside of the Joint Base boundary, categorized by municipality and zoning designation is presented in Table 6.2. The total acreage outside of the Joint Base for the projected condition that is within Noise Zone II is approximately 5,105 acres and within Noise Zone III is approximately 112 acres.

The population outside of the Joint Base boundary within each Noise Zone for the 2008 scenario is summarized in Table 6.3. The total population outside of the Joint Base that is within Noise Zones II and III is approximately 4,301 people; approximately 4,189 people within Noise Zone II and approximately 112 people within Noise Zone III. Seventy-eight percent of the population within Noise Zones II and III is in Pemberton Township.

The projected peak noise zone contours associated with small arms munitions use at Fort Dix are depicted in Figure 6.6. As shown in this Figure, small arms peak noise levels associated with Noise Zone III are contained within the boundaries of Fort Dix; the exception being some off-base impacts in Pemberton and Manchester Townships similar to the baseline condition.

Off-base impacts associated with post-2008 Noise Zone II small arms peak sound levels are similar to pre-BRAC conditions. Off-base impacts extend further into New Hanover Township, are similar in Plumsted Township, and show a decrease in Jackson Township when compared to the pre-BRAC condition. Noise Zone II peak noise levels associated with small arms munitions encroach on the Collier Mills Wildlife Management Area to the northeast of the base. Off-base impacts are similar to pre-BRAC conditions in Manchester and Pemberton Townships to the south. The northern-most sections of the Browns Mills community, along Trenton Avenue and Range Road, are exposed to noise levels within Noise Zone II. Noise Zone II is also present in the northwestern section of Manchester Township, within the Brendan T. Byrne State Forest. The extent of Noise Zone II sound impacts are similar to the pre-BRAC condition for McGuire AFB to the east and show a slight decrease from the pre-BRAC condition for Lakehurst NAES to the west of Fort Dix.

Joint Base DNL The following includes an assessment of Joint Base small arms, large arms, aircraft and vehicle noise. Joint Base noise levels are assessed using the DNL for small arms, large arms, aircraft noise. The DNL provides a single measure of overall noise impact and represents total sound exposure. The DNL is found to be the best measure for assessing levels of annoyance associated with all types of environmental noise.

DNL can be assessed using the A-weighted scale or C-weighted scale. The A-weighted Day-Night Average Sound Level (ADNL) noise descriptor is used to describe the noise environment around airfields and the firing of small arms. The C-weighted Day-Night Average Sound Level (CDNL) is used for intense noise containing low frequency sound energy (near or below the threshold of human hearing) like that from large gun blasts and sonic booms.

The acreage associated with post-2008 Joint Base operational noise levels outside of the Joint Base boundary is discussed by each Base and encapsulated in the Joint Base Summary.

Fort Dix Small Arms ADNL The projected ADNL noise zone contours associated with small arms munitions use at Fort Dix are depicted in Figure 6.7. Off-base impacts associated with Noise Zone II small arms ADNL sound levels are similar to the pre-BRAC condition and include Manchester and Pemberton Townships to the south. As shown in Figure 6.7, Noise Zone III ADNL noise levels associated with small arms munitions use at Fort Dix are mostly contained on base lands and range areas within the boundaries of Fort Dix, and generally do not pose compatibility issues with surrounding civilian uses. However, Noise Zones II and III associated with Fort Dix small arms operations expand further into Pemberton and Manchester townships. The areas of incompatible land use associated with small arms munitions operations at Fort Dix are located outside the southern sections of the base boundary in Pemberton and Manchester townships. Within Pemberton Township, Noise Zone II (65 to 75 ADNL) encroaches on areas zoned High-Density Single Family Residential. The noise produced is primarily associated with munitions ranges. Noise Zone II and III are present in the northwestern section of Manchester Township, within the Brendan T. Byrne State Forest. This area is zoned as Pinelands Preservation Area (PPA).

As with the pre-BRAC condition, the LUPZ contours extend slightly further into Manchester and Pemberton Townships to the south. However, the noise environment has not changed significantly and any existing land uses would experience a similar sound environment.

Fort Dix Large Arms CDNL The CDNL noise zone contours associated with large arms munitions use at Fort Dix are depicted in Figure 6.7. As shown in this Figure, Noise Zone III CDNL noise levels associated with large arms munitions use at Fort Dix are mostly contained on range areas within the boundaries of Fort Dix and, therefore, generally do not pose compatibility issues with surrounding civilian uses. However, there are off-base impacts in Manchester Township, at the very southern end of the base, associated with noise levels in Noise Zone III that show a slight increase from the baseline condition.

Noise Zone II CDNL noise levels associated with large arms munitions use at Fort Dix show an increase compared to the pre-BRAC condition. Off-base impacts associated with Noise Zone II large arms CDNL sound levels include portions of Manchester Township to the south and east of the installation and Plumsted Township to the north. While Noise Zone II contours do encroach on Plumsted Township, this section of the township is zoned rural agricultural and rural development.

Figure 6.6 - Projected Noise Conditions: Small Arms Peak (No Aviation)

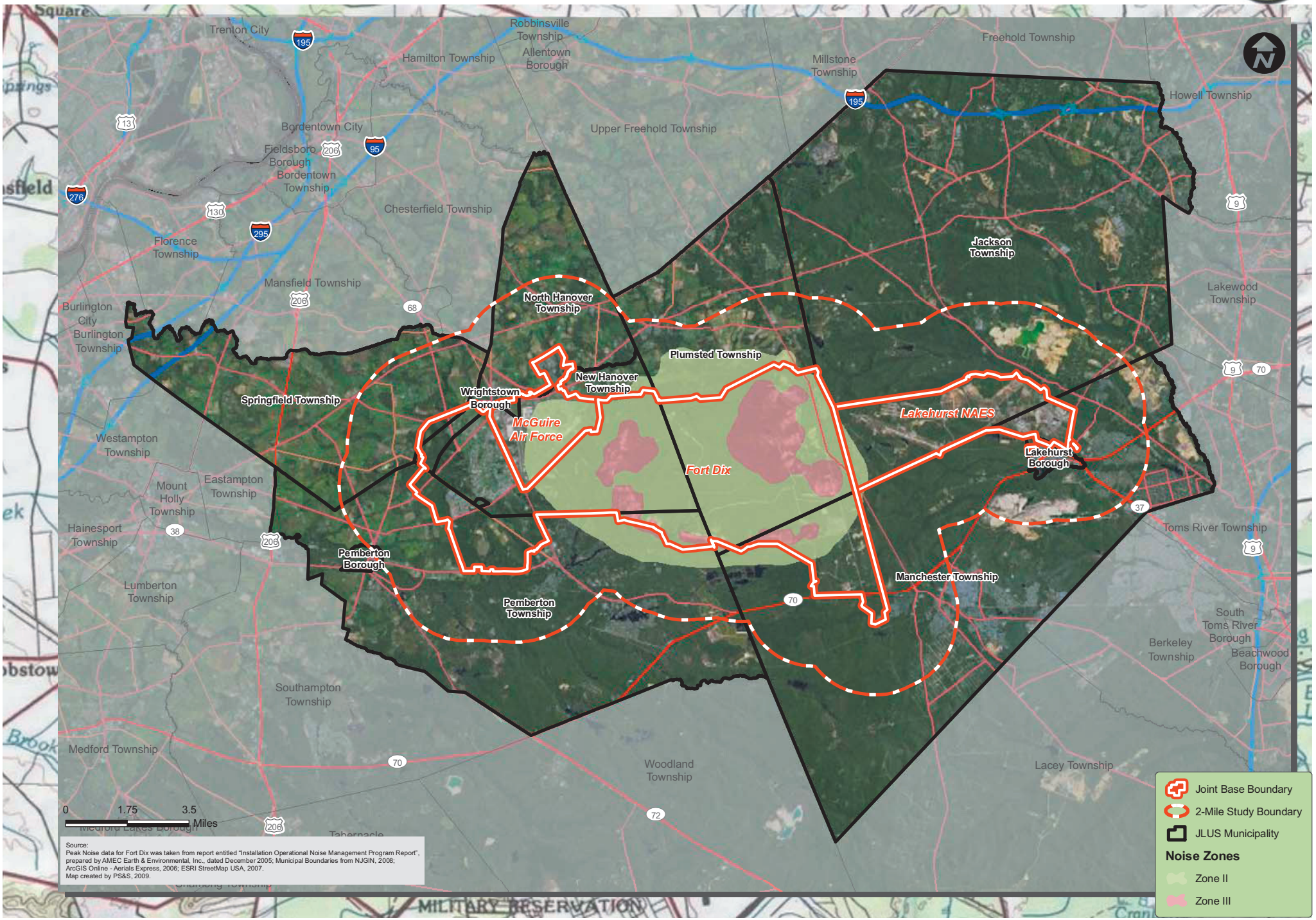
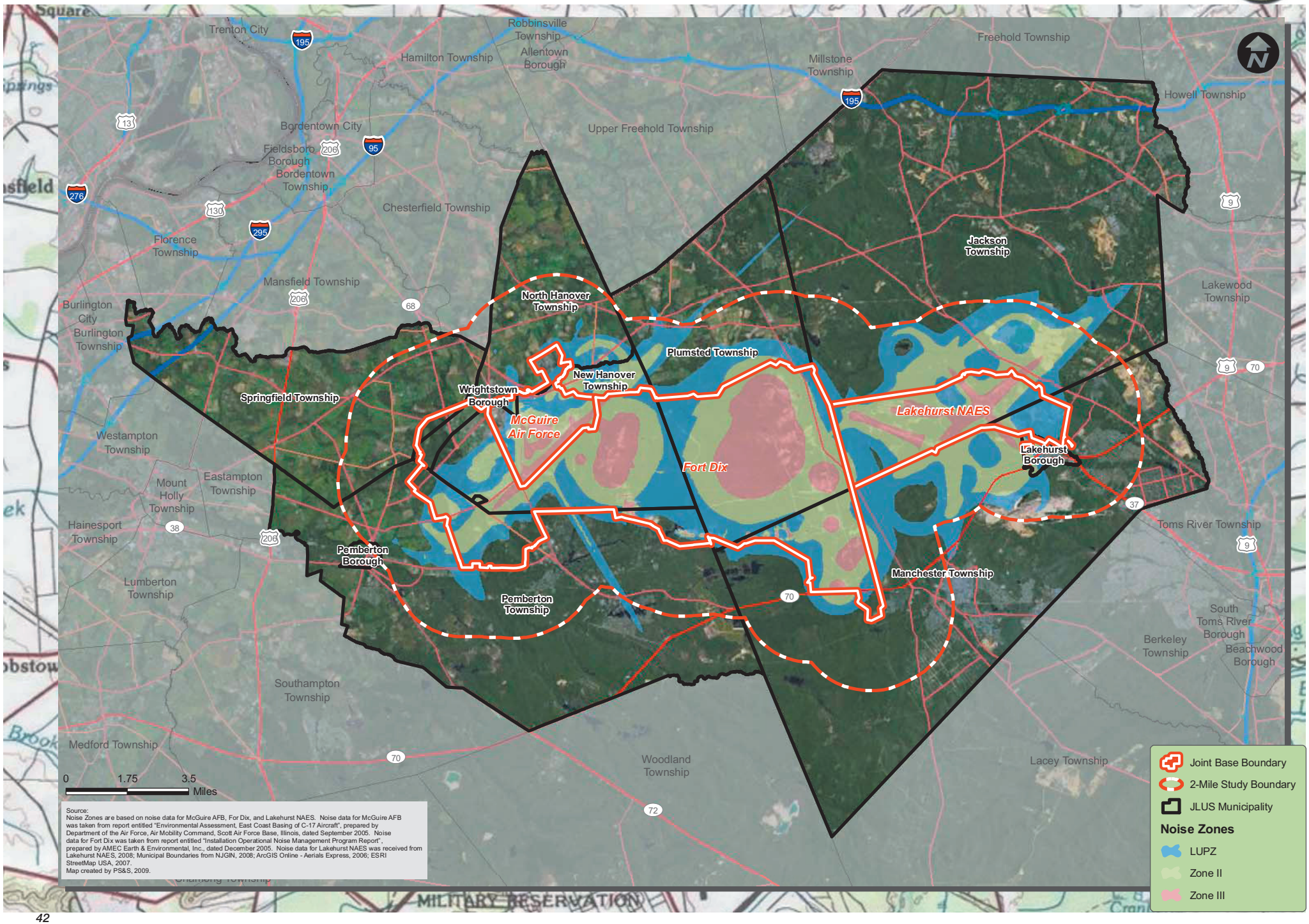


Figure 6.7 - Projected Noise Conditions: Small Arms ADNL, Large Arms CDNL, and Aviation



The LUPZ shows a large increase compared to the baseline condition and extends beyond the installation boundary affecting Pemberton Township to the south, Plumsted and New Hanover Townships to the north, and further into Manchester Township to the south and east. Both Noise Zone II and the LUPZ extend into McGuire AFB to the west and NAES Lakehurst to the east.

Aircraft Noise

Fort Dix Aircraft Operations Fixed-wing noise levels associated with the Fort Dix Aviation Ramp have been captured in McGuire AFB's AICUZ Study. Projected 2008 noise levels generated by rotary-wing aircraft activity within Fort Dix Airspace do not exceed 65 DNMRL (a monthly DNL) beyond Fort Dix boundaries according to the 2005 Fort Dix IONMP.

McGuire AFB Aircraft Noise (ADNL Noise Contours) The BRAC Commission approved specific recommendations for McGuire AFB. As previously discussed, the Commission approved the closure of Willow Grove NASJRB and the realignment of Cambria Regional Airport and relocation of all Navy and Marine Corps squadrons, their aircraft and necessary personnel, equipment and support to McGuire AFB. (See Section 5 for more detail.)

Pre-BRAC noise contours were obtained from the 2005 Department of the Air Force, Air Mobility Command, Environmental Assessment East Coast Basing of C-17 Aircraft. The 2008 projected noise contours were provided by military personnel from a preliminary noise dataset "McGuire AFB NJ 2008 AICUZ Update."

Figure 6.7 shows the projected conditions (post-2008) ADNL noise contours. As shown in this figure, Noise Zone III ADNL associated with aircraft are mostly contained on the base. However, noise levels in the range of 65 to 80 ADNL (Noise Zone III) that are associated with aircraft operations encroach on Fort Dix property.

Noise levels associated with Noise Zone II is mainly contained within the boundaries of McGuire AFB and Fort Dix military bases. The largest increase in acreage consists of McGuire AFB property. Due to the decrease in airfield operations associated with runway 18/36 (aligned NNW to SSE) the off-base impacts are significantly reduced in Wrightstown Borough from the baseline condition and include a small section of Wrightstown Borough (directly adjacent to the Fort Dix).

Off-base impacts associated with Noise Zone II ADNL sound levels (beyond the boundaries of the Joint Base) increase to the northeast and southwest into New Hanover and Plumsted Townships (to the northeast) and Pemberton Township (to the southwest). The majority of the area beyond the Joint Base boundary within Noise Zone II is in undeveloped agricultural and forested areas. However, within Pemberton Township, Noise Zone II (65 to 75 ADNL) encroaches on areas zoned low, medium and high-density residential.

The LUPZ extends beyond the installation boundary affecting Pemberton Township to the south, and Plumsted and New Hanover Townships to the north. Both Noise Zone II and the LUPZ extend into Fort Dix.

NAES Lakehurst Aircraft Noise (ADNL Noise Contours) Future operations at NAES Lakehurst are dramatically changing in the near term. New and expanded operations are increasing aviation-related operations, both during the day and nighttime hours. Additionally, expansions of other facilities and operations near the flight-line will provide an enhanced presence of aviation research and maintenance functions.

Air operations have changed dramatically, primarily due to increases in C-17 and helicopter operations. This analysis is based on the modeling of predicted impacts at the time of the referenced studies; however, specific operational impacts are still unknown. The completion of a Joint Base AICUZ, planned for 2011, will help quantify and specify impacts.

The post-2008 noise contours were obtained from the 2005 Department of the Air Force Air Mobility Command Environmental Assessment East Coast Basing of C-17 Aircraft. The projected condition (post-2008) ADNL noise contours is shown in Figure 6.7. As a result of the increased operations, the noise contours increase in all directions from the airfield.

As shown in Figure 6.7, Noise Zone III ADNL noise levels associated with aircraft are mostly contained on the base, however, noise levels associated with aircraft operations that are in the range of 65 to 80 ADNL (Noise Zone III) extend off-base into Jackson and Manchester Townships. The area zoned residential near the end of the primary runway (Runway 15/33) lie in what is modeled to be a high noise zone with an average range of 75 to 85 dB.

As a result of the increased operations, the noise contours associated with Noise Zone II increase in all directions from the airfield. Noise levels associated with Noise Zone II are mostly off-base. Off-base impacts associated with Noise Zone II ADNL sound levels have incompatibilities in Jackson and Manchester Townships and Lakehurst Borough. A large portion of Noise Zone II extends into residentially-zoned land in Jackson Township. Aircraft flying at low elevations in approach to McGuire AFB have generated complaints from some Jackson residents.

The LUPZ extends beyond the installation boundary affecting Jackson Township to the north and Manchester Township and Lakehurst Borough to the south. Overall, the NAES Lakehurst Landing Zone Alternative noise contours increase in all directions from the airfield (see Figure 6.7). The shift in noise contours could result in long-term adverse effects, depending on future land use compatibility. The areas in which the noise exposure extends the farthest from the airfield are to the north, northeast, south, and southwest of NAES. The exposed area to the north includes the Colliers Mills Wildlife Management Area, while the area south and southwest of NAES would primarily encompass the Manchester Fish and Wildlife Management Area. Except for a strip of land along Highway 571, most of the additionally exposed area northeast of NAES across the highway is industrial land that includes activities such as sand and gravel mining.

The apparent increase in the area covered by noise contours is from increased operations. Operations have not only increased, but the increase of fixed-wing operations has increased from 20% of total operations to 50% of total operations. In addition, fixed-wing operations have changed from a few C12 and C130 aircraft along with turbo-props to the addition of C-17 aircraft and an assault landing zone.

Vehicle Noise The additional full-time personnel and reservists as defined by the BRAC Commission will cause an increase in vehicle traffic. However, the reservists would typically drive to the base on only one weekend per month. In addition, future vehicle operations at Fort Dix could include an increase in or introduction of numerous types of off- and on-road vehicles. Given the anticipated increase in range use in the future, it is likely that an increase in vehicles accessing ranges would increase. Although the personnel changes under BRAC would cause an increase in vehicle traffic and as such, an increase in ambient noise levels, this increase is not likely to be significant to the noise environment given the dominance of military aircraft and weapons training in the area.

Joint Base DNL Projected Summary (Acreage, Zoning and Population) The DNL noise contours associated with small arms munitions and aviation use for the 2008 condition at Joint Base McGuire-Dix-Lakehurst are depicted in Figure 6.7. Table 6.4 presents the acreage outside of the Joint Base boundary within each Noise Zone for the projected DNL noise contours associated with small arms, large arms and aviation (McGuire and Lakehurst), categorized by municipality and zoning designation. The total acreage outside of the Joint Base for the post-2008 condition that is within Noise Zone II is approximately 7,801 acres and within Noise Zone III is approximately 232 acres. The total acreage outside of the Joint Base for the projected condition that is within the LUPZ is approximately 15,788 acres. The increase in total acreage from the baseline to the projected condition is an increase of 2,696 acres in Noise Zone II and an increase of 120 acres in Noise Zone III.

The total acreage outside of the Joint Base boundary that is zoned residential and within Noise Zone II increases from 110 acres to 2,283 acres, a 2,173 acre increase over the pre-BRAC condition. The total acreage outside of the Joint Base boundary that is zoned residential and within Noise Zone III increases from 0 acres to 84 acres over the pre-BRAC condition. The greatest increase in area, due to the increased operations, that is within Noise Zones II and III and is zoned residential is within Jackson Township. The total acreage outside of the Joint Base boundary that is zoned residential and falls within the LUPZ is approximately 5,076 acres for the post-2008 condition, an increase of 4,994 acres over the pre BRAC condition. Figure 6.8 shows the projected DNL noise contours for the Joint Base and the zoning classifications for the surrounding municipalities.

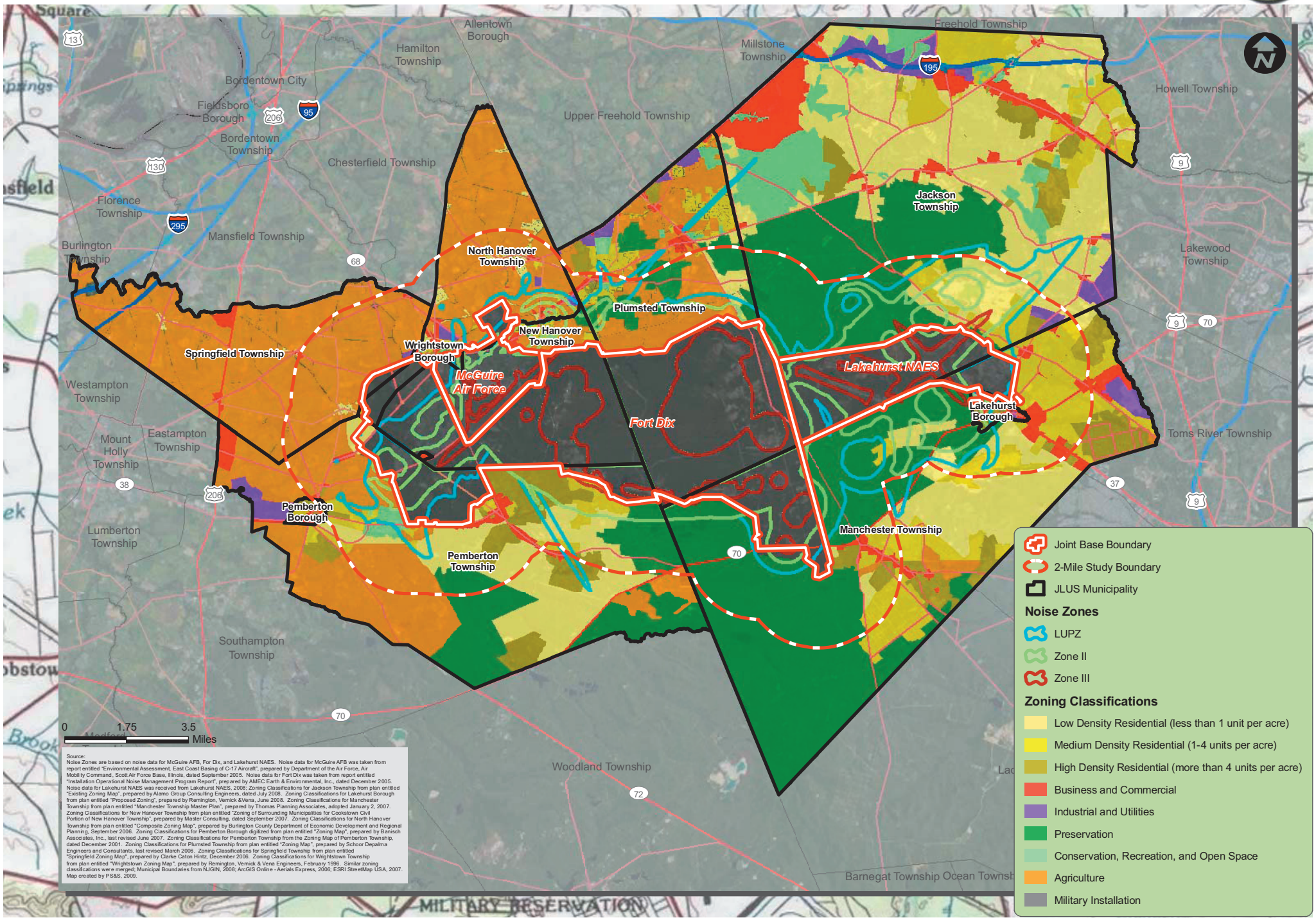
The estimated population outside of the Joint Base boundary within each Noise Zone for the projected scenario is presented in Table 6.5. The total population outside of the Joint Base that is within Noise Zones II and III is approximately 2,976 people; approximately 2,941 people within Noise Zone II and approximately 35 people within Noise Zone III. The greatest population that may be affected by noise levels within Noise Zones II and III is in Jackson Township and Lakehurst Borough.

Table 6.4 Land Area and Zoning Exposed to Noise Zones from Projected (2008 DNL) Small Arms, Large Arms, and Aviation Operations at Fort Dix, McGuire, and Lakehurst (Area in Acres)

Municipality	Zoning Categories	LUPZ	Zone II	Zone III	Grand Total
Jackson Township	Conservation, Recreation, and Open Space	14.6			14.6
	Low Density Residential (less than 1 unit per acre)	2,592.5	1,692.4	83.5	4,368.5
	Preservation	2,266.8	1,559.9	70.1	3,896.9
Jackson Township Total		**4,874.0**	**3,2542.4**	**153.7**	**8,280**
Lakehurst Borough	Business and Commercial	17.0	25.8		42.8
	High Density Residential (more than 4 units per acre)	84.4	82.8		167.2
	Industrial and Utilities	27.9	29.7		57.5
Lakehurst Borough Total		**129.2**	**138.3**		**267.6**
Manchester Township	Business and Commercial	4.0			4.0
	Low Density Residential (less than 1 unit per acre)	522.3	330.8		853.1
	Medium Density Residential (1-4 units per acre)	127.6			127.6
	Preservation	4,289.3	2,131.3	77.1	6,497.7
Manchester Township Total		**4,943.2**	**2,462.1**	**77.1**	**7,482.5**
New Hanover Township	Agriculture	192.0	502.5	0.4	694.9
	Business and Commercial	19.6	79.6		99.2
	Conservation, Recreation, and Open Space	16.6	13.3		30.0
	Medium Density Residential (1-4 units per acre)	250.0	110.6	0.8	361.5
	Preservation	19.3	85.6		104.9
New Hanover Township Total		**497.5**	**791.7**	**1.2**	**1,290.4**
North Hanover Township	Agriculture	784.5	229.9		1,014.3
	Business and Commercial	63.4	29.2		92.6
	Industrial and Utilities	53.8	8.7		62.5
	Low Density Residential (less than 1 unit per acre)	29.3			29.3
	Medium Density Residential (1-4 units per acre)	35.1	6.7		41.9
North Hanover Township Total		**966.0**	**274.6**		**1,240.6**
Pemberton Township	Agriculture	482.3	232.9		715.2
	Business and Commercial	11.7			11.7
	Conservation, Recreation, and Open Space	259.4	5.5		265.0
	High Density Residential (more than 4 units per acre)	493.9	39.9		533.9
	Low Density Residential (less than 1 unit per acre)	202.5			202.5
	Medium Density Residential (1-4 units per acre)	349.0	19.1		368.1
Pemberton Township Total		**1,798.9**	**297.5**		**2096.3**
Plumsted Township	Agriculture	1,653.7	429.9		2,083.6
	Business and Commercial	26.1			26.1
	Conservation, Recreation, and Open Space	29.1			29.1
	Low Density Residential (less than 1 unit per acre)	121.9			121.9
	Medium Density Residential (1-4 units per acre)	249.0	2.9		251.9
	Preservation	473.7	149.3		623.0
Plumsted Township Total		**2,553.5**	**582.0**		**3,135.5**
Wrightstown Borough	Business and Commercial	7.9			7.9
	Medium Density Residential (1-4 units per acre)	18.1	2.0		20.1
Wrightstown Borough Total		**26.0**	**2.0**		**28.0**
		LUPZ	**Zone II**	**Zone III**	**Grand Total**
Total Area (acreage) Outside of Joint Base Boundary:		**15,788**	**7,801**	**232**	**23,821**

Source: Noise Contours and GIS Data

Figure 6.8 - Projected Noise Conditions: Small Arms Peak and ADNL, Large Arms CDNL, and Aviation with Surrounding Zoning



Source:
Noise Zones are based on noise data for McGuire AFB, For Dix, and Lakehurst NAES. Noise data for McGuire AFB was taken from report entitled "Environmental Assessment, East Coast Basing of C-17 Aircraft", prepared by Department of the Air Force, Air Mobility Command, Scott Air Force Base, Illinois, dated September 2005. Noise data for Fort Dix was taken from report entitled "Installation Operational Noise Management Program Report", prepared by AMEC Earth & Environmental, Inc., dated December 2005. Noise data for Lakehurst NAES was received from Lakehurst NAES, 2008. Zoning Classifications for Jackson Township from plan entitled "Existing Zoning Map", prepared by Alamo Group Consulting Engineers, dated July 2008. Zoning Classifications for Lakehurst Borough from plan entitled "Proposed Zoning", prepared by Remington, Vernick &Vena, June 2008. Zoning Classifications for Manchester Township from plan entitled "Manchester Township Master Plan", prepared by Thomas Planning Associates, adopted January 2, 2007. Zoning Classifications for New Hanover Township from plan entitled "Zoning of Surrounding Municipalties for Cookstown Civil Portion of New Hanover Township", prepared by Master Consulting, dated September 2007. Zoning Classifications for North Hanover Township from plan entitled "Composite Zoning Map", prepared by Burlington County Department of Economic Development and Regional Planning, September 2006. Zoning Classifications for Pemberton Borough digitized from plan entitled "Zoning Map", prepared by Banisch Associates, Inc., last revised June 2007. Zoning Classifications for Pemberton Township from the Zoning Map of Pemberton Township, dated December 2001. Zoning Classifications for Plumsted Township from plan entitled "Zoning Map", prepared by Schoor Depalma Engineers and Consultants, last revised March 2006. Zoning Classifications for Springfield Township from plan entitled "Springfield Zoning Map", prepared by Clarke Caton Hintz, December 2006. Zoning Classifications for Wrightstown Township from plan entitled "Wrightstown Zoning Map", prepared by Remington, Vernick & Vena Engineers, February 1996. Similar zoning classifications were merged; Municipal Boundaries from NJGIN, 2008; ArcGIS Online - Aerials Express, 2006; ESRI StreetMap USA, 2007. Map created by PS&S, 2009.

Table 6.5 Estimated Population in Joint Base DNL Noise Zones for Projected Conditions (Outside of Joint Base Boundary)

Municipality	Noise Zones			
	LUPZ population	Zone II population	Zone III population	Pop Total
Jackson Township	1,219	620	29	1,868
Lakehurst Borough	729	792	-	1,521
Manchester Township	331	159	5	495
New Hanover Township	314	418	1	733
North Hanover Township	1,024	375	-	1,399
Pemberton Township	2,408	309	-	2,717
Plumsted Township	1,487	267	-	1,754
Wrightstown Borough	40	1	-	41
Total Population	**7,552**	**2,941**	**35**	**10,528**

Source: Census 2004 Projected Population by Block Group

The most significant acreage and population increases are associated with the LUPZ. Approximately 7,552 people are located within the LUPZ, an increase of 7,361 people from the baseline (pre-BRAC) condition. It should be noted that there are no incompatible land uses in the LUPZ and people residing in this zone may not perceive any impact. The LUPZ is presented for illustrative purposes as an additional buffer zone for future land use planning.

Noise Compatibility Concerns

Land Use Planning and Compatibility Guidelines The Joint Base noise effects were evaluated to assess compatibility with zoning designations on land surrounding the installation. The following analysis assesses the compatibility of existing zoning around the installation. Incompatibilities discussed below may have existed under the baseline condition, however for planning purposes these incompatible areas are discussed for the projected (post-2008) condition since these areas can be accounted for in future land use planning and zoning decisions.

Compatible land uses can exist next to each other without causing interference or exposing people to undue safety risks or nuisance. In this JLUS context, military training activities create compatibility issues when the activity occurs in the proximity of following land uses:

- Noise sensitive uses, such as housing, schools, medical facilities or places of worship; and
- Uses that tend to concentrate people (certain higher residential densities, schools, churches, hospitals)

For purposes of evaluating compatibility regarding noise, this JLUS draws guidance from the Federal Interagency Committee on Urban Noise (FICUN) land use guidelines (FICUN 1980). These compatibility guidelines are standards only and do not determine acceptable uses of land within communities. Local governments have the authority to establish permissible land uses and to define the relationship between specific properties and noise (see Appendix 13-5 for a full listing of land use compatibility guidelines).

Projected noise zone contours for the Joint Base and the zoning classifications for the surrounding municipalities are shown in Figure 6.8. This figure presents the collective noise zones from the Peak (refer to Figure 6.6) and DNL (refer to Figure 6.7) noise conditions along with the municipal zoning designations.

As previously mentioned, noise zones provide a useful framework for identifying those off-base areas in which noise exposure may be high enough to generate annoyance among a certain percentage of people and provide general guidance on what proportion of the existing population in that zone might be “highly annoyed” by the noise generated. One key element of the DOD environmental noise policy used in this JLUS study is setting acceptability limits for different kinds of military noise. The noise levels that define each noise zone, for each type of noise exposure (ADNL, CDNL and Peak noise), result in the same percentage of people determined to be “highly annoyed”. The various noise metrics are related through the use of noise zones as presented in Table 6.1 ‘Noise Zone Guidelines’. After the conclusion of this technical section (Section 6.0), the use of noise zones throughout the remainder of the document no longer distinguishes between the various noise metrics, but focuses on incompatibility issues between zoning/land use and noise (based on the FICUN noise zone and land use compatibility guidelines).

All lands in the vicinity of Fort Dix, McGuire and NAES Lakehurst are zoned by their respective municipalities. Jurisdictions responsible for zoning designations, maps, and associated

ordinances adjacent to the Joint Base include New Hanover Township, North Hanover Township, Pemberton Township, Springfield Township, and Wrightstown Borough in Burlington County; and Jackson Township, Manchester Township, Lakehurst Borough and Plumsted Township in Ocean County. Because of the extensive land coverage and vast differences among the zoning designations of different jurisdictions, composite or generalized zoning designations for all lands surrounding the military installations were created and are provided in Section 7.

Compatible land uses/zoning relative to levels of noise exposure associated with the military installation are shown in Table 6.6. The guidelines below are based on the A-weighting function, which evaluates noise from transportation (vehicle and aircraft), small arms, and continuous noise sources. However, these compatibility guidelines also apply to CDNL and Peak noise as outlined in Table 6.1 "Noise Zone Guidelines" set forth by FICUN for considering noise in land use planning (see section 6.1.1).

In general, guidance states that housing is compatible with outdoor noise exposure up to DNL 55 dB. The noise range from 55 to 65 dB, which is within Noise Zone I and incorporates the LUPZ, is considered to have low to moderate noise exposure and is generally compatible to residential development. Municipalities may wish to tailor evaluations of future residential development within this noise range given local circumstances. Standards indicate that with exposure between DNL 65 to 75 dB, additional protective measures, such as indoor noise reduction, for residential uses may be warranted. For conditionally compatible residential land uses, guidelines suggest consideration of the following factors:

- A demonstrated community need for residential uses that would not be met if development were prohibited in these zones
- Where the community determines that residential uses are desired, structures should incorporate noise level reduction measures of at least 25 dB (65 to 70 ADNL) and 30 dB (70 to 75 ADNL)
- Noise level reduction 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

Guidelines deem noise exposure that exceeds DNL 75 dB to be "incompatible" with all residential uses. Many uses, such as manufacturing, retail, government facilities, and agriculture, however, can be suitable even within a relatively high noise setting.

Noise Impact The focus of this discussion is on incompatible land use with the goal of identifying potential land areas/uses to be addressed by the JLUS team. Incompatibilities discussed below may have existed under the baseline condition, however for planning purposes these incompatible areas are discussed for the current condition since these areas can be accounted for in future land use planning and zoning decisions. There are currently over 16,600 acres located within the boundary of the noise zones that are considered compatible land area. Land area that is either compatible with military operations, or outside of the area of potential noise impact and is compatible with development, is discussed in the following land use sections.

Peak Noise Levels Land area and zoning (outside of Joint Base Boundary) exposed to noise from projected (2008) peak small arms munitions use at Fort Dix are shown in Table 6.2. Areas that are zoned residential and are considered incompatible for the 2008 condition with peak small arms munitions use include:

- New Hanover Township: 79 acres in Noise Zone II
- Pemberton Township: 1,444 acres in Noise Zone II and 94 acres in Noise Zone III
- Plumsted Township: 30 acres in Noise Zone II

New Hanover, Pemberton and Plumsted townships all have areas zoned residential that fall within Noise Zone II (87 to 104 dBP) associated with peak noise levels. Typically, residential areas within Noise Zone II are considered incompatible unless noise level reduction methods have been incorporated during construction or would be incorporated in the future. Further, within Pemberton Township, Noise Zone III (> 104 dBP) levels encroach on high-density single family residential areas. Residential areas are considered incompatible with Noise Zone III. Within Manchester Township, Noise Zone III exists within Brendan T. Byrne State Forest. In Jackson Township, a small area of Noise Zone II encroaches on Collier Mills Wildlife Management Area.

DNL Noise Levels Land area and zoning (outside of Joint Base Boundary) exposed to noise zones from projected (2008) DNL small arms, large arms and aviation operations at Joint Base McGuire-Dix-Lakehurst are shown in Table 6.4. Areas that are zoned residential and are considered incompatible for the 2008 condition include:

- Jackson Township: 1,692 acres in Noise Zone II and 84 acres in Noise Zone III (2,593 acres in the LUPZ)
- Lakehurst Borough: 83 acres in Noise Zone II (84 acres in the LUPZ)
- Manchester Township: 331 acres in Noise Zone II (650 acres in the LUPZ)
- New Hanover Township: 111 acres in Noise Zone II and 1 acre in Noise Zone III (250 acres in the LUPZ)
- North Hanover Township: 6.7 acres in Noise Zone II (64 acres in the LUPZ)
- Pemberton Township: 59 acres in Noise Zone II (1,046 acres in the LUPZ)
- Plumsted Township: 3 acres in Noise Zone II (371acres in the LUPZ)
- Wrightstown Borough: 2 acres in Noise Zone II (18 acres in the LUPZ)

Noise Zone II is normally incompatible with residential areas but could be considered compatible if noise level reduction methods had been incorporated during construction or would be incorporated in the future. Residential areas are considered incompatible with Noise Zone III. Any proposed future development should consider noise levels in the LUPZ. It is expected that as more people move to the area who are unfamiliar with current Joint Base operations, complaints will continue or intensify. Therefore, development proposed in these areas should be evaluated with regard to the potential noise levels.

Any residential buildings on land zoned as agriculture, forest, preservation or military and within Noise Zone II should be required to meet a noise level reduction standard of 25 to 30 dBA. Agriculture, conservation, recreation and open space, and park land are acceptable within the LUPZ and Noise Zone II. Applicable guidelines for planned conservation, recreation or open space and park land within the LUPZ and Noise Zone II should be evaluated on a case specific basis and be evaluated based on the goals of the municipality. Recreational and park areas are incompatible within Noise Zone III.

Areas that are zoned for business and commercial, that should be assessed for compatibility within the Noise Zones, include:

- Lakehurst Borough: 26 acres in Noise Zone II
- New Hanover Township: 80 acres in Noise Zone II
- North Hanover Township: 29 acres in Noise Zone II

Lakehurst Borough, New Hanover, and North Hanover Townships all have areas zoned business and commercial that should be assessed for compatibility within Noise Zone II. Areas zoned business and commercial are normally considered acceptable within areas of 70 dBA or less. However, areas zoned as business and commercial in Noise Zone II that have sound levels greater than 70 dBA are recommended to incorporate noise level reduction methods during any future construction.

Conclusions Zoning patterns around the installation in Ocean County include zones of existing and potential new residential development in areas that are subject to high noise levels from Joint Base operations (see Figure 6.8). The Townships of Jackson and Manchester have areas zoned for residential use, including medium density residential, near noise impacts associated with NAES Lakehurst. The western part of Lakehurst Borough is subject to potentially elevated noise levels and is zoned for business and commercial activity and high density residential; these are potentially “non-compatible” zoning designations in this area.

Zoning patterns around the installation in Burlington County have zoned land mainly for agricultural purposes, requiring a relatively large tract size for each residence resulting in lower residential density. A few residentially-zoned tracts are located in New Hanover and North Hanover Townships in areas that are near noise zones associated with the Joint Base. The exception is the Browns Mills area of Pemberton Township, which has areas zoned for high density residential (according to JLUS composite zoning) and commercial activity that are within Noise Zone II. Land use and zoning decisions within Noise Zones II and III should be assessed for compatibility.

Table 6.6 Noise Zone and Land Use Compatibility Guidelines, A-Weighting

FICUN		NZ I	NZ II		NZ III	
	< 55 DB	55 to 65 DB	65 to 70 DB	70 to 75 DB	75 to 80 DB	80 to 85 DB
Households	Y	C	C	C	N	N
Manufacturing	Y	Y	Y	C	C	C
Retail – General	Y	Y	Y	C	C	N
Restaurants	Y	Y	Y	C	C	N
Personal Services	Y	Y	Y	C	C	N
Hospitals	Y	C	C	C	N	N
Government	Y	C	C	C	C	N
Education	Y	C	C	C	N	N
Public Assembly	Y	Y	Y	N	N	N
Parks	Y	C	C	C	N	N
Agriculture	Y	Y	C	C	C	C

Notes:
Table is a summary of the Guidelines for considering noise in Land Use Planning and Control (FICUN, 1980).
See Appendix for complete Table and suggested compatibility restrictions.
Y = Compatible use
C = Conditionally compatible use (see Appendix 13.5)
N = Non-compatible use

Air Safety

This section presents information on the use of Air Safety Zones. Please see Appendix 13.4 and 13.6 for more detail on accident potential and safety zones, and studies used to identify potential off-base accident impact areas associated with military operations. This information provides criteria to identify and assess the compatibility of land use, zoning and air safety of surrounding communities with operations associated with the primary missions of the Joint Base.

Air Safety Zones (Accident Potential Zone (APZ)) Defined Areas around military airfields are exposed to the possibility of aircraft accidents. Military flights at McGuire AFB and NAES Lakehurst are primarily for training purposes but even with rigorous maintenance of aircraft and training of aircrews the potential for accidents exists.

The DoD approaches aircraft safety issues from a land use planning perspective. Designation of safety zones around airfields and restriction of incompatible land uses can reduce the potential for public exposure to aircraft safety hazards.

The DoD has determined that the areas immediately beyond the ends of runways along the approach and departure flight paths have significant potential for impacts associated with aircraft accidents. The DoD has developed three zones that have relative potential for aircraft related accidents. The accident potential criteria used to define these Safety Zones are based on statistical analyses of past military aircraft accidents. These zones are used for planning land use and zoning to foster compatibility and prevent conflicts with sensitive land uses, such as housing, schools, and medical facilities etc. The air safety and compatibility guidelines are presented in Table 6.7 and are presented with greater detail in Appendix 13.6.

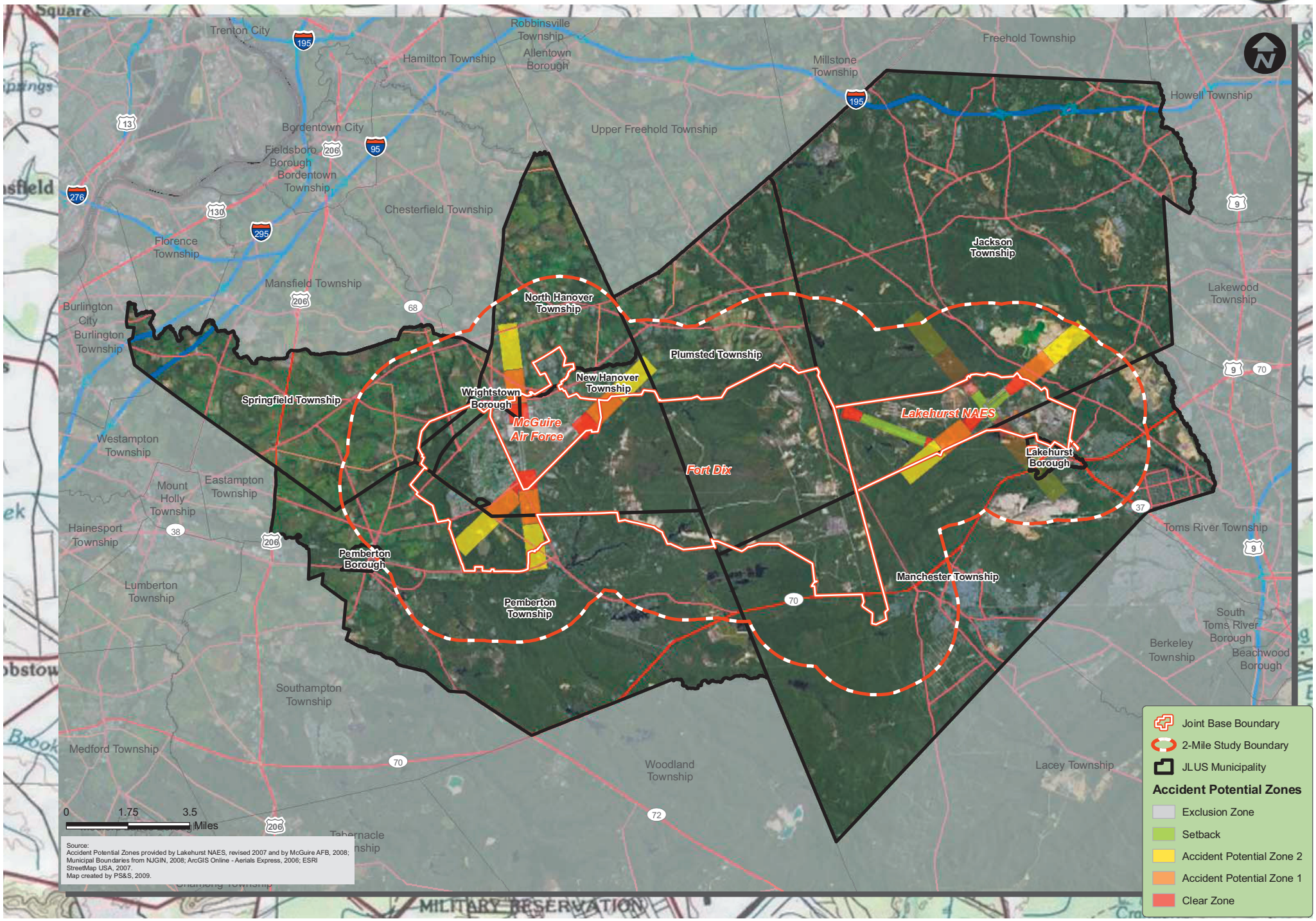
Three planning zones (CZ, APZ 1, and APZ 2) have been established that are related to runway configuration and aircraft missions. These three zones are described below.

CZ - Clear Zone - These zones are the areas closest to the ends of the runway, which are considered to have the highest potential for accidents (approximately 27% of the total accidents studied occurred in this zone). Runways typically have two CZs that start at each end of the runway and extend outward along the runway centerline 3,000 feet with a width of 3,000 feet. The DOD has a general policy of acquiring property rights through purchase or easement in CZs to prevent development in these areas; because of the relatively high aircraft accident potential for CZs.

APZ 1 - Accident Potential Zone 1 – These zones are areas beyond the CZs that have significant though reduced potential for aircraft related accidents (10% of the total accidents studied occurred in this zone). APZ 1 areas extend outward from the CZs an additional 5,000 feet along the runway centerline with a width of 3,000 feet.

APZ 2 - Accident Potential Zone 2 - These zones extend beyond APZ 1 areas and have lesser, but still significant potential for aircraft related accidents (5% of the accidents studied occurred in this zone). APZ 2 areas extend from the outer end of each APZ 1 an additional 7,000 feet along the runway centerline with a width of 3,000 feet.

Figure 6.9 - Accident Potential Zones



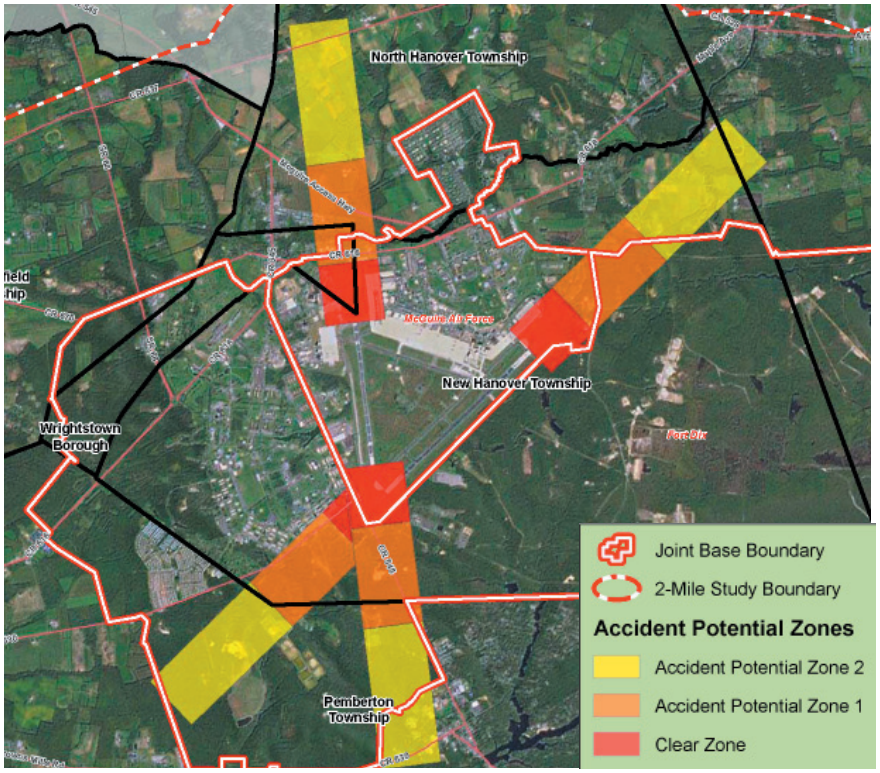
Overall these safety zones make up an area that extends outward from each end of the runway, along the runway centerline, approximately 2.8 miles with a width of 3,000 feet. The aircraft accident potential in APZs 1 and 2 is much less that of CZs and usually does not warrant land acquisition by the DoD. Instead, land use planning and controls are strongly encouraged in these areas to reduce exposure of the public to potential aircraft accidents. Clear Zones (CZs) and Accident Potential Zones (APZs) for Joint Base (McGuire and Lakehurst) runways are shown on Figure 6.9.

McGuire Air Safety Zones

The CZs and APZs for McGuire runways are shown on Figures 6.10.
The following runways are located at McGuire:

- Runway 06/24 (southwest-northea
- Runway 18/36 (north-south)

Figure 6.10 Accident Potential Zones for McGuire Runways(Southern End)



Areas extending beyond the base boundaries are related to aircraft departure (taking off) and approach (landing). The CZ and APZs for McGuire Runway 06/24 and 18/36 are shown on Figure 6.11 for southern runway ends and Figure 6.12 for northern runway ends. The CZs are contained within the boundaries of the base for both runway 06/24 and runway 18/36.

APZ 1 areas at the southern ends of the runways are primarily within the base boundaries with the exception of a very small area of APZ 1 for the southern end of runway 18/36 which is outside the base boundaries. The APZ 1 area at the northern end of runway 06/24 is primarily beyond the base boundary with a small area within the base boundaries. The APZ 1 area at the northern end of runway 18/36 is primarily within the base boundary with a small area beyond the base boundaries.

Figure 6.11 Accident Potential Zones for McGuire Runways 06/24 and 18/36 (Southern End)

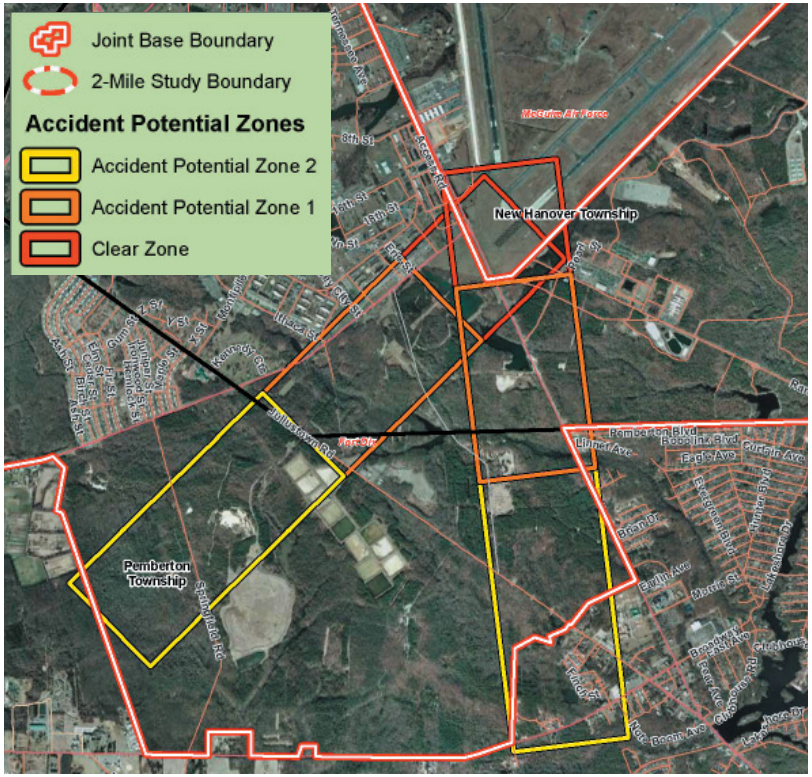
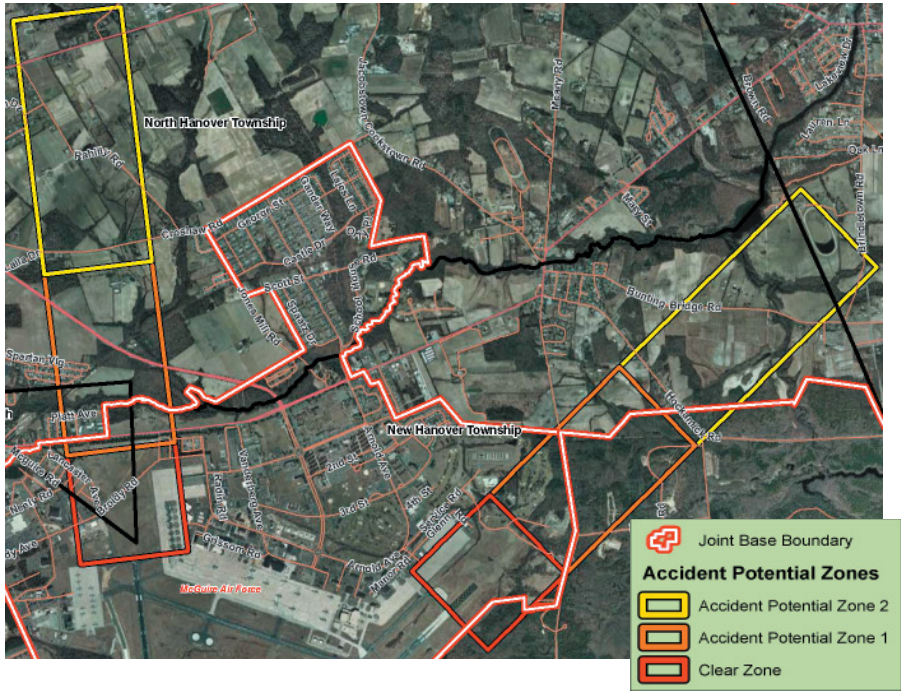


Figure 6.12 Accident Potential Zones for McGuire Runways 06/24 and 18/36 (Northern End)



APZ 2 areas at the northern ends of the runways are primarily off-base with the exception of a very small area of APZ 2 for runway 18/36. The APZ 2 area at the southern end of the runway 06/24 is almost completely on the base. A major portion of the APZ 2 area at the southern end of the runway 18/36 is on the base with a large area extending off-base.

NAES Lakehurst Safety Zones

The CZs and APZs for NAES Lakehurst runways are shown on Figures 6.13

The following runways are located at NAES Lakehurst:

- Runway 06/24 (northeast-southwest)
- Runway 15/33 (northwest-southeast)
- Runway 12/30 (west-east)

Figure 6.13 Accident Potential Zones for Lakehurst Runways

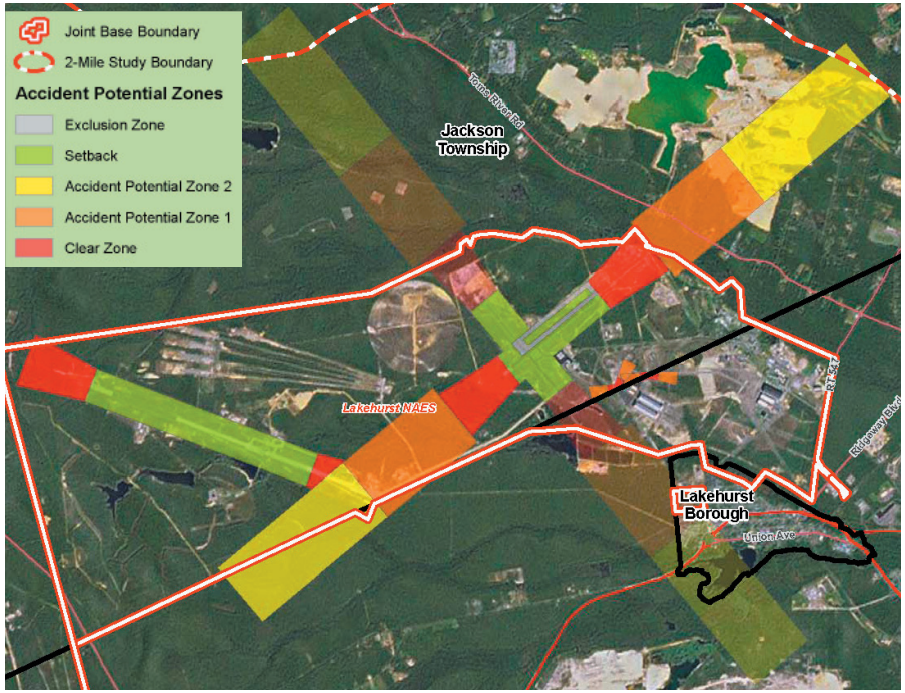


Figure 6.14 Unrestricted Accident Potential Zones for Lakehurst Runway 15/33 (Southern End)

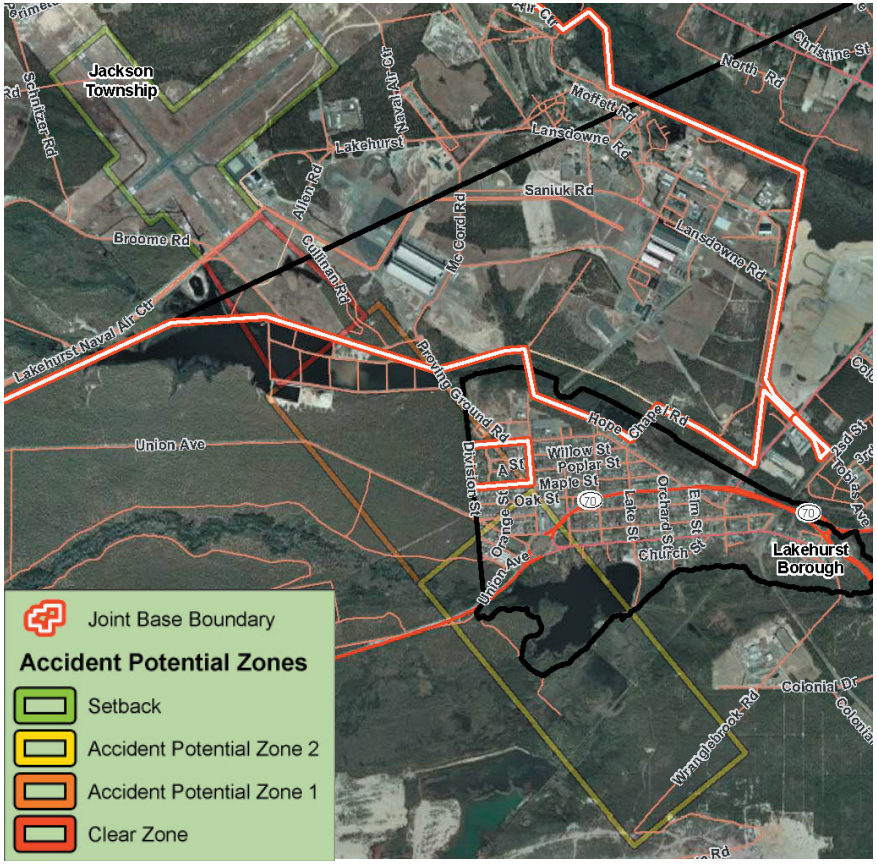
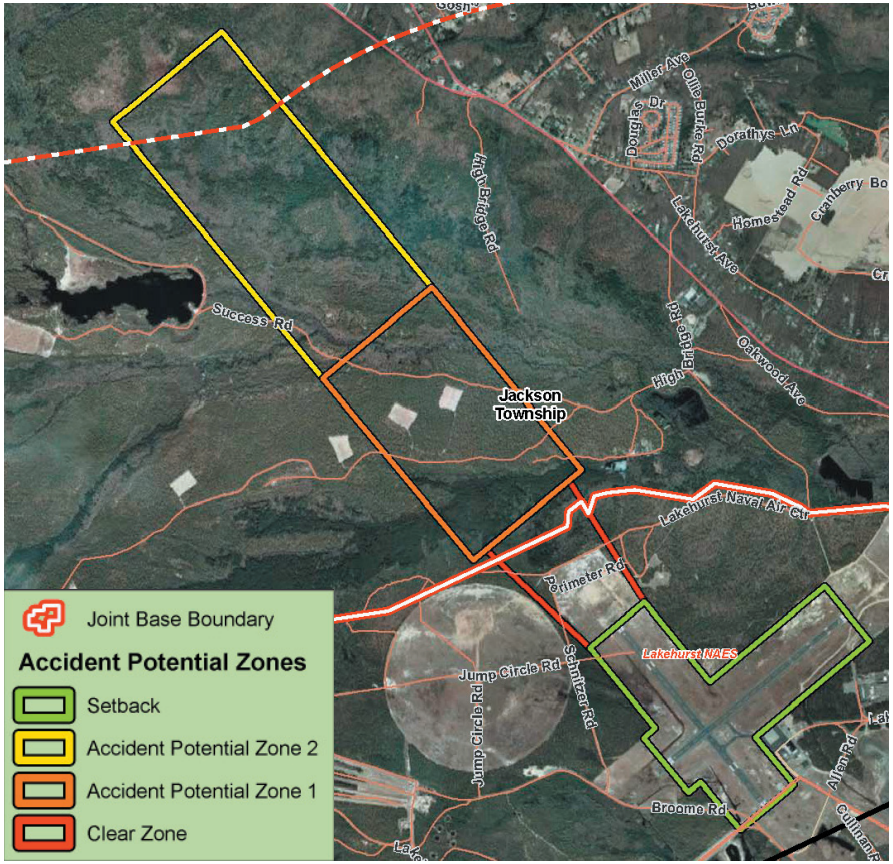


Figure 6.15 Unrestricted Accident Potential Zones for Lakehurst Runway 15/33 (Northern End)



Areas extending beyond the base boundaries are related to aircraft departure (taking off) and approach (landing). The unrestricted APZs for Lakehurst Runway 15/33 are shown on Figures 6.14 and 6.15. While shown in the above figures, data from 2008 confirms that there are no active APZs for this runway. Navy guidance on the designation of APZs says that they are only required on runways from which more than 5,000 flight operations occur a year. It should be noted that the 15/33 runway is not currently utilized and not anticipated to be utilized more than 5,000 flight operations per year. (A flight operation is defined as either a landing or a takeoff.) This APZ is shown for guidance purposes only.

Figure 6.16 Accident Potential Zones for Lakehurst Runway 06/24 (Southern End)

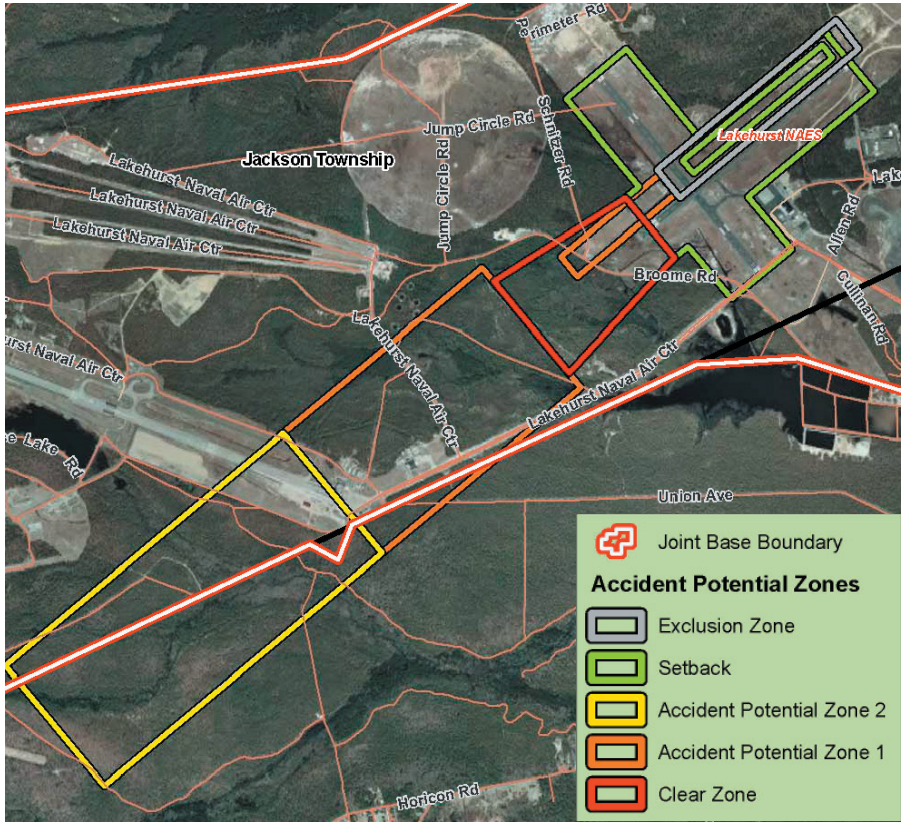
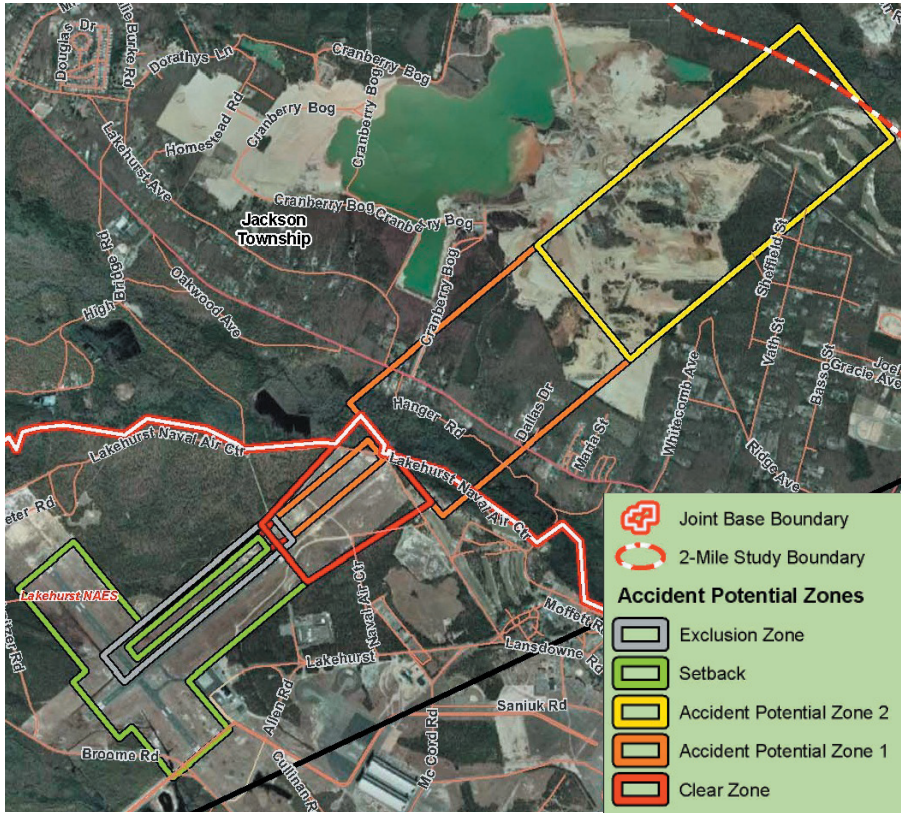
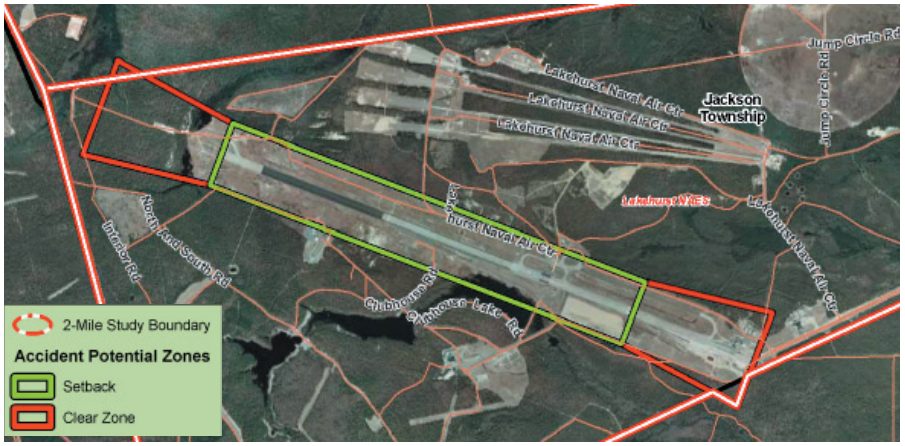


Figure 6.17 Accident Potential Zones for Lakehurst Runway 06/24 (Northern End)



The CZ and APZs for NAES Lakehurst Runway 06/24 are shown on Figures 6.16 and 6.17. Runway 06/24 is the primary runway for NAES Lakehurst. The CZs are contained within the boundaries of the Base. APZ 1 areas mostly extend beyond the base boundaries to the northeast of the runway and a small area at the southwest end. APZ 2 areas for runway 06/24 in the northeast quadrant are entirely off-base and partially extend beyond the 2 mile JLUS study area. APZ 2 areas for runway 06/24 in the southwest quadrant are partly off-base.

Figure 6.18 Accident Potential Zones for Lakehurst Runway 12/30



Lakehurst Runway 12/30 is shown on Figure 6.18. This runway is used primarily for testing. The CZs for runway 12/30 are primarily contained within the boundaries of the base with a very small area just beyond the base boundaries to the northwest end of the runway. APZ 1 and APZ 2 areas are not shown for Runway 12/30 as this runway is used for testing purposes and is not an operational runway.

Air Safety Compatibility Concerns

Land Use Planning and Compatibility Guidelines The Joint Base air safety zones were evaluated to assess compatibility with zoning designations on land surrounding the installation. The following analysis assesses the compatibility of existing zoning around the installation. Incompatibilities discussed below may have existed under the baseline condition, however for planning purposes these incompatible areas are discussed for the current condition since these areas can be accounted for in future land use planning and zoning decisions.

Compatible land uses can exist next to each other without causing interference or exposing people to undue safety risks or nuisance. In this JLUS context, military training activities create compatibility issues when the activity occurs in the proximity of following land uses:

- Noise sensitive uses, such as housing, schools, medical facilities or places of worship
- Uses that tend to concentrate people (certain higher residential densities, schools, churches, hospitals)

For purposes of evaluating compatibility, the JLUS draws guidance from the DoD guidelines for compatible land use for clear zones and accident potential zones (U.S. Army 1981). These compatibility guidelines are standards only and do not determine acceptable uses of land within communities. Local governments have the authority to establish permissible land uses and to define the relationship between specific properties and air safety contours (see Appendix 13-6 for a full listing of land use compatibility guidelines).

All lands in the vicinity of Fort Dix, McGuire and Lakehurst are zoned by their respective townships and boroughs. Jurisdictions responsible for zoning designations, maps, and associated ordinances adjacent to the Joint Base include New Hanover Township, North Hanover Township, Pemberton Township, Springfield Township, and Wrightstown Borough in Burlington County; and Jackson Township, Manchester Township, Lakehurst Borough and Plumsted Township in Ocean County. Because of the extensive land coverage and vast differences among the zoning designations of different jurisdictions, composite or generalized zoning designations for all lands surrounding the military installations were created and are provided in Section 7.

Accident Potential Zone Impact Compatible land uses/zoning within the various air safety zones around the Joint Base, specifically, McGuire AFB and NAES Lakehurst are presented in Table 6.7. Guidelines strongly discourage any uses within the Clear Zone around airfields due to the risk of an aircraft mishap. However, certain non-residential activities can maintain compatibility with designated Accidental Potential Zones.

These compatibility guidelines are standards only and do not determine acceptable uses of land within communities. Only local governments have the authority to establish permissible land uses and to define the relationship between specific properties and noise or safety contours (see Appendix 13-6 for a full listing of land use compatibility guidelines).

The APZ for the Joint Base and the zoning classifications for the surrounding municipalities is shown in Figure 6.19. Joint Base APZs have not changed from the baseline condition; residential uses presently exist within and adjacent to the APZs. Residential uses and certain business types are typically not recommended as compatible in the APZ, with some exceptions

Table 6.7 Air Safety Compatibility Guidelines

LAND USE	APZ 2	APZ 1	CLEAR ZONE
Households	C	N	N
Industrial	Y	Y	N
Retail	Y	N	N
Personal Services	Y	N	N
Public Services	C	N	N
Outdoor Recreation	C	C	N
Agriculture	Y	Y	C

Table is a summary of the DOD Compatible Land Use Guidelines for Clear Zones and APZ.
(U.S. Army, 1981). See Appendix for complete Table and suggested compatibility restrictions.
Y = Compatible use
C = Conditionally compatible use (see Appendix 13.6)
N = Non-compatible use

in APZ Zone 2. The suggested maximum density is one to 2 dwelling units per acre, possibly increased under a Planned Unit Development where maximum lot coverage is less than 20 percent.

APZ 1 for McGuire AFB extends northward into Wrightstown Borough, North Hanover Township and New Hanover Township. The majority of land in this zone is agricultural and forest. Wrightstown Borough and North Hanover Township both have areas zoned residential within APZ 1. APZ 2 extends further into North Hanover and New Hanover Townships. The majority of land in APZ 2 is agricultural, however there are several areas zoned residential.

The APZ 1 for McGuire AFB extends south into a small portion of Pemberton Township zoned high-density residential. The APZ 2 for McGuire AFB extends into the Browns Mills portion of Pemberton Township and encompasses an area zoned medium to high-density residential and commercial and business. Further development in these areas surrounding McGuire AFB should be evaluated with regard to the existing and projected APZ.

The APZ 1 and 2 for NAES Lakehurst extend northwest into an area of Jackson Township zoned as preservation; an area that is compatible with these zones. APZ 1 and 2 for NAES Lakehurst extend northeast into an area of Jackson Township zoned as residential; an area that is suggested as non-compatible. Further development in these APZ zones surrounding NAES Lakehurst should be evaluated with regard to the existing and projected APZ.

The APZ 1 and 2 for NAES Lakehurst extend southwest into an area of Manchester Township zoned as preservation; an area that is compatible with these zones. NAES Lakehurst APZ 1 extends southeast into Manchester Township and Lakehurst Borough. The area within APZ I and Manchester Township is zoned as preservation and is compatible in this APZ zone. The area within Lakehurst Borough is zoned as high-density residential and industrial. A portion of APZ 1 within Lakehurst Borough falls within Joint Base boundaries and is used for Navy housing. APZ 2 extends southeast of Lakehurst NAES further into Lakehurst Borough and Manchester Township. Lakehurst Borough zoning within APZ 2 is mostly high-density residential and business and commercial. The APZ for NAES Lakehurst Runway 15/33 is not currently active, as the number of air operations on the crosswind runway is <5,000 annually. Further development in these APZ zones surrounding NAES Lakehurst should be evaluated with regard to the existing and projected APZ.

The area of the APZ zone within Jackson Township falling within the Pinelands Area is subject to the Pinelands CMP. Both the Pinelands Commission and the township encourage, and in certain cases mandate, cluster development. Increased residential density around the Joint Base, especially in APZ, may result in safety concerns by placing additional residents in areas susceptible to adverse impacts, and may create additional operational challenges and concerns.

Conclusions The Townships of Jackson and Manchester have areas zoned for residential use, including medium density residential, near safety impacts associated with NAES Lakehurst. The western part of Lakehurst Borough is subject to air safety risks should flight patterns increase from Runway 15/33; however this is not currently anticipated.

Zoning patterns around the installation in Burlington County have zoned land mainly for agricultural purposes, requiring a relatively large tract size for each residence resulting in lower residential density. A few residentially-zoned tracts are located in New Hanover and North Hanover Townships in areas that are near the safety impacts associated with the Joint Base. The exception is the Browns Mills area of Pemberton Township, which has areas zoned for high density residential (according to JLUS composite zoning) and commercial activity in areas that are near the APZ zone for McGuire AFB. Land use and zoning decisions within the Air Safety Zones should be assessed for compatibility.

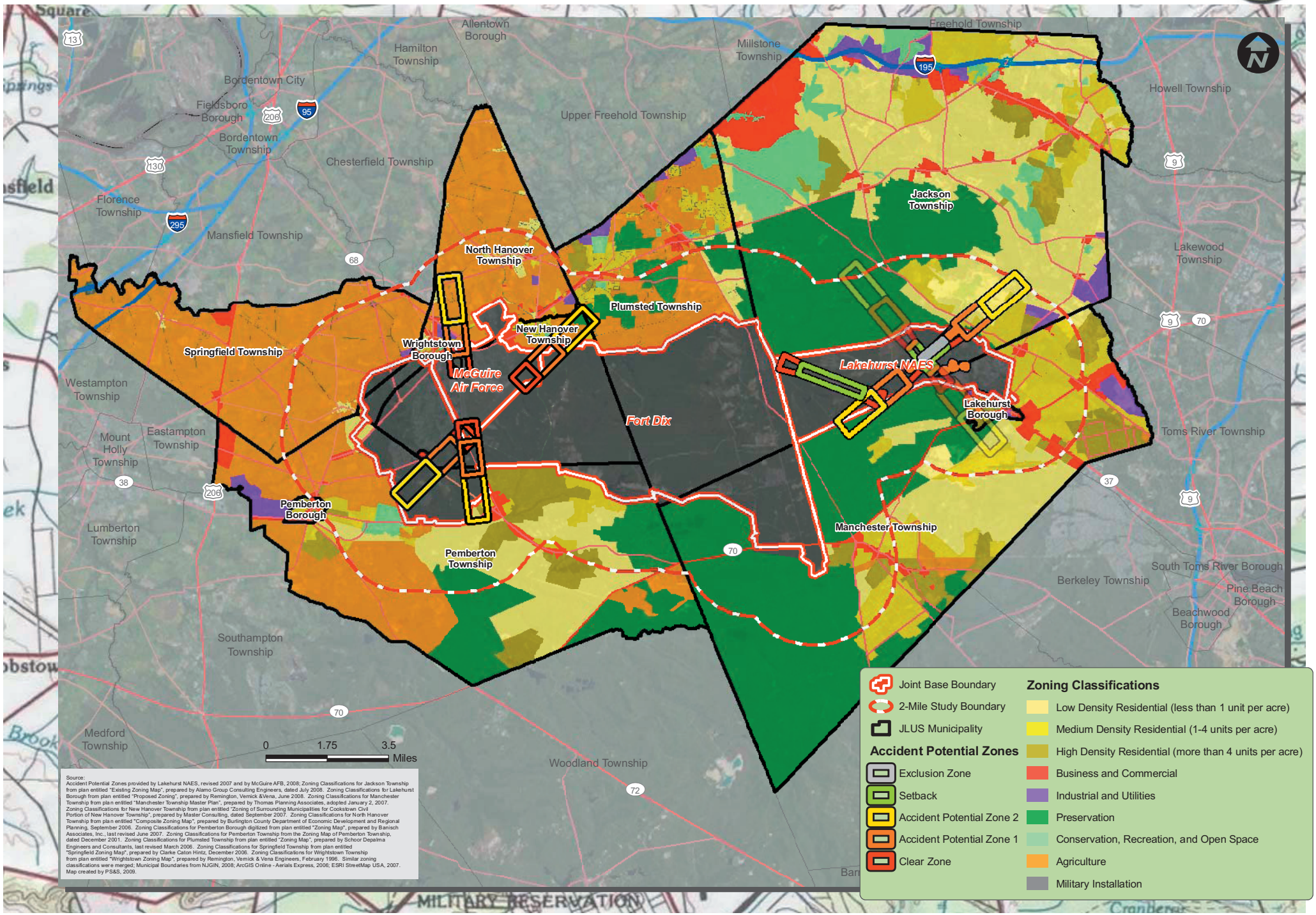



Figure 6.19 - Accident Potential Zones with Surrounding Zoning