

Onslow County
**Joint Land
Use Study**

February 2003

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This study was prepared under contract with Onslow County, the City of Jacksonville, the Town of Holly Ridge, the Town of North Topsail Beach, the Town of Richlands, the Town of Swansboro, Marine Corps Base Camp Lejeune, and Marine Corps Air Station New River, with financial support from the Office of Economic Adjustment, Department of Defense. The content reflects the views of Onslow County, the City of Jacksonville, the Town of Holly Ridge, the Town of North Topsail Beach, the Town of Richlands, the Town of Swansboro, Marine Corps Base Camp Lejeune, and Marine Corps Air Station New River, and does not necessarily reflect the views of the Office of Economic Adjustment.

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Town of Richlands
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Marine Corps Base Camp Lejeune
Marine Corps Air Station New River

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Introduction

Though Marine Corps Base Camp Lejeune was originally located far from cities and towns, it has generated economic activity that has surrounded it with civilian communities, which support and are supported by the Marine base. In communities that are immediately adjacent to the base, the number of residents and business owners exposed to the negative impacts of military training activities such as noise and safety risks has increased. As development continues and spreads farther into the areas immediately surrounding Camp Lejeune, encroachment and incompatible land uses have created conflicts with these training activities.

Planning efforts that simultaneously engage representatives of a military installation and the adjacent civilian communities can stimulate discussions regarding the potential for land development conflicts and encroachment problems, as well as address current conflicts and offer solutions for dealing with them. Such planning activities have been conducted in areas throughout the United States utilizing the Joint Land Use Study (JLUS) program, which was developed in 1985 to provide financial and technical incentives to help resolve the conflicts between mission objectives and community growth patterns. These studies provide an opportunity to identify changes that might be made on the part of both the civilian communities and the military installation in order to minimize conflicts and prevent future conflicts. Without this, an alternative solution can bring less desirable results: pressure on the military base to eliminate practices that cause noise and safety impacts can result in a reduction of mission assignments and a corresponding reduction in economic benefits to the community brought by Marines and others living and working on the base. Finding ways to minimize conflicts without reducing the quality of life or effectiveness of either party ensures that both the civilian communities and the Marine base benefit.

To achieve this cooperative planning effort, a Joint Land Use Study has been undertaken for the area immediately surrounding Camp Lejeune. Taking part in the study are Onslow County, the City of Jacksonville, the Town of Holly Ridge, the Town of North Topsail Beach, the Town of Richlands, the Town of Swansboro, Marine Corps Base Camp Lejeune, and Marine Corps Air Station New River, with financial support from the Department of Defense.

Historic Overview

Marine Corps Base Camp Lejeune was first established in Onslow County in September, 1941, when the 1st Marine Division set up camp in response to a need for an East Coast amphibious training facility. The base, which began as an 11,000-acre tract of land purchased by the War Department, has grown over time into a premier military training facility, which includes the satellite facilities at Camp Geiger, Camp Johnson, Stone Bay, and the Great Sandy Run Area. The addition of the Great Sandy Run Area (GSRA) in 1992 increased the size of the base by 41,000 acres, bringing it to its current size of 246 square miles. Today, 47,000 active duty Marines are stationed at Camp Lejeune, and military forces from around the world come to Camp Lejeune on a regular basis for special training.

Marine Corps Air Station New River, delineated in 1944, started as an airfield within the original tract of land purchased. Today, MCAS New River occupies 2,600 acres of the federal land in Onslow County. It is considered the premier helicopter air station.

As the base grew, so did the neighboring cities and towns. The City of Jacksonville, which is the largest of the municipalities in Onslow County in terms of geographic area and population, adjoins Camp Lejeune on the north side. It is home to almost 70,000 people and Carolina Coastal Community College, and is considered the commercial hub of the county. Much of its growth is due to the presence of Camp Lejeune and its proximity to the base's main gate.

Swansboro to the east, a quaint coastal town that began as a colonial port in the 1700s, is one of the oldest municipalities in the county and home to approximately 1,500 residents.

Holly Ridge, North Topsail Beach, and Surf City to the southwest together have a population of about 3,000. In close proximity to the beaches and Wilmington, NC, these towns have attracted both full-time and seasonal residents.

While it does not adjoin the base, Richlands is home to just over 900 people. This town, too, is experiencing some residential growth due to its proximity to Camp Lejeune and the coast.

Camp Lejeune has strong ties to the surrounding communities in the cities, towns, and unincorporated areas. Many of the 150,000 residents of Onslow County are active duty officers and their dependents, retirees, or civilians employed on the base. Marine Corps Base Camp Lejeune also plays a major role in the economy of Onslow County, with a total impact of more than \$2.3 billion a year. Wages and salaries to Marines, Sailors, civilians, and retired military personnel make up \$1.4 billion of this impact. Construction contracts and the purchase of material, supplies, and services contribute an additional \$100 million to the local economy. Charity drives such as the Combined Federal Campaign, as well as the sale of timber harvests, are means for donating funds to the local community.

Recently, changes in military training activities and increases in area population have resulted in an increase in the impacts, real and perceived, of military training activities on the surrounding communities, and vice versa. The decision to conduct the Onslow County Joint Land Use Study was based on a need to minimize these impacts and address current and long-term concerns.

Purpose of Study

This eight-month study is meant to use cooperative land use planning to address short- and long-term issues and conflicts between the military and civilian communities in the areas surrounding Camp Lejeune in Onslow County. It also aims to reduce military impacts within the study area in order to improve quality of life and spur economic development.

Study Area

The study area for the JLUS was defined by the Policy Committee before the study began. The boundary is completely contained within Onslow County and generally includes all areas within one mile of the boundaries of Camp Lejeune. In addition, the low level training routes, portions of flight tracks in and out of the base's impact areas, and areas outside the one-mile area that are known to be experiencing noise and/or vibration impacts were included. The study area was defined for the sole purpose of describing a project scope, focusing the consultant team's attention on a specific geographic area for the JLUS, and it is displayed on the JLUS Study Area Map (See Map 1).

Planning Process

The Joint Land Use Study was conducted over an eight-month period during which the Team conducted interviews, extensive research, and plan and policy review, and later developed recommendations and implementation strategies to address the issues identified. The process was guided by a 13-member Policy Committee (See Appendix II) and was structured around a public participation process that included seven forums held in various locations throughout the Study Area. The following phase descriptions outline the process in detail.

Public Forum Schedule

Forum One

- July 17, 2002 (Jacksonville)

Forum Two

- August 20, 2002 (Dixon)
- August 21, 2002 (Jacksonville)
- August 22, 2002 (Swansboro)

Forum Three

- November 19, 2002 (Dixon)
- November 20, 2002 (Jacksonville)
- November 21, 2002 (Swansboro)

Phase One: Project Initiation

Phase One began with a Study Area Tour and Policy Committee Meeting on June 19, 2002 to establish project goals, develop a key stakeholders list, review materials provided by the County and Marine Corps Base Camp Lejeune, and discuss the Project Schedule.

Phase Two: Existing Conditions Analysis and Mapping

To prepare for and begin Phase Two, the Project Team reviewed data, reports, plans, and other relevant documents needed for the study. On July 17, 2002, the Consultant Team conducted interviews with key stakeholders to verify and supplement the data already reviewed. During this one-day visit, the Consultant Team also attended the initial Public Forum to meet members of the community and participate in describing the project process to the attendees with a brief presentation.

A Policy Committee Meeting and the Second Forum followed on August 21, 2002. The Team took the lead in conducting the forum and engaged attendees in a discussion designed to obtain specific input.

Also as part of Phase Two, the Team reviewed local ordinances, codes, and other regulations, and evaluated whether language in each lessens or increases the potential impacts that military operations have on adjacent land uses within the Study Area. The Team collected from the County

and reviewed a summary of proposed infrastructure and community facility improvements within the Study Area.

Phase Three: Future Conditions Analysis and Issues Identification

Phase Three included additional analyses that led to the identification of issues and a set of preliminary strategies for addressing the issues. The Team met with the Policy Committee and Technical Advisory Committee in October to discuss the proposed strategies, and to generate ideas for a process to continue and improve dialog between USMC officials, local government, and concerned citizens.

Phase Four: Recommendations and Implementation Strategies

As part of Phase Four, the Team identified existing and potential policies and regulations that could reduce conflicts between developing uses and military operations. Implementation strategies were developed through discussions with Staff, the Policy Committee, and the Technical Advisory Committee. Recommendations include suggestions for modifications to existing policies and military activities.

In November, the Third Public Forum was held. The Team took the lead in conducting the public forum, and presented draft recommendations and implementation strategies for feedback.

Phase Five: Final Report Process

The Team compiled and delivered all portions of the draft report, including changes derived from comments received from the Policy Committee and Technical Advisory Committee during the process. The Team received and reviewed comments from the County and all others responsible for reviewing the draft report. Based on comments received through a discussion with the Policy Committee, the Team finalized and delivered the report.

Goals

Early in the process, two primary objectives were defined:

1. Encourage cooperative land use planning between military installations and the surrounding communities so that future community growth and development are compatible with training or operational missions of installations.
2. Seek cooperative means to anticipate and minimize military operational impacts on adjacent lands and surrounding communities.

Building on these objectives, the Policy Committee established the following goals for the Study.

- Protect the military mission and the viability of the military base.
- Establish a clear vision for the future of the study area.
- Through a successful public participation process, create a plan that:
 - takes into consideration the needs of the community as well as the needs of the military
 - reflects the vision as described by the community
 - attempts to balance competing interests
 - is based on models, local input, etc., and leads to modification of policies and ordinances
- Heighten awareness of the military's plans and activities as well as awareness of the base as an economic engine.
- Identify opportunities to create partnerships for the protection of land around Camp Lejeune.
- Develop a method for disclosure, making home buyers and financial institutions aware of impacts of activities at Camp Lejeune on adjacent/nearby properties.
- Establish implementation strategies and a committee to carry out those strategies.

Existing Conditions

Current Development Patterns and Activities

Development activity is occurring in Onslow County, but most of it is in response to relocation of existing population rather than high population growth. Though it was among the 19 most populated counties in North Carolina in 2000, Onslow County was ranked 97th out of 100 in the state in population growth over the past decade.

Population growth in Onslow County appears to have slowed dramatically over the past 10 years;

a growth rate of 32.9% from 1980 to 1990 was high in comparison to the growth rate of 0.3% between 1990 and 2000 (NC State Demographic Dept.). In 1990, the county was among those categorized as high growth, high in-migration counties. The number of births was six times greater than the number of deaths, and net migration was 10,227.

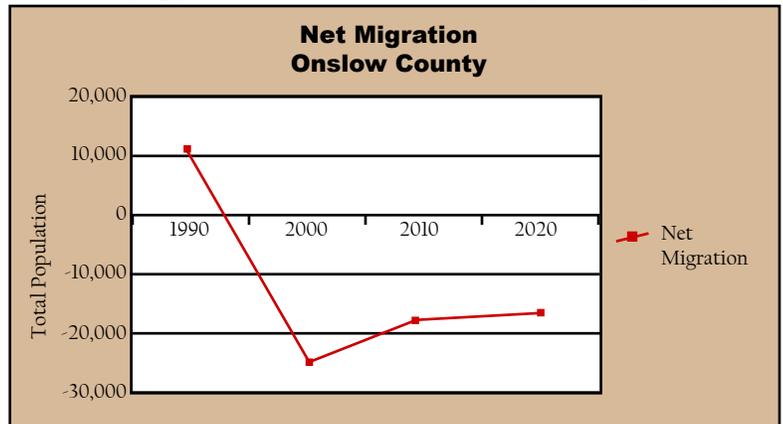


Figure 1: Net Migration, 1990-2020

Source: North Carolina State Data Center, Census Data

In 2000, the county was at the bottom of the growth scale, categorized as a county with extreme natural increase (births) and out-migration. The number of births was still nearly six times the number of deaths, but net migration was -25,221 (See Figure 1). The growth rate of 0.3% from 1990 to 2000 reflects that balance between births and people moving out of the county.

The 10 years of high growth followed by 10 years of almost no growth is partially due to changes in military population. Military decisions and activities tend to affect population growth in areas where military installations are located. The actual circumstances are unclear. An examination of the county's population less the population in military group quarters revealed a different rate of growth in the same time period, but the difference in the two growth rates is much less: a 28% increase from 1980 to 1990 as opposed to 32.9%, and a 13% increase from 1990 to 2000 as opposed to 0.3%. These numbers represent a less dramatic difference in the growth rate and are closer to the State's growth rates for the same years (See Figure 2).

According to the Office of State Planning, the County's growth rate is expected to increase slightly between 2000 and 2010, and then remain constant to reach an anticipated county wide population of 166,376 in 2020, approximately 10% more people than the current number of approximately 150,000 (See Figure 3).

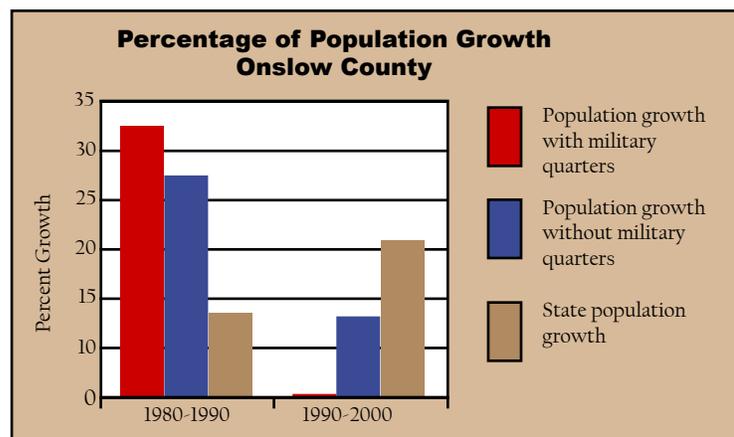


Figure 2: Population Growth Rates, 1980-2000

Source: North Carolina State Data Center, Census Data

Recent development activities in Onslow County are primarily in response to a growing demand for new housing. While people moving into the county generate some of the demand, a larger percentage is generated by existing county residents and military personnel choosing to relocate to a different community within the county. Buyers include many people associated with the base,

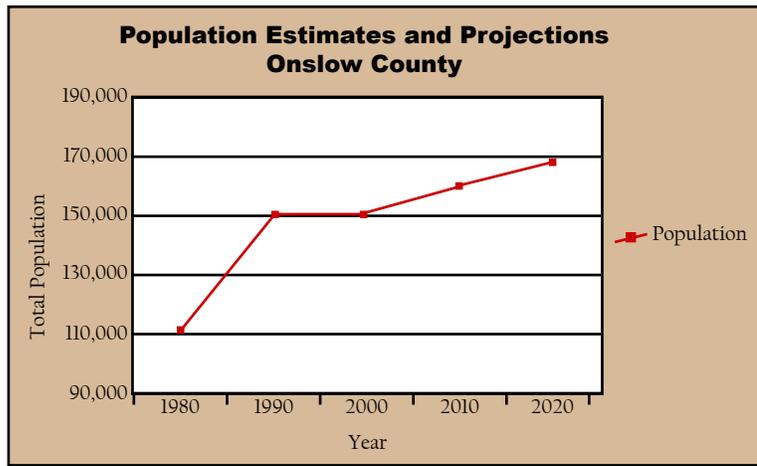


Figure 3: Onslow County Population, 1980-2020
 Source: North Carolina State Data Center, Census Data

including retired military personnel, active military personnel wanting to live off the base, and civilians who work on the base. Most buyers (about 90%) are able to purchase new homes easily using VA entitlement, which requires no down payment.

Those who have relocated to Onslow County from other

counties or states are attracted to Onslow County for a variety of reasons. Among the major factors influencing decisions to move to Onslow County are the following:

- Weather
- Low density development
- Proximity to waterfront
- Recreational opportunities
- Affordability (in comparison to nearby waterfront communities, such as Wilmington and New Bern)
- For retired military personnel, a desire to be near the services at Camp Lejeune
- For parents of active duty officers, an opportunity to live near their children



According to local realtors, residential development is on the rise in the northern and eastern portions of the county. The high growth areas in the study area are in and around the cities of Jacksonville and Swansboro, and in the communities of Sneads Ferry and Verona (See Map 2: Population Comparison Map). Local realtors have indicated that, while people moving into the Sneads Ferry community tend to be civilians with no military connection, those moving into Swansboro and areas east of the base (or “east of the river”) are typically retired military personnel or civilians employed by Camp Lejeune. Their

location decisions are influenced by a perception that the east side is closer to the main gate of Camp Lejeune. Some believe that this will change when the Bypass is complete (See Transportation section). In addition, with its proximity to the waterfront, its location halfway between Cherry Point and Jacksonville (good for couples commuting in opposite directions), and its historic center, Swansboro has become an attractive place for current county residents to relocate to, particularly from Jacksonville.



Development in North Topsail Beach, incorporated in 1990, has risen moderately due to a favorable economic recovery in real estate and a stable weather pattern since 1999. This community is a popular destination with ample public access.

Areas west of Camp Lejeune and around Holly Ridge are growing slowly. The lack of amenities

Top Ten Major Employers in the County:

- United States Marine Corps
- Onslow County Schools
- Marine Corps Community Services
- Onslow County Government
- Coastal Carolina Community College
- Onslow Memorial Hospital
- Convergys Corporation
- City of Jacksonville
- Ecom
- Stanadyne Automotive Corporation

Source: Onslow Chamber of Commerce, September 2002

and utilities contributes to the lack of development in this location.

Developers are attracted to sites within the study area because many of these sites are accessible to the amenities buyers are looking for, and the raw land is inexpensive, which means the developers can reduce overall development costs while providing a desirable product at a reasonable rate.

As a result of increased demand for housing, sale prices have risen. In Jacksonville, for example, high-end housing has soared from the upper \$100s to approximately \$400,000 in the last eight years.

Existing policies, regulations, environmental conditions, and market demand are among the factors shaping recent development patterns. In contrast to the development patterns of the past, which consisted of a mix of uses in traditional urban centers surrounded by rural/agricultural areas, current development patterns are characterized by single-use development in the form of low-density residential subdivisions and commercial strip development along the county's major thoroughfares (See Map 3: Existing Land Use Map). Very little industrial development exists within the county, but what does exist is primarily inside or at the edge of the study area. Some of these industrial businesses and operations are among the major employers within the county.

Within the study area, the following settings can be found:

- Urban – the relatively dense, historic town centers of Jacksonville and Swansboro
- Suburban – the residential communities in the unincorporated portions of the County, such as Hubert, Bear Creek, Sneads Ferry, and Verona, that are comprised primarily of single-family residential subdivisions, but include individual parcels carved out incrementally for home sites, such as those along NC 172 between NC 24 and Camp Lejeune's east gate
- Oceanfront – low-density residential development along the beach, such as that found in North Topsail Beach
- Rural – the relatively undeveloped or agricultural areas, such as those west of US 17
- Commercial Corridor – continuous, one-parcel-deep, roadside commercial development, such as that found along NC 24
- Marine Corps Base Camp Lejeune

Existing Development Regulations, Plans, and Policies

Onslow County and a number of its municipalities have some form of adopted land use or development plan. Likewise, these municipalities have also adopted a variety of development regulations including zoning, subdivision, flood protection requirements, and others.



Urban Setting



Ocean Front Development



Rural Areas



Commercial Corridor



Camp Lejeune

Collectively these documents represent the expressed public policy with regard to how each of the respective jurisdictions desires to grow and develop. Plans set the communities' expectations, and ordinances are structured to implement those expectations.

A summary analysis of these various documents reveals several characteristics or potential conflicting situations that relate to this study. First, and probably most significant, is that the current adopted plans rarely, if ever, mention the existence of Camp Lejeune or New River Air Station, much less describe any of the activities on these facilities that may have an impact on nearby civilian land. This is most unusual since the military presence dates back some 50+ years and the Great Sandy Run base addition roughly 10 years. This omission may be due, in part, to the fact that many of the adopted plans follow a format prescribed by the Coastal Area Management Act (CAMA), which focuses on coastal, flooding, and environmental issues. There is virtually no acknowledgement in adopted plans of the land use issues and potential conflicts that naturally occur between military activities and nearby civilian activities.

Second, the adopted plans often call for or advocate various development futures which, if carried out, could create additional potential conflicts with base operations and vice versa. A careful review of these prescriptions should focus on clarifying areas that are appropriate or inappropriate for certain types of land uses.

Third, and not surprisingly, local development ordinances also lack any development restrictions or provisions relating to civilian activity around and near the bases. Without any policy guidance from adopted plans, ordinances focus on the typical issues that they are drawn to regulate with no particular provisions that acknowledge or create any special expectations with regard to development near the bases.

Finally, the basic ordinance framework that exists in the various jurisdictions can form a basis for new or revised standards to relate civilian development activities to military operations with an objective of minimizing future conflicts. There may be opportunities to jointly develop ordinance provisions to address a variety of issues, thus saving local staff resources and local tax dollars. Then, it would be up to each separate jurisdiction to consider and adopt, through a public process, those provisions that best suit the needs and expectations of each community for future growth and development.

Utility Infrastructure

Water

Public and private utilities provide water service within the study area, including Onslow County, the City of Jacksonville, the Town of Swansboro, North Topsail Water and Sewer, Inc., the Town of Holly Ridge, and Kenwood Homes Development. Service is provided to several smaller, specific developments (generally with on-site systems) by private utility companies. Water is currently obtained from aquifers. However, new restrictions on pumping water from some aquifers in several coastal counties dictate that the amount of water pumped from these aquifers be reduced by up to 75% over the next 16 years. These restrictions will require that the study area's water needs be met by providing water from other sources, such as quarries, surface waters, and wells in other, more plentiful aquifers, and potentially from Camp Lejeune's excess capacity. The cost of using these alternative sources for water can be very high and will have a significant impact on the County's long range utility plans.

Sewer

Roughly 20 to 25 percent of the study area currently lies within the existing centralized sewer service area boundaries (See Map 4: Existing Sewer Infrastructure Map). The majority of the remaining sections of the study area have generally unsuitable soils for on-site septic, particularly the southwestern area bordering Pender County. This presents limitations for anything other than low-density residential development. Sewer service that is available is provided by both public and private utilities. The goals of the newly created water and sewer authority (Onslow County Water and Sewer Authority, or ONWASA) to provide county-wide sewer service implies that in the long run, sewer service can and will be provided wherever relevant land use plans recommend development. In the short run, funding availability for sewer extensions will determine the timing, priorities, and direction of extensions.

ONWASA

ONWASA's primary purpose is to provide water and sewer service to all new development in the County, and to serve existing development where septic and private sewer systems have failed or are failing. Onslow County, the Town of Swansboro, the Town of North Topsail Beach, and the Town of Richlands have agreed to participate as full-service members. Neither the Town of Holly Ridge nor the City of Jacksonville has determined whether it intends to be a full-service, wholesale, or customer-provider participant. Such decisions will be based on the findings stated in the Water and Sewer Resources Plan.

The Water and Sewer Resources Plan, a draft of which was completed in October 2002, will help the ONWASA Board determine whether new or expanded water and sewer plants will be required, and it will be the basis for identifying priorities for the extension of services. The plan will also be instrumental in determining the need for alternative water sources, taking into consideration the State's aquifer mandate. According to Ron Coy, a consultant to ONWASA, Camp Lejeune has agreed in principle to make available some portion of the Camp's excess water and sewer system capacity to ONWASA; connection points have not yet been determined, but the final draft of the Resources Plan will identify the points that should be considered first from a cost-effectiveness standpoint.

ONWASA is expected to be functioning by 2003 and fully operational by January 2006. ONWASA anticipates moving forward with water and sewer projects, as identified in the Water and Sewer Resources Plan, which could include extension of new service in the study area. Extension priorities will consider the recommendations of the Joint Land Use Study and the County's Comprehensive Plan.

Transportation

The accessibility of an area's transportation network is a key determinant of future growth and development; therefore, the transportation network is a key component of the infrastructure that plays a role in determining land use patterns. An interstate highway, for example, stimulates development activity along its corridor, permanently changing the orientation and intensity of development in the communities through which it passes. The lack of interstate highways, which translates into less accessibility, in Onslow County is likely a primary reason for the lower rate of growth and economic development compared to other counties in North Carolina.

The portion of the county's transportation network that lies within the JLUS study area is comprised of federal, state, and local roads, a number of disconnected sidewalk systems, and a rail line used only for military purposes. Transit services are provided by Onslow United Transit Systems (OUTS), Inc., a private non-profit corporation that provides transportation services to clients of public and private non-profit human service agencies within Onslow County. Currently, the City of Jacksonville is contracting with OUTS to provide the only fixed route service in the County. The service consists of a van that travels in a loop within the city limits, stopping at major commercial and employment destinations as well as neighborhoods. The City of Jacksonville is preparing a Transit Implementation Plan, which will be presented to the City Council in 2003, and will address options for routes, vehicles, and areas served.

Roads

While the road network is extensive in the urbanized areas, the local roads outside of the downtown areas are disconnected, forcing local traffic onto the highways. The major north-south route, US 17, connects Jacksonville to points south, such as Wilmington. NC 24 is primarily an east-west route linking Jacksonville to Swansboro, Cherry Point, and other towns to the east. NC 172 is also an east-west route passing through the southern part of Camp Lejeune. It is part of a series of roads that parallel the NC shoreline connecting coastal cities and towns. The USMC is dependent on some of these thoroughfares, such as NC 24, which it uses to move troops quickly and easily to Morehead City for deployment.

The Jacksonville Urban Area Transportation Plan Update 2000-2025 (1999) indicates a need for a variety of roadway improvements that would affect future development in the study area. Of the major thoroughfare projects listed, several are in or near the study area and are currently included in the Draft 2004-2010 North Carolina Transportation Improvement Program (TIP). The project that would have the greatest impact on the direction of development in the study

area in the near future is the Jacksonville Bypass, an eight-mile, four-lane, divided roadway under construction on the southeast side of Jacksonville. This roadway will improve access to the base's main gate from the west side, making the west side a more attractive location for new development. Construction has begun on this project, which is funded by the National Highway System and the Highway Trust Fund. The expected completion date is 2006 (See Map 5: Bypass Map provided by Jacksonville Area MPO).

Pedestrians and Bicycles

Currently, pedestrian and bicycle facilities (i.e. sidewalks and trails) in the study area are limited to the urbanized areas, such as Jacksonville. With the adoption of a Comprehensive Sidewalk Plan (1999) and the Jacksonville Urban Area Greenways Master Plan, providing pedestrian and bicycle routes that are safe and that are a reasonable alternative to vehicular transportation has become a priority for the City of Jacksonville. Two related projects are currently included in the Draft 2004-2010 TIP: the US 17 USMC Rail Trail and the Lejeune Boulevard Greenway.

Rail

Rail service has been discontinued in Onslow County; the Seaboard rail line was abandoned in the 1990s. The USMC utilizes a Department of Defense rail line between Camp Lejeune and Cherry Point to transport equipment between the base and Morehead City.

Civilian Air Traffic

Air transportation in and out of the county is available via Albert J. Ellis (Ellis) Airport, located along Route 111, northwest of the JLUS study area. Ellis Airport is an uncontrolled facility (i.e. no air traffic control tower) that accommodates both commercial and general aviation operations. Aviation facilities at Ellis Airport include a single, 7,100-foot runway (Runway 5/23); one ten-unit T-hangar; a 21,600-square-foot passenger terminal facility; fueling facilities; and emergency response equipment. The airfield currently exhibits no significant encroachments by incompatible uses. Surrounding land uses are primarily rural in character, including agriculture, forested areas, and sparsely developed commercial and residential uses.

Commercial passenger operations at Ellis Airport have exhibited a decline over the last decade associated with the restructuring of airlines serving the region. Currently, only a single carrier serves the airport, US Airways Express, which provides service to Charlotte, NC. Annual passenger enplanements, which peaked in 1988 at over 109,000, were reduced to 29,500 by 2001. Planned improvements at the airport are targeted to attempt to progressively recapture a portion of previous levels of passenger activity, with a projected growth to almost 100,000 annual enplanements by the year 2020.

Similar to other airfields across the country, military aircraft (such as USMC and other branches) periodically use Ellis Airport for training, such as for touch-and-go operations. Typically, military operations total an average of 8,000 per year (out of roughly 38,000 total annual operations at the airport), and are expected to remain at this level into the foreseeable future.

Based upon review of the Ellis Airport Master Plan and discussions with airport personnel, military operations at New River and Camp Lejeune have had little impact on civilian air traffic utilizing Ellis Airport. Several of the areas surrounding the airport are designated as special use airspaces associated with military operations (e.g., restricted areas, military operating areas, etc.), which allow non-participating civilian aircraft and have procedures to advise commercial and general aviation operators in navigating through them. There have been no reported mishaps associated with conflicts between civilian and military operations at the facility in at least a decade. Ellis Airport administration, both through participation in the JLUS process and in other forums, monitors military operations in the region regarding their affect on the airport.

Environmental Conditions

Onslow County is located in the lower coastal region of North Carolina, having a generally flat terrain. The county, particularly in the portion closest to the shore where the study area is located, is in a region with various environmental constraints for development and is subject to the State's Coastal Area Management Act (CAMA) requirements. As evidenced by the policies outlined in the 1997 Land Use Plan, Onslow County values its natural resources that enhance the environment and encourage tourism and other economic activities. The North Carolina Coastal

Resources Commission (CRC), which adopts rules and policies for meeting the requirements of CAMA, has recently developed a new set of guidelines to be used in the development of CAMA Land Use Plans. The new guidelines call for the preparation of a land suitability analysis upon which the CAMA Land Use Plan is to be based. Among the many environmental factors to be considered in a suitability analysis – and any development decision in this area – are flood zones, wetlands, estuarine shorelines, Outstanding Resource Water shorelines, protected lands, historic and archaeological sites, Natural Heritage Inventory sites, and soils.

Flood Zones are primarily located along the river bottoms, tributaries, and pocosins (defined as designated areas suffering from an overflow of inland or tidal waters). The following types of flood zones limit development in the study area:

- Storm Surge Area – The storm surge area is an abnormal increase in the ocean's level, which can come to shore up to five hours before the storm and be as destructive as the storm. Storm surges are particularly damaging during high tides and in low elevation coastal areas and can encompass vicinities of up to 100 miles wide.
- 100-year floodplain – The 100-year floodplain is the flood elevation that has a one percent or greater chance of being equaled or exceeded each year. The 100-year floodplain is also known as “areas of special flood hazard” and “Zone A.”
- 500-year floodplain – The 500-year floodplain is the flood elevation that has a two tenths of a percent or greater chance of being equaled or exceeded each year.
- Velocity Zone (V-Zone) – The V-Zone is associated with the 100-year floodplain and has an additional risk associated with storm waves.

The Federal Emergency Management Agency (FEMA) is an independent federal agency that works in partnership with other organizations that are part of the nation's emergency management system. FEMA gives assistance to states, communities, businesses, and individuals in disaster situations, such as flooding, and manages the national flood insurance programs. Of these flood zone types listed above, FEMA is primarily concerned with preventing losses associated with flooding in the 100-year floodplain and the V-zone. Accordingly, Onslow County's Flood Damage Prevention Ordinance limits development by setting forth design standards for structures built within these two zones related to building elevation and flood proofing. (See Map 6: Flood Zone Map.)

Wetlands have a number of properties that qualify them as significant natural resources that should be preserved and protected from development. They provide recharge areas for groundwater, serve as filter traps for sediment, pesticides, and other pollutants, provide a natural, non-structural flood control, buffer against shoreline erosion, serve as buffer zones between upland activities and valuable aquatic systems, and provide habitats for wildlife. A detailed analysis of the wetlands in Onslow County has been performed. The Division of Coastal Management (DCM), which serves as staff to the CRC, has employed a wetland functional assessment procedure, the North Carolina Coastal Region Evaluation of Wetland Significance (NC-CREWS), to rate the various types of wetlands present in the County. However, for the purposes of this study, coastal wetlands have been distinguished from other types of wetlands because they are more fragile and sensitive to development.

Estuaries are the part of the river, stream, or other body of water that connects with the open sea. These areas require protection because they support valuable coastal habitats, such as shellfish habitats, and provide areas for recreational activities. While estuarine waters are defined as the dominant component linking the entire estuarine system, the estuarine shorelines are especially critical as they are susceptible to erosion, flooding, and other effects of wind and water. Development is restricted along these shorelines (75' landward of the mean high water level) because in their natural state, they serve as buffers maintaining water quality, minimizing impacts due to flooding and erosion, and protecting wildlife habitats in these areas.

Outstanding Resource Waters (ORW) are waters that are considered to be valuable marine resource areas. They have clean, pristine waters and are significant recreational and natural resources. Within Onslow County, the Bear Island and Stump Sound areas are designated as outstanding water resource areas. The ORW shorelines include land within 575' of the mean high water level of ORW-designated waters. A limited amount of development is permitted in these areas, as they

serve as buffers in their natural state.

Protected Lands, as defined by the Center for Geographic Information and Analysis that supplied the data, are areas managed for conservation and open space, such as property owned by federal, state, local, and nonprofit entities. The use and/or management of these lands permanently precludes private development on them. Within the study area, local and state parks and conservation easements are included among the protected lands. (See Map 3: Existing Land Use Map.)

Historic and archaeological sites provide unique and irreplaceable assets that serve as educational resources for North Carolina's coastal heritage. Within the designated archaeological sites are undisturbed and significant archaeological remains, typically located along and near creeks, rivers, and streams. Development near these sites must be sensitive to the potential impacts on these sites. In Onslow County, there are 12 districts on the National Register of Historic Places, five of which are within or near the study area. They are

- Band of Onslow and Jacksonville Masonic Temple District, Jacksonville
- Mill Avenue Historic District, Jacksonville
- Pelletier House and Wantland Spring District, Jacksonville
- Southwest Historic District, Waltons Store
- Swansboro Historic District, Swansboro

(See Map 7: Heritage / Conservation Map.)

The North Carolina Natural Heritage Program of the Division of Parks and Recreation identifies ecologically significant natural areas in the state. These areas, Natural Heritage Inventory sites, are selected for preservation because they provide important habitat for rare and endangered species or because they contain examples of the rich natural diversity of North Carolina. This program has designated 49 significant natural heritage areas in Onslow County (ranked third among the 100 counties in the number of natural heritage areas). The many significant natural areas that have been identified include the high quality tidal marsh systems as well as the Great Sandy Run and White Oak Pocosins. Development in these areas is restricted in order to protect these natural habitats. (See Map 7: Heritage / Conservation Map.)

Soils in Onslow County are mainly poorly to very poorly drained, having severe limitations for development. According to the U.S. Soil Conservation Service, roughly 57% of the county's soils have these limitations. Since the soils that are not suitable for septic tank absorption fields are the most restrictive in terms of development, these soils comprise the list of poor soils that, for the purposes of this study, are an environmental consideration. Soil types that are best suited for septic tank absorption fields include Alpin, Autryville, Marvyn, and Norfolk series. The following soils have been found unsuitable for septic: Carteret, Corolla, Craven, Goldsboro, Marvyn, and Wando series (See Map 8: Soil Suitability Map.)

In an effort to aid planners in the 20 coastal counties of North Carolina in conducting land suitability analyses, the DCM has engaged a consultant to develop a GIS-based land suitability model. Onslow County was selected as the pilot site to test the model, which takes into consideration the factors described above as well as proximity to existing development and infrastructure (roads, water, and sewer). The Environmental Composite Map produced for this study includes many of these factors used in DCM's study. (See Map 9: Environmental Composite Map.)

Air Installation Compatible Use Zone Program and Implications

The US Department of Defense (DoD) established the Air Installation Compatible Use Zones (AICUZ) Program in 1973. By working with local governments, the AICUZ Program fosters compatible development around military airfields (such as MCAS New River) to protect the health, safety, and welfare of those living in nearby communities while enabling DoD to conduct its flight operations safely. The program defines areas around the station that are exposed to increased levels of aircraft noise and the potential for aircraft accidents. An AICUZ study includes a detailed analysis of aircraft noise, accident potential, land use compatibility, operational procedures, and recommendations for compatible development in the vicinity of the installation. The two primary components of AICUZ studies include the delineation of the following:

- Noise Exposure Zones, associated with noise created by airfield operations; and
- Accident Potential Zones (APZs), relating to aircraft safety around runways and along approach/departure tracks.

AICUZ Noise Exposure Zones

Noise is defined as a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. A sound is interpreted as unpleasant noise dependent upon the listener's current activity, past experience, and attitude toward that sound.

The measurement and perception of sound involves three basic physical characteristics: intensity, frequency, and duration. First, intensity is a measure of acoustic energy of sound vibrations expressed in terms of sound pressure. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. The second characteristic, sound frequency, indicates the number of times per second the air vibrates or oscillates. The third characteristic of sound is duration, or the length of time the sound can be detected.

Measures of the environmental impacts of noise involve units that quantitatively measure the effect of noise on adjacent areas. Many noise measurements have evolved as researchers have tried to understand the effects of noise. Sound pressure is typically measured in decibels (dB). A sound level of 0 dB is the threshold of human hearing. Normal human speech has a sound level of about 60 dB, while sound levels of 120 dB begin to be felt inside the ear as discomfort. It is important to note that dB measurements are not additive; two 60 dB sounds does not equal 120 dB. A 10 dB change in sound levels typically represents a doubling (or halving) of the perceived sound level by the average person.

Sound frequency is measured in hertz (Hz). The normal human ear can detect sounds that range in frequency from about 20 Hz to about 15,000 Hz, but is most sensitive to frequencies in the 1,000 to 4,000 Hz range. In measuring community noise (and particularly noise associated with airfield operations), the very high and very low frequencies are adjusted to approximate the human ear's lower sensitivity to those frequencies. This is called A-weighting, expressed in decibels (dBA).

Airfield noise can typically be attributed to two major sources: aircraft takeoffs/landings and engine operations for maintenance purposes or during pre-flight checks, referred to as run-ups. Takeoffs and landings are considered intermittent sounds while run-ups are considered continuous sounds. Operations at MCAS New River and MCB Camp Lejeune primarily involve rotary-wing aircraft (helicopters) and V-22 aircraft (Osprey rotary/turboprop fleet), and do not typically involve pre-flight run-ups, though a limited amount of run-ups are conducted during engine maintenance activities.

The DoD and the Federal Aviation Administration have agreed that federal aviation noise assessments are to use time-average sound level measurements. These are measurements of multiple sound events that are averaged over a specific length of time, providing a measure of the average sound energy to be expected during the measurement period. For the evaluation of aircraft noise effects, the day-night average sound level (DNL) is used, expressed in dBA. The A-weighting scale closely resembles the frequency response of the human ear and therefore is considered to provide a good indication of the impact of noise produced by aircraft operations.

DNL averages total aircraft sound levels at a location over a complete 24-hour period, with a 10-dBA adjustment added to those noise events that take place between 10:00 PM and 7:00 AM the following morning. The DNL noise measurement recognizes the greater noise sensitivity associated with night operations because of the greater potential annoyance experienced during typical sleeping periods when ambient noise levels are low.

DNL measurements are used to create noise exposure contours, which are developed by computer modeling of aircraft operations at an airfield. These contours reflect airfield-specific operation data such as flight tracks, type and mix of aircraft, frequency/times of operations, altitude profiles, and aircraft performance parameters (power and airspeed). Under the AICUZ Program, noise exposure areas are divided into three categories, based upon DNL measurements:

- Noise Zone 1 – where the DNL is less than 65 dBA. This zone is the area of lowest noise exposure and where the most limited or no land use controls are typically recommended. It

should be noted that even in this zone studies have indicated that approximately 15 percent of the population will be annoyed by the noise. However, there is a wide consensus that zoning controls are rarely needed in these areas.

- Noise Zone 2 – where the DNL is between 65 and 75 dBA. This zone is the area of moderate noise exposure and where some land use controls are typically recommended.
- Noise Zone 3 – where the DNL is greater than 75 dBA. This zone is the area of highest noise exposure and where the most extensive land use controls are typically recommended.

A summarized version of suggested land use compatibility guidelines for each noise zone is presented in Table 1.

Land Use	Noise Zone 3	Noise Zone 2	Noise Zone 1
Residential	Incompatible	<i>Note 1</i>	Compatible
Transient Lodging	Incompatible	<i>Note 1</i>	Compatible
School Classrooms, Libraries, Churches	Incompatible	Incompatible	<i>Note 2</i>
Hospitals, Nursing Homes	Incompatible	Incompatible	<i>Note 2</i>
Auditoriums, Theaters	Incompatible	Incompatible	<i>Note 2</i>
Office Buildings	Incompatible	<i>Note 2</i>	Compatible
Outdoor Sports Facilities	Incompatible	<i>Note 3</i>	Compatible
Industrial, Warehouse	Incompatible	<i>Note 2</i>	Compatible
Commercial, Retail, Manufacturing	Incompatible	<i>Note 2</i>	Compatible
Livestock Farming	Incompatible	Compatible	Compatible
Natural Recreation Areas	Incompatible	Compatible	Compatible
Military Training Activity	Incompatible	Compatible	Compatible
Playgrounds/Parks	Incompatible	Compatible	Compatible
Golf Courses, Stables, Water Recreation	Incompatible	Compatible	Compatible
Agriculture (excluding livestock)	Compatible	Compatible	Compatible
Public Rights-of-Way	Compatible	Compatible	Compatible

Notes:

1. Residential uses in Noise Zone 2 are discouraged unless no better or viable use is available. In such cases, noise level reduction (NLR) measures of at least 25 dB are strongly recommended. This could include, where applicable, outdoor measures such as construction of berms or sound barriers, and/or indoor measures such as HVAC improvements and wall insulation.
2. Measures to achieve NLR of 25 dB are recommended.
3. Sound reinforcement systems are recommended.

AICUZ Accident Potential Zones

Unique to military airfields is the concept of APZs. As early as 1952, the federal government recognized the threat by urban encroachment to military airfields and, conversely, the impact of air operations on surrounding communities. The Airport and Its Neighbors, the Report of the President’s Airport Commission, more commonly known as the Doolittle Report, recommended that an area surrounding the airfield be set aside as a buffer for aircraft accidents. The Doolittle Report recommended the ends of each runway be kept clear and free of obstacles. Now referred to as clear zones, these zones represented the first step by DoD toward controlling land use near air installations. Originally aimed toward protecting pilots and their aircraft from obstructions and hazards on the ground, this safety concept evolved over the years to include an equal concern for

the safety of those people living near the installations.

The first APZ guidelines were developed after a 1972 tri-service (Departments of the Army, Navy, and Air Force) investigation of accidents. This investigation showed that on airfields with normal approaches and departures, the greatest distribution of accidents occurred near the airfield along the extended runway centerline. The distribution also decreased with distance from the end of the runway. Follow-up studies by the Air Force and the Navy reaffirmed this concept.

The APZ concept, based on the initial investigations and follow-up studies, clearly indicates a pattern of accident locations on or near the runways at military airfields. The data suggest that the areas defined by the APZs are more likely to experience an aircraft accident than other areas within a 5-mile radius of the airfield. While APZs indicate probable accident locations, they do not imply that it is unsafe to live and work in the vicinity of military airfields. Safety is a relative measure, particularly given the number of aircraft accidents that have occurred at Navy and Marine Corps airfields since APZs were identified in the early 1970s. To protect the operational capability of military airfields, the DoD works with local communities to promote future land use development in the vicinity of military airfields.

It should be clearly noted that the concept of the APZ is not a prediction of accidents. Rather, APZs define those areas near military airfields where an accident is most likely to be located if it were to occur. APZs do not in any way define the probability of an accident. Generally, three defined zones extend from the end of the runway along the extended centerline:

- The Clear Zone, extending 3,000 feet from the runway threshold;
- APZ I, extending 5,000 feet beyond the clear zone; and
- APZ II extending 7,000 feet beyond APZ I.

Base studies have indicated that nearly 80% of accidents tend to occur on or near the runway or within the APZs. Based on these studies, the highest potential for accidents is within or adjacent to the runway (56%), followed by the clear zone (12%). The potential for accidents then decreases with distance from the runway. Approximately 7% of reported accidents tend to occur in APZ I, and less than 3% in APZ II. It should be noted that site-specific conditions influence the APZ geometry at a particular airfield. These conditions include, but are not limited to:

- Local accident history;
- Type of aircraft operations;
- Airspace restrictions as they affect flight operations; and
- Weather and other environmental conditions (e.g., bird strike hazards).

MCAS New River AICUZ Program

MCAS New River issued an updated AICUZ Study in February 2001. This study revised the analyses associated with operating characteristics at New River documented in the previous 1978 AICUZ Study, primarily associated with the planned introduction of the V-22 (Osprey) into the 2nd Marine Aircraft Wing stationed at New River, along with other rotary aircraft projected to be based at the airfield in the foreseeable future.

The projected AICUZ footprint (i.e. the combination of projected noise zones and APZs) is depicted in Map 13. As is shown, the airfield's APZs and all of Noise Zone 3 are encompassed within lands owned by the USMC. In addition, the large majority of Noise Zone 2 is also within the base boundaries. The only exceptions involve a very small area extending over the New River north of the base near the City of Jacksonville and a 33-acre area extending into the Verona area, west of US 17.

Range Compatible Use Zone Program and Implications

The USMC's Range Compatible Use Zone (RCUZ) Program has similar objectives to the AICUZ program, but is more focused on compatibility issues associated with ground training. The evolution of the RCUZ Program stems from earlier efforts developed by the Army and Navy. In January 1983, the Army established the Installation Compatible Use Zone (ICUZ) program based on the earlier experiences of the United States Air Force, Navy, and Marine Corps. Since these branches of the service focused only on aircraft noise and land use compatibility, the Army ICUZ program was broader in scope. The Army program addresses all sources of noise, including aircraft (fixed and rotary wing), weapons fire, and ordnance (heavy artillery). The Army's Installation

Environmental Noise Management Program (ENMP), defined in Army Regulation (AR) 200-1, issued in February 1997, has incorporated and replaced the ICUZ program. Later efforts involved assessing the implications of target ranges on surrounding land use. The Range Air Installation Compatible Use Zone (RAICUZ) program was developed to take into account the noise and safety impacts of air-to-ground training operations on ranges. The program is described in Naval Operations Instruction (OPNAVINST) 3550.1, issued in August 1998.

RCUZ Noise Exposure Zones

As noted above, noise associated with aircraft activities under the AICUZ program measured in terms of DNL is measured in A-weighted decibels (dBA). However, the RCUZ program uses this measurement in combination with noise measurements expressed in C-weighted decibels (expressed as dBC) to delineate anticipated noise exposure zones. In contrast to dBA, the C-weighting scale gives nearly equal emphasis to sounds of all frequencies and approximates the actual (un-weighted) sound level. The dBC sound level measurement is typically used for large impulse sound events, in which the total amount of energy is an important factor.

Impulse noise events resulting from ground range operations (e.g., tank firing, artillery, demolition training activities) are all best described in terms of dBC. The C-weighting scale measures more of the low-frequency components of this noise than the A-weighting. These low-frequency components can cause buildings and windows to rattle and shake. This is an important factor in an individual's perception of and reaction to blast noise and his level of annoyance.

The difference in weighting scales produces different numerical values and reflects the differing noise characteristics that typically produce annoyance. Aircraft noise is annoying primarily because of the sounds heard, while annoyance associated with noise from blasts or other similar events is typically a result of vibrations that can shake houses. Annoyance due to both scales is also related to the time of occurrence, the frequency and extent of the occurrence, and whether it is unexpected. The predisposition of the individual to the nature of the event itself is also a factor in the response.



Like the AICUZ program, the RCUZ program classifies noise zones into three levels (using both dBA and dBC measurements) corresponding to compatibility with certain types of land use,

- Noise Zone 1 – where the DNL is less than 62 dBC (or 65 dBA);
- Noise Zone 2 – where the DNL is between 62 – 70 dBC (or 65 – 75 dBA); and
- Noise Zone 3 – where the DNL is greater than 70 dBC (or 75 dBA).

Recommended land use compatibility guidelines for each zone are similar to those of the AICUZ program.

Range Safety Zones

The RCUZ program also includes the delineation of areas that exhibit relative degrees of safety associated with range operations. In contrast to the AICUZ Program, which deals with APZs identifying potential locations of aircraft mishaps, the RCUZ Safety Zones are established to address issues associated with ground-to-ground range activities. Such areas are unique to the specific training activities at a particular range.

Range Safety Zones generally include five categories ranging from RSZ A (the maximum safety hazard) to RSZ E (the minimum safety hazard). Each safety zone is defined below.

- **RSZ A – Dedicated Impact Areas** represent areas of maximum safety hazard. This surface impact area supports training for ground-to-ground and ordnance delivery. It is the only area where dud-producing ordnance may be delivered. Because this area contains hazardous material, including possible unexploded ordnance, all troop and vehicular access for maneuver activities within the boundaries of the impact area is prohibited.

- **RSZ B – Controlled Impact Areas and Artillery Overhead Fire Areas** generally extend from the firing line to the maximum range of the weapon and ammunition fired. When indirect artillery firing is conducted, the area of artillery rounds overflight from the gun position to the impact area is classified as RSZ B.
- **RSZ C – Controlled Aviation Areas** include those controlled aviation areas designated as tactical landing zones (TLZs) and drop zones (DZs). A TLZ is a pre-designated helicopter landing zone that provides air and ground units a site for helicopter operations. A DZ is a tactical landing zone in which personnel or cargo parachute drops are authorized. Airspace above the controlled area is restricted to use by participating aircraft only. Aircraft landings and equipment or personnel drops impact the area on the ground.
- **RSZ D – Training and Maneuver Areas** cover areas designated for tactical exercises and field training by troops and equipment. Live firing within maneuver areas is restricted to established ranges; training in the use of pyrotechnics, demolitions, mines, and booby traps; and driver training. RSZ D is an area of minimal safety concern, but it should remain undeveloped. The only appropriate development is that facilitating the training mission.
- **RSZ E – Aviation Overflight** includes overflight areas specifically designated for aircraft activities. Land areas beneath the overflight space is subject to safety concerns because of potential drop hazards of equipment or unarmed ordnance from military aircraft approaching, entering, or exiting a range at relatively low altitudes.

MCB Camp Lejeune RCUZ Program

MCB Camp Lejeune issued its final RCUZ Study in May 2002. The study primarily focused on two areas at the base: the Great Sandy Run Area (GSRA) and the G-10 Impact Area (including its surrounding training activities). The GSRA was established in 1992 on 41,000 acres of land west of US 17 to provide helicopter support to ground training. No fixed wing aircraft use weapons during training operations there. The GSRA contains four ranges (see Map 14: GSRA Ranges and Firing Points Map):

- SR-6, containing two firing points;
- SR-7, containing five firing points;
- SR-10, containing 18 firing points; and
- SR-11, containing one firing point.

Small arms firing is permitted at all of the GSRA ranges, while heavy weapons (e.g. tank) firing only takes place at the SR-7 and SR-10 ranges. Only inert (not live) weapons firing is permitted in the GSRA. Map 15 depicts the projected RCUZ noise footprint for the GSRA. As is shown, designated safety areas at the GSRA do not extend beyond the GSRA boundaries. While the same applies to Noise Zone 3, Noise Zone 2 extends beyond the GSRA boundaries in three locations:

- the Verona area along High Hill Road and Hawsrun Road;
- a small area north of the GSRA south of Dawson's Cabin Road; and
- an area west of the GSRA south of Shelter Creek and north of Shakey Creek.

The G-10 Impact Area is located east of the New River, west of NC 172, and south of NC 24. It serves as a multi-purpose bombing and target range. The area accommodates indirect artillery, infantry weapons, selected aviation ordnance, and laser operations. There are five active firing ranges in areas surrounding the G-10 area in designated primary and secondary danger zones:

- the G-3 Infantry Weapons Range;
- the G-3 A Smoke Grenade Launcher Range;
- the G-4 Close Quarter Battle Range;
- the G-8 Grenade Launcher Range; and
- the LAW and SMAW Range.

There are also 28 designated firing points for artillery and eight mortar positions designed to fire at targets in the G-10 Impact area (see Map 16: G-10 Area Range Safety Zones Map). These are concentrated southwest of the G-10 area (east of Courthouse Bay), however, three firing points are located just south of NC 24. In addition, while not directly related to the G-10 area, there exists a series of Engineer Training Areas (ETAs) located in the vicinity of Courthouse Bay where the USMC conducts demolition training.

Map 17 depicts the projected RCUZ footprint for the G-10 Impact Area. Almost all of Noise Zone 3 is within the base's lands; a very small area extends beyond the base where Route 172 crosses the

base boundary. Noise Zone 2, however, extends well beyond the base, primarily in areas north of NC 24 and in the Bear Creek area. With the exception of portions of certain overflight areas (RSZ E), all the RCUZ Safety Zones are within the base boundaries. Specifically, four flight tracks extend east from the G-10 area.

Other Military Operations Affecting Land Use

In addition to areas assessed as part of the AICUZ and RCUZ studies, two other issues involve the relationship between military operations and surrounding land uses. The first is the use of various air routes for military training operations associated with New River, Camp Lejeune, and other installations in the region. Along these routes, military aircraft typically operate at low altitudes, including helicopter operations that are often at treetop levels in sparsely developed areas (such as over the Hoffman Forest). Because of the nature of these operations, the potential exists for conflicts with tall structures, such as communication towers. While FAA regulations require structures of certain heights to be equipped with lighting, such treatment often impedes vision and navigation, particularly for night vision operations. The potential exists for similar conflicts to occur near TLZs located near the base boundaries; there is at least one location near the base where construction of cellular towers has impeded helicopter operations.

Secondly, helicopter movements between Camp Lejeune/MCAS New River and the GSRA have resulted in reported noise conflicts with residential uses on or near US 17. This is because helicopter operators use the highway as a fixed ground navigation point in moving between these areas, particular in times of low visibility.

Future Development Potential Potential Development Areas

Analysis of information about existing conditions gathered through research and provided by the County has revealed various factors that affect potential development patterns. Some of these factors arise from the presence of Camp Lejeune, while others would apply even in the absence of a major military installation.

Various environmental constraints play the most significant role in determining the development potential of the study area. These constraints, including coastal wetlands, poor soils, floodplains, and protected land, characterize most of the Joint Land Use Study Area, but are more severe and abundant in some areas than in others. This study aims first to understand the locations and severity of these constraints in order to determine the degree to which lands in the study area are suitable for development.

A detailed environmental constraints analysis (described in 'Environmental Conditions' in the existing conditions section) has been simplified to identify land in three categories of environmental restrictions to development: highly constrained, constrained, and not constrained. Each is displayed on the Developable Areas Map (See Map 10). Areas with severe environmental restrictions such as coastal/saltwater wetlands or velocity zones are defined as **highly constrained**. These constraints are grouped under one category and are not differentiated from one another, so highly constrained areas may exhibit any number of these restrictions. Areas with one or more moderate environmental constraints such as freshwater wetlands, 100-year floodplain, storm surge areas, or poor soil (for septic systems) are defined as **constrained**. Areas with no environmental constraints are defined as **not constrained**.

The Developable Areas Map does not include a "no development" category, since all areas of the study area are developable to a certain degree and under certain conditions. It is more important that the development that does occur is consistent with the recommendations of the County plans, the CAMA Land Use Plan, and other local plans. Development within environmentally sensitive areas is controlled by local, state, and federal regulations, and the Developable Areas Map merely recognizes the environmental factors that are addressed by those regulations.

The Developable Areas Map also displays Noise Zones 2 and 3 related to range and airfield operations, derived from the Marine Corps' RCUZ and AICUZ programs. It displays low level training routes (LLTR), low level approach routes/safety zones, a half-mile buffer around helicopter landing areas, and NC-24 Traffic Conflict Zones. In addition, the map displays other components of military training that could affect land use patterns, including:

- Low level aircraft training routes;
- Flight Tracks/safety zones associated with aircraft ingress/egress from training ranges;
- A half-mile area around helicopter landing areas at Camp Lejeune that would represent a reasonable clear area for tall structures/towers; and
- A potential traffic conflict zone along NC-24, where military transport/convoy activities periodically interrupt civilian traffic movements.

Potential Land Uses

Development in the study area is dependent on several other factors in addition to environmental and military-impact constraints, such as market conditions, the availability of water and sewer, and developers’ willingness to take risks. Thus, suitability for development may need to be judged on a site-specific basis. These site-specific evaluations may be aided by the Land Use Compatibility Matrix and Map II: Conflicts/Impacts Map.

Table 2: Recommended Land Use Compatibility Matrix

Legend

- Compatible
- Compatible with conditions
- Discouraged
- Incompatible

	Residential	Hotel/Motel	Schools/Libraries/Churches	Hospitals/Nursing Homes	Auditorium/Assembly	Office	Outdoor Stadium	Industrial/Warehouse	Comm./Retail	Natural Rec. Area	Military Training	Agricultural
Protected Lands	●	●	●	●	●	●	●	●	●	●	●	●
Saltwater/Coastal Wetlands	●	●	●	●	●	●	●	●	●	●	●	●
Freshwater Wetlands	●	●	●	●	●	●	●	●	●	●	●	●
100-year Floodplain	●	●	●	●	●	●	●	●	●	●	●	●
Storm Surge Areas	●	●	●	●	●	●	●	●	●	●	●	●
Poor Septic Soils (outside svc area)	●	●	●	●	●	●	●	●	●	●	●	●
Outside Sewer Service Area	●	●	●	●	●	●	●	●	●	●	●	●
Outside Water Service Area	●	●	●	●	●	●	●	●	●	●	●	●
No Major Highway Access	●	●	●	●	●	●	●	●	●	●	●	●
Zone 2	●	●	●	●	●	●	●	●	●	●	●	●
Zone 1	●	●	●	●	●	●	●	●	●	●	●	●
Safety Zone E	●	●	●	●	●	●	●	●	●	●	●	●
No Constraints	●	●	●	●	●	●	●	●	●	●	●	●

Most studies of areas near military or civilian airports focus on land use relationships that are affected by the noise impacts of the aircraft operations. Many of these studies (AICUZ studies) include ‘standard’ land use compatibility charts that reflect well-recognized recommendations for future land uses. In cases where a military base also involves range activities that create noise or vibration, special studies (RCUZ studies) define those areas in and around the base that may be impacted by range activities and often include similar land use compatibility charts. These recommendations, however, do not take into account other natural and man-made conditions and may not be appropriate or sufficient to offer guidance for Onslow County. Based on the existing natural and man-made conditions and the recommendations for compatible land uses contained in RCUZ and AICUZ studies, this study has organized various types of development that have been determined compatible, compatible under certain conditions, discouraged, or incompatible with the various types of land found within the study area. These relationships are displayed in the Land Use Compatibility Matrix (See Table 2). This matrix is not a decision-making tool but

rather a guide that users and developers of land can consult for a general reference as to how land uses relate to military as well as natural influences. The matrix gives a more detailed view of the potential uses for sites that fall within the study area. Uses that are considered compatible can be developed in nearly any way the developer chooses as long as the development is in accordance with adopted plans. A use that is deemed compatible under certain conditions may be developed on a site if conditions such as noise attenuation, a change in military operations, or density limitations are met. A discouraged use for a particular location is not incompatible, but is also not the most appropriate use for that location, and other uses may be more fitting. It, too, would be subject to conditions that would improve compatibility. A land use identified as incompatible is not suitable for development on the land identified, and though the use may not be prohibited, it should be highly discouraged.

As evidenced by the input received during the public forums, the impacts of the military operations on the surrounding community and vice versa extend beyond the noise, safety, and buffer zones noted on the Developable Areas Map. Areas in which conflicts arise have been mapped to highlight areas in which site-specific evaluations of military impact on development suitability should be made (See Map 11: Conflicts/Impacts Map).

Issues

Based on the analysis of information and input received throughout the process, a number of issues to be addressed through the Study surfaced.

1. Noise generated by land-based military training activities (e.g. demolition training, live fire/inert weapons training, tank training) and aircraft operations is impacting residents near the base, particularly in the Verona, Sneads Ferry, Willis Landing, and Bear Creek communities.
2. In addition to noise impacts, vibration effects associated with target/impact areas have been perceived as potentially affecting structures surrounding the training ranges.
3. Development of cell towers and other tall structures near the helicopter landing zones and along aircraft ingress/egress routes for training ranges increases the hazard potential associated with low-level flight training.
4. Within Noise Zone 2 as identified in the most recent RCUZ and AICUZ studies (which extends beyond Base boundaries), many land uses exist that are considered under DoD guidance to be incompatible with average daily noise levels. Single-family homes are among those uses, and there is potential for additional single-family development to occur in Noise Zone 2.
5. Additional development in the study area increases the potential for encroachment of incompatible land uses near military training areas.
6. There is potential for new incompatible development to occur in the designated safety zones, particularly along designated aircraft flight tracks associated with ingress/egress to the G-10 Impact Area, over the Bear Creek area and Swansboro.
7. Citizens have stated that warning signs, fencing, and the perimeter road (and the removal of trees to accommodate it) along the boundary of the Great Sandy Run Area (GSRA) where it abuts properties along High Hill Road have lessened the aesthetic appeal of the neighborhood and its properties, deterring potential buyers and potentially reducing the value of those properties.
8. Aircrafts fly over homes along US 17; homeowners do not understand why these flights are not made over Camp Lejeune property instead.
9. Many of the purchasers of property within the Study Area were not made aware of the specific locations and implications of military training activities when they purchased their properties.
10. The public has expressed concerns that current methods for communicating and reporting incidents at Camp Lejeune and New River are unclear. Residents have stated that when they have complaints, they do not clearly understand whom to contact, what number to call, or whether the appropriate person or office received their messages.
11. The public has expressed concerns that there is currently no system in place to ensure a consistent means of communication between the military and the local governments, particularly when and if command structures change.
12. The public has expressed that military training schedules are unclear and not well publicized, making it difficult for residents to be prepared for impacts.
13. There is a perception that Camp Lejeune will incorporate more property in the future.
14. As NC 24 traffic levels increase from new development in Onslow County, the potential increases for periodic congestion and conflicts with movement of troops/equipment to Morehead City for deployment.
15. Water and sewer availability is limited, further decreasing development options for property owners.
16. There is a limited supply of highly developable land in the Study Area, as much of the land is subject to existing local, state, and federal environmental regulations.

When reviewing the methods that have the greatest effect in reducing land use conflicts, there is a rather obvious range of choices. Conflict can be prevented if the conflicting uses are so far apart that no effects from one reach the other or that they simply do not exist proximate to each other. Conflict can be reduced if the conflicting uses are far enough apart that the effects from one to the other are minimal to average sensibilities. Conflicts can be moderated if the characteristics of one use can be modified to reduce the impacts to or from the other. In assessing the JLUS study area, all three of these conditions exist and each requires a different approach.

In the hierarchy of controls, ownership is always the most effective but is almost always the least practical choice. However, if ownership is an option, there are several approaches that may be considered. The most common is the fee simple purchase of property in which the purchaser controls all of the future use of the site. The purchaser can be private or public and the use could range from preservation to agriculture or silviculture, to uses that are not sensitive to other activities, to passive or active recreation. An alternative is the purchase or lease of only a portion of the development rights for the property, such as timber or mineral rights, or even the rights to build on or use the property for certain uses. The purchaser could be private or public and the resulting or remaining uses would be those that are not sensitive to other activities.

The alternatives formed through the Joint Land Use Study process focus less on ownership, and instead address the issues listed in the previous section and ways future conflict can be reduced through changes within the study area and mitigation efforts on the part of Camp Lejeune. Thus, two sets of recommendations for land use and military impact mitigation have been developed. Many of these recommendations are illustrated on the Strategy Map (See Map 12).

Note: These recommendations also apply to the Hoffman Forest portion of the Study Area, though it is not displayed on the maps produced as part of the planning effort.

Land Use Recommendations Specific Actions

The following list proposes specific actions that are recommended for consideration by Onslow County and the municipalities with jurisdiction in the study area. Any consideration of the actions listed below should be considered in conjunction with other County policies in the Comprehensive Plan or with the plans of the municipalities with jurisdiction in the JLUS study area.

- Adopt zoning in the form of overlay districts in some cases that applies land use restrictions to areas affected by military operations (See Appendix VII). The separation of uses can occur naturally by virtue of the location of physiographic limitations to development and barriers. Since many of these natural barriers can be overcome by the actions of man, the next and most common means to separate incompatible uses is through the imposition of land use controls, typically zoning restrictions, that define where certain uses should or should not locate. The power for local governments to regulate the type and placement of land uses is well established in the law dating back to the 1920s. It is becoming rare to find a community that does not have some form of land use regulations, whether they be for aesthetic, environmental, economic, or growth management reasons. The basis for these regulations comes from local policies that advance the community's desires for the future. Other regulations such as subdivision ordinances and adequate public facilities ordinances can augment zoning standards in areas where the absolute prohibition of certain uses may not be possible. In addition, there may be areas where the community feels that certain uses are appropriate from a locational standpoint but consideration still needs to be paid to minimizing impacts. In these areas, specific construction standards can be established to reduce the effects of activities from other land uses. While not as absolute as ownership as a means of land use control, it is by far the most common and widely accepted means of dealing with the placement of uses to reduce conflicts between various land uses.
 - a. Low Level Training Route: These areas are used by air operations for navigation during poor visibility (due to fog or other environmental conditions), when ground landmarks are used for navigation. To maintain public health and welfare wherever these routes exist under the County's jurisdiction, height limitations should be established for all structures (buildings, cell towers, etc.) within these zones with an overlay zoning district that sets forth maximum height restrictions. (See Map 12: Strategy Map.)

- b. Flight Track/Safety Hazard Zone for Aircraft Ingress/Egress to Ranges: Particularly related to flights associated with the G-10 impact area, these areas would have similar controls for tall structures as under the policies for low level training routes. Severely limit activities that would be likely to create high levels of light, smoke or dust, have a tendency to attract birds (e.g. landfills), or create electromagnetic interference. These areas should also restrict certain uses that may be susceptible to the noise of aircraft overflights or permit them only if requirements for noise attenuation construction are met. In addition, due to safety hazards, the following uses may be permitted under certain conditions and at limited densities: residential uses, hotels, motels, institutional uses (churches, schools, libraries, hospitals, and nursing homes), auditoriums, places of assembly, office uses, parks and recreation areas, commercial/manufacturing/utilities, and industrial/warehouse uses. (See Map 12: Strategy Map.)
- c. Helicopter Landing Zone Buffer: These are half-mile buffers around Tactical Landing Zones in which building heights should be restricted and no new cell, radio, TV, or other communication or utility towers, or other similar obstructions, should be constructed. (See Map 12: Strategy Map.)
- d. NC 24 Traffic Impact Zone: Development on either side of NC 24 within a 1000-foot wide buffer should be designed to minimize traffic impacts, particularly those that would interfere with troop deployment through this corridor. (See Map 12: Strategy Map) Design standards may address the following:
 - Access management
 - Minimization of curb cuts
 - Internal circulation systems among adjoining properties
 Critical public safety facilities, such as fire stations and hospitals, should not be located along Hwy 24 unless an alternate access on another arterial road can be provided.
- e. Noise Zone 2: In areas defined in either the AICUZ study for MCAS New River or the RCUZ study for Camp Lejeune as Noise Zone 2, encourage noise attenuation (see Appendix V) for structures, and discourage uses that may be susceptible to the noise of aircraft overflights or range activities:
 - Residential
 - Schools
 - Hospitals and nursing homes
 - Auditoriums and other places of assembly
 - Other institutional uses (churches, libraries, etc.)
 Permit these uses only if requirements for noise attenuation construction are met.
- f. Verona and other Great Sandy Run Areas: Adopt specific land use regulations that limit the residential density that is permitted in the Verona area and the areas west and south of the Great Sandy Run ranges or allow residential uses only if requirements for noise attenuation construction are met. Alternately, in the Verona area only, severely limit residential uses but specifically permit uses that are not sensitive to the impacts of military training activities.
- g. Ellis Airport: Around Ellis Airport, especially in the areas along the extension of runway centerline, prohibit structures over a certain height and prevent or severely restrict land uses that may be sensitive to airport and aircraft operations. The airport is located in a sparsely developed area and the time to establish protective regulations is before there is significant development that may have conflicts with airport operations.

Note: Parts of these recommendations are based on the RCUZ and AICUZ studies previously prepared for range and air operations. These studies identify certain 'impacted' areas based on an analysis of a range of factors, which serves as a strong indicator of a need to pay special attention to land uses in those areas. However, even within these areas the conditions vary, and there are areas outside of the areas identified in the studies that may also be impacted but are beyond the range of the impacts considered the most critical. This JLUS looks at both the areas identified in the prior studies and those that are impacted but outside the 'scientifically' determined areas.

- Do not extend sewer service to those areas where the JLUS study has identified existing or future conflicts between military training activities and sensitive land uses. As an alternative to zoning, the timing and location of the extension of public infrastructure is also a powerful tool for directing development toward or away from key areas. This includes the

construction and extension of water lines, sewer lines, roads, and other growth supportive facilities such as schools, parks, and fire stations. Sewer may be extended to areas where land use restrictions on sensitive land uses, such as those noted above, are in place.

- Prepare and record a map in the Onslow County Register of Deeds office that illustrates the JLUS study area and notes that land uses within the area defined on the map may be subject to noise and/or vibration from military training activities including but not limited to the sounds and vibration from range activities and low level aircraft over flights. The notation on the map should recommend that the potential purchasers of vacant or developed residential properties familiarize themselves with these activities and be aware that their property may experience varying impacts from these activities. The notation on the map should note that properties outside of the study area might also experience varying degrees of impacts as well but that the occupants of properties within the JLUS study area are more likely to notice impacts from military training activities than those outside of the study area. The following is a sample of how this notification might read:

The area designated on this map represents the area covered by the Onslow County Joint Land Use Study completed in February 2003. The areas within this study boundary are areas that may be affected by activities and operations conducted at Camp Lejeune or MCAS New River. These activities and operations can include training involving a variety of weapon systems and armament, the movement of troops and equipment, aircraft ground and air operations, and simulated military exercises of various sizes. As a result of these activities and operations, persons within the area represented on this map can expect, from time to time, to hear or feel noise and/or vibrations or to see or hear aircraft operations, including low level operations, training, and landing exercises. Persons in the area represented on this map, or those considering living or doing business in this area, should familiarize themselves with the various activities and operations so as to be aware of the impact that these activities and operations may have. It should be noted that areas outside of the area represented on this map may also be affected by these activities and operations but the areas within the area represented on the map could expect to notice these activities or operations on a more frequent basis.

- Disclosure of information about impacts

The impacts of Camp Lejeune on residents of the area immediately surrounding it should be disclosed to anyone buying property in the Study Area. This disclosure could take place in any of three ways.

- a. Create a standard disclosure form(s), conduct training for local real estate sales agents to explain the JLUS program and its recommendations, and encourage the use of the form as a supplement to the North Carolina residential property disclosure form when required, or in place of the North Carolina form where it is not required. (See Appendix III for sample disclosure statements.)
- b. Establish a notification or disclosure statement, as a local county ordinance, that requires a specific notification to be executed by the purchaser of any vacant or residentially developed properties located within the JLUS study area to be recorded with any deed for such property transfer. This could also be accomplished by the creation of a zoning district defined by the JLUS study area and establishing the notification or disclosure as a public health, safety, and welfare requirement. The disclosure should generally contain the same information as the map noted in the previous recommendation. (See Appendix VI)
- c. The County should also consider efforts through the General Assembly or the NC Real Estate Commission (NCREC) that existing and potential impact from the base be determined a “material fact” that should be disclosed to a potential purchaser within the designated areas (such as AICUZ or RCUZ areas) as well as in areas outside any specific designation but within the environs of the base where military training activities may occur. The County should send a specific notification to every “Broker in Charge” registered with the NCREC with a business address in Onslow, Pender, New Hanover, Jones, Craven, or Carteret counties that explains the County’s requirement for disclosure within the JLUS study area.

- Conduct educational programs to increase awareness of military activities on Camp Lejeune and potential impacts of such activities.
- Local land use plans should be modified to acknowledge the role that Camp Lejeune and MCAS New River play in the community as a significant and unusual land use and acknowledge the current and potential off-site impacts of military training activities. Local

Types of Disclosure Statements

- Type 2 Disclosure – This type of disclosure would be used to alert buyers of property in Noise Zone 2 (at or above a day/night noise level of 65 dB) to the potential noise impacts associated with military training activities. (See 135° black hatching on Map 12: Strategy Map.)
- Type 1 Disclosure – This type of disclosure would be used to alert buyers of property in the portions of the study area that lie outside Noise Zone 2 to the possibility of occasional noise impacts associated with military training activities.

ordinances should be reviewed and modified pursuant to any public policies arising from these modifications.

General Recommendations

- All portions of the study area may be developable to varying degrees. Encourage and guide growth toward areas where the land and infrastructure can support development.
 - a. In the existing cities and towns, development should continue as urban infill. (See areas labeled 'A' on Map 12: Strategy Map.)
 - b. In the areas outside the cities and towns, development should be consistent with the recommendations of County plans (i.e. Onslow County Comprehensive Plan and CAMA Land Use Plan for Onslow County). Development intensity will vary due to environmental and other constraints. For this reason, the unincorporated areas of the county that lie within the study area are categorized in the following ways:
 - Medium Intensity Development – These areas have major highway access and have little or no environmental constraints, and therefore could be developed in accordance with county plans. (See areas labeled 'B' on Map 12: Strategy Map.)
 - Low to Medium Intensity Development – These areas have one or more environmental constraints (i.e. wetlands, floodplains, poor soils for septic, etc.), but with mitigation could be developed for lower intensity uses. Also, these areas have no or limited sewer service and, in some places, also have limited access to roads. (See areas labeled 'C' on Map 12: Strategy Map.)
 - Special Development Area – This area (Verona/High Hill Road) needs further study. It is primarily residential, but could shift to non-residential uses over time to be more compatible with base activities and blend well with services that may be constructed in the future on base property with accessibility from Hwy. 17. (See areas labeled 'D' on Map 12: Strategy Map.)
 - Low Intensity Development – These areas have severe environmental constraints - coastal wetlands, velocity zone, floodplains, etc. Development in these areas should be highly restricted and controlled. (See areas labeled 'E' on Map 12: Strategy Map.)
- Note: Proposed zoning districts displayed on the Strategy Map are further explained on pages 22-23 and in Appendix VII.
- In all portions of the study area, development should take into consideration the proximity of Natural Heritage Inventory sites, Natural Heritage Element Occurrence sites, registered historic places and districts, and existing protected areas (parks, conservation areas, etc.) and minimize impacts to such areas/sites. (See Map 12: Strategy Map.)

Ongoing Implementation

In support of the recommendations, several actions or on-going efforts could be considered by Onslow County and the affected communities. These actions will aid in accomplishing the goals of the study and in maintaining an ongoing dialog between the civilian and military communities.

- Establish a standing JLUS committee under the auspices of Onslow County, with representatives from affected communities and Camp Lejeune, to monitor the progress of the recommendations and to report annually to the Board of County Commissioners and the Base Commander as to their findings and recommendations. This committee would meet at least quarterly and conduct at least one public hearing annually to provide public information and to receive public comment prior to their report to the Board and Base Commander. The committee should also discuss base training operations and review quarterly any noise concerns received by Camp Lejeune with the goal of sharing information and informing the local communities of efforts to mitigate any negative impacts.
- Create and maintain a website that contains the JLUS recommendations and study maps as well as other information pertaining to implementation (e.g. meeting minutes of the JLUS Committee or an implementation progress report). In addition, this website should provide a means for community members to submit comments and obtain information regarding public JLUS meetings. A web designer may need to be retained to design and construct the website if such capabilities do not currently exist within the County's Planning Department.

County staff may be trained to maintain and update the site as needed. This site should be a link on the Onslow County website (and the County's Planning Department page within that site), on the website for Camp Lejeune, and on the websites of the cities and towns within the Study Area.

- Develop staff teams or retain consultant services to focus on specific implementation techniques and standards to be considered by all affected jurisdictions. Adoption of ordinances remains the prerogative of the individual governmental entity but all who choose could adopt common standards to aid in application and enforcement.
- Coordinate JLUS implementation with the implementation of the Onslow Comprehensive Plan and other adopted plans of the County or affected communities to assure the continuity of recommendations and enforcement of standards. JLUS recommendations typically will anticipate additional restrictions or limitations on the use of property but may also result in development opportunities and reinforce the focus for development in otherwise sensitive areas.
- Revisit the JLUS Report at least every year to assess implementation progress, assess level of complaints, and assess needs for future actions or updates. The advent of any significant change within the community, such as widespread availability of public sewer, or significant changes to base operations or mission may trigger a review of the report sooner than one year.

Military Impact Mitigation Recommendations

Specific Actions

The following mitigation strategies are recommended for consideration by Camp Lejeune and MCAS New River, all targeted at attempting to continually lessen the severity of off-base impacts to existing incompatible uses surrounding the base. The USMC is embarking on drafting a long-term strategic plan related to range operations on the base. The feasibility of the following items should be assessed as part of this effort, in terms of their implications on the base's operational mission and their financial feasibility in light of current and future funding levels. It is likely that implementation of any or all of these strategies would be phased over a 10- to 20-year period.

- Investigate impact mitigation in five key areas (see numbered areas on Strategy Map). Based upon comments received at public forums during the course of the JLUS process, it is recommended that initial consideration for mitigation measures be focused on the following four key areas surrounding USMC installations:
 1. Verona/High Hill Road Area
This area is unique in the fact that it has areas within Noise Zone 2 associated both with the GSRAs and operations at MCAS New River. Accordingly, the area has been the source of the greatest number of noise complaints associated with military operations. In addition, residents state that the GSRAs' northern perimeter road has an aesthetic impact on their properties. The USMC has already taken some actions to address these issues, the most significant being moving MIAI Tank training operations from the SR-7 Range (which abuts the area) to the SR-10 Range in the southwest portion of the GSRAs. The USMC is examining a long-term plan for the structure of the GSRAs ranges. This effort should include
 - continuing to examine ways to reduce off-range noise levels generated at GSRAs, possibly through efforts such as additional refinements of the range structure and continued examination of source mitigation as technology develops; and
 - examining ways of improving aesthetics along the GSRAs boundary along High Hill Road, such as
 - planting trees/vegetation between perimeter road and base boundary to soften appearance of perimeter road; and
 - seeking relief from Marine Corps order regarding warning signs at perimeter, and shifting such signs along High Hill Road inward onto USMC property.
 2. US 17 Flyovers
As previously discussed, helicopter operators use US 17 as a fixed navigation point to move between the GSRAs and activities east of the Highway, often flying over homes on or near this road. It is recommended that the USMC implement measures to minimize such occurrences by designating alternate helicopter routes over

base property when GSRA training and weather permits. In the long term, the USMC should examine the feasibility of installing fixed navigation aids along these designated routes to prevent flyovers during inclement weather.

3. Demolition training in ETAs along Courthouse Bay
Although outside of Noise Zone 2, Sneads Ferry residents are only second to Verona in the number of complaints logged regarding noise/vibration impacts. This is primarily a result of demolition training in ETAs in this portion of the base. The USMC has taken actions to address this issue, involving installation of deflector walls and restrictions on operations in ETA 1 (the primary source of the impact). It is recommended that the USMC continue efforts to mitigate noise/vibration impacts on Sneads Ferry through additional amendment and refinement of operations or possible relocation of such ETAs into more interior portions of the base.
4. G-10 Flight Tracks/Safety Zones
It is recommended that the USMC examine the feasibility of refining certain flight tracks to the least populated area(s) along these tracks and/or increase flying altitude approach profiles.
5. Base Uses along NC 24
As previously discussed, selected training areas and firing points currently exist along Camp Lejeune's northern boundary along NC 24. It is recommended that this area of the base be examined for alternate uses in order to create a good transition between development adjacent to the base and Camp Lejeune facilities/uses.

- Source Mitigation

The USMC should continue efforts to reduce noise at its source(s) using noise mitigation measures, such as building baffle walls to deflect noise, reducing maximum allowable explosive pounds, and burying larger demolition charges, particularly as technology advances to address such issues.

- Improve communications

It is recommended that Camp Lejeune, MCAS New River, Onslow County, and affected municipalities engage in establishing a long-term communications program. In the short term the public should simply be better informed of pertinent contacts, while in the long term a single-point contact should be established to address all complaint reporting/resolution and ongoing planning. Elements of such an effort could include the following:

- a. Publishing both MCAS and Camp Lejeune contact telephone numbers (complaint/resolution mechanism) together in newspapers, on websites, in blue pages of local telephone book, etc. In the long-term, establish *one* point of contact for entire base.
- b. Establishing a continuous communication structure. As military command structure changes, methods of communication should be maintained. Consider drafting a memorandum of understanding (MOU) and/or memorandum of Agreement (MOA) between the Marine Corps, Onslow County, and other involved municipalities to outline policies and responsibilities for continued JLUS efforts and communication.
- c. Centralizing communications using
 - "in-the-field," variable message signs along highways to indicate Camp Lejeune's planned activities for the day/week or to advise on road closures (such as along NC 172)
 - News releases
 - Website/web page that should be updated regularly with unclassified information on Camp Lejeune range operations. Provide links to this site/page on the websites of the County and the cities and towns in the Study Area.
 - Billboards
 - Brochure
 - TV ads
- c. Utilize the Onslow County GIS Department as a repository for unclassified map data generated or collected by Camp Lejeune's GIS Department.

- Limited Training Blackouts

It is recommended that the USMC consider the feasibility of limited blackouts of operations except for critical training during periods such as Sunday mornings (when many churches hold their services) or late at night when many residents are sleeping. For example, the USMC could require all night operations to be scheduled before 22:00 hours.

- Off-site Mitigation
 - The USMC should examine the feasibility of securing funding for federally funded programs of off-site mitigation that could include:
 - a. Purchase of noise/aviation easements
 - b. Programs for dB reduction measures in surrounding properties – insulation, HVAC, etc.
 - c. Fee/development right purchase

Ongoing Implementation

Past and ongoing military efforts to refine training procedures/facilities in an attempt to lessen the severity of off-base noise/vibration/land use impacts are generally outside the direct purview of local or state regulation. In such situations where there are no specific regulatory relationships, agencies will often document anticipated actions by voluntarily entering in a memorandum of agreement (MOA) and/or a memorandum of understanding (MOU). MOAs/MOUs are procedural documents that address how two or more agencies intend to exercise their respective statutory and regulatory authority in a coordinated manner to achieve agreed-upon objectives. Depending on their specific provisions, MOAs and MOUs are often not subject to specific procedural requirements of enacting laws or regulations; rather, they are more general documents intended to set forth good faith on the part of the parties involved to reach a desired end.

The execution of an MOA or MOU would be a workable method of documenting the anticipated actions/initiatives to be conducted by the Camp Lejeune, New River, Onslow County, and affected municipalities to implement the JLUS recommendations. Such an agreement could also serve as a basis for relative consistency of military and local policies into the future, regardless of changes in command structure and/or local elected administration.

An MOA or MOU should contain provisions that clearly establish the relationships and strategic actions to be taken by the respective military and local agencies, yet be flexible enough to allow for potential changes associated with National Defense policies/requirements, anticipated schedules for federal appropriations, and changes in the nature of military/civilian land use relationships. Such provisions could include, but not be limited to:

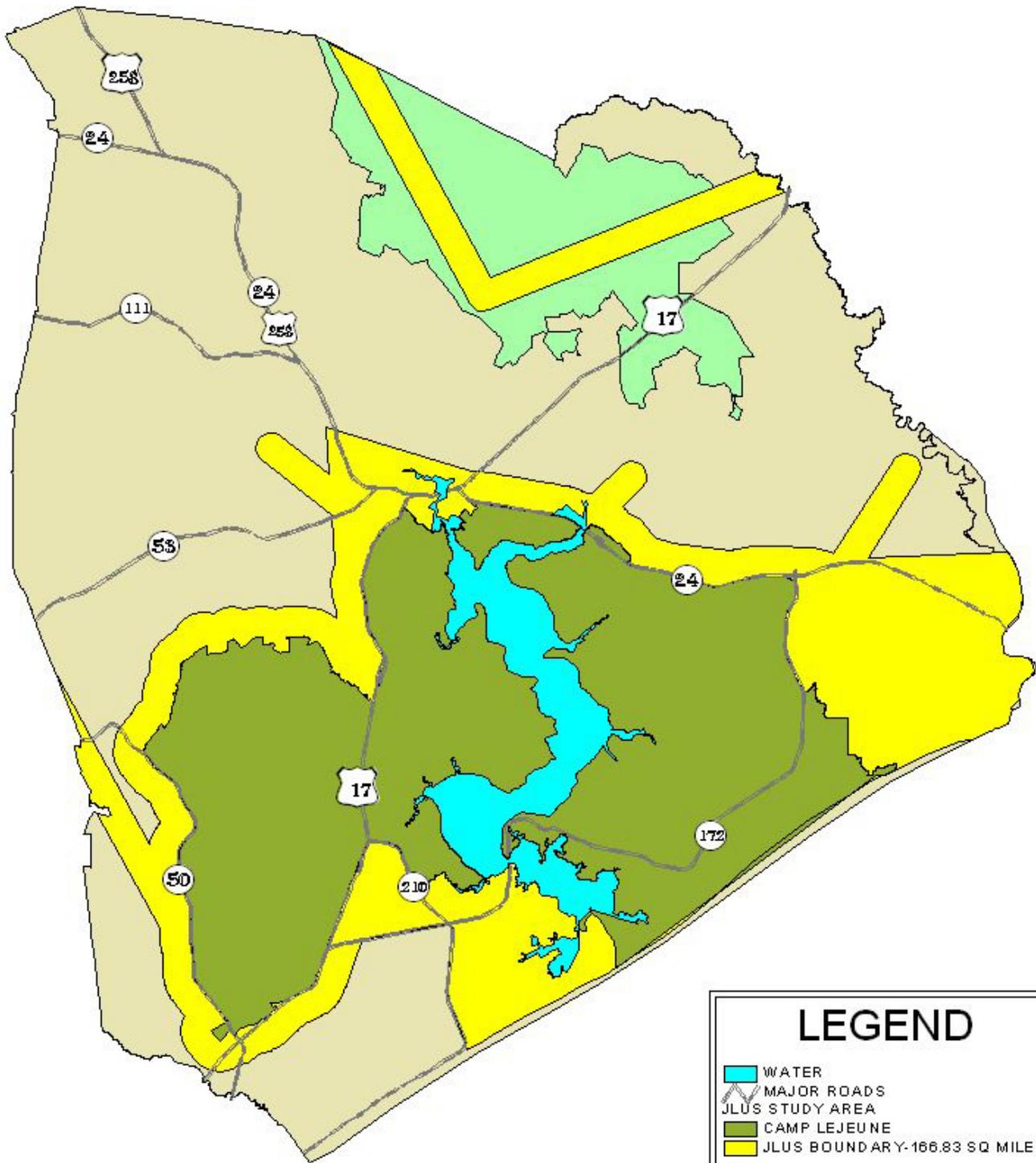
- a. Policies on the establishment of specific structures for on-going communication/discussion among military commands and local government agencies.
- b. Potential phased implementation of coordinated single-point system for complaint reporting/resolution as well as overall public information on military operations.
- c. Strategic initiatives to review the operational and financial feasibility of implementing refinement of range and/or airspace operations over a specified period.
- d. Establishing policies, procedures, and timeframes for future updates of RCUZ/AICUZ analyses (e.g., establishment of thresholds for changes in operations that would likely affect the nature of off-base noise exposure)
- e. Joint military/local government efforts to solicit subsequent federal funding for improvements and programs.

Appendix I: Maps

The following maps were developed throughout the process to demonstrate both existing conditions and the products of analyses. The Maps include

- Map 1: JLUS Study Area Map
- Map 2: Population Comparison Map
- Map 3: Existing Land Use Map
- Map 3A: Existing Land Use/Noise Zone Map: Swansboro Area
- Map 3B: Existing Land Use/Noise Zone Map: Verona Area
- Map 4: Existing Sewer Infrastructure Map
- Map 5: Bypass Map provided by Jacksonville Area MPO
- Map 6: Flood Zone Map
- Map 7: Heritage Conservation Map
- Map 8: Soil Suitability Map
- Map 9: Environmental Composite Map
- Map 10: Developable Areas Map
- Map 11: Conflicts/Impacts Map
- Map 12: Strategy Map
- Map 12A: Strategy Map—Upper Left
- Map 12B: Strategy Map—Upper Right
- Map 12C: Strategy Map—Lower Right
- Map 12D: Strategy Map—Lower Left
- Map 13: AICUZ Noise Zones and APZs Map
- Map 14: GSRA Ranges and Firing Points Map
- Map 15: Projected RCUZ Footprint for GSRA
- Map 16: G-10 Area Range Safety Zones Map
- Map 17: Projected RCUZ Footprint for G-10 Impact Area

JOINT LAND USE STUDY AREA



LEGEND

- WATER
- MAJOR ROADS
- JLUS STUDY AREA
- CAMP LEJEUNE
- JLUS BOUNDARY-166.83 SQ MILES
- HOFMANN FOREST
- ONSLOW COUNTY BOUNDARY



SOURCE:
 AIRCRAFT TRACKING
 DATA: COUNTY PLANNING
 DIVISION
 GIS DATA
 SOURCE: ESRI
 SOURCE: ESRI
 SOURCE: ESRI

PRODUCED BY
 ONSLOW COUNTY GIS
 MARCH 6, 2002

THIS MAP IS A PRELIMINARY PRODUCT AND
 IS NOT TO BE USED FOR ANY PURPOSES
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Map 1: JLUS Study Area Map

Joint Land Use Study
 Onslow County, North Carolina
 Black Group Population Density 1990 - 2000

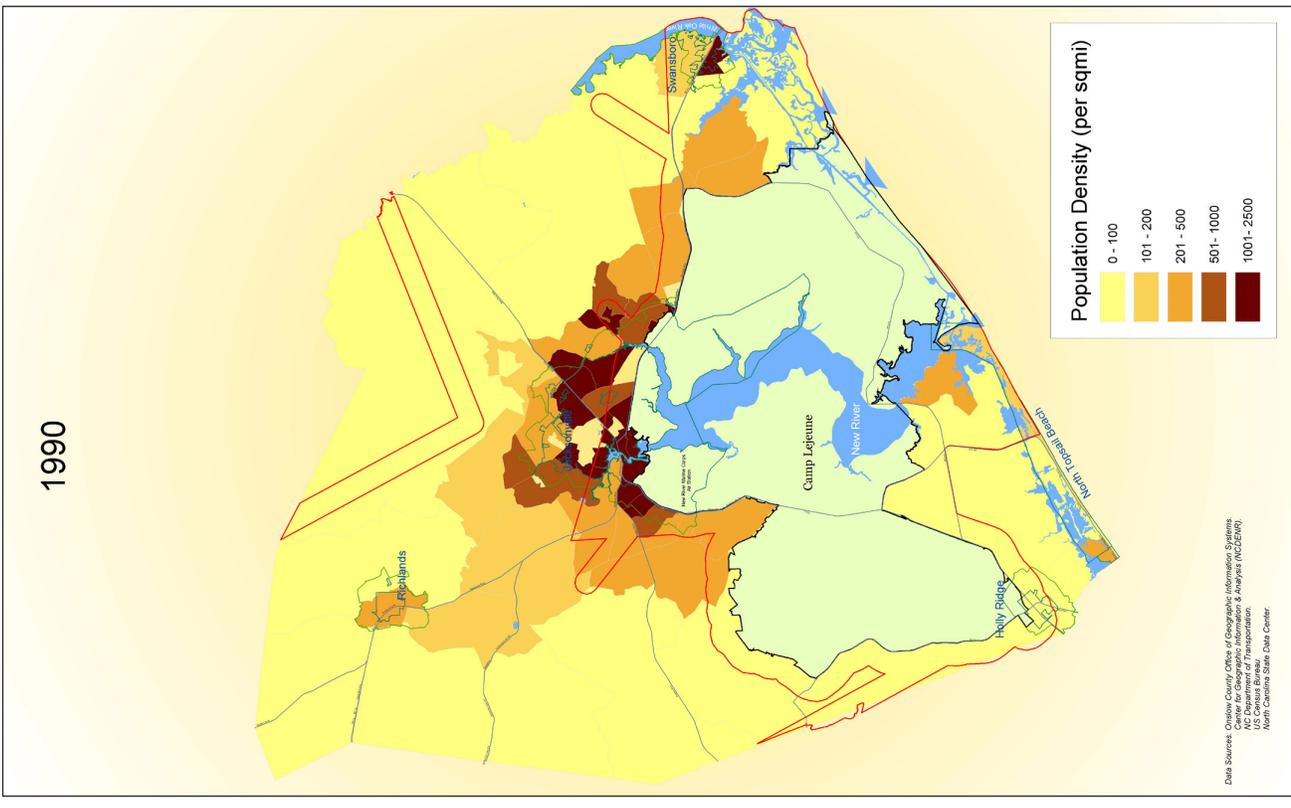
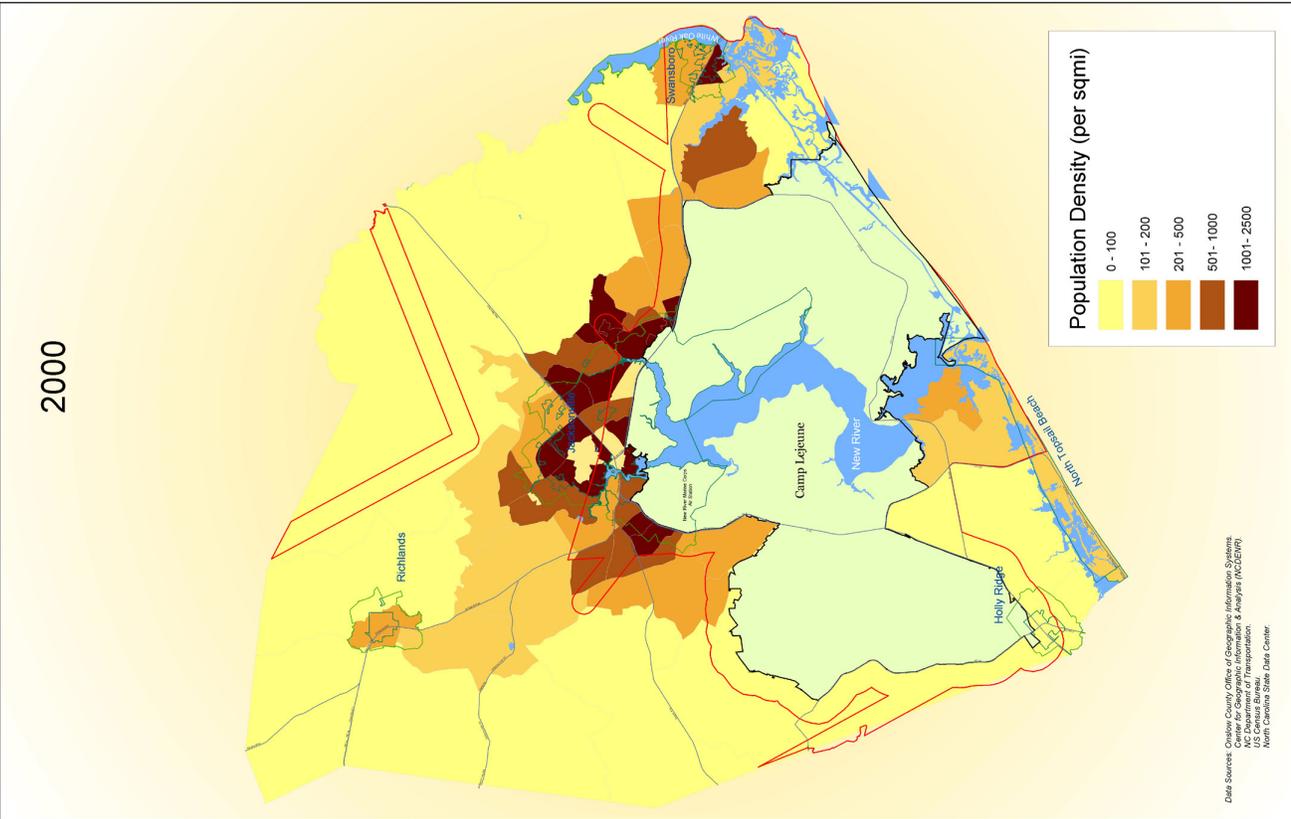
- Legend**
- Major Roads
 - JLUIS Boundary
 - Water
 - City Boundaries
 - ETJs
 - Camp Lejeune



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Date: 02/20/03
 Project Number: 1002087
 Revision 2
 Revision 3



Map 2: Population Comparison Map

Joint Land Use Study
 Onslow County, North Carolina
 Existing Land Use / Noise Zone Map

Legend

- Major Roads
- JLUS Boundary
- City Limits
- City ETUs
- Water
- Camp Lejeune Boundary
- Surrounding Counties

Landuse

- Apartments
- Commercial
- Dwellings
- Industrial
- Other Buildings
- Vacant
- Protected Lands
- Mortar Gun Positions
- Artillery Guns Positions

AICUZ NOISE ZONES

- Zone 2
- Zone 3

RCUZ NOISE ZONE

- Zone 2
- Zone 3

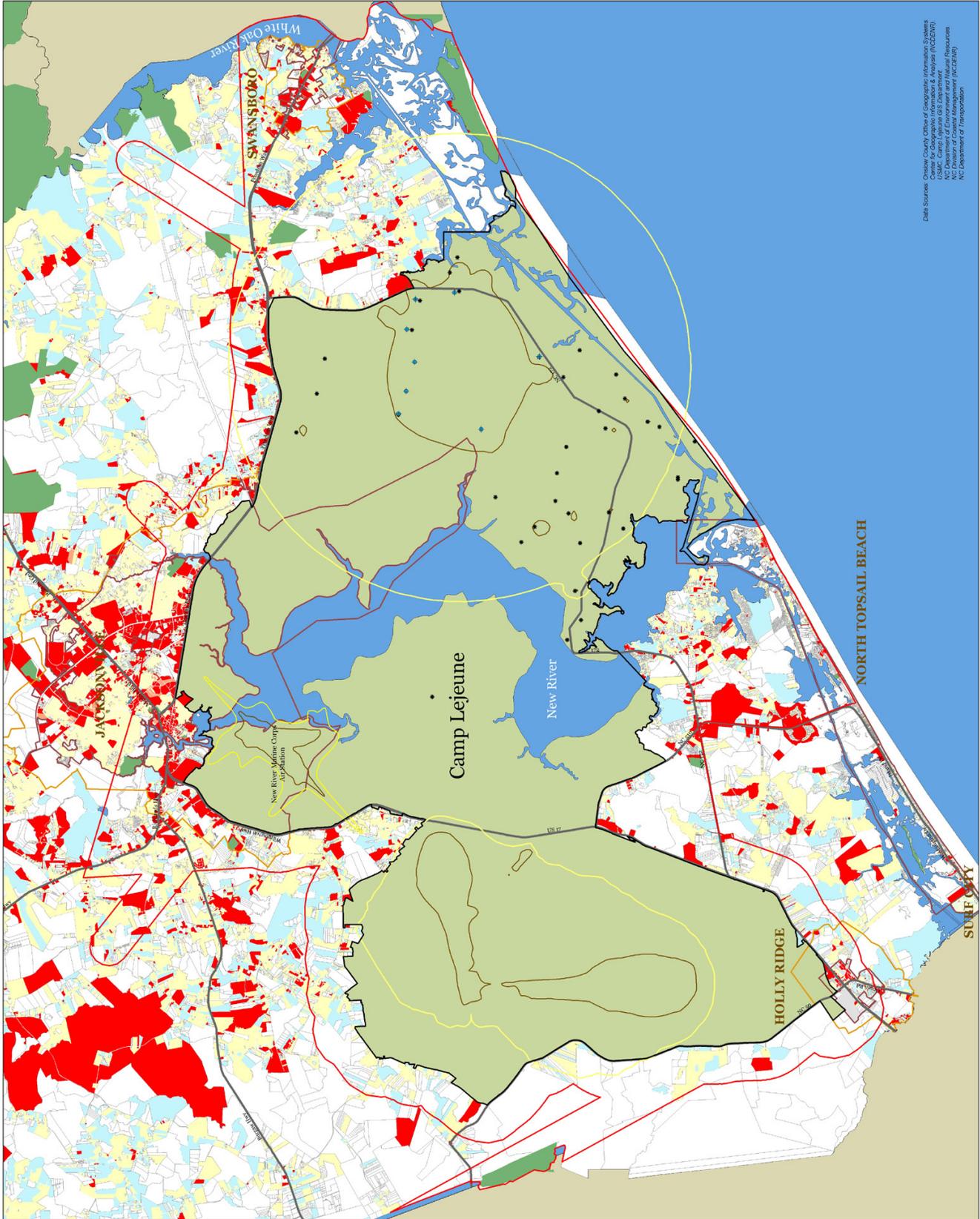


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 Feet

Scale: 6:1 ES
 Project Number: 1002067
 Revision 1:
 Revision 2:
 Revision 3:

Date Source: Onslow County Office of Geographic Information Systems
 USACE, Camp Lejeune GIS Department
 US Army Corps of Engineers, District of Jacksonville
 NC Division of Coastal Management (NCCDM)
 NC Department of Transportation



Map 3: Existing Land Use Map

Joint Land Use Study
Onslow County, North Carolina
Land Use / Noise Zone Map
Verona Area

Legend

- Major Roads
- JLUS Boundary
- City Limits
- City ETJs
- Water
- Camp Lejeune Boundary
- Surrounding Counties

Landuse

- Apartments
- Commercial
- Dwellings
- Industrial
- Other Buildings
- Vacant
- Protected Lands

AICUZ NOISE ZONES

- Zone 2
- Zone 3

RCUZ NOISE ZONE

- Zone 2
- Zone 3



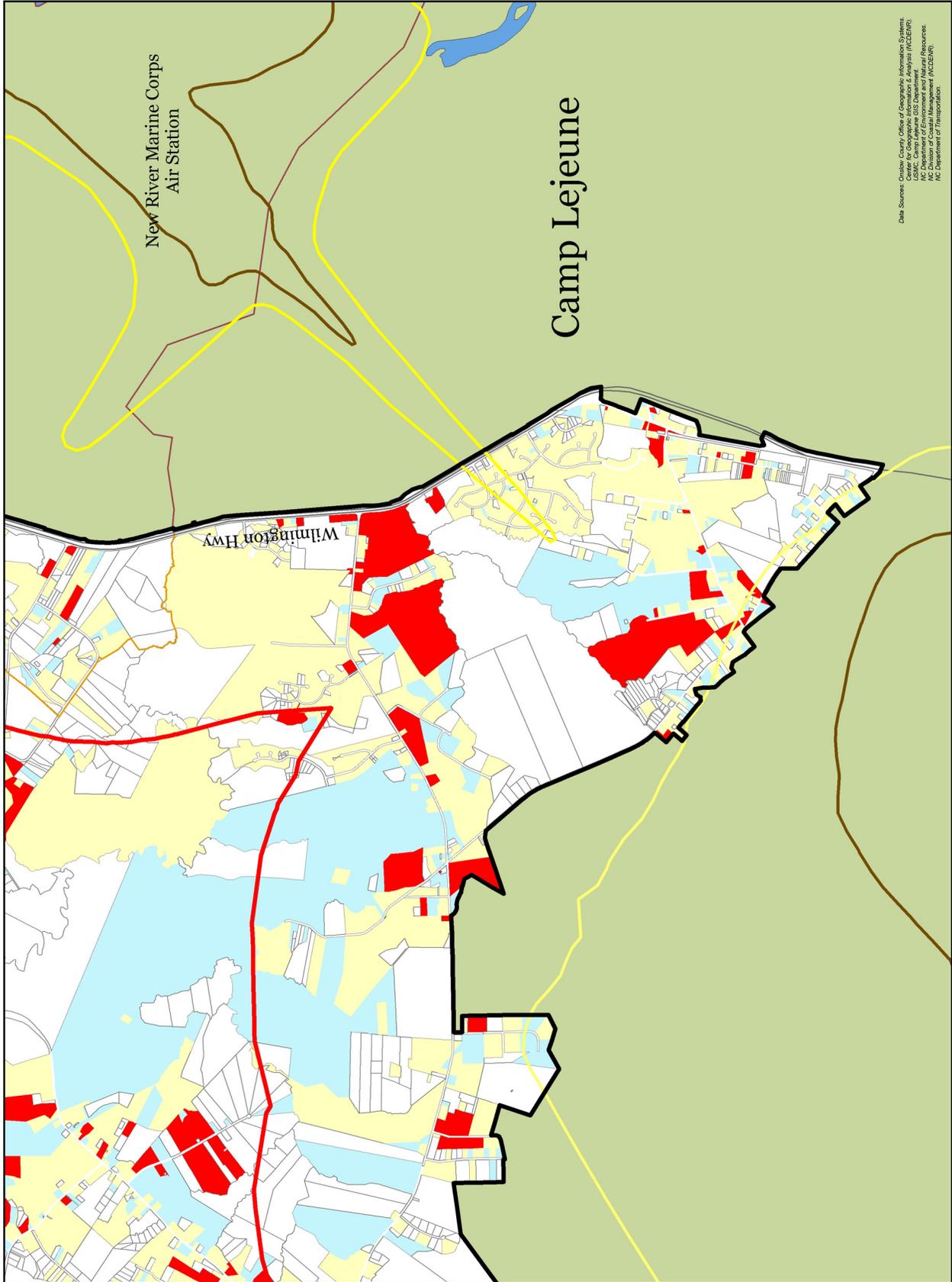
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Date: 02/05/03
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Revision 3:



Data Sources: Onslow County Office of Geographic Information Systems
Onslow County Planning & Development (OCPEW)
USMC, Camp Lejeune GIS Department
Onslow County Planning & Development (OCPEW)
NC Division of Coastal Management (MCEWR)
NC Department of Transportation

Map 3B: Existing Land Use/Noise Zone Map: Verona Area

Joint Land Use Study

Onslow County, North Carolina
Utility Service Area Map

Legend

- Sewer Treatment Plants
- Water & Waste Plants
- J/LUS Boundary
- Major Roads
- Water
- Camp Lejeune Boundary
- Onslow County
- Surrounding Counties
- Sewer, Type A Service
- Sewer, Type B Service



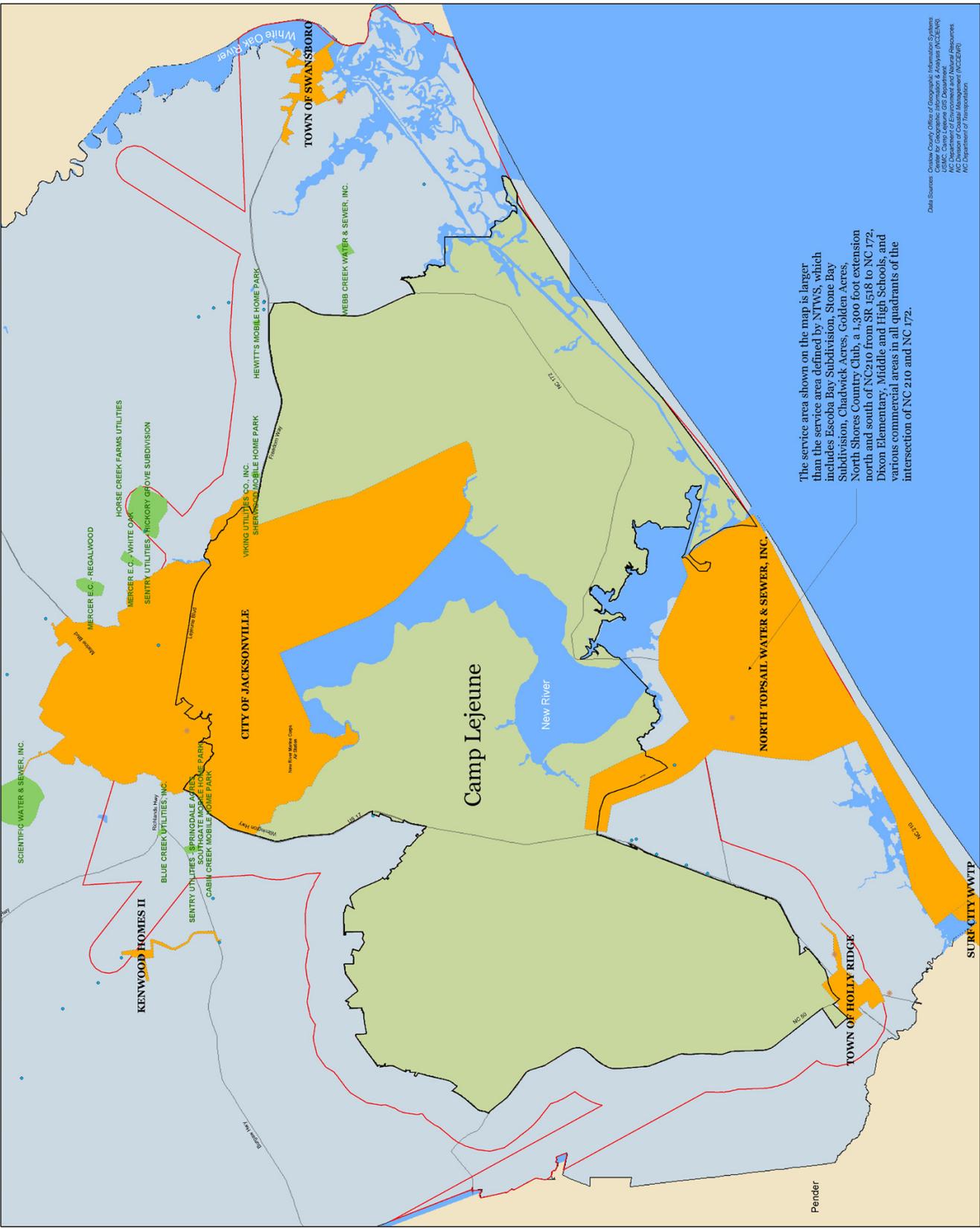
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PARSONS BRINCKERHOFF

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Project Number: 1002087
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Revision 3

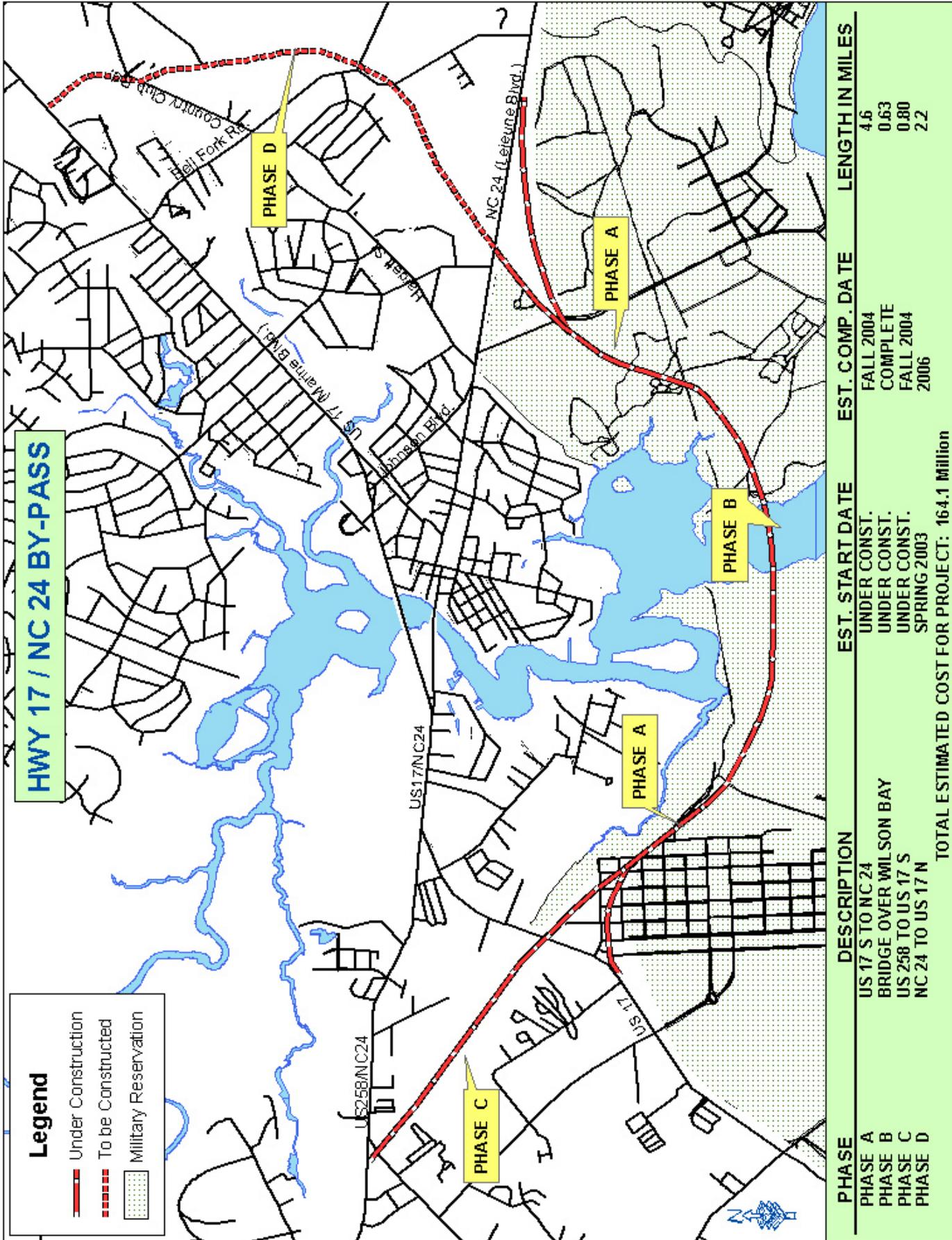
Scale: 0 3,000 7,000 14,000 21,000 Feet



The service area shown on the map is larger than the service area defined by NIWS, which includes Escoba Bay Subdivision, Stone Bay Subdivision, Chadwick Acres, Golden Acres, North Shores Country Club, a 1,300 foot extension north and south of NC210 from SR 1518 to NC 172, Dixon Elementary, Middle and High Schools, and various commercial areas in all quadrants of the intersection of NC 210 and NC 172.

Data Sources: Onslow County Office of Geographic Information Systems
Center for Geographic Information & Analysis (CGI&A)
Onslow County GIS Department
NC Department of Transportation
NC Division of Coastal Management (NCCM/DCM)
NC Department of Transportation

Map 4: Existing Sewer Infrastructure Map



Map 5: Bypass Map provided by Jacksonville Area MPO

Joint Land Use Study
 Onslow County, North Carolina
 Heritage / Conservation Map

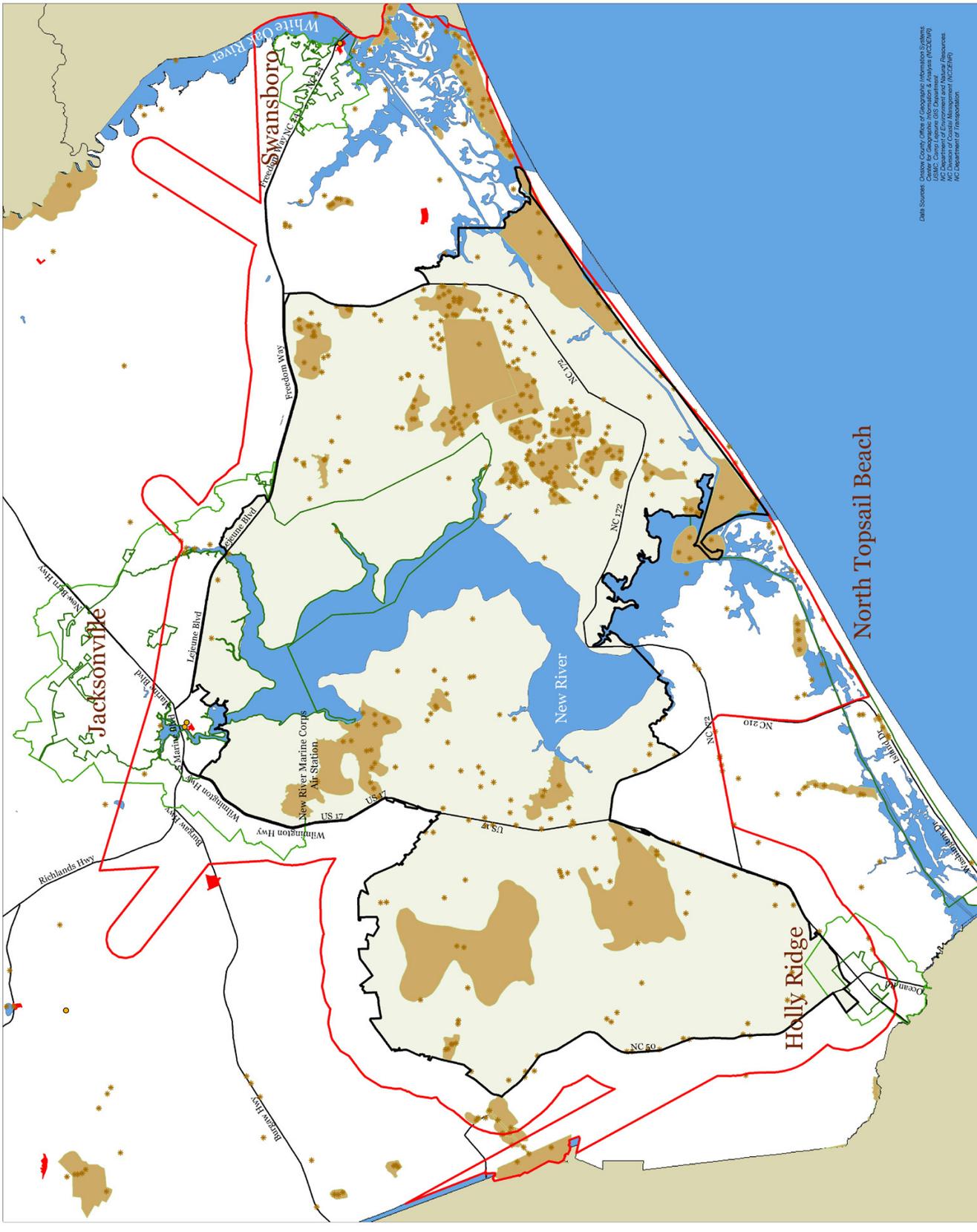
Legend

- City Boundaries
- JULIS Boundary
- City ETJ's
- Water
- Major Roads
- Camp Lejeune Boundary
- Onslow County
- Surrounding Counties
- Significant Natural Heritage Area
- Natural Heritage Element Occurrence Sites
- * Historic sites
- Historic District



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 Revision 2:
 Revision 3:



Data Source: Onslow County Office of Geographic Information Systems
 Onslow County Office of Geographic Information Systems (OCGIS)
 USGS, Coastal and Estuarine Science (CEAS)
 USMC, Camp Lejeune GIS Department
 NC Department of Environment and Natural Resources
 NC Department of Transportation (NCDOT)

Map 7: Heritage/Conservation Map

Joint Land Use Study
Onslow County, North Carolina
Soil Suitability Map

Legend

- Major Roads
- JLUS Boundary
- City Limits
- City ETJs
- Water
- Camp Lejeune Boundary
- Onslow County
- Surrounding Counties
- Soil Not Suitable for Septic



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 Revision 1:
 Revision 2:
 Revision 3:



Data Sources: Onslow County Office of Geographic Information Systems
 USMC Camp Lejeune GIS Department
 USGS National Wetlands Inventory
 NC Division of Coastal Management (NCCM)
 NC Department of Transportation

Map 8: Soil Suitability Map

Joint Land Use Study
Onslow County, North Carolina
Noise / Environmental Composite Map

Legend

- Major Roads
- ILUS Boundary
- Onslow County
- Surrounding Counties
- Water
- Camp Lejeune Boundary
- Sewer: Type A, Service
- Protected Lands
- Historic District
- Historic sites
- Natural Heritage Element Occurrence Sites
- Significant Natural Heritage Area
- coastal wetlands
- Wetlands
- Flood Zones
- Storm Surge
- Not Suitable for Septic
- Unimproved Helicopter Landing Areas
- Administrative Landing Zones
- Live or Inert Ordnance Impact Area
- Noise Sources Excluding Ranges
- Positions of Artillery Guns
- Mortar Gun Positions
- RGIZ NOISE ZONE
 - Zone 1
 - Zone 2
 - Zone 3
- AICUZ NOISE ZONES
 - Zone 1
 - Zone 2
 - Zone 3



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 Revision 3:



Data Sources: Onslow County, Office of Geographic Information Systems
 Center for Geographic Information & Analysis (CGEIA)
 NC Department of Environment and Natural Resources
 NC Department of Transportation

Map 9: Environmental Composite Map

Joint Land Use Study
Onslow County, North Carolina
Developable Areas Map

Legend

- Major Roads
- JLUS Boundary
- Surrounding Counties
- Water
- Camp Lejeune Boundary
- Sewer Type A Service
- Highly Constrained
- Historic District
- Historic Sites
- Natural Heritage Element Occurrence Sites
- Significant Natural Heritage Area
- Unimproved Helicopter Landing Areas
- Administrative Landing Zones
- Line of Inlet Orientation Impact Area
- Noise Sources Excluding Ranges
- Problems of Military Gunnery
- Military Gun Positions
- OTL - Range Safety Zone
- ROUZ NOISE ZONE
 - Zone 2
 - Zone 3
- AICUZ NOISE ZONES
 - Zone 2
 - Zone 3

Developable Areas

- Highly Constrained
- Constrained
- Not Constrained



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 Charlotte, NC

Date: 06/25/02
 Project: 1002087
 Revision 1:
 Revision 2:
 Revision 3:

Scale: 0 3,500 7,000 14,000 21,000 Feet

North Arrow



Data Sources: Onslow County Office of Geographic Information Systems
 Center for Geographic Information & Analysis (CGIA/NO)
 NC Department of Environment and Natural Resources
 Department of Transportation
 NC Department of Transportation

Map 10: Developable Areas Map

Joint Land Use Study
 Onslow County, North Carolina
Conflicts / Impacts Map

Legend

- Major Roads
- ILUB Boundary
- City Limits
- City ETJs
- Water
- Camp Lejeune Boundary
- Surrounding Counties
- Noise Zone 2
- Residential Within Noise Zone 2
- Schools Within Noise Zone 2
- Cell Tower
- Flying Over Homes
- Treeline Removed, Road & Fence Installed
- Impacted Area



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 Fax: 704.376.1777 | Fax: 704.376.8285

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 Project Number: 1000067
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 Revision 2:
 Revision 3:

Scale: 1" = 1,000'

North Arrow



Data Sources: Onslow County Office of Geographic Information Systems
 USGS National Wetlands Inventory
 USMC Camp Lejeune GIS Department
 NC Department of Environment and Natural Resources
 NC Department of Transportation

Map II: Conflicts/Impacts Map

Joint Land Use Study
Onslow County, North Carolina
Strategy Map - Zone B

Legend

- Major Roads
- JULS Boundary
- City ETLs
- County ETLs
- County
- Surrounding Counties
- Water
- Private Land
- Historic District
- Historic Sites
- Natural Heritage Element Occurrence Sites
- Special Natural Heritage Area
- RZLZ Buffer Zones
 - Zone 1
 - Zone 2
 - Zone 3
- RZLZ Study Zones
 - Zone 1
 - Zone 2
 - Zone 3

Land Use Options

- Use Intensity
- Development Consistent With Co. Plans
- Limited Development Area
- Special Development Area
- Highly Constrained - Very Ltd. Dev. Area
- Neighborhood 2 Regulations
- Neighborhood 3 Regulations
- Neighborhood 4 Regulations
- Neighborhood 5 Regulations
- Neighborhood 6 Regulations
- Neighborhood 7 Regulations
- Neighborhood 8 Regulations
- Neighborhood 9 Regulations
- Neighborhood 10 Regulations
- Neighborhood 11 Regulations
- Neighborhood 12 Regulations
- Neighborhood 13 Regulations
- Neighborhood 14 Regulations
- Neighborhood 15 Regulations
- Neighborhood 16 Regulations
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- Neighborhood 92 Regulations
- Neighborhood 93 Regulations
- Neighborhood 94 Regulations
- Neighborhood 95 Regulations
- Neighborhood 96 Regulations
- Neighborhood 97 Regulations
- Neighborhood 98 Regulations
- Neighborhood 99 Regulations
- Neighborhood 100 Regulations

Military Options

- Area of Potential Impact Mitigation Efforts



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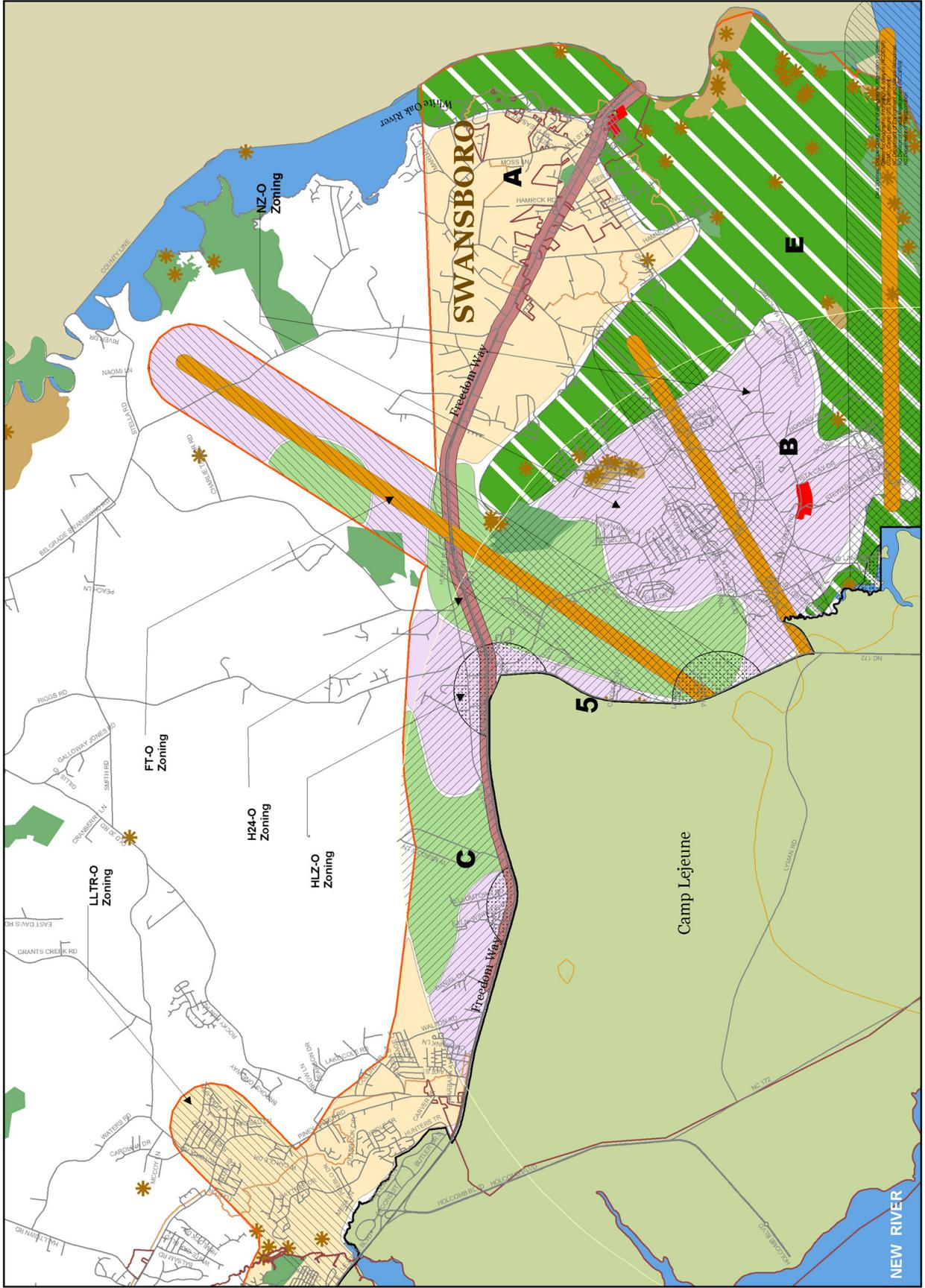
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STRICKHOFF

223 North Calumet Street
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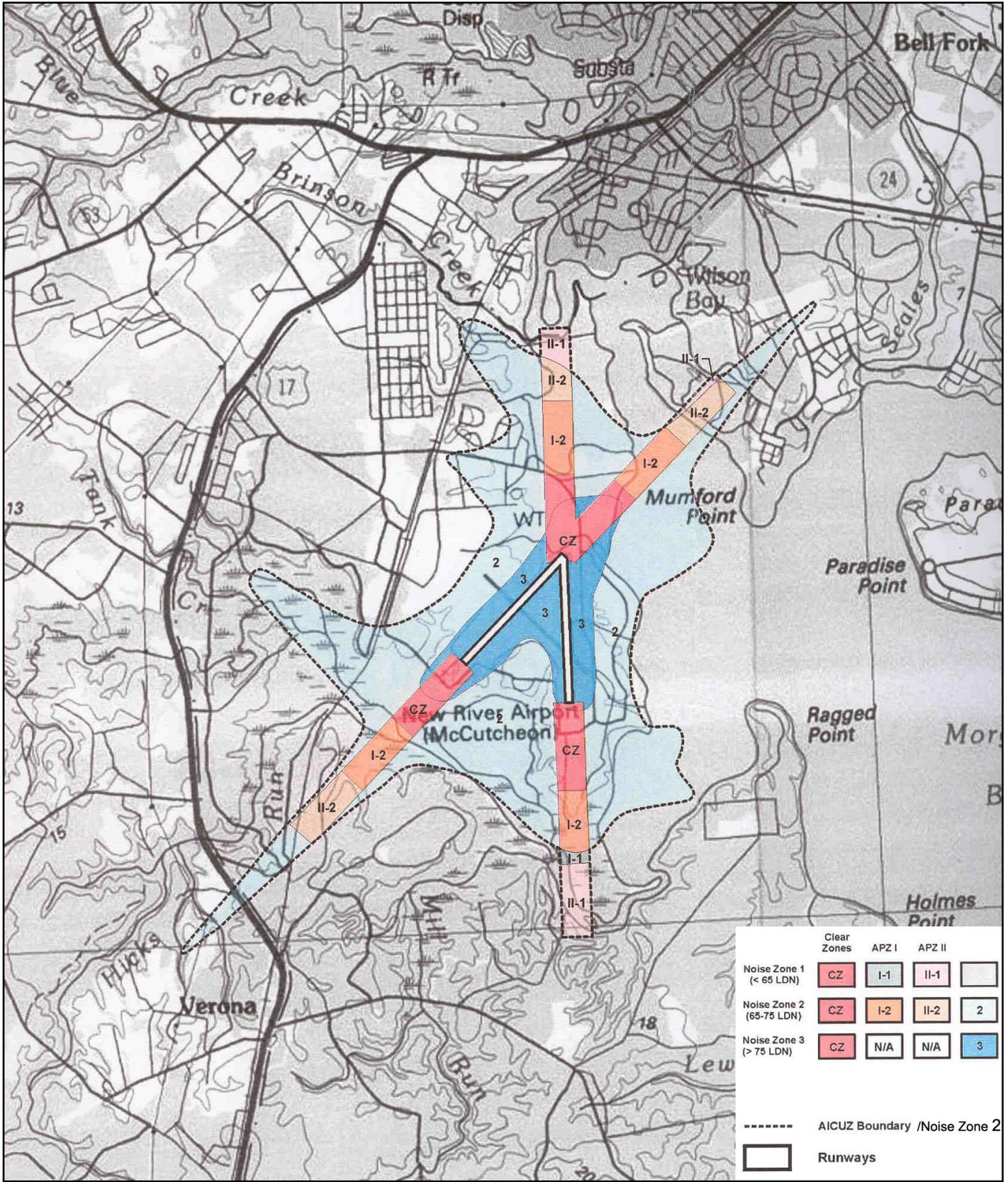
Date: 09/11/02
 Project Number: 002097
 Revision 1: 01/03/03
 Revision 2: 01/03/03
 Revision 3: 01/03/03

Scale: 1" = 1,000'

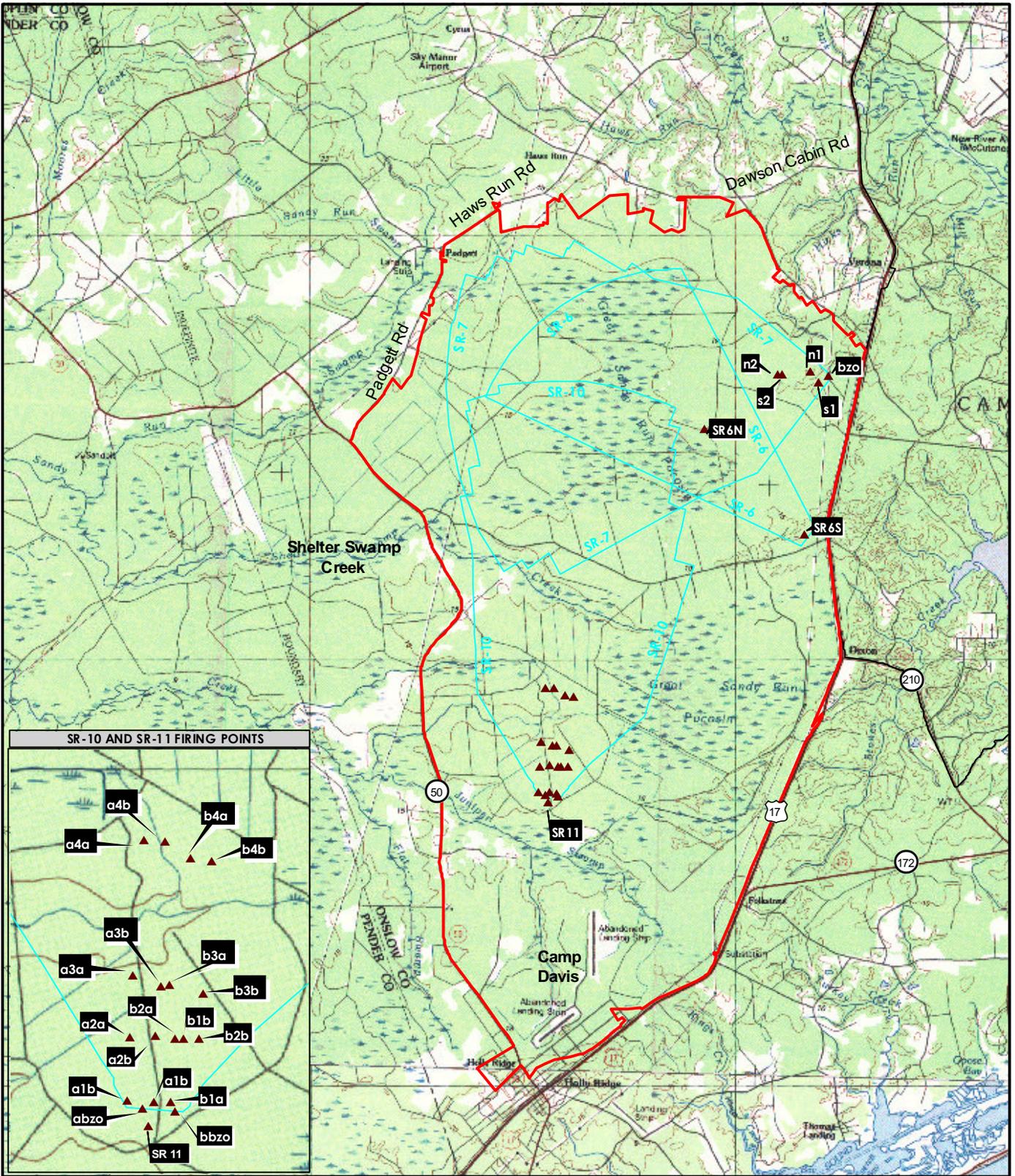
North Arrow



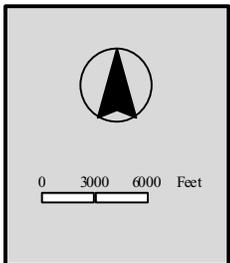
Map 12B: Strategy Map- Upper Right



Map 13: AICUZ Noise Zones and APZs Map provided by Onyx, May 2002, RCUZ Study for MCB Camp Lejeune



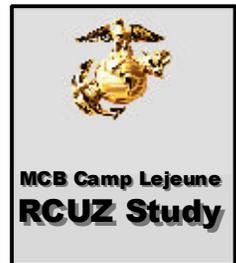
Map 14: GSRA Ranges and Firing Points Map provided by Onyx, May 2002, RCUZ Study for MCB Camp Lejeune



GSRA Ranges and Firing Points

- GSRA
- MCB Boundary
- Range Boundary
- ▲ Firing Point

Sources:
 MCB Camp Lejeune
 Military Installation Map: 1993
 Image: 1:100,000 USGS DRG



Joint Land Use Study
 Onslow County, North Carolina
 AICUZ/RCUZ Noise Zone Map

Legend

- JLUJ Boundary
- Major Roads
- City Limits
- City ETJs
- Water
- Camp Lejeune Boundary
- Onslow County
- Surrounding Counties
- + Mortar Gun Positions
- * Artillery Guns Positions

AICUZ NOISE ZONES

- Zone 2
- Zone 3

RCUZ NOISE ZONE

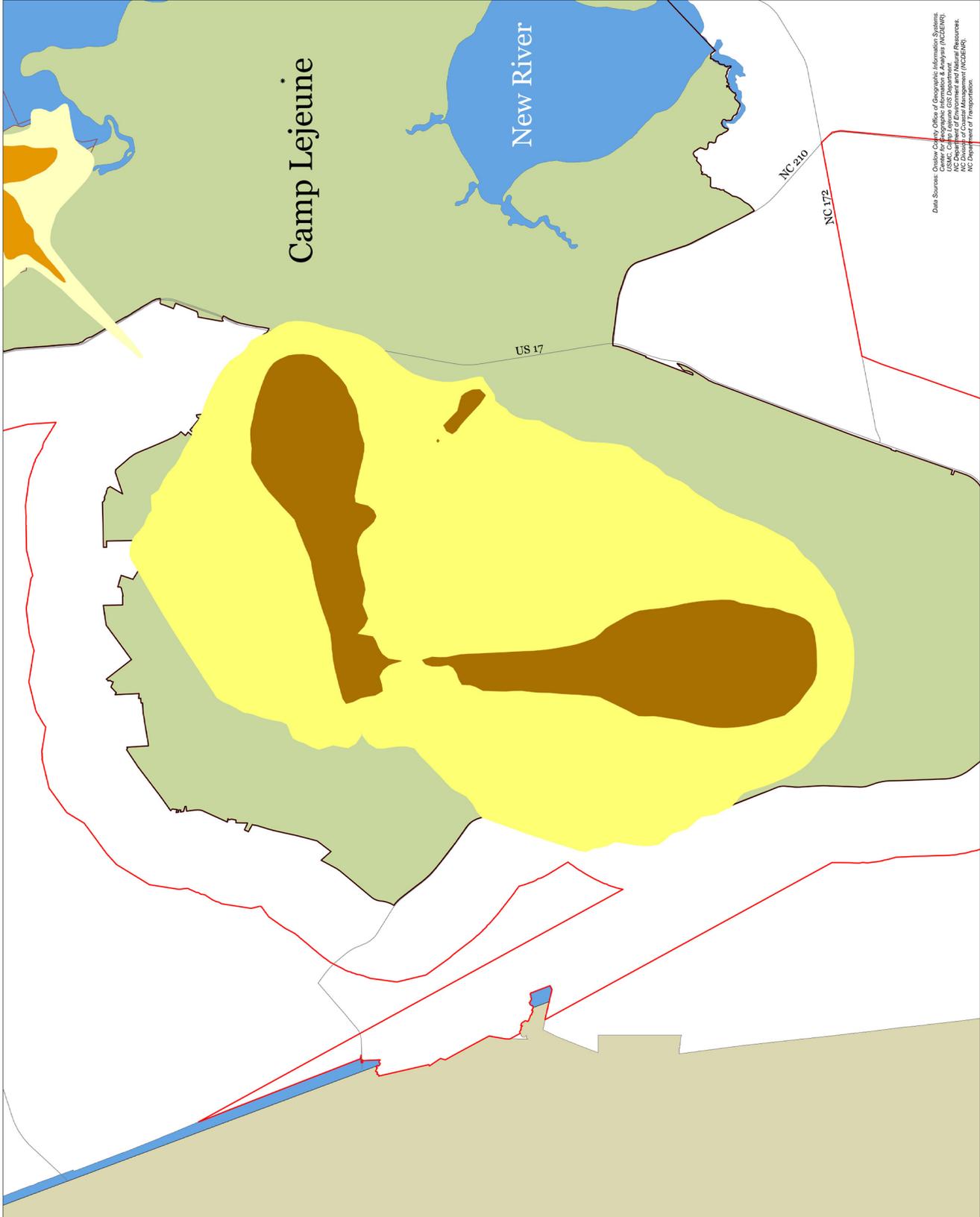
- Zone 2
- Zone 3
- Zone 1



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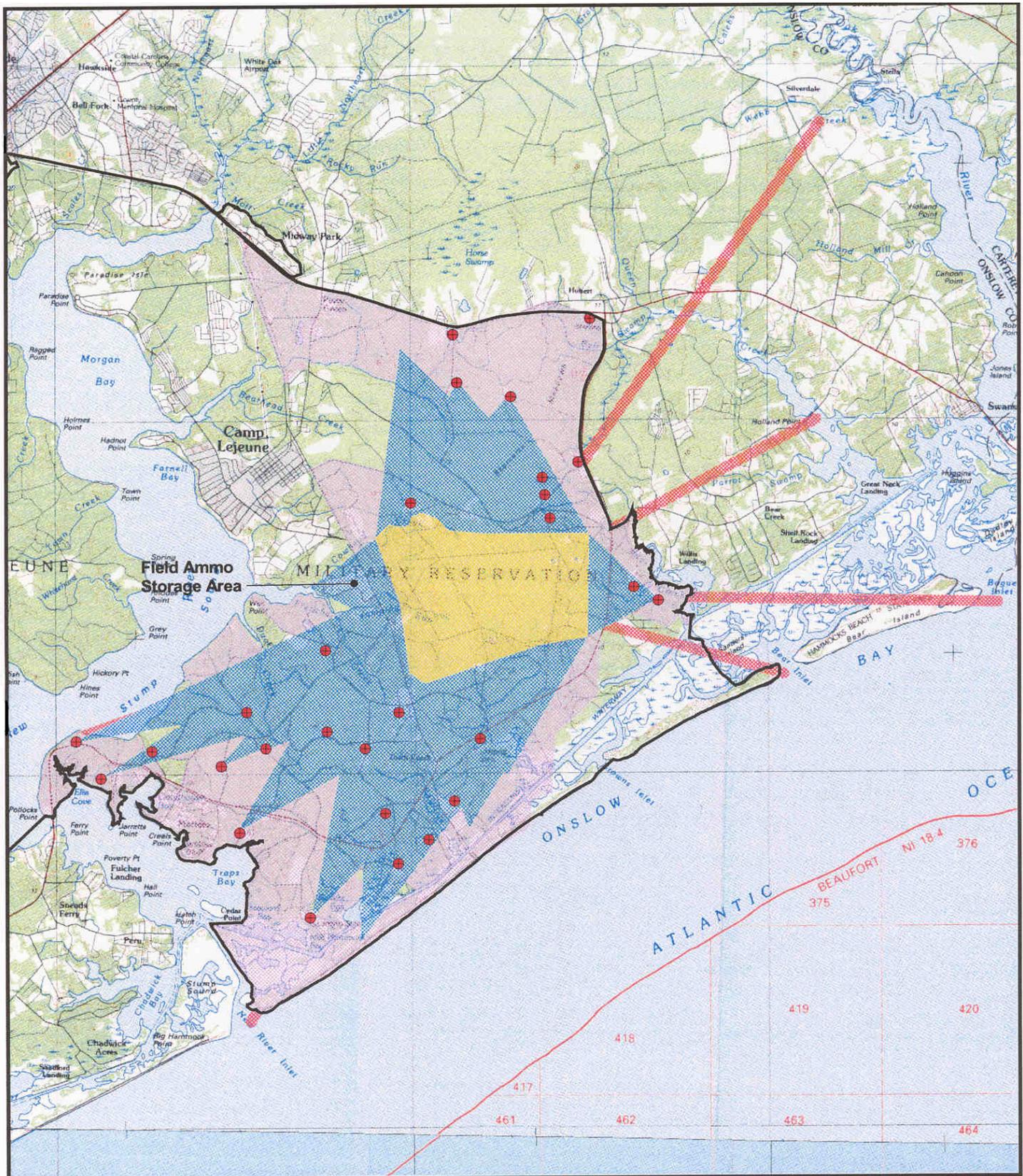


Date: 11/18/02
 Project Number: 1002087
 Revision 1:
 Revision 2:
 Revision 3:

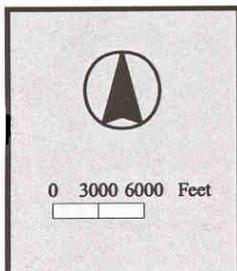


Data Sources: Onslow County Office of Geographic Information Systems
 Center for Geographic Information & Analysis (MCEGIS)
 Onslow County Office of Environmental and Natural Resources
 NC Department of Environment and Natural Resources
 NC Department of Transportation

Map 15: Projected RCUZ Footprint for GSRA



Map 16: G-10 Area Range Safety Zones Map provided by Onyx, August 2001, AICUZ Requirement Update for MCAS New River



G-10 Area Range Safety Zones

- RSZ A - Dedicated Impact Area
- RSZ B - Controlled Impact Area & Artillery Overhead Fire Area
- RSZ C - Controlled Aviation Area
- RSZ D - Training and Maneuver Area
- RSZ E - Aviation Overflight

Sources:
 MCB Camp Lejeune
 Military Installation Map: 1993
 Image: 1:100,000 USGS DRG

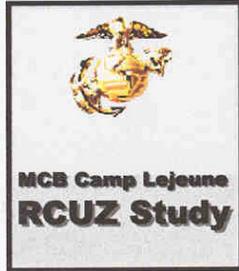
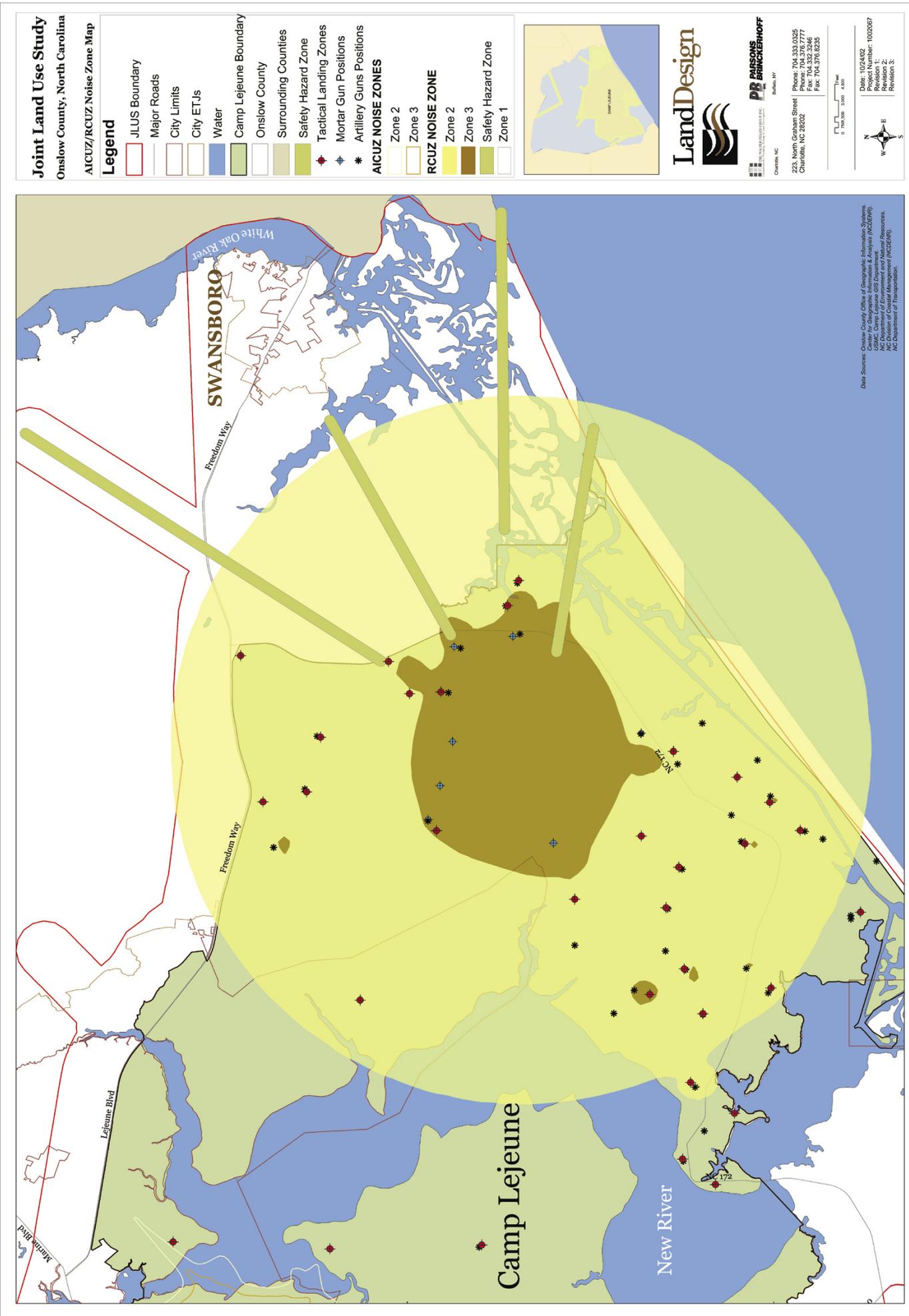


Figure
4-2
 Page 4-3



Map 17: Projected RCUZ Footprint for G-10 Impact Area

Appendix II: Advisory Committees

Policy Committee

Delma Collins, *Commissioner, Onslow County*
Gregory Hines, *Councilman, Town of Holly Ridge*
Jerry Bittner, *Councilman, City of Jacksonville*
Marty Bostic, *Mayor, Town of North Topsail Beach*
Donnell Jarman, *Alderman, Town of Richlands*
David Russell, *Commissioner, Town of Swansboro*
David M. Mize, *Commanding General, Marine Corps Base Camp Lejeune*
Patrick Farmer, *Citizen, Jacksonville Township*
Alfred (Al) Reyer, *Citizen, Richlands Township*
Joe Rigby, *Ret. Maj. Gen., Citizen, Stump Sound Township*
Nelda Howell, *Citizen, Swansboro Township*
Terry Partain, *Citizen, White Oak Township*
Dr. Ron K. Lingle, *Coastal Carolina Community College*

Technical Advisory Committee

Bill Price, *Planning and Dev. Director, Onslow County*
Tom Cassell, *Dev. Services Director, City of Jacksonville*
Don Betz, *Town Manager, Town of North Topsail Beach*
Greg Whitehead, *Town Manager, Town of Richlands*
Richard Banks, *Code Enforcement Officer, Town of Swansboro*
Joe Ramirez, *Director-Train. Res. Mgmt. Div., Marine Corps Base Camp Lejeune*
Ruth Leggett, *AICP, Division of Community Assistance*
Jerry Vickers, *Manager, Albert J. Ellis Airport*
Patricia Rouse, *Director, GIS Department*
Mona Padrick, *Executive Director, Jacksonville Onslow Chamber of Commerce*
Mary Waller, *Director, Onslow County Tourism*
Todd Daugherty, *President, Onslow County Board of Realtors*
Lt Col. Craig Herold (primary MCAS member), *S-4 Officer, Marine Corps Air Station New River*

Appendix III: Sample Disclosure Statements

Noise disclosure statement—Example One

The land in Section _____, Range _____, Township _____, in _____ County, situated at _____ (Address) which is being purchased from _____ by _____ lies within Noise Zone ____ of the _____ Airport as depicted on the Map _____, Appendix ____ in _____ County Airport Zoning Ordinance _____.

The purchaser, _____, is hereby notified that:

“This land lies within Noise Zone ____ for the _____ County Airport and is subject to noise that may be objectionable.”

The undersigned purchaser(s) of said land hereby certify(ies) that (he/they) (has/have) read and understand(s) the above disclosure statement and acknowledges that preexistence of the above named airport and the potential for objectionable noise.

Seller

Buyer

Sworn to and subscribed
before me at:

Notary Public

Source: Airport Compatible Land Use Guidance For Florida Communities, Florida Department Of Transportation. Office Of Public Transportation, Aviation Office 1994

Noise disclosure statement—Example Two

No person shall sell, lease, nor offer for sale or lease any property within the airport hazards area unless the prospective buyer or lessee has been given the following notice:

To: _____

The property at (address) is located within the airport environs of (airport) . Santa Rosa County has determined that this is an area of airport operations. The County has placed certain restrictions on the development and use of property within airport environs zones in addition to the restrictions in Article Six of the Land Development Code (the zoning code). Before purchasing or leasing the above property, you should consult Article Eleven of the Santa Rosa County Land Development Code to determine the restrictions which have been placed on the subject property.

Certification

As the owner of the subject property, I hereby certify that I have informed _____, as a prospective purchaser/lessee, that the subject property is located in an Airport Environs Zone.

Dated this _____ day of _____, 19__.

Witness _____ Owner _____

As a prospective purchaser/lessee of the subject property, I hereby certify that I have been informed that the subject property is in an Airport Environs Zone and I have consulted Article Eleven of the Santa Rosa County Land Development Code to determine the restrictions which have been placed on the subject property.

Dated this _____ day of _____, 19__.

Witness _____ Purchaser/Lessee _____

Source: Santa Rosa County, Florida Land Development Code

Noise disclosure statement—Example Three
Air Installation Compatible Use Zone Disclosure Form

The property at the following location:

Parcel # _____
Deed Book # _____ Page # _____
Address _____

is situated within the following zones of the Air Installation Compatibility Use Zone (AICUZ) of the Marine Corps Air Station (MCAS) Cherry Point, Marine Auxiliary Landing Field (MCALF) Bogue or Outlying Landing Field (OLF) Atlantic.

- Clear Zone: Greatest potential for accidents & highest noise exposure.
- Accident Potential Zone 1 (APZ1): Significant potential for accidents
- Accident Potential Zone 2 (APZ2): Measurable potential for accidents
- Noise Exposure Level N3 (75 ldn or higher): Area of significant impact from noise
- Noise Exposure Level N2 (65 to 74 ldn): Area of moderate impact from noise
- Noise Exposure Level N1 (below 65 ldn): Area of some impact from noise

The City/County has placed certain use restrictions on the development of property within the MCAS AICUZ footprint. Before purchasing the above property, you should consult the City/County Planning Department to determine what restrictions have been placed on the subject property. For properties identified as being within Noise Exposure Level zones, the City/County provides information for methods to reduce noise levels for existing or planned development.

I, _____, owner of the subject property, hereby certify that I have informed _____, prospective purchaser/lessee/renter, that the subject property is located in an Air Installation Compatibility Use Zone.

_____	_____
Owner	Purchaser/Lessee/Renter
_____	_____
Owner	Purchaser/Lessee/Renter

Signed before me on this _____ day of _____, 20__, in the County of _____, North Carolina.

My commission expires on _____.

_____, Notary Public, State of North Carolina.

Source: Division of Community Assistance, North Carolina Department of Commerce

Appendix IV: Land Use Compatibility Tables

Please see the following pages for land use tables created for the AICUZ and RCUZ programs. The first two tables were derived from the Department of Defense Instruction No. 4165.57, Air Installations Compatible Use Zones, November 8, 1977.

SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES¹

LAND USE		NOISE ZONES DNL Levels in Ldn						
SLUCM NO.	NAME	1		2		3		
		0-55	55-65	65-70	70-75	75-80	80-85	85+
10	<i>Residential</i>							
11	<i>Household units</i>							
11.11	Single units detached	Y	Y*	25 ¹	30 ¹	N	N	N
11.12	Single units; semidetached	Y	Y*	25 ¹	30 ¹	N	N	N
11.13	Single units; attached row	Y	Y*	25 ¹	30 ¹	N	N	N
11.21	Two units; side-by-side	Y	Y*	25 ¹	30 ¹	N	N	N
11.22	Two units; one above the other	Y	Y*	25 ¹	30 ¹	N	N	N
11.31	Apartments; walk up	Y	Y*	25 ¹	30 ¹	N	N	N
11.32	Apartments; elevator	Y	Y*	25 ¹	30 ¹	N	N	N
12	Group quarters	Y	Y*	25 ¹	30 ¹	N	N	N
13	Residential hotels	Y	Y*	25 ¹	30 ¹	N	N	N
14	Mobile home parks or courts	Y	Y*	N	N	N	N	N
15	Transient lodgings	Y	Y*	25 ¹	30 ¹	35 ¹	N	N
16	Other residential	Y	Y*	25 ¹	30 ¹	N	N	N
20	<i>Manufacturing</i>							
21	Food ~ kindred products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
22	Textile mill products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
23	Apparel and other finished products made from fabrics, leather, and similar materials; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
24	Lumber and wood products (except furniture); manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
25	Furniture and fixtures; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
26	Paper & allied products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y ²	Y ³	Y ⁴	N
28	Chemicals and allied products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
29	Petroleum refining and related industries	Y	Y	Y	Y ²	Y ³	Y ⁴	N

* 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 (Guidelines for Considering Noise in Land Use Planning and Control, June 1980).

¹ Department of Defense Instruction No. 4165.57, Air Installations Compatible Use Zones, November 8, 1977

LAND USE		NOISE ZONES DNL Levels in Ldn						
SLUCM		1		2		3		
NO.	NAME	0-55	55-65	65-70	70-75	75-80	80-85	85+
30	<i>Manufacturing (cont'd)</i>							
31	Rubber and misc. plastic products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
32	Stone, clay and glass products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
33	Primary metal industries	Y	Y	Y	Y ²	Y ³	Y ⁴	N
34	Fabricated metal products; manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks manufacturing	Y	Y	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
40	<i>Transportation, communication and utilities</i>							
41	Railroad, rapid rail transit and street railway transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	N
42	Motor vehicle transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	N
43	Aircraft transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	N
44	Marine craft transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	N
45	Highway & street right-of-way	Y	Y	Y	Y ²	Y ³	Y ⁴	N
46	Automobile parking	Y	Y	Y	Y ²	Y ³	Y ⁴	N
47	Communication	Y	Y	Y	25 ⁵	30 ⁵	N	N
48	Utilities	Y	Y	Y	Y ²	Y ³	Y ⁴	N
49	Other transportation, communication and utilities	Y	Y	Y	25 ⁵	30 ⁵	N	N
50	<i>Trade</i>							
51	Wholesale trade	Y	Y	Y	Y ²	Y ³	Y ⁴	N
52	Retail trade – building materials, hardware and farm equipment	Y	Y	Y	Y ²	Y ³	Y ⁴	N
53	Retail trade – general merchandise	Y	Y	Y	25	30	N	N
54	Retail trade – food	Y	Y	Y	25	30	N	N
55	Retail trade – automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade – apparel and accessories	Y	Y	Y	25	30	N	N
57	Retail trade – furniture, home furnishings and equipment	Y	Y	Y	25	30	N	N
58	Retail trade – eating and drinking establishments	Y	Y	Y	25	30	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N
60	<i>Services</i>							
61	Finance, insurance and real estate services	Y	Y	Y	25	30	N	N
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y ²	Y ³	Y ^{4,11}	Y ^{6,11}
63	Business services	Y	Y	Y	25	30	N	N
64	Repair services	Y	Y	Y	Y ²	Y ³	Y ⁴	N

65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, nursing homes	Y	Y*	25*	30*	N	N	N
65.1	Other medical facilities	Y	Y	Y	25	30	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Governmental services	Y	Y*	Y*	25*	30*	N	N
68	Educational services	Y	Y*	25*	30*	N	N	N
69	Miscellaneous services	Y	Y	Y	25	30	N	N
70	<i>Cultural, entertainment and recreational</i>							
71	Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
71.2	Nature exhibits	Y	Y*	Y*	N	N	N	N
72	Public assembly	Y	Y	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	Y	Y*	N	N	N	N	N
72.2	Outdoor sports, spectator sports	Y	Y	Y ⁷	Y ⁷	N	N	N
73	Amusements	Y	Y	Y	Y	N	N	N
74	Recreational activities (incl. Golf courses, riding stables, water recreation)	Y	Y*	Y*	25*	30*	N	N
75	Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
76	Parks	Y	Y*	Y*	Y*	N	N	N
79	Other cultural, entertainment and recreation	Y	Y*	Y*	Y*	N	N	N
80	<i>Resource production and extraction</i>							
81	Agriculture (except live-stock)	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
81.5	Livestock farming and							
81.7	animal breeding	Y	Y	Y ⁸	Y ⁹	N	N	N
82	Agricultural related activities	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
83	Forestry activities and related services	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
84	Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	Y	Y	Y	Y	Y	Y	Y
89	Other resource production and extraction	Y	Y	Y	Y	Y	Y	Y

E5.1. NOTES FOR SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES TABLE

1. a) Although local conditions regarding the need for housing may require residential use in these Zones, residential use is discouraged in DNL 65-70 and strongly discouraged in DNL 70-75. The absence of viable alternative development options should be determined and an evaluation should be conducted prior to approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these Zones.

b) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (DNL 65-70) and 30 dB (DNL 70-75) 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 or vibrations.

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 NLR 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.

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.

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.

4. 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.

5. If project or proposed development is noise sensitive, use indicated NLR; if not, land use is compatible without NLR.

6. No buildings.

7. Land use compatible provided special sound reinforcement systems are installed.

8. Residential buildings require a NLR of 25

9. Residential buildings require a NLR of 30.

10. Residential buildings not permitted.

11. Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.

E5.2. KEY TO SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES TABLE

SLUCM	Standard Land Use Coding Manual
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Yx (Yes with restrictions)	Land Use and related structures generally compatible; see notes 2-4.
25, 30, or 35	The numbers refer to Noise Level Reduction levels. Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 must be incorporated into design and construction of structure.
25*, 30* or 35*	The numbers refer to Noise Level Reduction levels. Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.
DNL	Day-Night Average Sound Level.
Ldn	Mathematical symbol for DNL.

AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES ¹

SLUCM* NO.	LAND USE NAME	CLEAR ZONE Recommendation	APZ-I Recommendation	APZ-II Recommendation	Density Recommendation
10	<i>Residential</i>				
11	Household Units				
11.11	Single units: detached	N	N	Y ²	Maximum density of 1-2 Du/acre.
11.12	Single units: semidetached	N	N	N	
11.13	Single units: attached row	N	N	N	
11.21	Two units: side-by-side	N	N	N	
11.22	Two units: one above the other	N	N	N	
11.31	Apartments: walk-up	N	N	N	
11.32	Apartment: elevator	N	N	N	
12	Group quarters	N	N	N	
13	Residential Hotels	N	N	N	
14	Mobile home parks or courts	N	N	N	
15	Transient lodgings	N	N	N	
16	Other residential	N	N	N	
20	<i>Manufacturing</i>				
21	Food & kindred products; manufacturing	N	N	Y ¹	Maximum FAR of 0.56 .
22	Textile mill products; manufacturing	N	Y ¹	Y ¹	Maximum FAR of 0.28 in APZ I/ 0.56 in APZ II.
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	Y ¹	Y ¹	Same as above
24	Lumber and wood products (except furniture); manufacturing	N	Y ¹	Y ¹	Same as above
25	Furniture and fixtures; manufacturing	N	Y ¹	Y ¹	Same as above
26	Paper and allied products; manufacturing	N	Y ¹	Y ¹	Same as above
27	Printing, publishing, and allied industries	N	Y ¹	Y ¹	Same as above
28	Chemicals and allied products; manufacturing	N	N	N	
29	Petroleum refining and related industries	N	N	N	
30	<i>Manufacturing (continued)</i>				
31	Rubber and misc. plastic products; manufacturing	N	N	N	
32	Stone, clay and glass products; manufacturing	N	N	Y	Maximum FAR of 0.56 in APZ 2
33	Primary metal products; manufacturing	N	N	Y	Same as above
34	Fabricated metal products; manufacturing	N	N	N	

35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	N	N	N	
39	Miscellaneous manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ 1 & FAR of 0.56 in APZ 2
40	<i>Transportation, communication and utilities.</i>				See Notes 2 & 3 Below.
41	Railroad, rapid rail transit, and street railway transportation	N ³	Y ⁴	Y	Same as above.
42	Motor vehicle transportation	N ³	Y	Y	Same as above
43	Aircraft transportation	N ³	Y ⁴	Y	Same as above
44	Marine craft transportation	N ³	Y ⁴	Y	Same as above
45	Highway and street right-of-way	N ³	Y	Y	Same as above
46	Automobile parking	N ³	Y ⁴	Y	Same as above
47	Communication	N ³	Y ⁴	Y	Same as above
48	Utilities	N ³	Y ⁴	Y	Same as above
49	Other transportation, communication and utilities	N ³	Y ⁴	Y	Same as above
50	<i>Trade</i>				
51	Wholesale trade	N	Y ¹	Y ¹	Maximum FAR of 0.28 in APZ I. Maximum FAR of .56 in APZ II.
52	Retail trade – building materials, hardware and farm equipment	N	Y ¹	Y ¹	Maximum FAR of 0.14 in APZ I & 0.28 in APZ II
53	Retail trade – general merchandise	N	N	Y ¹	Maximum FAR of 0.14.
54	Retail trade - food	N	N	Y ¹	Maximum FARs of 0.24
55	Retail trade – automotive, marine craft, aircraft and accessories	N	Y ¹	Y ¹	Maximum FAR of 0.14 in APZ I & 0.28 in APZ II
56	Retail trade – apparel and accessories	N	N	Y ¹	Maximum FAR 0.28
57	Retail trade – furniture, home, furnishings and equipment	N	N	Y ¹	Same as above
58	Retail trade – eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y ¹	Maximum FAR of 0.22
60	<i>Services</i>				
61	Finance, insurance and real estate services	N	N	Y	Maximum FARs of .22 for “General

					Office/Office park”
62	Personal services	N	N	Y	Office uses only. Maximum FAR of 0.22.
62.4	Cemeteries	N	Y	Y	No chapels.
63	Business services	N	Y	Y	Max. FARs of 0.11 APZ I; 0.22 in APZ II
63.7	Warehousing and storage services	N	Y ¹	Y ¹	Maximum FAR of 1.0
64	Repair Services	N	Y	Y	Max. FARs of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Max. FARs of 0.22
65.1	Hospitals, nursing homes	N	N	N	
65.1	Other medical facilities	N	N	N	
66	Contract construction services	N	Y ⁵	Y	Max. FARs of 0.11 APZ I; 0.22 in APZ II
67	Government Services	N	N	Y	Max FAR of 0.22
68	Educational services	N	N	N	
69	Miscellaneous	N	N	Y ¹	Max. FAR of 0.22
70	<i>Cultural, entertainment and recreational</i>				
71	Cultural activities	N	N	N	
71.2	Nature exhibits	N	Y ^{1,5}	Y ^{1,5}	
72	Public assembly	N	N	N	
72.1	Auditoriums, concert halls	N	N	N	
72.11	Outdoor music shells, amphitheaters	N	N	N	
72.2	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements	N	N	Y	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y ^{1,5}	Y ^{1,5}	No Club House
75	Resorts and group camps	N	N	N	
76	Parks	N	Y ^{1,5}	Y ^{1,5}	Same as 74
79	Other cultural, entertainment and recreation	N	Y ^{1,5}	Y ^{1,5}	Same as 74
80	<i>Resource production and extraction</i>				
81	Agriculture (except live stock)	Y ²	Y ¹	Y ¹	
81.5, 81.7	Livestock farming and breeding	N	Y ¹	Y ¹	
82	Agriculture related activities	N	Y ¹	Y ¹	Max FAR of 0.28; no activity which produces smoke, glare, or involves explosives
83	Forestry Activities	N	Y ¹	Y ¹	Same as Above
84	Fishing Activities	N	Y ¹	Y ¹	Same as Above
85	Mining Activities	N	Y ¹	Y ¹	Same as Above
89	Other resource production or extraction	N	Y ¹	Y ¹	Same as Above

LEGEND. The following legend refers to the preceding table in this enclosure.

*Standard Land Use Coding Manual (SLUCM), U.S. Department of Transportation

Y (Yes) -Land uses and related structures are normally compatible with out restriction.

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

Y^x – (yes with restrictions) the land uses and related structures are generally compatible; see notes indicated by the superscript.

N^x – (no with exceptions) See notes indicated by the superscript.

NOTES. The following notes refer to the preceding table in this enclosure.

1. A “yes” or a “no” designation for compatible land use is to be used only for general comparison. Within each land use category, where due to the variation of densities of people and structures, uses exist where further evaluation may be needed in each category. In order to assist installations and local governments, general suggestions as to floor/area ratios are provided as a guide to density in some categories. In general, land use restrictions which limit commercial, services, or industrial buildings or structure occupants to 25 per acre in APZ I, and 50 per acre in APZ II are the range of occupancy levels considered to be low density. Outside events should normally be limited to assemblies of not more than 25 people per Acre in APZ I, and maximum assemblies of 50 people per Acre in APZ II. Other factors to consider are height of structures, labor intensity in the building; structural coverage, explosive characteristics, air-pollution, electronic interference with aircraft, and potential glare to pilots.

2. The suggested maximum density for detached single family housing is one to two du/acre. In a Planned Unit Development of single family detached units this density could possibly be increased slightly, where the amount of open space is significant and the amount of surface area covered by structures does not exceed 20% of the PUD total area.

3. The placing of structures, buildings or above-ground utility lines in the clear zone is subject to severe restrictions. In the majority of clear zones these items are prohibited. See Tri-Service Manual AFM 32-1123(I); TM 5-803-7, NAVFAC P-971 “Airfield and Heliport Planning & Design” dated May 1, 1999 (reference b above) for specific details.

4. No accessory uses – e.g., No passenger terminals and major above ground electrical transmission lines in APZ I.

5. Accessory uses such as meeting places, auditoriums, etc. are not recommended.

Suggested Land Use Compatibility in Noise Zones

	Noise Zone 3	Noise Zone 2	Noise Zone 1
LAND USE	Aircraft	75	65
	Impulse	70	60
			dBA
			dBC
Residential - Single Family, Duplex, Mobile Homes		1	
Residential - Multiple Family		1	
Transient Lodging		1	
School Classrooms, Libraries, Churches			2
Hospitals, Nursing Homes			2
Auditoriums, Concert Halls, Movie Theaters			2
Office Buildings - Personal Business, Professional		2	
Outdoor Spectator Sports		3	
Industrial, Warehouse, Supplies		2	
Commercial, Retail, Manufacturing, Utilities		2	
Livestock Farming			
Extensive Natural Recreation Areas			
Military Training Activity			
Playgrounds, Neighborhood Parks			
Golf Courses, Riding Stables, Water Recreation			
Agriculture (except Livestock), Mining			
Public Right-of-Way			

	Incompatible
	Conditionally Compatible
	Compatible

NOTES:

1. Residential use in this zone is discouraged unless no better or viable alternative is found. Where residential use is to be allowed, noise level reduction (NLR) measures of at least 25 dB are recommended (e.g., berms and sound barriers to mitigate outdoor noise, mechanical ventilation and closed windows to mitigate indoor noise).
2. Measures to achieve NLR of at least 25 dB are recommended.
3. Sound reinforcement systems are recommended.

Source: MCB Camp Lejeune RCUZ Study

Suggested Land Use Compatibility in Range Safety Zones

LAND USE	RANGE SAFETY ZONES				
	A	B	C	D	E
Residential - Single Family, Duplex, Mobile Homes					1
Residential - Multiple Family					1
Transient Lodging					2
School Classrooms, Libraries, Churches					2
Hospitals, Nursing Homes					2
Auditoriums, Concert Halls, Movie Theaters					2
Office Buildings - Personal Business, Professional					3
Outdoor Spectator Sports					2
Playgrounds, Neighborhood Parks					2
Golf Courses, Riding Stables, Water Recreation					
Commercial, Retail, Manufacturing, Utilities					
Industrial, Warehouse, Supplies					
Livestock Farming					
Agriculture (except Livestock), Mining					
Public Right-of-Way				4	4
Extensive Natural Recreation Areas				2	2
Military Training Activity					

	Incompatible
	Conditionally Compatible
	Compatible

NOTES:

1. Due to safety concerns inherent in aviation overflight, suggested maximum density in RSZ E is less than one dwelling for 10 acres.
2. This use is incompatible when the training mission requires low-altitude overflights (less than 500 ft AGL).
3. Office uses should be restricted to low intensity. Building height should be limited in accordance with established minimum training flight altitudes.
4. Warnings should be posted along public rights-of-way when training activities have the potential of impacting public safety.

Source: MCB Camp Lejeune RCUZ Study

Appendix V: Construction Techniques for Noise Attenuation

The following construction techniques for noise attenuation are provided as a model for developing similar guidelines for construction in impacted areas surrounding Camp Lejeune.

Source: *Airport Compatible Land Use Guidance For Florida Communities, Florida Department Of Transportation, Office Of Public Transportation, Aviation Office 1994*

A. Recommended Construction Methods And Materials To Achieve A Minimum 25db SLr, Exterior To Interior

1. Compliance

Compliance with the following standards shall be deemed to meet the requirements of the compatible use noise zones in which an SLR 25 is specified.

2. General

- a. Brick veneer, masonry blocks or stucco exterior walls shall be grouted or caulked airtight.
- b. At the penetration of exterior walls by pipes, ducts, or conduits, the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.
- c. Window and/or through-the-wall ventilation units shall not be used.
- d. Through-the-wall door mail boxes shall not be used.

3. Exterior Walls

- a. Exterior walls other than as described in this section shall have a laboratory sound transmission class rating of at least STC-39.
- b. Masonry walls having a surface weight of at least 25 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.
- c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer.
 - (1) Interior surface of the exterior walls shall be of gypsum board or plaster at least 1/2" thick, installed on the studs.
 - (2) Continuous composition board, plywood or gypsum board sheathing at least 1/2" thick shall cover the exterior side of the wall studs behind wood or metal siding. Asphalt or wood shake shingles are acceptable in lieu of siding.
 - (3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.
 - (4) Insulation material at least 2" thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

4. Windows

- a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28.
- b. Glass shall be at least 3/16" thick.
- c. All operable windows shall be weather stripped and airtight when closed so as to conform to an air infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM E-283-65-T.
- d. Glass of fixed-sash windows shall be sealed in an airtight manner with a non-hardening sealant, or a soft elastomer gasket or glazing tape.
- e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-00153.
- f. The total area of glass in both windows and doors in sleeping spaces shall not exceed 20% of the floor area.

5. Doors

- a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-28.
- b. All exterior side-hinged doors shall be solid-core wood or insulated hollow metal at least 1-3/4" thick and shall be fully weather stripped.

- c. Exterior sliding doors shall be weather stripped with an efficient airtight gasket system with performance as specified in Section 1-4C. The glass in the sliding doors shall be at least 3/16" thick.
- d. Glass in doors shall be sealed in an airtight non-hardening sealant or in soft elastomer gasket or glazing tape.
- e. The perimeter of door frames shall be sealed airtight to the exterior wall construction as described in Paragraph 1-4E above.

6. Roofs

- a. Combined roof and ceiling construction other than described in this Section and Section 1-7 shall have a laboratory sound transmission class rating of at least STC-39.
- b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.
- c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weights of at least 25 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.
- d. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-28.

7. Ceilings

- a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 1-6b above. Ceilings shall be substantially airtight, with a minimum number of penetrations.
- b. Glass fiber or mineral wool insulation at least 2" thick shall be provided above the ceiling between joists.

8. Floors

- a. Openings to any crawl spaces below the floor of the lowest occupied rooms shall not exceed 2% of the floor space area of the occupied rooms.

9. Ventilation

- a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior.
- b. Gravity vent openings in attic shall not exceed code minimum in number and size.
- c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1" thick coated glass fiber, and shall be at least 5 feet long with one 90 bend.
- d. All vent ducts connecting the interior space to the outdoors, excepting domestic range exhaust ducts, shall contain at least a 5 ft. length of internal sound absorbing duct lining. Each duct shall be provided with a bend in the duct such that there is no direct line of sight through the duct from the venting cross section to the room-opening cross section.
- e. Duct lining shall be coated glass fiber duct liner at least 1" thick.
- f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the bent duct material.
- g. Fireplaces shall be provided with well-fitted dampers.

B. Recommended Construction Methods And Materials To Achieve A Minimum 30 Db Slr, Exterior To Interior

1. Compliance

Compliance with the following standards shall be deemed to meet the requirements of the compatible use noise zones in which an SLR 30 is specified.

2. General

- a. Brick veneer, masonry blocks or stucco exterior walls shall be constructed airtight. All joints shall be grouted or caulked airtight.

- b. At the penetration of exterior walls by pipes, ducts or conduits, the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.
- c. Window and/or through-the-wall ventilation units shall not be used.
- d. Operational vented fireplaces shall not be used.
- e. All sleeping spaces shall be provided with either a sound-absorbing ceiling or a carpeted floor.
- f. Through-the-wall/door mailboxes shall not be used.

3. Exterior Walls

- a. Exterior walls other than as described below shall have a laboratory sound transmission class rating of at least STC-44.
- b. Masonry walls having a surface weight of at least 40 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.
- c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco or brick veneer.
 - (1) Interior surface of the exterior walls shall be of gypsum board or plaster at least 1/2" thick, installed on the studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer or stucco. If the exterior is siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.
 - (2) Continuous composition board, plywood or gypsum board sheathing shall cover the exterior side of the wall studs behind wood, or metal siding. The sheathing and facing shall weight at least 4 pounds per square foot.
 - (3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.
 - (4) Insulation material at least 2" thick shall be installed continuously throughout the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

4. Windows

- a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33.
- b. Glass of double-glazed windows shall be at least 1/8" thick. Panes of glass shall be separated by a minimum 3" air space.
- c. Double-glazed windows shall employ fixed sash or efficiently weather stripped operable sash. The sash shall be rigid and weather stripped with material that is compressed airtight when the window is closed so as to conform to an infiltration test not to exceed 0.5 cubic foot per minute per foot of crack length in accordance with ASTM-E-283-65-T.
- d. Glass of fixed-sash windows shall be sealed in an airtight manner with a non-hardening sealant, or a soft elastomer gasket or glazing tape.
- e. The perimeter of window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following Federal Specifications: TT-S-0027, TT-S-00230, or TT-S-00133.
- f. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.

5. Doors

- a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-33.
- b. Double door construction is required for all door openings to the exterior. Openings fitted with side-hinged doors shall have one solid-core wood or insulated hollow metal core door at least 1-3/4" thick separated by an airspace of at least 4" from another door, which can be a storm door. Both doors shall be tightly fitted and weather stripped.
- c. The glass of double-glazed sliding doors shall be separated by a minimum 4" airspace. Each sliding frame shall be provided with an efficiently airtight weather stripping material as specified in Paragraph 2-4c above.
- d. Glass of all doors shall be at least 3/16" thick. Glass of double sliding doors shall not be equal in thickness.

- e. The perimeter of door frames shall be sealed airtight to the exterior wall construction as indicated in Section 8-4E. f. Glass of doors shall be set and sealed in an airtight non-hardening sealant, or a soft elastomer gasket or glazing tape.

6. Roofs

- a. Combined roof and ceiling construction other than described in this section and Section 2-7 shall have a laboratory sound transmission class rating of at least STC-44.
- b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.
- c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weight of at least 40 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.
- d. Window or dome skylights shall have a laboratory sound transmission class rating of at least STC-33.

7. Ceilings

- a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 2-6b above. Ceilings shall be substantially airtight with a minimum number of penetrations.
- b. Glass fiber or mineral wool insulation at least 2" thick shall be provided above the ceiling between joists.

8. Floors

- a. The floor of the lowest occupied rooms shall be slab on fill, below grade or over a fully enclosed basement. All door and window openings in the fully enclosed basement shall be tightly fitted.

9. Ventilation

- a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without the need to open any windows, doors, or other openings to the exterior.
- b. Gravity vent openings in attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least 3 ft. in length containing internal sound absorbing duct lining. Each duct shall have a lined 90 bend in the duct such that there is no direct line of sight from the exterior through the duct into the attic.
- c. If a fan is used for forced ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel which shall be lined with 1" thick coated glass fiber, and shall be at least 5 ft. long with one 90 bend.
- d. All vent ducts connecting the interior space to the outdoors excepting domestic range exhaust ducts, shall contain at least a 10 ft. length of internal sound absorbing duct lining. Each duct shall be provided with a lined 90 bend in the duct such that there is no direct line of sight through the duct from the venting cross section to the room opening cross section.
- e. Duct lining shall be coated glass fiber duct line at least 1" thick.
- f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.
- g. Building heating units with flues or combustion air vents shall be located in a closet or room closed off from the occupied space by doors.
- h. Doors between occupied space and mechanical equipment areas shall be solid core wood or 20 gauge steel hollow metal at least 1-3/4" thick and shall be fully weather stripped.

C. Recommended Construction Methods And Materials To Achieve A Minimum 35 Db Slr, Exterior To Interior

1. Compliance

Compliance with the following standards shall be deemed to meet the requirements of the Compatible Use Districts in which an NLR 35 is specified.

2. General

- a. Brick veneer, masonry blocks or stucco exterior walls shall be constructed airtight. All joints shall be grouted and caulked airtight.
- b. At the penetration of exterior walls by pipes, ducts or conduits, the space between the wall and pipes, ducts or conduits shall be caulked or filled with mortar.
- c. Window and/or through-the-wall ventilation units shall not be used.
- d. Operational vented fireplaces shall not be used.
- e. All sleeping spaces shall be provided with either a sound absorbing ceiling or a carpeted floor.
- f. Through-the-wall/door mailboxes shall not be used.
- g. No glass or plastic skylight shall be used.

3. Exterior Walls

- a. Exterior walls other than as described below shall have a laboratory sound transmission class rating of at least STC-49.
- b. Masonry walls having a surface weight of at least 75 pounds per square foot do not require a furred (stud) interior wall. At least one surface of concrete block walls shall be plastered or painted with heavy "bridging" paint.
- c. Stud walls shall be at least 4" in nominal depth and shall be finished on the outside with siding-on-sheathing, stucco, or brick veneer.
 - (1) Interior surface of the exterior walls shall be of gypsum board or plaster at least 1/2" thick, installed on studs. The gypsum board or plaster may be fastened rigidly to the studs if the exterior is brick veneer. If the exterior is stucco or siding-on-sheathing, the interior gypsum board or plaster must be fastened resiliently to the studs.
 - (2) Continuous composition board, plywood or gypsum board sheathing shall cover the exterior side of the all studs behind wood, or metal siding. The sheathing and facing shall weigh at least 4 pounds per square foot.
 - (3) Sheathing panels shall be butted tightly and covered on the exterior with overlapping building paper. The top and bottom edges of the sheathing shall be sealed.
 - (4) Insulation material at least 3-1/2" thick shall be installed continuously through the cavity space behind the exterior sheathing and between wall studs. Insulation shall be glass fiber or mineral wool.

4. Windows

- a. Windows other than as described in this section shall have a laboratory sound transmission class rating of at least STC-38.
- b. Double-glazed windows shall employ fixed sash. Glass of double-glazed windows shall be at least 1/8" thick. Panes of glass shall be separated by a minimum 3" air space and shall not be equal in thickness.
- c. Glass of windows shall be sealed in an airtight manner with a non-hardening sealant, or a soft elastomer gasket or glazing tape.
- d. The perimeter or window frames shall be sealed airtight to the exterior wall construction with a sealant conforming to one of the following; Federal Specifications: TT-S-00227, TT-S-00230, or TT-S-00153.
- e. The total area of glass of both windows and exterior doors in sleeping spaces shall not exceed 20% of the floor area.

5. Doors

- a. Doors, other than as described in this section shall have a laboratory sound transmission class rating of at least STC-38.
- b. Double door construction is required for all door openings to the exterior. The doors shall be side-hinged door and shall be solid-core wood or insulated hollow core door at least 1-3/4" thick separated by a vestibule at least 3 feet in length. Both doors shall be tightly fitted and weather stripped.
- c. The perimeter of door frames shall be sealed airtight to the exterior wall construction as specified in Section III-4d.

6. Roofs

- a. Combined roof and ceiling construction other than described in this section and Paragraph 3-7 shall have a laboratory sound transmission class rating of at least STC-49.
- b. With an attic or rafter space at least 6" deep, and with a ceiling below, the roof shall consist of closely butted 1/2" composition board, plywood or gypsum board sheathing topped by roofing as required.
- c. If the underside of the roof is exposed, or if the attic or rafter spacing is less than 6", the roof construction shall have a surface weight of at least 75 pounds per square foot. Rafters, joists or other framing may not be included in the surface weight calculation.

7. Ceilings

- a. Gypsum board or plaster ceilings at least 1/2" thick shall be provided where required by Paragraph 3-6. Ceilings shall be substantially airtight, with a minimum number of penetrations. The ceiling panels shall be mounted on resilient clips or channels. A non-hardening sealant shall be used to seal gaps between the ceiling and walls around the ceiling perimeter.
- b. Glass fiber or mineral wool insulation at least 3 1/2" thick shall be provided above the ceiling between joists.

8. Floors

The floors of the lowest occupied rooms shall be slab on fill or below grade.

9. Ventilation

- a. A mechanical ventilation system shall be installed that will provide the minimum air circulation and fresh air supply requirements for various uses in occupied rooms without need to open any windows, doors or other openings to the exterior.
- b. Gravity vent openings in attic shall not exceed code minimum in number and size. The openings shall be fitted with transfer ducts at least 6 ft. in length containing internal sound absorbing duct lining. Each duct shall have a line 90 bend in the duct such that there is no direct line of sight from the exterior through the duct into the attic.
- c. If a fan is used for force ventilation, the attic inlet and discharge openings shall be fitted with sheet metal transfer ducts of at least 20 gauge steel, which shall be lined with 1" thick coated glass fiber, and shall be at least 10 ft. long with one 90 bend.
- d. All vent ducts connecting the interior space to the outdoors excepting domestic range exhaust ducts, shall contain at least a 10 ft. length of internal sound absorbing duct lining. Each duct shall be provided with a lined 90 bend in the duct such that there is not direct line of sight through the duct from the venting cross section to the room-opening cross section.
- e. Duct lining shall be coated glass fiber duct liner at least 1" thick.
- f. Domestic range exhaust ducts connecting the interior space to the outdoors shall contain a baffle plate across the exterior termination which allows proper ventilation. The dimensions of the baffle plate should extend at least one diameter beyond the line of sight into the vent duct. The baffle plate shall be of the same material and thickness as the vent duct material.
- g. Building heating units with flues or combustion air vents shall be located in a closet or room closed off from the occupied space by doors.
- h. Doors between occupied space and mechanical equipment areas shall be solid core wood or 20 gaged steel hollow metal at least 1-3/4" thick and shall be fully weather stripped.

Basic Sound Level Reduction Construction Methods and Materials List

The following combination of materials and construction or their Sound Transmission Class rating equivalents are recommended in Noise Zone B and Noise Zone C when using this option to meet the sound reduction requirements of this Ordinance.

A. Seal all leaks in the building envelope.

Seal all openings in walls and floor/ceiling structures. Caulk all openings in walls and floor/ceiling structures. Cut holes for electrical outlets and wire runs neatly; caulk air tight with elastic caulk. Seal all cracks in subfloor with airtight caulk or install underlayment over entire surface. Use weather stripping around windows and doors.

B. Windows/Glass.

Use double glazing, insulated glass or storm windows to help reduce noise transmission through windows and glass surfaces. Use caulking and weather stripping around windows.

C. Exterior doors.

Use solid wood or mineral core doors for exteriors. Storm doors also help reduce sound transmission and thermal loss. Hollow core doors cannot be used on the exterior. The solid core door should be flush and weather stripped.

D. Roof.

Use heavy weight felt on the roof or two layers of felt.

E. Insulation.

Use highly porous insulation or dense foam insulation to reduce sound transmission in the cavity of walls and ceilings. Nontoxic foam insulation when exposed to a flame should be use. This type of insulation provides cavity absorption of sound transmission.

F. Interior and Exterior Wall Boards.

Use 5/8" wall board or dense interior wallboard and dense or porous exterior sheathing that has an equivalent Sound Transmission Class rating.

G. Other.

Materials that have both thermal and acoustical benefits such as heavy drapes for walls, windows or doors and thick carpeting on slab floors are recommended additional materials and construction techniques. A person requesting the use of construction materials or methods other than those recommended and required above may do so provided a qualified acoustical consultant (e.g., qualified engineer or architect) certifies those materials and/or methods to be used by the person will achieve a minimum Sound Transmission Class rating of 50 for the walls and roof/ceiling sections, or a comparable STC rating depending on the specific materials or methods to be used.

H. Resilient Furring Channels(Recommended but not Required).

A roof and walls transmit sound most effectively when they vibrate as a total unit. Any method that can be used to interfere with the transmission of vibration between the roof surface and walls will help reduce sound transmission. An effective technique is the use of resilient furring channels to reduce vibration, thus sound transmission, through the roof to the walls. Resilient furring channels should be fastened to 2" x 4" studs using screws and the channels spaced horizontally 24" on center on one side of the wall and the roof only. A 1/2" x 3" gypsum filler strip can be used for additional fastening of the wall board to the stud.

Appendix VI: Ordinance Reference List

The following zoning references and excerpts are provided as a model for addressing issues similar to those identified through this study, related to disclosure and height limitations.

Disclosure

Source: Arizona Department of Real Estate

Disclosure requirements for property which is within
“territory in the vicinity of a military airport.”

A.R.S. § 28-8461(11), formerly A.R.S. § 2-321, defines the “territory in the vicinity of a military airport” as:

The stated purpose of the following statutes is “to encourage the preservation of military airports and to promote the public health and safety in the vicinity of military airports by permitting and encouraging military airport planning and zoning regulations which assure uses of land compatible with the continued operation of military airports.” In 1996, the Legislature enacted A.R.S. §§ 28-8483 and 28-8484 which became effective October 1, 1997.

§ 28-8483. Registry of military airport flight operations; public inspection

A. The state real estate department and political subdivisions that have territory in the vicinity of a military airport shall request from the military airports in this state a registry of information including maps of military flight operations and a list of contact persons at each military airport who are knowledgeable about the impacts of military flight operations. The state real estate department shall maintain the registry and make the registry available to the public on request.

B. The registry of information required by this section shall be used to enforce the sound attenuation and public disclosure requirements of sections 28-8481 and 28-8482.

§ 28-8484. Military airport disclosure; residential property (as amended in 1991)

A. Any public report issued after December 31, 2001 pursuant A.R.S. § 32-2183 or 32-2195.03 Applicable to property that is located within territory in the vicinity of a military airport shall include the following statements:

1. That the property is located within territory in the vicinity of a military airport.

2. If the state real estate department has been provided the registry of information described in § 28-8483, that the state real estate department maintains a registry of information, including the maps of military flight operations provided by the military airport, pursuant to § 28-8483 and, if provided to the department, the map prepared by the military airport pursuant to subsection b of this section.

3. If the state real estate department has been provided the registry of information described in § 28-8483, that the information is available to the public on request.

B. Each military airport may provide the state real estate department and each political subdivision with territory in the vicinity of the military airport with a map that is in electronic form and that is eight and one-half inches by eleven inches in size showing the exterior boundaries of each

territory in the vicinity of a military airport and the exterior boundaries of each high noise or accident potential zone. The state real estate department shall work closely with each military airport and political subdivisions with territory in the vicinity of a military airport as necessary to create a map that is visually useful in determining whether property is located in or outside of a territory in the vicinity of a military airport or in or outside of a high noise or accident potential zone. If there are changes to the map, the military airport shall notify the state real estate department and political subdivisions of the changes and shall provide a new map in electronic form. If a new map is provided, the department and the political subdivisions shall include the map in the registry of information maintained pursuant to § 28-8483. The map shall be included in public reports issued pursuant to §§ 32-2183 or 32-2195.03, And the map shall be available to the public on request.

C. For any lot reservation or conditional sale that occurs before the issuance of a public report, the disclosure statements listed in subsection a of this section shall be included within the reservation document or conditional sales contract.

D. This section does not require the amendment or reissuance of any public report issued on or before December 31, 2001 or the amendment or reissuance of any reservation document or conditional sales contract accepted on or before December 31, 2001.

The maps are available for your inspection at _____. You may view them online in Microsoft Word, PowerPoint, or other format.

In addition to the above statutes, A.R.S. § 32-2181(A)(23) requires this disclosure in an application for a Subdivision Public Report:

“A true statement as to whether all or any portion of the subdivision is located in territory in the vicinity of a military airport.”

Height Limitations

Refer to the Advisory Circular entitled “A Model Zoning Ordinance U.S. to Limit Height of Objects Around Airports” produced by the Department of Transportation - Federal Aviation Administration on 12/14/87.

Appendix VII: Suggested Zoning Districts

The following are examples of zoning districts that could be established in the JLUS study area, as generally depicted on Map 12. More detailed maps at a smaller scale should be used in determining the specific areas to which zoning districts might be applied and in delineating boundaries for such districts.

Zoning Area	Conditions/Characteristics	Land Use Restrictions & Development Standards *
LLTR-O	Low Level Training Route	Height limitation for all structures: max. height 60'. **
FT-O	Flight Track/Safety Hazard Zone	Height limitation for all structures: max. height 60'. ** Prohibit land uses that are likely to create high levels of light, smoke, and/or dust, or have a tendency to attract birds (e.g. landfills), or create electromagnetic interference. Discourage incompatible uses. Limit residential density to one dwelling per acre. Prohibit uses that may be susceptible to aircraft noise, unless standards for noise attenuation are met.***
HLZ-O	Helicopter Landing Zone Buffer	Height limitation for all structures: max. height 40' or as allowed by underlying zoning, whichever is more restrictive. ** No cell, TV, radio, or other communication or utility towers, or other similar obstructions may be constructed.
H24-O	NC 24 Traffic Impact Zone	Prohibit critical public safety facilities (hospitals, fire stations, etc.) unless alternate access can be provided. Establish site design standards that limit the number of access points from Hwy. 24 to the site (e.g. max. one driveway per parcel), and encourage connections to adjacent parcels.
NZ-O	Noise Zone 2	Discourage incompatible uses, OR require noise attenuation in new residential, educational, hospital, and similar structures. Limit residential density to one dwelling unit per acre.
A-O	Ellis Airport	Height limitation for all structures along extension of runway centerline. **** Prohibit uses that may be susceptible to aircraft noise, unless standards for noise attenuation are met within the noise contours. ****
NZ-A	Verona Area	Prohibit uses that may be susceptible to aircraft noise, unless standards for noise attenuation are met.*** Permit non-residential uses that are compatible with base activities.
NZ-B	Areas south & west of GSRA, and other environmentally sensitive areas	Only low density development should be encouraged. Development intensity in these areas is already controlled by state and federal environmental regulations. Sewer service should not be extended to these areas, unless zoning is in place.

* See Appendix VI for a listing of ordinances containing relevant language, or excerpts from such ordinances.

** Height limitation may vary depending on actual flight activity in each location. Representatives of the USMC Camp Lejeune should participate in determining the appropriate height limitations.

*** See Appendix V for construction techniques for noise attenuation.

**** See zones in Ellis Airport Master Plan, and FAA Circular for a model zoning ordinance to control height of structures (referenced in App. VI).

Appendix VIII: Resources

Federal Emergency Management Agency website <http://www.fema.gov>

Holland Consulting Planners, Inc. *Onslow County, North Carolina: 1997 Land Use Plan*. Adopted February 11, 2000.

Marine Corps Base Camp Lejeune websites. <http://www.lejeune.usmc.mil/MAIN/history.html> and http://www.lejeune.usms.mil/mcasnr/marine_corps_history.htm

National Register of Historic Places website <http://www.cr.nps.gov/nr>

NC Center for Geographic Information and Bill Farris Consultants. *Land Suitability Analysis Project: Technical Report*. North Carolina Division of Coastal Management: August 2002.

North Carolina Coastal Region Evaluation of Wetland Significance website. http://www.wes.army.mil/el/emrrp/emris/emrishelp6/north_carolina_coastal_region_evaluation_of_wetland_significance_tools.htm

North Carolina Department of Environment and Natural Resources website. <http://www.enr.state.nc.us>

North Carolina Division of Coastal Management website. <http://dcm2.enr.state.nc.us>

North Carolina State Demographics website. <http://demog.state.nc.us>

North Carolina Wetlands Restoration Program website. <http://h2o.enr.state.nc.us/wrp>

Office of Economic Adjustment, Department of Defense. *Joint Land Use Study Program*. <http://hq.usace.army.mil/isd/librarie/RP/JLUSINFO.PDF>

http://www.tourswansboro.com/swansboro_history.html

U.S. Census website. <http://www.census.gov>