Air Installations Compatible Use Zones Study

Hill Air Force Base, Utah

August 2018

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 75TH AIR BASE WING (AFMC)
HILL AIR FORCE BASE UTAH

5 July 2018

MEMORANDUM FOR AREA GOVERNMENTS

FROM: 75 ABW/CC
7981 Georgia Street, Building 1102, Suite 100
Hill AFB UT 84056

SUBJECT: Air Installations Compatible Use Zones (AICUZ) Study

1. This AICUZ Study for Hill Air Force Base (AFB) is an update of the AICUZ Study dated 1993. This update was initiated because of mission and flight procedure changes at the base as well as improved noise modeling technology and Air Force policies. It is a reevaluation of aircraft noise and accident potential related to Air Force flying operations. It is designed to aid in the development of local planning mechanisms, which will protect the public safety and health as well as preserve the operational capabilities of Hill AFB.

2. The AICUZ Study contains a summary description of the affected area around the base. It outlines the location of runway Clear Zones, aircraft Accident Potential Zones, noise contours, and provides recommendations for development compatible with military flight operations. It is our recommendation that local governments incorporate these recommendations into community plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

3. This update exposes the noise contours in the base's vicinity, utilizing the Day-Night Average Sound Level (DNL) metric as well as a planning noise contour. Long-range planning by local land use authorities involves strategies to influence present and future uses of land. Due to the long-range nature of planning, the Air Force provides planning contours, which are noise contours based on reasonable projections of future missions and operations. AICUZ studies using planning contours provide a description of the long-term (5- to 10-year) aircraft noise environment for projected aircraft operations that is more consistent with the planning horizon used by state, tribal, regional, and local planning bodies.

4. We greatly value the positive relationship that Hill AFB has maintained with its neighbors over the years. As a partner in the process, we have attempted to minimize noise disturbances through such actions as minimizing night flying, avoiding flights over heavily populated areas to the extent practicable, and installing jet engine noise suppressors for maintenance activities. We solicit your cooperation in implementing the recommendations and guidelines presented in this AICUZ Study update.

JON A. EBERLAN, Colonel, USAF
Commander

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Abbreviations and Acronyms

419 FW	419th Fighter Wing
75 ABW	75th Air Base Wing
ACC	Air Combat Command
AFB	Air Force Base
AFI	Air Force Instruction
AFMC	Air Force Materiel Command
AFNWC	Air Force Nuclear Weapons Center
AICUZ	Air Installations Compatible Use Zones
APZ	Accident Potential Zones
ATC	Air Traffic Control
BASH	bird/wildlife-aircraft strike hazard
CFR	Code of Federal Regulations
CZ	Clear Zone
dB	decibels
dBA	A-weighted decibel
DLA	Defense Logistics Agency
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EMI	electromagnetic interference
FAA	Federal Aviation Administration
GCA	Ground Control Approach
HAFZ	Hazards to Aircraft Flight Zone
HQ	Headquarters
Hz	hertz
ICBM	intercontinental ballistic missile
JLUS	Joint Land Use Study
LED	light-emitting diode
NVGs	night vision goggles
OO-ALC	Ogden Air Logistics Complex
OOAMA	Ogden Air Materiel Area
SLUCM	Standard Land Use Coding Manual
SR	State Route
USAF	U.S. Air Force
UTTR	Utah Test and Training Range
WFRC	Wasatch Front Regional Council

1.0 Introduction

This study is an update of the Hill Air Force Base (AFB) Air Installations Compatible Use Zones (AICUZ) Study. The update presents and documents the changes to the AICUZ since the release of the last study in 1993. It reaffirms Air Force policy of promoting public health, safety, and general welfare in areas surrounding the base while seeking development compatible with the defense flying mission. This study presents changes in flight operations since the last study and provides current noise contours and recommendations for achieving development compatible with the defense flying mission.

1.1 AICUZ Program

Military airfields attract development—people who work on base want to live nearby while others want to provide services to base employees and residents. When incompatible development occurs near an installation or training area, affected parties within the community may seek relief through political channels that could restrict, degrade, or eliminate capabilities necessary to perform the defense mission. In the early 1970s, the Department of Defense (DoD) established the AICUZ Program to protect the health, safety, and welfare of those living and working near air installations while sustaining the Air Force's operational mission. The Air Force accomplishes this goal by promoting proactive, collaborative planning for compatible development to sustain mission and community objectives.

The AICUZ Program recommends that noise levels, Clear Zones (CZs), Accident Potential Zones (APZs), and flight clearance requirements associated with military airfield operations be incorporated into local community planning programs in order to maintain the airfield's operational requirements while minimizing the impact to residents in the surrounding community. Cooperation between military airfield planners and community-based counterparts serves to increase public awareness of the importance of air installations and the need to address mission requirements and associated noise and risk factors in the public planning process. As the communities that surround airfields grow and develop, the United States Department of the Air Force has a responsibility to communicate and collaborate with local government on land use planning, zoning, and similar matters that could affect the installation's operations or missions. Likewise, the Air Force has a responsibility to understand and communicate potential impacts that new and changing missions may have on the local community.

1.2 Scope and Authority

1.2.1 Scope

This AICUZ Study uses projected aircraft operations reflecting a potential long-term (5- to 10-year) aircraft noise environment to best support long-term land use planning. Noise zones, CZs, APZs, and other planning factors associated with the Hill AFB runways are provided to the local communities along with recommendations for compatible land

use near the base for incorporation into comprehensive plans, zoning ordinances, subdivision regulations, building codes, and other related documents.

1.2.2 Authority

Authority for the Air Force AICUZ Program is in two documents:

Air Force Instruction (AFI) 32-7063, *Air Installations Compatible Use Zones Program* implements DoD Instruction 4165.57 *Air Installations Compatible Use Zones* and applies to all Air Force installations with active runways located in the United States and its territories. This instruction provides guidance to installation AICUZ Program Managers with a framework that complies with Air Force Policy Directive 32-70, *Environmental Quality*.

Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*, provides installation AICUZ Program Managers specific guidance concerning the organizational tasks and procedures necessary to implement the AICUZ Program. It is written in a "how to" format and aligns with AFPD 32-70, *Environmental Quality*.

1.3 Previous AICUZ Efforts and Related Studies

Previous studies relevant to this AICUZ Study include:

- 1974 initial Hill AFB AICUZ Study
- 1977 Hill AFB AICUZ Study (1974 study amended)
- 1978 Davis County-Hill AFB Land Use Compatibility Study
- 1982 Hill AICUZ Study (1977 study amended)
- 1983 Hill AICUZ Study (1982 study amended)
- 1993 Talking Paper on AICUZ and Hill AFB Compatible Land Use Study (referred to as "1993 AICUZ" for brevity and because the content parallels content in an AICUZ study) (U.S. Air Force 1993)
- 1995 Joint Land Use Study (JLUS)
- 2013 F-35A Operational Basing Environmental Impact Statement

1.4 Changes that Require an AICUZ Update

The 2018 Hill AFB AICUZ Study updates the 1993 AICUZ Study and provides flight track, APZ, and noise zone information that reflects the most accurate picture of the installation's aircraft activities as projected to include full-strength operations for all existing based units and the operations of an additional potential future flying unit. As such, the AICUZ Program allows surrounding communities to consider potential future Air Force operations within a 5- to 10-year planning window when making land use decisions.

As the DoD aircraft fleet mix and training requirements change over time, the resulting flight operations change as well, affecting the noise contours. Additionally, non-operational changes may also require the need for an AICUZ update. The primary

changes since the previous AICUZ update are as follows and are discussed in Section 4.4.2:

- Changes in based aircraft, including the basing of F-35A aircraft and the departure of F-16 aircraft
- Changes in operational procedures and tempo
- Changes in noise modeling software
- Changes in AICUZ Air Force policies
- Changes in off-base land use

2.0 Hill AFB, Utah

2.1 Location

Hill AFB is located about 25 miles north of Salt Lake City and 11 miles south of Ogden (Figure 2-1), with the Wasatch Range located to the east and the Great Salt Lake approximately 7 miles to the west. The base itself is situated on a high plateau with terrain sloping downwards from the runway in all directions. Most of the installation is located in Davis County, but the northernmost portion is in Weber County. The installation is bounded to the west by Interstate (I)-15 and the cities of Roy, Sunset, and Clearfield. To the south, the installation is bordered by State Route (SR)-193 and the cities of Clearfield and Layton. On the eastern edge of the installation are developed areas of Layton and unincorporated areas of Davis County. To the north are the Davis-Weber Canal and the cities of Riverdale, Washington Terrace, and South Weber.

2.2 History

Construction of what would become Hill AFB started in 1940 as Hill Field was established as part of Ogden Air Depot. The Army Air Corps field supported major aircraft maintenance and supply activities for the B-17, B-24, B-26, P-40, P-47, A-20 and AT-11 aircraft, and aircraft could operate off of four 7,500-foot runways. Wartime employment during World War II reached 43,000 persons. After the end of World War II and with the establishment of the U.S. Air Force, Hill Field became Hill AFB in 1948 and was part of Air Materiel Command. Leading up to the Korean conflict, hundreds of B-26 and B-29 were removed from storage and rapidly returned to combat readiness at the depot.

In the 1950s, Hill AFB's acreage doubled when the U.S. Army Ogden Arsenal was added to the base and one runway was extended to 13,500 feet. New missions were added including the assemblage and maintenance of intercontinental ballistic missiles (ICBMs) such as the SM-65 Atlas ICBM in 1958 and the SM-80 Minuteman ICBM in 1959.

Also in the 1950s, the Ogden Air Materiel Area (OOAMA), the ranking activity at Hill, began support of jet aircraft, such as the F-84F Thunderstreak, F-84G Thunderjet, RF-84J Thunderflash, F-89 Scorpion, F/RF-101 Voodoo, F-102 Delta Dagger, B-47 Stratojet, and B-57 Night Intruder. OOAMA also assumed prime maintenance responsibilities for the SM-62 Snark, IM-99 Bomarc, SM-73 Goose, and SM-64 Navaho missile systems, as well as the MB-1 Genie rocket system.

In the 1960s, OOAMA was assigned support and system management duties for the U.S. Air Force F-4 Phantom II, Titan II/Titan III missiles, and the AGM-65A Maverick missile. Hill AFB also supported the war in Southeast Asia by direct airlifts of hundreds of tons of air munitions via C-124, C-130, C-133, and C-141 aircraft. The base also picked up maintenance responsibilities for B-58 Hustler and F/RF/FB-111A Aardvark landing gear components.

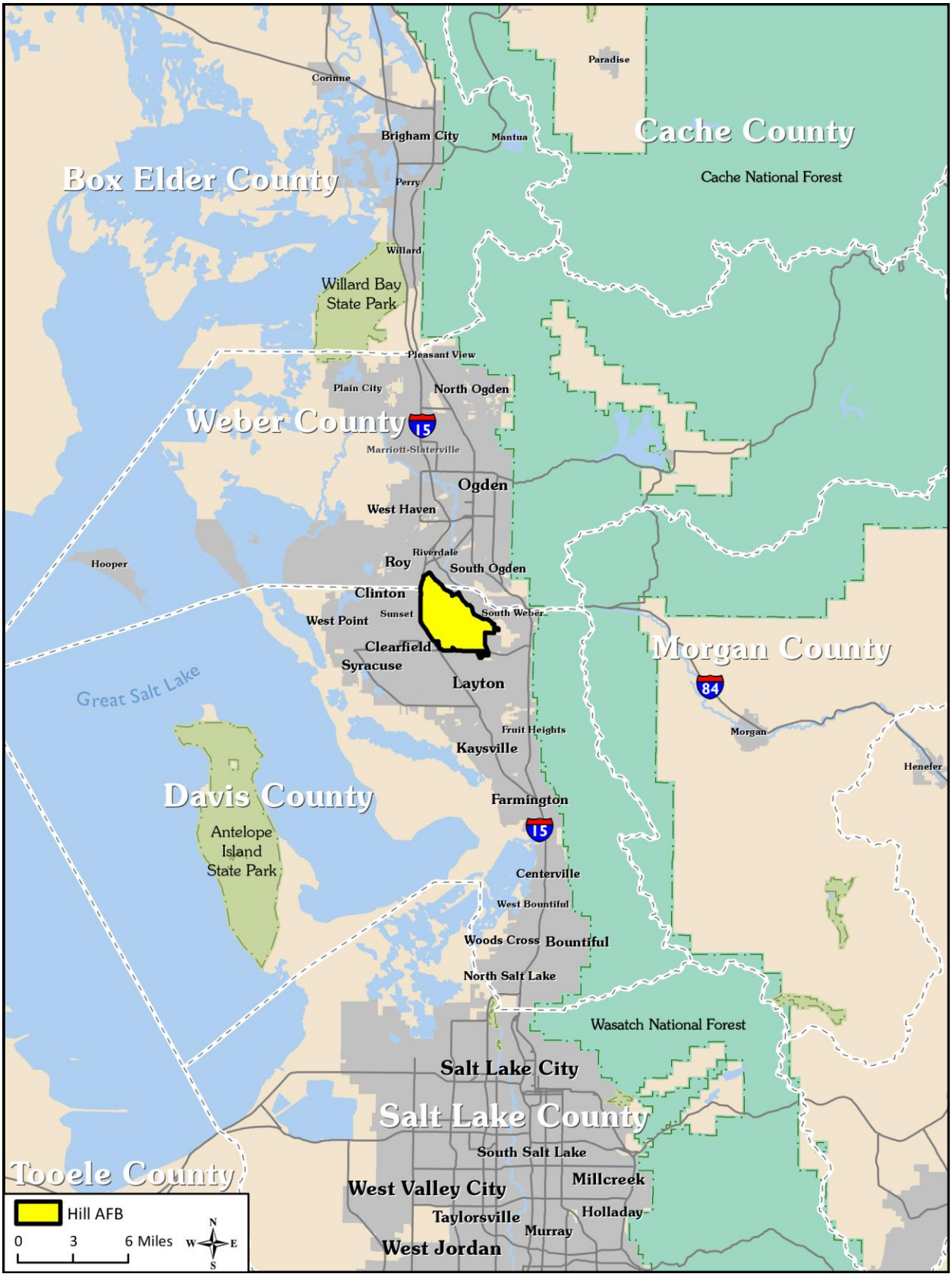


Figure 2-1. Regional Setting

Hill AFB began managing certain components of the F-15 Eagle in 1971. That same year field testing began at Hill AFB on the UH-1H Iroquois helicopter. The following year saw the production of the first version of the Short Range Attack Missile, delivered from Boeing Air Force Plant 77 at Hill AFB.

The Ogden Air Logistics Complex (OO-ALC) also became system manager of the F-16 Fighting Falcon, the Advanced Intercontinental Ballistic Missile System, and the A-10 Thunderbolt II in the 1970s. OO-ALC had logistics responsibility for Alaska, western Canada, Idaho, Montana, North and South Dakota, Wyoming, Utah, Colorado, Arizona, and New Mexico. In December 1975, the 388th Tactical Fighter Wing moved to Hill AFB and began operations with F-4 aircraft and the 421st Tactical Fighter Squadron was established. The wing began its conversion to F-16 aircraft in 1979, becoming the first fully operational F-16 fighter wing.

The 1980s saw the assignment of repair responsibilities for the BGM-109G Ground Launched Cruise Missile to Hill AFB. During Fiscal Year 1980, airfield traffic totaled 145,243 takeoffs and landings. The OO-ALC Directorate of Distribution then managed an inventory valued at approximately $2.04 billion. The base was also assigned repair projects for the OV-10A Bronco and C-130 Hercules aircraft.

In August 1990, OO-ALC and Hill AFB began support of Operation Desert Shield by helping to sustain the U.S. deployment to Southwest Asia. All shifts and work hours were extended to support the various aircraft involved in the mission. The 388th Fighter Wing, a Hill AFB tenant, also deployed its 4th and 421st Fighter Squadrons to Southwest Asia.

During the 1990s and the 2000–2015 timeframe the installation continued to support the Air Force mission and also added support to the F-22 aircraft. In 2012, the Air Force selected Hill AFB for the beddown of the first operational squadrons of the F-35A aircraft. In 2015, F-35A aircraft began to arrive at Hill AFB, beginning the transition from an F-16 fleet to an F-35A fleet.

2.3 Mission

Today, Hill AFB is home to numerous operational and support missions. Multiple Air Force Major Commands and units are represented on the installation. The host unit is the 75th Air Base Wing (75 ABW) (Air Force Materiel Command [AFMC]). The installation is also home to over 50 tenant units, with the larger organizations listed in Section 2.4.

Headquarters (HQ) Utah Test and Training Range (UTTR) under Air Combat Command (ACC), manages the daily operations within the UTTR, which is an Air Force-controlled DoD Major Range and Test Facility Base Activity located approximately 100 miles west of Hill AFB, in the West Desert of northwestern Utah and eastern Nevada. Its 12,574 square nautical miles of airspace and 2.3 million acres of DoD-owned land make it an invaluable national asset for training and testing activities in support of the DoD mission. Dugway Proving Ground, a U.S. Army facility, is an integral part of the UTTR.

2.4 Host and Tenants Organizations

2.4.1 75th Air Base Wing

The 75 ABW's primary mission is to provide readiness and installation support for the nearly 22,000 personnel at Hill AFB. The ABW supports all organizations on Hill AFB, the OO-ALC, two fighter wings, and the more than 50 associate units that reside at Hill AFB. In addition, it directly supports the Air and Space Expeditionary Forces operations and provides all support and management activities for the UTTR. The 75 ABW reports to AFMC headquartered at Wright-Patterson AFB, Ohio. The 75 ABW is divided into multiple support and administrative functions including:

- 75th Mission Support Group provides installation security, personnel development, logistics operations, emergency response, and recreation services, as well as workforce morale and welfare support.
- 75th Civil Engineering Group provides infrastructure, facilities, environmental, and UTTR support, as well as fire protection, housing management, explosive ordnance disposal, and energy management for Hill AFB.
- 75th Medical Group provides full-spectrum, high quality healthcare and support to over 67,000 eligible TRICARE beneficiaries.

2.4.2 Ogden Air Logistics Complex

The OO-ALC is the major organization at Hill AFB and is one of three such organizations assigned to AFMC. The Complex has engineering, sustainment, and logistics support for some of the Air Force's most sophisticated weapons systems, including ICBM, and low-observable, "stealth" aircraft materials. The aircraft supported at the OO-ALC include the F-35 Lightning II, F-22 Raptor, F-16 Fighting Falcon, A-10 Thunderbolt II, T-38 Talon, and the C-130 Hercules. The Air Force Life Cycle Management Center at Wright-Patterson, AFB, Ohio, provides oversight of the OO-ALC and other Air Logistics Complexes at Tinker AFB and Robins AFB.

2.4.3 514th Flight Test Squadron

The 514th Flight Test Squadron is an Air Force Reserve Command (AFRC) unit assigned to the OO-ALC. Its mission is to execute flight tests to aircraft in support of the depot maintenance mission. It conducts low-risk acceptance flights on the A-10, C-130 (23 variants), F-16 (8 variants), F-35, and F-22 aircraft following depot-level modifications and major maintenance and provides the final quality-control checks.

2.4.4 388th Fighter Wing

The 388 FW, under the ACC, has recently transitioned from F-16 to F-35A aircraft. The 388 FW is composed of two groups and eight squadrons, with a personnel complement of approximately 2,200 Airmen organized into the 388th Operations Group, the 388th Maintenance Group, and staff agencies. The 388 FW operates jointly with the AFRC's 419th Fighter Wing (419 FW).

2.4.5 419th Fighter Wing

The 419 FW consists of 1,200 Reserve Airmen, who performed a variety of F-16 missions and expeditionary combat support during the time the F-16 was assigned to the unit (1984–2017). Starting in 2017, the unit was assigned the F-35A aircraft and will train for worldwide deployment.

2.4.6 Headquarters Utah Test and Training Range

HQ UTTR, based at Hill AFB and subordinate to the 388 FW, is tasked with the management and scheduling of activities at UTTR. Airspace management executes scheduled activities through Clover Control while the Air Traffic Control (ATC) for the restricted airspace is in use, with UTTR activity published via Notices to Airmen through the Federal Aviation Administration's (FAA's) Salt Lake Air Route Traffic Control Center.

2.4.7 Air Force Nuclear Weapons Center, Intercontinental Ballistic Missile Systems Directorate

The Air Force Nuclear Weapons Center (AFNWC), ICBM Systems Directorate is responsible for lifecycle integrated systems management of Minuteman weapons systems. In this capacity, the Directorate develops and supports silo-based ICBMs and provides for their acquisition, depot repair and maintenance, systems engineering, storage, and transportation. The Directorate uses multiple facilities to accomplish its mission, including the Little Mountain Test Facility, the Strategic Missile Integration Complex at Hill AFB, and the UTTR and its Oasis Compound. The Directorate is an AFMC organization that reports to the AFNWC at Kirtland AFB, New Mexico.

2.4.8 748th Supply Chain Management Group

The 748th Supply Chain Management Group (Planning and Execution) is an AFMC unit that provides lifecycle support to sustain worldwide weapons systems. The Group's activities include developing demand and supply plans, developing and implementing sourcing strategies, executing supply plans for aircraft structural and avionics systems, landing gear, secondary power systems, and Space Command, Control, Communications, and Intelligence commodities.

2.4.9 *Defense Logistics Agency Distribution Hill*

The Defense Logistics Agency (DLA) distribution center at Hill AFB performs distribution operations including storage, receiving, packaging, and shipping of military weapons systems and spare parts. Primary distribution support is provided for the Minuteman and Peacekeeper missile systems, the Emergency Rocket Communication System, the F-16, A-10, and C-130 aircraft, and all OO-ALC operations. The DLA center also assembles the U.S. Army's Deployable Medical System portable medical facilities ranging in size from single general purpose laboratories to 1,000-bed hospitals.

2.5 Airfield Environment

As shown in Figure 2-2 and Figure 2-3, the installation's active runway is 13,500 feet long and is oriented generally north-south. Flight operations towards the south (magnetic heading 141°) are described as operating on Runway 14 while operations towards the north (magnetic heading 321°) are described as operating on Runway 32. The runway is immediately surrounded by a network of taxiways and parking aprons. Hill AFB facilities that directly support flying operations include, but are not limited to, aircraft hangars for maintenance and storage, aircraft parking ramps and taxiways, the hard surface runway, assorted office buildings and support facilities such as hush houses for engine run maintenance, and munitions storage areas.

A runway is typically used in both directions and counted as two separate runways, depending on the direction of the departure. Each direction is labeled as a separate runway and numbered based on its magnetic heading, divided by 10 and rounded to a whole number.

The runways in use are determined by the direction of the prevailing winds and a variety of other factors discussed in Section 3.5. For example, if the prevailing winds are blowing (coming) "from" the north, then aircraft will take off and land towards the north on Runway 32, and if the prevailing winds are blowing (coming) "from" the south, then aircraft will take off and land towards the south on Runway 14. In other words, fixed-wing aircraft will almost always takeoff and land "into" the wind.

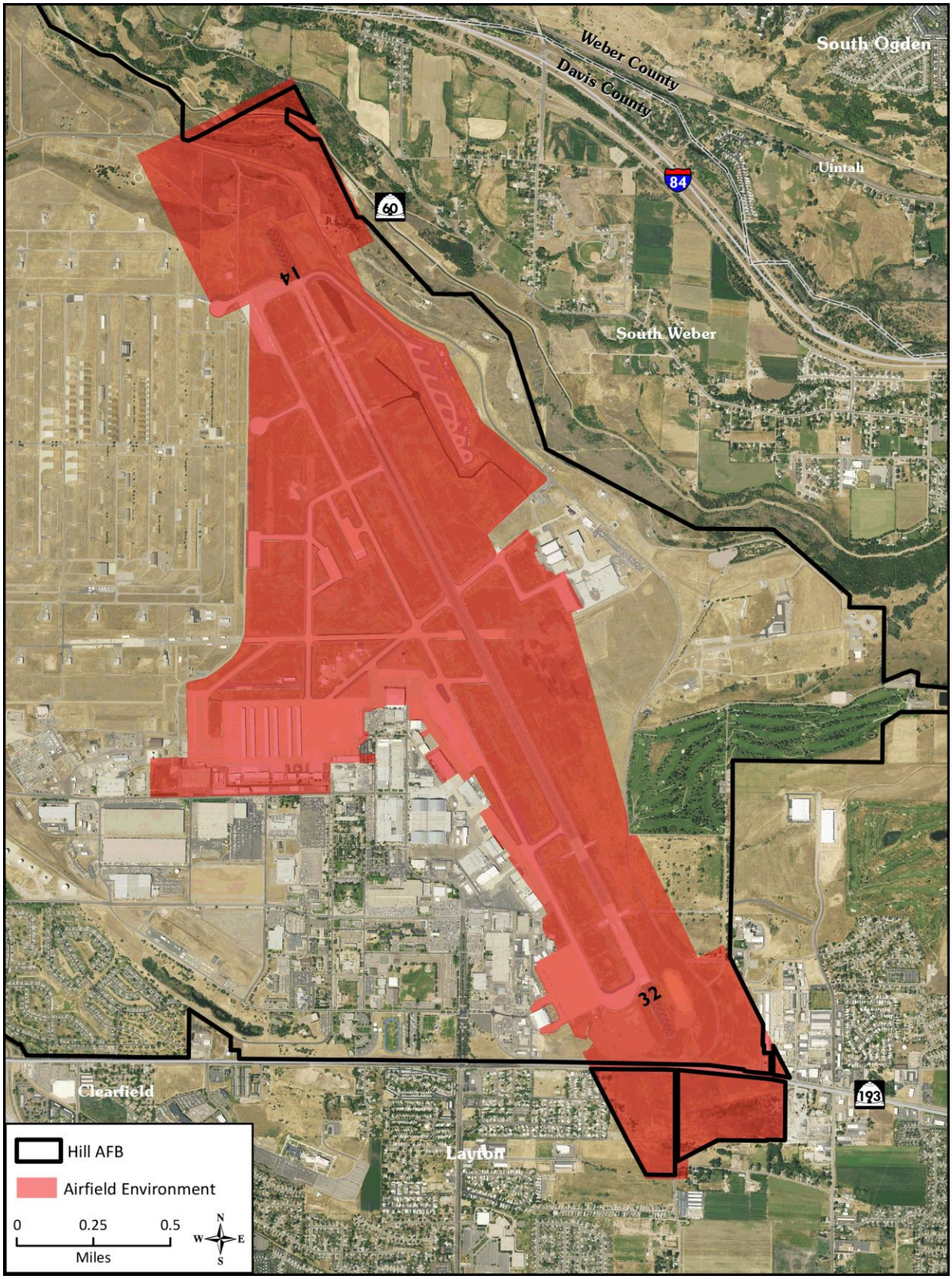


Figure 2-2. Hill AFB Airfield Environment

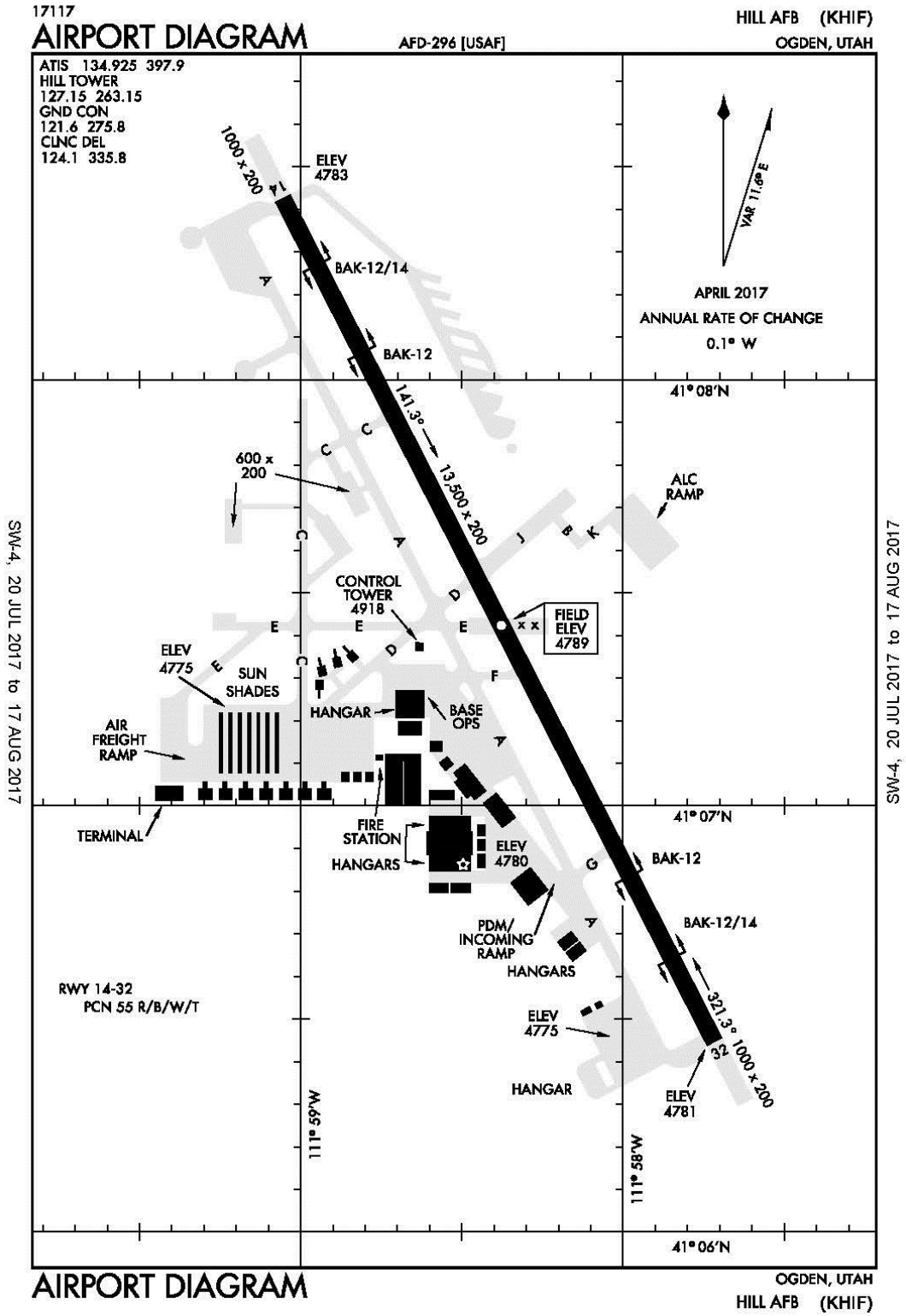


Figure 2-3. Hill AFB Airfield Diagram

2.6 Local Economic Impacts

The military provides direct, indirect, and induced economic benefit to local communities through jobs and wages. Benefits include employment opportunities and increases in local business revenue, property sales, and tax revenue. According to a University of Utah study in 2015, Utah's defense industry directly and indirectly supported over 109,000 jobs and $9.2 billion in economic activity in the state (University of Utah 2017).

The economic impact of a military installation is based on annual payroll (jobs and salaries), annual expenditures, and the estimated annual dollar value of jobs created. The military further contributes to the economic development of communities through increased demand for local goods and services and increased household spending by military and civilian employees.

Based on the Fiscal Year 2017 Economic Impact Report, Hill AFB directly employs approximately 21,138 military and civilian personnel, with military dependents accounting for an additional 3,362 personnel (U.S. Air Force 2018). Hill AFB's spending generated $655.57 million in local expenditures, including construction, services, and procurement methods, and created an additional 29,675 jobs in the local communities. In total, Hill AFB has an estimated total economic impact of nearly $3.4 billion on the local economy. The majority of this economic impact was due to the annual payroll and the estimated value of jobs created.

Table 2-1 through Table 2-5 provide summaries of personnel and the economic impact of the base.

Table 2-1. Total Military and Dependent Personnel by Classification and Housing (Total Persons)

Classification	On-Base Residents	Off-Base Residents	Total
Active Duty	436	4,095	4,531
Non-extended Active Duty Reserve/ANG	27	1,227	1,254
Dependents	1,223	2,139	3,362
Total	**1,686**	**7,461**	**9,147**

Source: U.S. Air Force 2018

Table 2-2. Total Civilian Personnel by Appropriated and Non-Appropriated Funds (Total Persons)

Appropriated Fund Civilians	Total
General Schedule	5,547
Federal Wage Board	3,659
AcqDemo	2,596
Other	943
Sub-Total	12,745
Non-Appropriated Fund (NAF) Air Force Civilians	**Total**
Civilian NAF	282
Civilian Base Exchange	164
Contract Civilians	3,124
Private Business	38
Sub-Total	3,608
Total	**16,353**

Source: U.S. Air Force 2018

Table 2-3. Annual Military Payroll by Category and Housing Location (Millions of Dollars)

Classification	On-Base Residents	Off-Base Residents	Total
Active Duty	$12.49	$251.27	$263.76
Non-extended Active Duty Reserve/ANG	$0.59	$21.21	$21.80
Total	**$13.08**	**$272.47**	**$285.56**

Source: U.S. Air Force 2018

Table 2-4. Annual Civilian Payroll by Appropriated and Non-Appropriated Funds (Millions of Dollars)

Appropriated Fund Civilians	Total
General Schedule	$472
Federal Wage Board	$312
AcqDemo	$221
Other	$83
Sub-Total	$1,088
Non-Appropriated Fund AF Civilians	**Total**
Civilian NAF	$7.2
Civilian Base Exchange	$2.3
Private Business	$1.7
Sub-Total	$11.2
Total	**$1,099**

Source: U.S. Air Force 2018

Table 2-5. Summary of Construction, Contracts, and Expenditures for Materials, Equipment, and Supplies (Millions of Dollars)

Expense Category	Amount
Commissary (inventory)	$1.29
Army & Air Force Exchange Service (inventory)	$0.95
Health (TRICARE)	$103.3
Education (tuition assistance)	$0.30
Temporary Duty	$4.77
Other Materials, Equipment, Supplies	$0.79
O&M	$18.8
Service Contracts	$513.2
Construction	$22.17
Total Annual Expenditure	**$655.57**

Source: U.S. Air Force 2018

3.0 Aircraft Operations

Aircraft operations are the primary source of noise associated with a military airbase. The level of noise exposure relates to a number of variables, including the aircraft type, engine power setting, altitude flown, direction of the aircraft, flight track, temperature, relative humidity, frequency and time of operation (day/night). This chapter discusses aircraft based at or transient to Hill AFB, the types and number of operations conducted at the airfields, and the runways and flight tracks used to conduct the operations.

3.1 Aircraft Types

Hill AFB supports the operations of flying units whose aircraft are permanently assigned, flying units whose aircraft are temporarily assigned, and transient aircraft. Temporarily assigned aircraft come to Hill AFB for intensive maintenance work, and are flight tested following the work. Transient aircraft may be aircraft stopping over during a long cross-country trip or aircraft that come to Hill AFB from their home base to practice approaches to an unfamiliar airfield. A brief description of base assigned and the most common transient aircraft is provided below.

3.1.1 Permanently and Temporarily Assigned Aircraft

The F-35 Lightning II is a family of single-seat, single engine, all-weather, stealth multi-role 5th generation fighters. The F-35A is the conventional takeoff variant used by the U.S. Air Force. The F-35 is intended to provide the bulk of the manned tactical airpower of the U.S. Air Force, Navy, and Marine Corps over the coming decades.

F-35

The F-16 Fighting Falcon is a 4th generation single-seat, single engine, all-weather fighter aircraft. The very first operational F-16 was delivered to the 388th Tactical Fighter Wing at Hill AFB in January 1979. Since that time, F-16 aircraft have played air-to-air and air-to-ground roles in a multitude of combat operations.

F-16

The A-10 Thunderbolt II is a single-seat, dual engine, attack aircraft that has excellent maneuverability at low air speeds and altitude. The aircraft can loiter near battle areas for extended periods of time, making it ideal for close air support, forward air control, and combat search and rescue roles.

A-10

The Lockheed C-130 Hercules is a four-engine turboprop military transport aircraft. Originally designed for troop transport, it has filled many roles such as a gunship, airborne assault, search and rescue, scientific research support, weather reconnaissance, aerial refueling, maritime patrol, and aerial firefighting.

C-130

The F-22 Raptor is a 5th generation single-seat, two-engine fighter aircraft. Its combination of stealth, supercruise, maneuverability, sensor capabilities, and integrated avionics result in the F-22 being unparalleled in an air-to-air role. The Raptor is also capable of performing air-to-ground missions.

F-22

3.1.2 Transient Aircraft

Some of the most common transient aircraft at Hill AFB are described below.

The F-15 Eagle is a 4th generation, two-engine, all-weather fighter that has been in service since 1972. U.S. Air Force F-15A/C aircraft are air-to-air variants, and the F-15D/E aircraft are variants designed primarily for air-to-ground missions.

F-15

The KC-135 Stratotanker provides the core aerial refueling capability for the U.S. Air Force and has excelled in this role for more than 50 years. It also provides aerial refueling support to Air Force, Navy, Marine Corps, and allied nation aircraft. The KC-135 is also capable of transporting litter and ambulatory patients, using patient support pallets during aeromedical evacuations.

KC-135

3.2 Maintenance Operations

Maintenance is an integral part of any flying operation and requires a dedicated team of professionals to ensure that units can meet their flying requirements. Two key tasks in maintaining aircraft are low- and high-powered engine maintenance runs.

Engine runs may be conducted at any power setting between idle and maximum power. Low- to mid-range powered engine runs are typically conducted on aircraft parking ramps or just outside of maintenance hangars. High powered engine runs are typically conducted in test cells and in acoustical enclosures commonly referred to as hush houses (buildings specifically designed to muffle engine noise). Noise associated with

these operations is included in the noise analysis and has been modeled for incorporation into the Hill AFB noise contours.

In order to facilitate on-schedule mission accomplishment, maintenance engine runs sometimes occur during nighttime hours. Engine runs between 10:00 PM and 7:00 AM are infrequent, making up only 4 percent of total engine run events. The noise associated with pre-flight and engine maintenance engine runs were included in the noise analysis and modeling associated with the noise contours.

3.3 Flight Operations

Flight activities, including where aircraft fly, how high they fly, how many times they fly over a given area, and the time of day they operate, must be fully evaluated to understand the relationship of flight operations and land use. This chapter discusses typical flight operations for aircraft based at Hill AFB.

Each time an aircraft crosses over a runway threshold (the beginning or ending of a runway's useable surface) with the intent to takeoff, practice an approach, or land, it counts as a single flight operation. For example, a departure counts as a single operation as does an arrival. However, when an aircraft conducts a pattern (a departure followed by an immediate return) it counts as two operations. This is because the aircraft crosses both the approach and departure ends of the runway during the pattern.

Operations are conducted throughout the year at Hill AFB and the tempo of operations temporarily increases during large-scale simulated combat exercises. The exercises known as Combat Hammer and Combat Archer are conducted on a regular basis at Hill AFB as a part of the Air Force's Weapons System Evaluation Program. The following paragraphs and figures describe aircraft operations conducted as part of day-to-day testing and training as well as large force exercises.

The following paragraphs and figures highlight typical flight tracks that are followed during normal or increased operations. Each track is designed to maximize flight operations and, when possible, minimize the effects of noise.

- **Takeoff.** When an aircraft is positioned on the runway, the engine power is set to facilitate movement and eventual flight.
- **Departure.** For the purpose of air traffic sequencing, separation, noise abatement, compliance with avoidance areas and overall safety of flight, aircraft follow specific ground tracks and altitude restrictions as they depart the airfield's immediate airspace.
- **Straight-In Arrival.** An aircraft is aligned with the runway extended centerline and begins a gradual descent for landing. This type of approach enables an aircraft to maintain a smooth, stable and steady approach and requires no additional maneuvering.
- **Overhead Break Arrival.** An expeditious arrival using visual flight rules. The aircraft arrives over the airfield on the runway centerline at a specified point and altitude and then performs a 180 degree "break turn" away from the runway to

enter the landing pattern. Once established, the landing gear and flaps are lowered and the pilot performs a second 180-degree descending turn toward runway centerline to land.

- **Pattern Work.** Pattern work refers to traffic pattern training where the pilot performs takeoffs and landings in quick succession by taking off, flying the pattern, and then landing. Traffic pattern training is demanding and utilizes all the basic flying maneuvers a pilot learns: takeoffs, climbs, turns, climbing turns, descents, descending turns, and straight and level landings.
- **Low Approach.** A low approach is an approach to a runway that does not result in a landing, but rather a descent towards the runway (usually below 500 feet above ground level) followed by a climb-out away from the airfield. Low approaches are accomplished for a number of reasons. One such reason is to practice avoiding potential ground obstructions (i.e., vehicles, debris, stray animals, etc.).
- **Touch and Go.** A touch-and-go landing pattern is a training maneuver that involves landing on a runway and taking off again without coming to a full stop. Usually the pilot then circles the airport in a defined pattern known as a circuit and repeats the maneuver.
- **Box Pattern.** Ground Control Approach (GCA) is a radar or "talk down" approach directed from the ground by an air traffic controller. ATC personnel provide pilots with verbal course and glide slope information, allowing them to make an instrument approach during inclement weather. A Box Pattern is normally flown to practice GCA approaches. The Box Pattern utilizes a "box-shaped" flight pattern with four 90-degree turns done at a set altitude, used to practice a variety of approach procedures at an airfield.
- **Radar Approach.** An instrument approach is provided with active assistance from ATC during poor weather conditions. ATC personnel direct the aircraft toward the runway centerline. Once established on the centerline, pilots use aircraft instruments to maintain runway alignment and adherence to altitude restrictions until the pilot is able to acquire visual sight with the runway environment. Pilots often practice this type of approach to maintain proficiency.
- **Simulated Flame-Out.** This is a visual flight maneuver used to simulate a landing recovery from a complete loss of engine thrust. To execute the maneuver, a pilot must establish the aircraft on a specified flight profile (altitude, airspeed, position over the airfield) that would allow the aircraft to glide safely across the runway threshold in a position to land. If properly executed, the maneuver should not require the use of additional engine power until after the maneuver is complete.

3.4 Annual Aircraft Operations

Figure 3-1 describes all aircraft operations that occurred at Hill AFB over a nine-year period as well as an estimated number of operations expected in 2023, when the F-35A beddown is scheduled to be completed. The 2023 estimate reflects all based flying units at full strength and the basing of an additional flying unit. As described in Table 3-1 below, total annual operations account for each departure and arrival, including those conducted as part of a pattern operation.

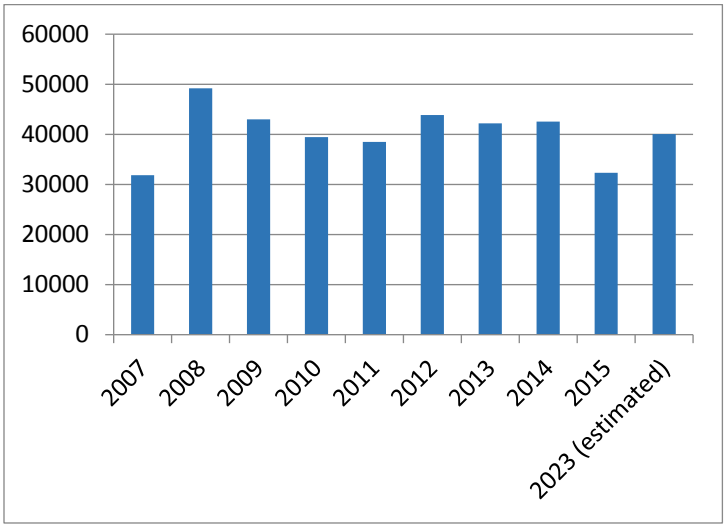


Figure 3-1. Summary of Flight Operations for FY 2007 – FY 2015 and the Planning Year

Table 3-1. Annual Flight Operations in the Planning Year

Aircraft	Departures			Arrivals			Closed Patterns [1]			Totals		
	Day*	Night*	Total	Day*	Night*	Total	Day*	Night*	Total	Day*	Night*	Total
F-35A	11,340	56	11,396	11,291	105	11,396	8,182	8	8,190	30,813	169	30,982
F-22 [2]	60	0	60	60	0	60	240	0	240	360	0	360
F-16C [2]	200	0	200	200	0	200	800	0	800	1,200	0	1,200
A-10C [2]	120	0	120	120	0	120	720	0	720	960	0	960
C-130 [2]	80	0	80	80	0	80	800	0	800	960	0	960
Adversary Air Aircraft	764	4	768	761	7	768	508	0	508	2,033	11	2,044
Transient	1,770	0	1,770	1,767	3	1,770	0	0	0	3,537	3	3,540
Grand Total	14,334	60	14,394	14,279	115	14,394	11,250	8	11,258	39,863	183	40,046

Note: 1. All numbers presented in this column are airfield operations, and there are 2 operations per Closed Pattern event.
2. Temporarily assigned aircraft come to Hill AFB for intensive maintenance work, and are flight tested following that work.
* Day = 7 AM to 10 PM; Night = 10 PM to 7 AM

3.5 Runway Utilization and Flight Tracks

3.5.1 Runway Utilization

The frequency with which aircraft utilize a runway involves a variety of factors including, but not limited to:

- the airfield environment (layout, lights, runway length, etc.),
- direction of prevailing winds,
- location of natural terrain features (rivers, lakes, mountains, and other features),
- wildlife activity,
- number of aircraft in the pattern, and/or
- the preference of a runway for the purpose of safety and noise abatement.

Figure 3-2 shows the percentage of runway usage for aircraft operations.

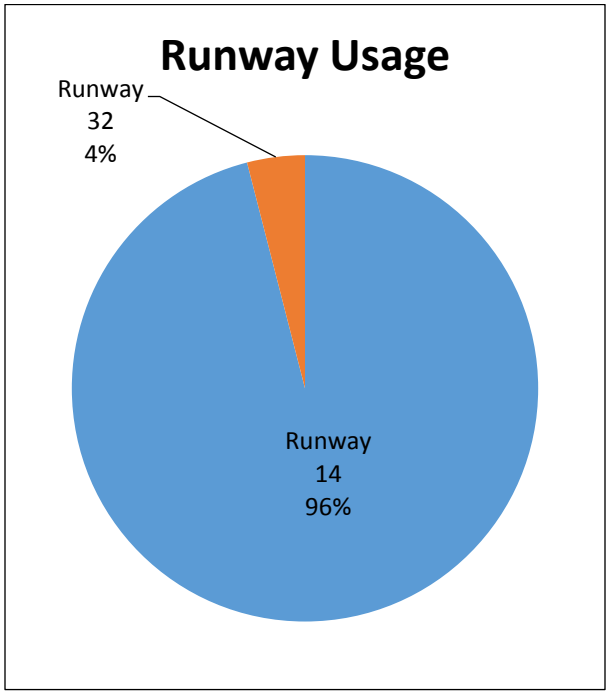


Figure 3-2. Runway Usage

3.5.2 Flight Tracks

Figure 3-3 through Figure 3-5 present the flight tracks for Hill AFB.

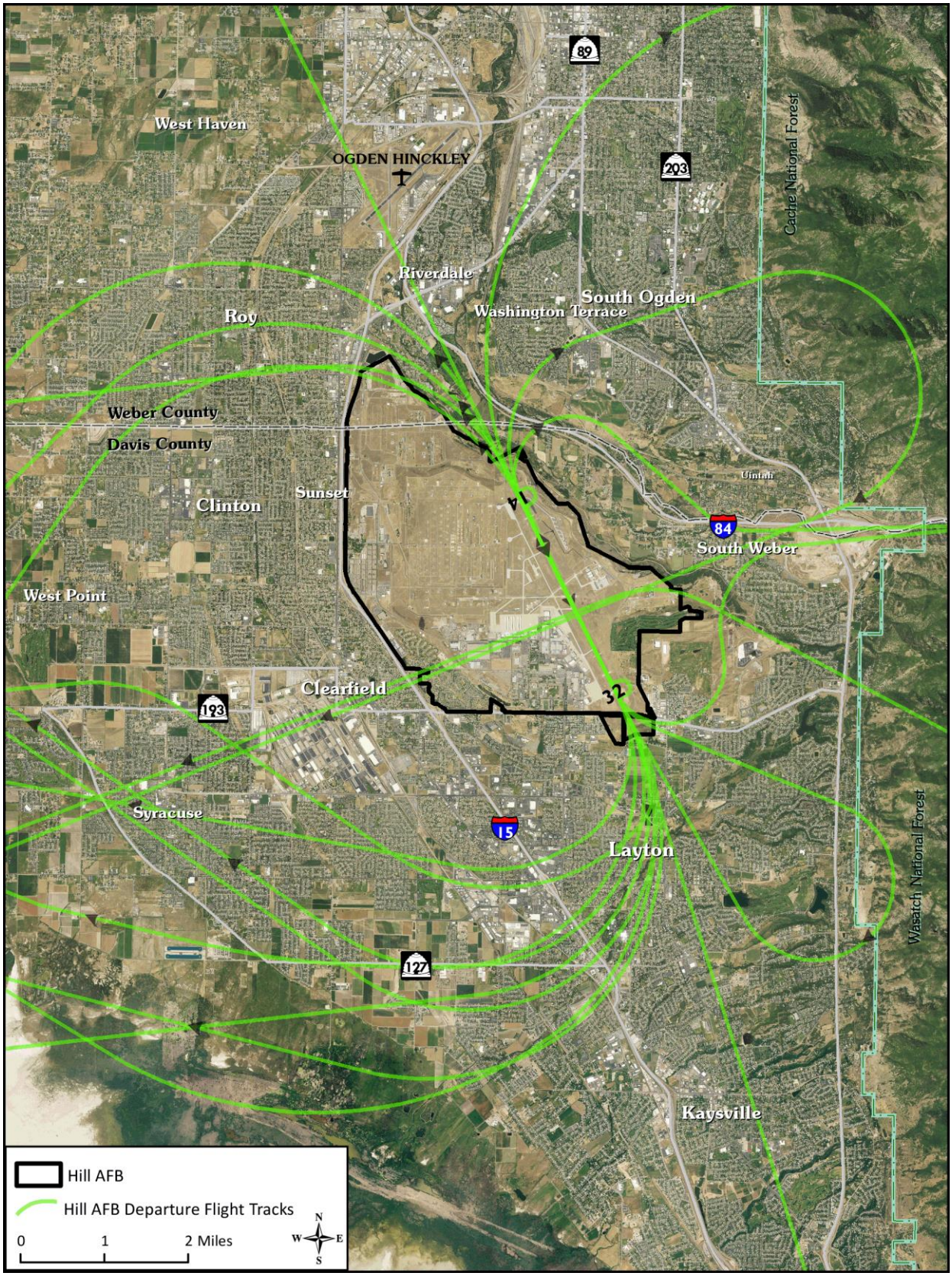


Figure 3-3. Departure Flight Tracks

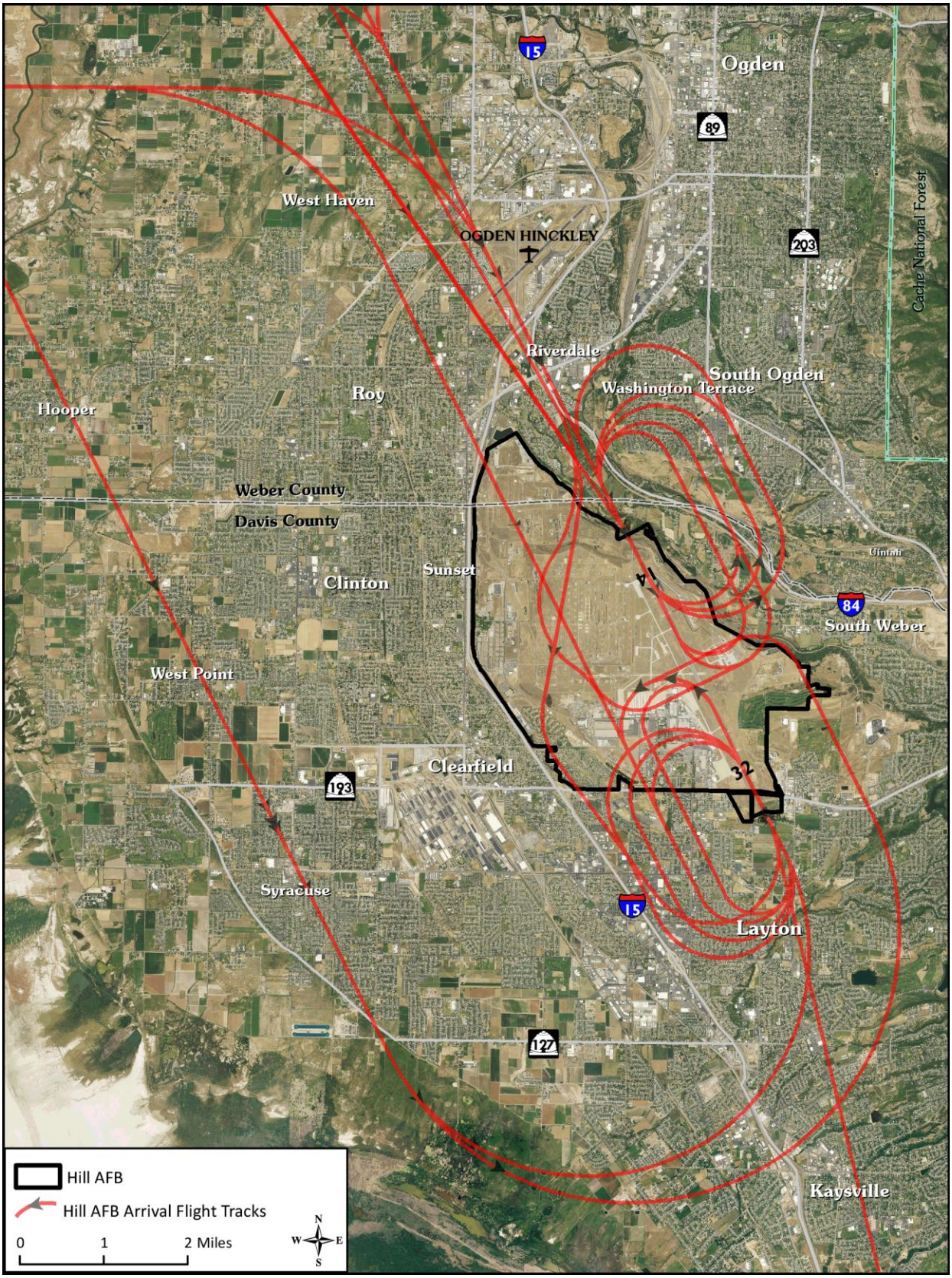


Figure 3-4. Arrival Flight Tracks

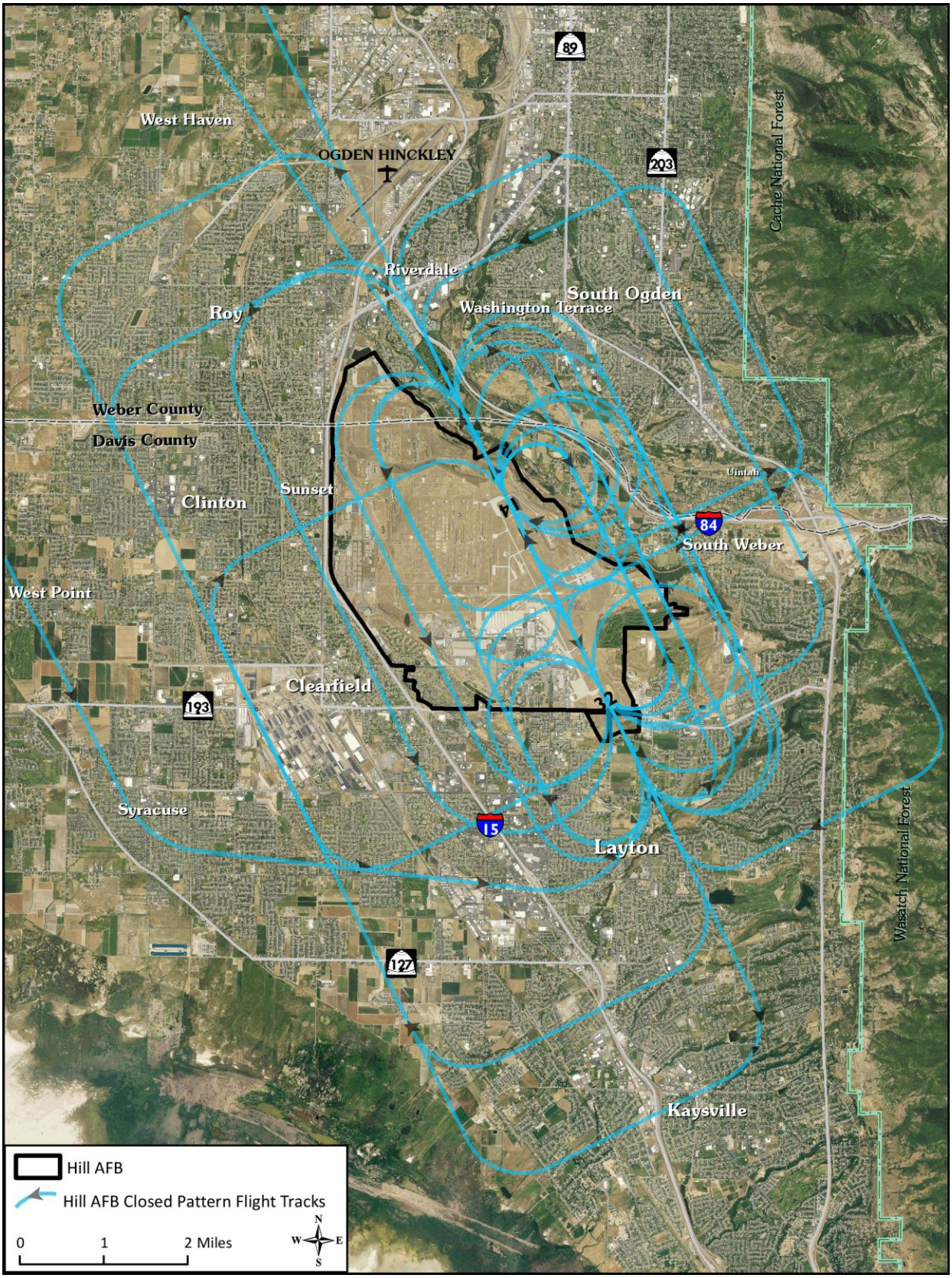


Figure 3-5. Closed Pattern Flight Tracks

Each runway has designated flight tracks which provide for the safety, consistency, and control of an airfield. Flight tracks depict where aircraft fly in relation to an airfield. They are designed for departures, arrivals and for pattern work procedures, and are designated for each runway to facilitate operational safety, noise abatement, aircrew consistency, and the efficient flow of air traffic within the tower's controlled airspace. Aircraft flight tracks are not set highways in the sky. While we show flight tracks as a line on the map, they are actually bands. Aircraft de-confliction, configuration, pilot technique, takeoff weight, and wind all affect the actual path taken on any given flight.

At Hill AFB, flight paths are strongly influenced by topography, the locations of training areas, and the presence of Salt Lake City International Airport approximately 20 miles to the south. The Wasatch Range, running approximately north-south, lies to the east of Hill AFB. Aircraft flight paths avoid the mountain range, pass through valleys between mountains, or climb over the mountains. The majority of air traffic at Hill AFB goes to or comes from the UTTR, which is located west of the installation. Salt Lake City International Airport controls airspace starting at a few miles south of Hill AFB. To avoid entering this airspace and potentially disrupting aircraft operations at the civilian airport, aircraft departing Hill AFB turn to the west soon after leaving the runway.

3.6 Noise Abatement

The Air Force recognizes that noise from military operations may cause concern for people living near military installations.

For this reason, the Air Force has established a Noise Program aimed at reducing and controlling the emission of noise and vibrations associated with the use of military aircraft, weapon systems and munitions while maintaining operational requirements. The result is the implementation of various strategies, techniques and procedures, documented under the Hill AFB Noise Abatement Program, that are aimed at protecting persons and structures from the harmful effects of noise and vibrations.

Hill AFB noise abatement procedures include:

- Avoid flying over densely populated areas, schools, churches, and public buildings to the extent practicable.
- Observe quiet hours between 10:00 PM and 6:00 AM. During quiet hours, only scheduled full-stop landings, departures, engine runs, and necessary taxi operations are authorized. To fulfill training requirements, Hill AFB-based aircraft may conduct scheduled local flying training past the onset of night quiet hours, but this is not the norm. As shown in Table 3-1, less than 200 airfield operations per year are conducted between 10:00 PM and 7:00 AM. This equates to less than 1 percent of the approximately 40,000 total airfield operations conducted per year.
- Use of afterburners is normally secured by the base boundary.
- Where possible, employ hush houses for in-frame maintenance engine runs requiring high engine power settings.

Base leadership periodically reviews flight operations and their potential impact on surrounding communities. This requirement facilitates the planning, designation and establishment of flight tracks over sparsely populated areas as often as practicable to balance operational safety and reduce noise exposure levels in surrounding communities.

3.7 Noise Complaints

At times, military operations may draw noise complaints. The Air Force evaluates all noise complaints to ensure future operations, where possible, do not generate unacceptable noise. Concerned citizens are encouraged to contact the 75 ABW (i.e., the Hill AFB host unit) Public Affairs Office with any noise complaints. You can reach the Public Affairs Office at (801) 777-5201. The base publishes public notices of upcoming exercises, which include increased operational tempo and noise, events on its official website http://www.hill.af.mil.

4.0 Aircraft Noise

Terrain features, weather phenomena, man-made structures and daily life activity contribute to noise exposure.

How an installation manages aircraft noise can play a key role in shaping an installation's relationship with the adjacent communities. Aircraft noise management is ideally a key factor in local land use planning.

While the level of noise produced by aircraft may have a direct effect on communities in close proximity to military air installations, other factors also influence the noise impact. An airfield's layout (its buildings, parking ramps and runways, etc.), type of aircraft, natural terrain features, weather phenomena, and daily activities all influence the levels of noise that the community experiences.

Because noise from aircraft may affect areas around the installation, the Air Force has defined noise zones using the guidance provided in the AICUZ instruction (AFI 32-7063).

4.1 What is Sound/Noise?

Sound consists of vibrations in the air. A multitude of sources can generate these vibrations, including roadway traffic, barking dogs, radios—or aircraft operations.

Sound becomes noise when it interferes with normal activities.

We call these vibrations compression waves. Just like a pebble dropped into a pond creates ripples, the compression waves—formed of air molecules pressed together—radiate out, decreasing with distance. If these vibrations reach your eardrum, at a certain rate and intensity, you perceive it as sound. When the sound is unwanted, we refer to it as noise. Generally, sound becomes noise to a listener when it interferes with normal activities. Sound has three components: intensity, frequency, and duration.

Intensity or loudness is related to sound pressure change. As the vibrations oscillate back and forth, they create a change in pressure on the eardrum. The greater the sound pressure change, the louder it seems.

Frequency determines how we perceive the pitch of the sound. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches. Sound frequency is measured in terms of cycles per second or hertz (Hz). While the range of human hearing goes from 20 to 20,000 Hz, we hear best in the range of 1,000 to 4,000 Hz. For environmental noise, we use A-weighting, which focuses on this range, to best represent human hearing. While A-weighted decibels may be written as "dBA," if it is the only weighting being discussed, the "A" is generally dropped.

Duration is the length of time we can detect the sound.

4.2 How Sound is Perceived

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because such large numbers become awkward to use, we measure noise in decibels (dB), which uses a logarithmic scale that doubles the noise energy every 3 dB.

Figure 4-1 is a chart of A-weighted sound levels from common sources. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB can cause discomfort inside the ear, while sound levels between 130 and 140 dB are felt as pain.

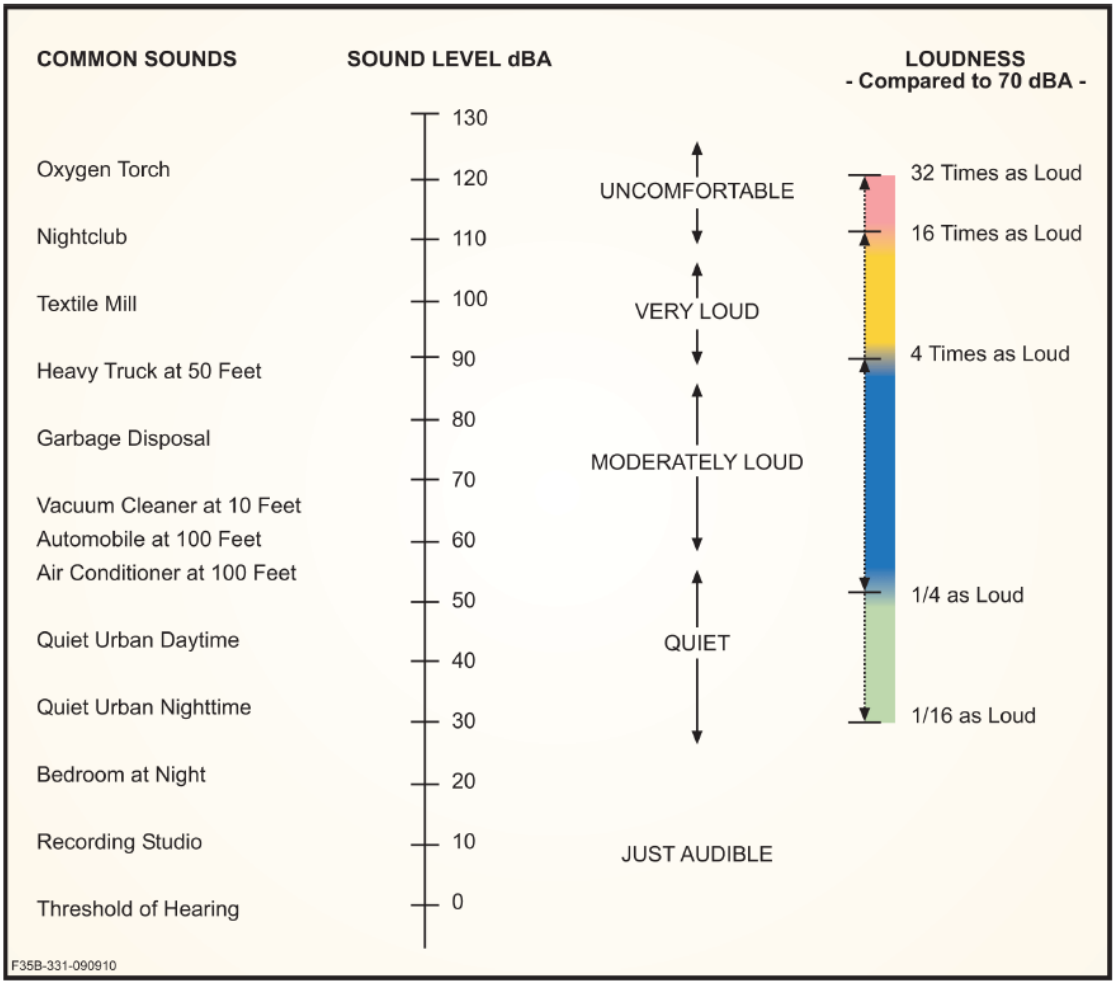


Figure 4-1. Typical A-weighted Sound Levels of Common Sounds

Table 4-1 tabulates the subjective responses with change in (single-event) sound level. While noise energy doubles or halves with every three-decibel change, we do not perceive all that noise energy. It takes a 10-dB increase or decrease for our ear to perceive a doubling or halving of loudness.

Table 4-1. Subjective Response to Changes in Sound Level

Change in Sound Level	Change in Loudness
20 dB	Striking 4-fold Change
10 dB	Dramatic 2-fold or Half as Loud
5 dB	Quite Noticeable
3 dB	Barely Perceptible
1 dB	Requires Close Attention to Notice

4.3 The Day-Night Average Sound Level

When we hear an aircraft fly over, the question may be asked, "How loud was that?" While we may often find ourselves concerned over the loudness of a sound, there are other dimensions to the sound event that draw our interest. For instance, does one overflight draw the same interest as 2 separate overflights—or as 20? Also, does the 30-second run-up of engines prior to takeoff roll draw the same interest as a 30-minute maintenance run? Additionally, is an overflight more noticeable at 2:00 in the afternoon or 2:00 in the morning, when the ambient noise is low and you are trying to sleep?

The length and number of events—the total noise energy—and the time of day play key roles in our perception of noise. To reflect these concerns, the Air Force uses a metric called the Day-Night Average Sound Level (DNL). DNL was created by the U.S. Environmental Protection Agency and is used throughout the United States.

DNL, when used as a metric for aircraft noise, represents the accumulation of noise energy from all aircraft noise events in a 24-hour period. Additionally, for all operations between 10:00 at night and 7:00 in the morning, a penalty of 10 dB is added to each event to account for the intrusiveness of nighttime operations. As is implied in its name, the DNL represents the noise energy present in a daily period. However, because aircraft operations at military airfields fluctuate from day to day, the Air Force typically bases DNL on a year's worth of operations and represents annual average daily aircraft events.

DNL is not a level heard at any given time, but represents long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL.

4.4 Noise Contours

The Air Force prepares noise contours, as needed, to assess the compatibility of aircraft operations. Noise contours connect points of equal value, just as contours on topographic maps connect points of equal elevation. This AICUZ Study presents the historic and future year planning noise contours. The Air Force utilizes NOISEMAP, the DoD standard model for assessing noise exposure from military aircraft operations at air installations. Noise contours, when overlaid on local land use maps, can help to identify areas of incompatible land uses and assist communities in planning for future development around an air installation.

4.4.1 Planning Contours

This AICUZ Study provides a future year planning noise contour. Long-range planning by local land use authorities involves strategies that influence present and future uses of land. Due to the long-range nature of this planning, the Air Force provides planning contours—noise contours based on reasonable projections of future missions and operations. AICUZ studies, using planning contours, provide a description of the long-term (5- to 10- year) aircraft noise environment for projected aircraft operations that is more consistent with the planning horizon used by state, tribal, regional, and local planning bodies.

The Air Force bases planning contours on the best available, realistic long-range projections of unclassified estimates of future mission requirements. This includes reasonable projections of future operations based on trends in operational tempo, retirement of legacy aircraft, new aircraft entering the inventory, and other factors.

These long-range projections are not commitments of future operations. Inclusion of planning contours in the AICUZ Study does not eliminate the need to conduct appropriate environmental analysis if an assumption used in the development of the planning contours becomes a proposed Air Force action.

Assumptions included in the Hill AFB planning contour include:

- Airfield operations projected to when beddown of the of F-35A Lightning II is scheduled to be complete.
- Inclusion of a Adversary Air fighter aircraft mission conducting an estimated 2,043 operations annually. The mission was represented—for noise modeling purposes—using F-35A aircraft operations. Hill AFB is being considered for this mission however no decision will be made until after the appropriate environmental analysis is completed.

Projected operations reflected in the 2018 Hill AFB AICUZ noise contours include the Adversary Air l fighter aircraft mission.

4.4.2 Hill AFB Noise Contours

The 2018 Hill AFB AICUZ noise contours, which are based on a planning scenario as described in the previous section, are shown in Figure 4-2. The 65-dB DNL contour extends beyond the northern boundary of the base by approximately 1 mile, and there is also a geographically-separated area of northeast of the base that is exposed to noise above 65 dB DNL. The 65-dB DNL noise contour stretches approximately 0.8 mile beyond the southern and southeastern borders of the base. No off-base land to the north of the installation is affected by greater than 75 dB DNL. Certain areas within 0.5 mile of the southern and eastern borders of the base are affected by noise levels above 75 dB DNL.

Figure 4-3 shows a comparison of the 2018 and the 1993 AICUZ noise contours. There are notable similarities between the two contour sets. For example, both contour sets are larger to the south of the runway than to the north. This reflects the fact that the majority of departures were made toward the south in both years and departures are substantially louder than arrivals. However, in the 24 years since publication of the 1993 AICUZ, there have been several changes that have resulted in changes in the noise contours. These changes include multiple mission changes, improvements in computer noise modeling technology, and changes in Air Force land use planning policy. Changes are summarized below:

- **Changes in based aircraft.** The 1993 AICUZ noise contours reflect the operations of several aircraft types that have either been retired from service (e.g., F-4 Phantom) or that no longer fly regularly at Hill AFB. The 2018 AICUZ noise contours reflect the currently-based F-35A aircraft, the current aircraft types undergoing depot-level maintenance at the OO-ALC, and transient aircraft types currently operating at Hill AFB.
- **Changes in operational procedures.** Operational procedures at Hill AFB are strongly influenced by natural factors (e.g., wind patterns and mountains to the east) as well as man-made factors (e.g., the location of airspace managed by Salt Lake City International Airport and the UTTR), which have remained constant between 1993 and the present. However, incremental changes to flight procedures are made to reflect changing conditions. For example, aircraft making instrument approaches now follow precision instrument approach procedures almost exclusively. In the past, non-precision approaches were relatively more common.
- **Changes in noise modeling software.** The noise modeling software NOISEMAP now accounts for the effects of topography on sound transmission, but this technology was not available in 1993. Topography plays an important role in the pattern of noise levels on and near Hill AFB. For example, the Weber River valley has a strong effect on the 2018 noise contours. Intervening terrain blocks noise generated by jets on the runway reducing noise levels in certain parts of the valley, but areas on the far side of the valley from Hill AFB receive noise that has not been impeded by terrain. This results in an area in 65-dB and 70-dB DNL

contours that is geographically separated from the remainder of the 65-dB DNL contour.

- **Changes in AICUZ Air Force policies.** Since 1993, the DoD and Air Force have shifted to use of an average annual day rather than an average busy day in representing noise for land use planning. The average annual day matches more closely with the noise levels on which DNL-annoyance social surveys results are based. Use of the average annual day, which reduces DNL by 1.5 dB if all other factors are held constant, also allows greater standardization of noise results across installations.

Table 4-2 presents the off-base land acreage and estimated population within the planning contours. The Air Force bases population estimates on 2010 Census block-level data, using a geometric proportion method to determine the estimated population within the contour bands. This method assigns population based on the portion of a census block that falls within the contour. The population across census blocks is assumed to be evenly distributed.

The off-base area exposed to a minimum of 65 dB DNL includes approximately 2,308 acres and 7,069 residents. Approximately 71 percent of the off-base area exposed to greater than 65 dB DNL is within 65–69 dB DNL, 26 percent is within 70–74 dB DNL, and less than 1 percent is within 75–79 dB DNL.

Table 4-2. Off-Base Land Area and Estimated Population within Noise Zones for the 2018 AICUZ Noise Contours

Noise Zone (dB DNL)	Acres	Population
65–69	1,639.2	5,300
70–74	613.6	1,737
75–79	55	32
80–84	0.5	0
85+	0	0
Total (65+)	**2,308.3**	**7,069**

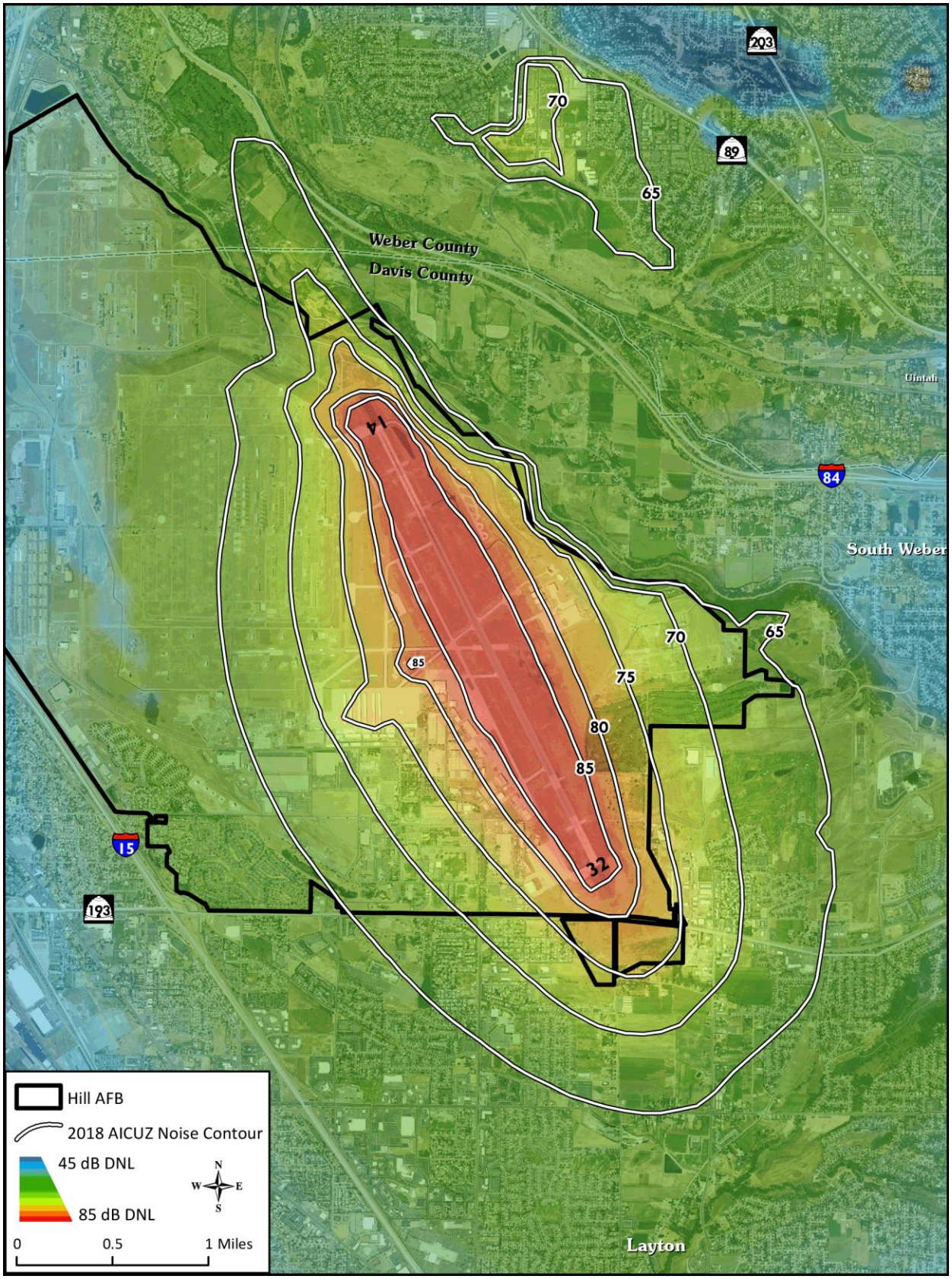


Figure 4-2. 2018 AICUZ Noise Contours with Gradient Shading

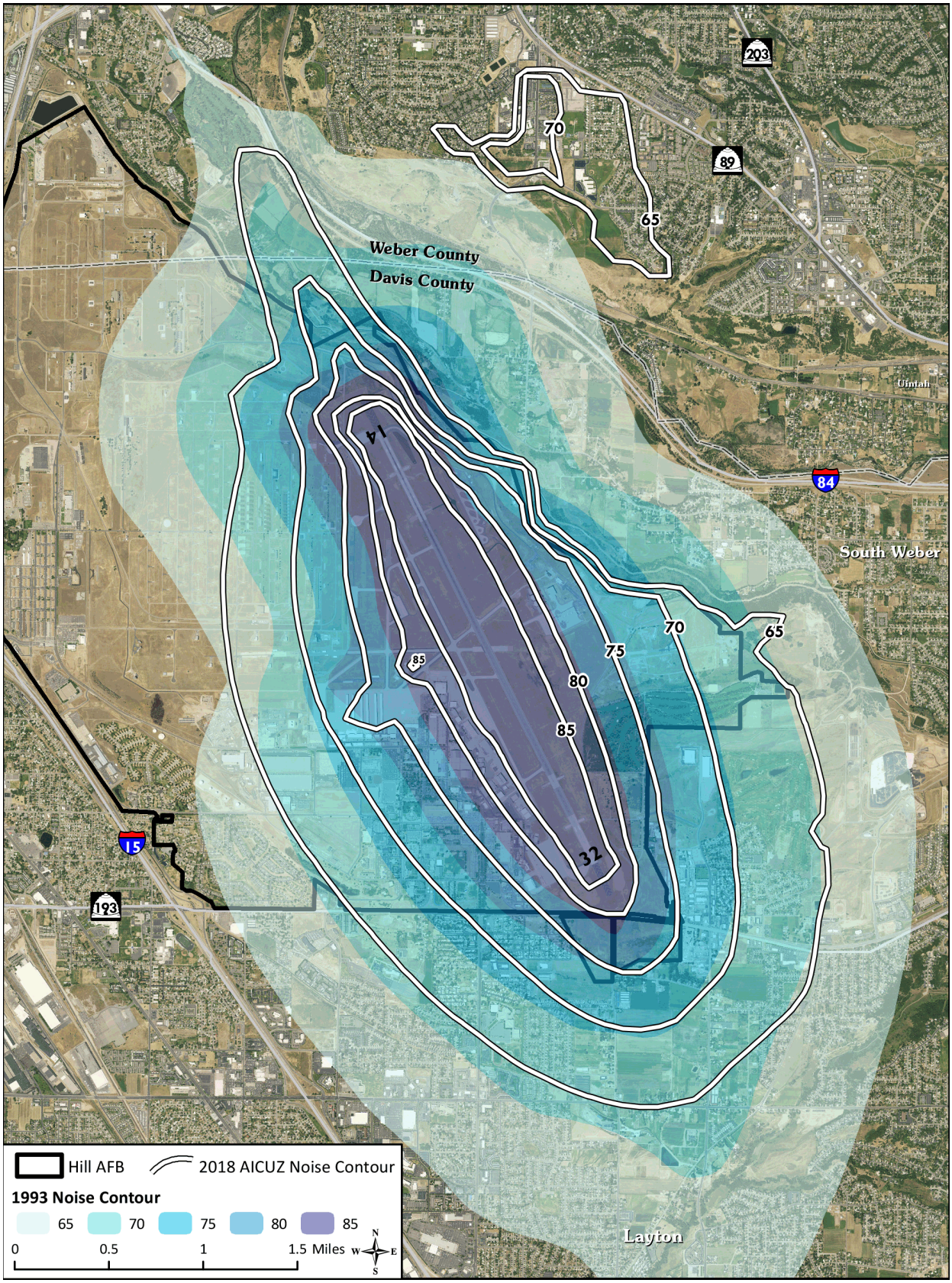


Figure 4-3. Comparison of 2018 and 1993 AICUZ Noise Contours

5.0 Community and Aircraft Safety

Safety is paramount to the Air Force and the community with each playing a vital role in its success. Cooperation between the Air Force and the community results in strategic and effective land use planning and development. As such, the Air Force has established a flight safety program and has designated areas of accident potential around its air installations to assist in preserving the health, safety, and welfare of residents living near the airfield. This AICUZ Study provides the information needed, in part, to reach this shared safety goal.

Identifying safety issues assists the community in developing land uses compatible with airfield operations. As part of the AICUZ Program, the Air Force defines areas of accident potential, imaginary surfaces, and hazards to flight.

Section 5.1 discusses CZs and APZs. Section 5.2 presents the imaginary surfaces, and Section 5.3 discusses the zones associated with hazards to aircraft flight.

5.1 Clear Zones and Accident Potential Zones

In the 1970s and 1980s, the military conducted studies of historic accident and operations data throughout the military. The studies showed that most aircraft mishaps occur on or near the runway, diminishing in likelihood with distance from the runway. Based on these studies, the DoD identified CZs and APZs as areas where an aircraft accident is most likely to occur if an accident were to take place—these zones are not predictors of accidents. The studies identified three areas that, because of accident potential, should be considered for density and land use restrictions: the CZ, APZ I, and APZ II. The CZs and APZs are described in the bullets below and are shown on Figure 5-1.

- **Clear Zone.** At the end of all active Air Force runways is an area known as the "Clear Zone." The CZ is a square area beyond the end of the runway and centered on the runway centerline extending outward for 3,000 feet. A CZ is required for all active runways and should remain undeveloped.
- **APZ I.** Beyond the CZ is APZ I. APZ I is 3,000 feet in width and 5,000 feet in length along the extended runway centerline.
- **APZ II.** APZ II is the rectangular area beyond APZ I. APZ II is 3,000 feet in width by 7,000 feet in length along the extended runway centerline.

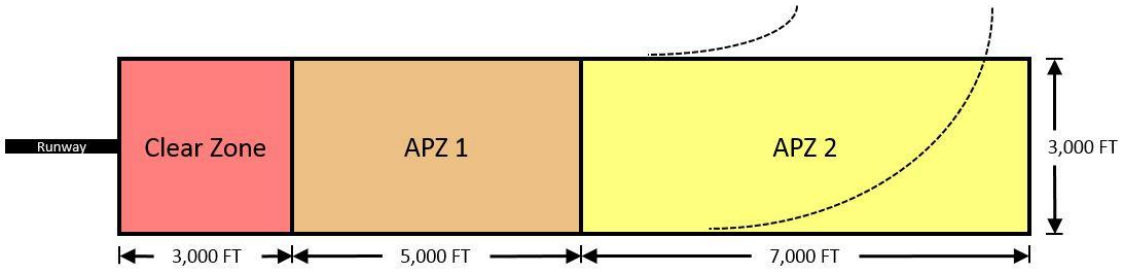


Figure 5-1. Runway Clear Zones and Accident Potential Zones

While the APZs extend outward from the ends of the runway along the extended runway centerline, the base may add a curved APZ when over 80 percent of the operations follow a curved departure.

Within the CZ, most uses are incompatible with military aircraft operations. For this reason, it is the Air Force's policy, where possible, to acquire real property interests in land within the CZ to ensure incompatible development does not occur. Within APZ I and APZ II, a variety of land uses are compatible; however, higher density uses (e.g., schools, apartments, churches, etc.) should be restricted because of the greater safety risk in these areas. Chapter 6 discusses land use and recommendations for addressing incompatibility issues within APZs for each airfield. Figure 5-2 depicts the CZs and APZs for Runways 14 and 32 for Hill AFB.

The standard APZs have been modified at Hill AFB to reflect local operation and land use considerations (Figure 5-2). The northern APZ I is 5,000 feet long and 3,000 feet wide, while the northern APZ II is 3,000 feet by 3,000 feet. The southern APZ I has been modified to follow the westward turn made by the vast majority of departing aircraft. The southern APZ I includes the standard rectangle 5,000 feet long by 3,000 feet wide, which follows the extended runway centerline. It also includes an additional area corresponding to the most frequently used flight path, which turns toward the west. The southern APZ II has been omitted because departing traffic from Runway 14 must initiate a turn prior to the southern boundary of APZ II to avoid entering Salt Lake City International Airport-controlled airspace. Entry into the Salt Lake City International Airport-controlled airspace could result in disruption of operations at the Airport.

Table 5-1 tabulates the off-base land acreage and estimated population within the CZs and APZs**.** The AF does not own 23.5 acres of the CZs. However, there are no residences within this area. Off-base areas within APZ I affect approximately 820 acres and an estimated 695 residents. Off-base areas within APZ II affect approximately 206 acres and an estimated 74 residents.

Table 5-1. Off-Base Land Area and Estimated Population within the Clear Zones and Accident Potential Zones

Zone	Acres	Population
CZ	23.5	0
APZ I	819.8	695
APZ II	206.6	74
Total	1,049.9	769

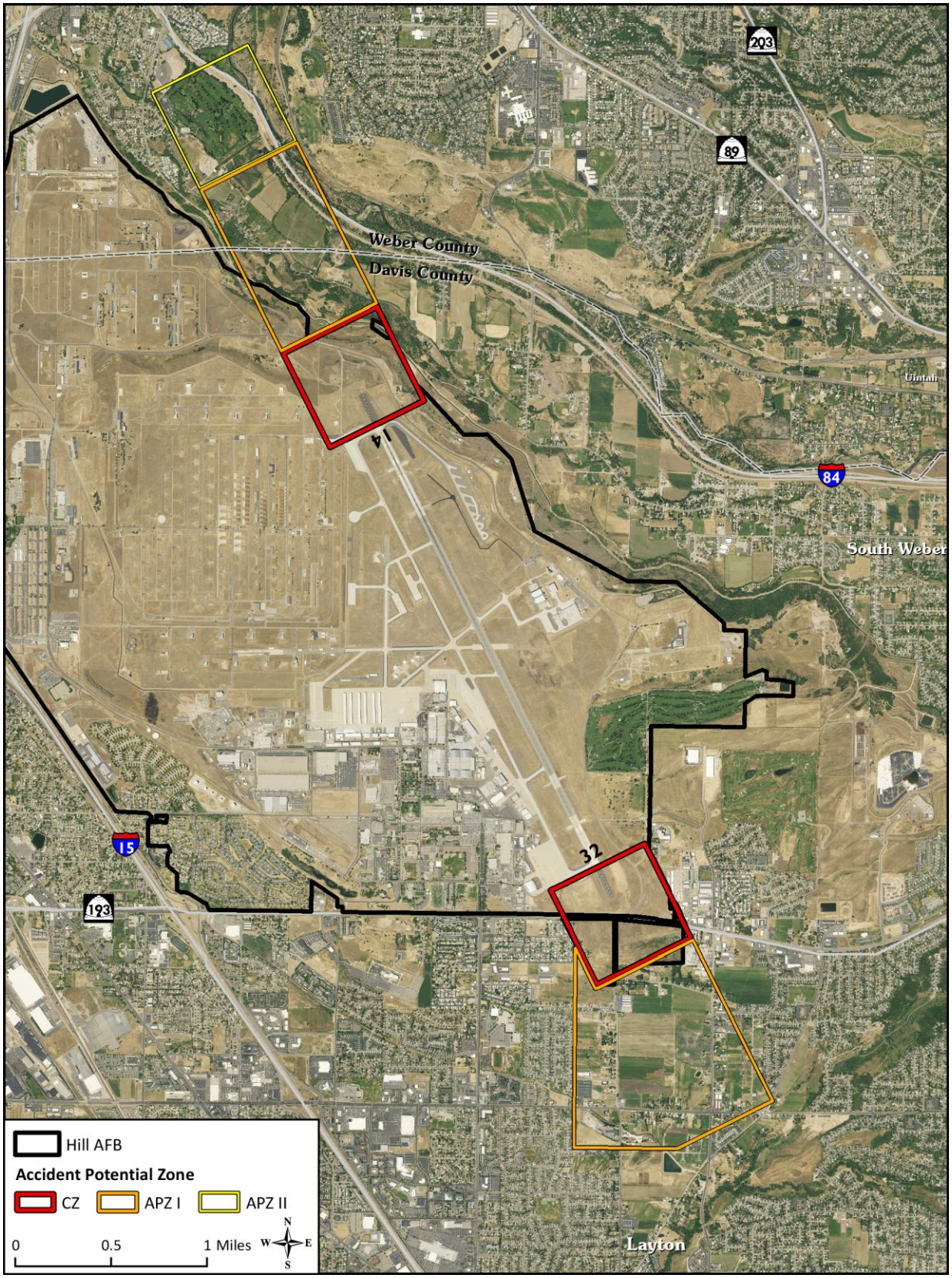
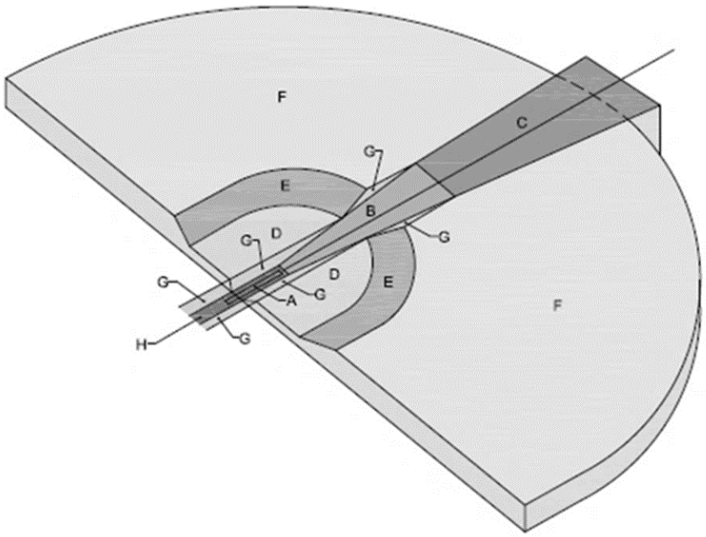


Figure 5-2. 2018 AICUZ Clear Zones and Accident Potential Zones for Hill AFB

5.2 Imaginary Surfaces

The DoD and FAA identify a complex series of imaginary planes and transition surfaces that define the airspace needed to remain free of obstructions around an airfield. Obstruction-free imaginary surfaces ensure safe flight approaches, departures, and pattern operations. Obstructions include natural terrain and man-made features, such as buildings, towers, poles, wind turbines, cell towers, and other vertical obstructions to airspace navigation.

Fixed-wing runways and rotary-wing runways/helipads have different imaginary surfaces. Brief descriptions of the imaginary surfaces for fixed-wing runways are provided on Figure 5-3 and in Table 5-2. Figure 5-4 depicts the runway airspace imaginary surfaces specific to Hill AFB. In general, the Air Force does not permit above-ground structures in the primary surface, and height restrictions apply to transitional surfaces and approach and departure surfaces. Height restrictions are more stringent the closer you are to the runway and flight paths.



LEGEND

A Runway
B Approach-Departure Clearance Surface (50:1 Slope Ratio)
C Approach-Departure Clearance Surface (Horizontal)
D Inner Horizontal Surface (45.72m [150'] Elevation)
E Conical Surface (20:1 Slope Ratio)
F Outer Horizontal Surface (152.40m [500'] Elevation
G Transitional Surface (7:1 Slope Ratio)
H Primary Surface

Figure 5-3. Runway Imaginary Surfaces and Transition Planes

Table 5-2. Description of Imaginary Surfaces for Military Airfields

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

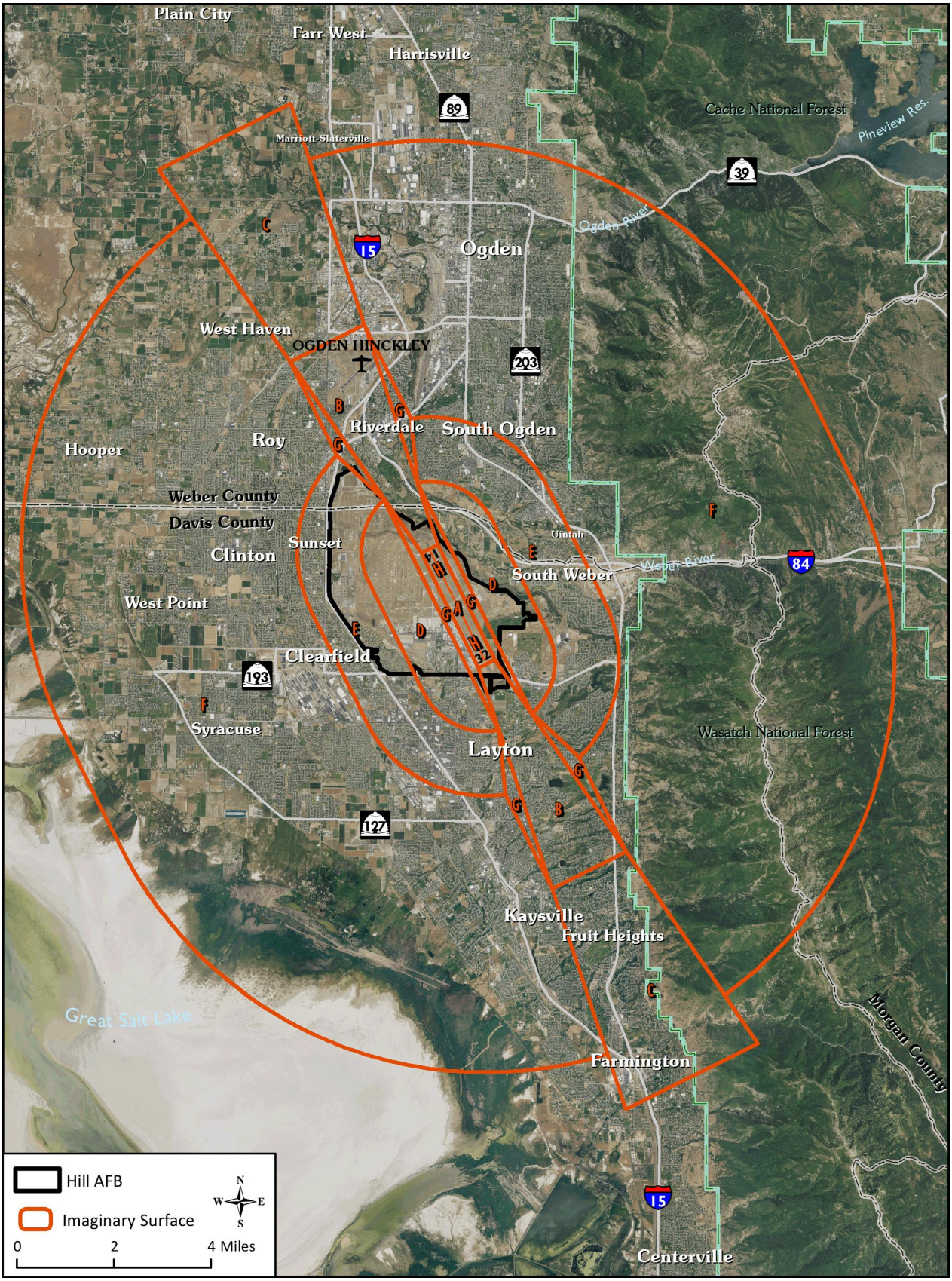


Figure 5-4. Runway Airspace Imaginary Surfaces and Transition Planes for Hill AFB

5.3 Hazards to Aircraft Flight Zone

Certain land uses and activities can pose potential hazards to flight. To ensure land uses and activities are examined for compatibility; the Air Force has identified a Hazards to Aircraft Flight Zone (HAFZ). The HAFZ is defined as the area within the "Imaginary Surfaces" that are shown in Figure 5-4, Imaginary Surfaces and Transition Plans for Hill AFB. Unlike Noise and Safety Zones, the HAFZ does not have recommended land use compatibility tables. Instead, it is a consultation zone recommending that project applicants and local planning bodies consult with the Air Force to ensure the project is compatible with Air Force operations. These land uses and activities include:

- **Height:** Tall objects can pose significant hazards to flight operations or interfere with navigational equipment (including radar). City/county agencies that are involved with approvals of permits for construction should require developers to submit calculations that show that projects meet the height restriction criteria of Title 14 Code of Federal Regulations (CFR) Part 77.17 for the specific airfield described in the AICUZ Study. City and county agencies may also consider requiring a "Determination of No Hazard" issued by the FAA for any tall objects within this zone.
- **Visual Interference:** Industrial or agricultural sources of smoke, dust, and steam in the airfield vicinity can obstruct the pilot's vision during takeoff, landing, or other periods of low-altitude flight. Close coordination between the base and the landowner can often mitigate these concerns. For example, irrigating before plowing can greatly reduce dust concerns.
- **Light Emissions:** Bright lights, either direct or reflected, in the airfield vicinity can impair a pilot's vision, especially at night. A sudden flash from a bright light causes a spot or "halo" to remain at the center of the visual field for a few seconds or more, rendering a person virtually blind to all other visual input. This is particularly dangerous for pilots at night when the flash can diminish the eye's adaptation to darkness. The eyes partially recover from this adaptation in a matter of minutes, but full adaptation typically requires 40 to 45 minutes. Specific examples of light emissions that can interfere with the safety of nearby aviation operations include:
    - Lasers that emit in the visible spectrum can be potentially harmful to a pilot's vision during both day and night.
    - The increasing use of energy-efficient light-emitting diode (LED) lights also poses potential conflicts in areas where pilots use night vision goggles (NVGs). NVGs can exaggerate the brightness of these lights, interfering with pilot vision.
    - The use of red LED lights to mark obstructions can produce an unintended safety consequence because red LED lights are not visible on most NVG models, rendering them invisible to NVG users in the area.

- **Bird/Wildlife-Aircraft Strike Hazard:** Wildlife represents a significant hazard to flight operations. Birds, in particular, are drawn to different habitat types found in the airfield environment including hedges, grass, brush, forest, water, and even the warm pavement of the runways. Although most bird and animal strikes do not result in crashes, they cause structural and mechanical damage to aircraft as well as loss of flight time. Most collisions occur when the aircraft is at an elevation of less than 1,000 feet. Due to the speed of the aircraft, collisions with wildlife can happen with considerable force.

  To reduce the potential of a bird/wildlife-aircraft strike hazard (BASH), the Air Force recommends that land uses that attract birds not be located near installations with an active air operations mission. These land uses include the following:

  - Waste disposal operations
  - Wastewater treatment facilities
  - Transfer stations
  - Landfills
  - Golf courses
  - Wetlands
  - Storm water ponds
  - Dredge disposal sites

  Birds and raptors in search of food or rodents will flock to landfills, increasing the probability of BASH occurrences in the vicinity of these facilities. Design modifications also can be used to reduce the attractiveness of these types of land uses to birds and other wildlife.

- **Radio Frequency/Electromagnetic Interference:** The American National Standards Institute defines electromagnetic interference (EMI) as any electromagnetic disturbance that interrupts, obstructs, or otherwise degrades or limits the effective performance of electronics/electrical equipment. EMI may be caused by atmospheric phenomena, such as lightning or precipitation static, and by non-telecommunications equipment, such as vehicles and industrial machinery.

New generations of military aircraft are highly dependent on complex electronic systems for navigation and critical flight and mission-related functions. Consequently, communities should use care when siting any activities that create EMI. Many of these sources are low-level emitters of EMI. However, when combined, they have an additive quality.

EMI also affects consumer devices, such as cell phones, FM radios, television reception, and garage door openers. In some cases, the source of interference occurs when consumer electronics use frequencies set aside for military use.

6.0 Land Use Analysis

The AICUZ area of influence or the "AICUZ footprint" of an airfield is the combination of noise contours, CZ, APZs, and the HAFZ, and is used as the basis for the land use compatibility analysis. The AICUZ footprint defines the minimum recommended area within which land use controls are needed to enhance the health, safety, and welfare of those living or working near a military airfield and to preserve the flying mission. The AICUZ footprint, combined with the guidance and recommendations set forth in the AICUZ Study, are the fundamental tools necessary for the planning process. The Air Force recommends local and regional governments adopt the AICUZ noise zones, CZs, APZs, and HAFZ into planning studies, regulations, and processes to best guide compatible development around the installation. This study uses the AICUZ footprint whose largest component is the imaginary surfaces (see Figure 5-4) for Hill AFB as the basis for the land use compatibility analysis.

6.1 Land Use Compatibility Guidelines and Classifications

In an effort to establish long-term compatibility for lands within the vicinity of military air installations, the DoD has created land use compatibility recommendations based on the Federal Highway Administration's Standard Land Use Coding Manual (SLUCM). These guidelines are used by DoD personnel for on-base planning and for engaging with the local community to foster compatible land use development. Table A-1 of Appendix A shows the suggested land use compatibility guidelines within the CZs and APZs. Table A-2 of Appendix A provides land use compatibility recommendations within noise contours.

6.2 Planning Authorities

This section presents information for each of the governing bodies who have land-use jurisdictions near Hill AFB, including descriptions of existing and future land uses. The state of Utah provides local governments the ability to exercise local autonomy and limits the degree of state interference in local affairs. This legislative authority for local autonomy is provided in Article VI, Section 28 of the Utah State Constitution. Hill AFB is immediately adjacent to six municipalities: Layton, Clearfield, Sunset, Roy, Riverdale, and South Weber City.

These local governments have adopted either a mayor and five-member council of government (Roy, South Weber City, Riverdale, Sunset) or a council/manager form of government (Layton, Clearfield). With the council/manager form, the government of a municipality rests in two separate, independent and equal branches of city government: the executive branch, consisting of a mayor, the administration departments and its officers, and the legislative branch, consisting of a municipal council. This differs from the five-and six-member council forms of government where there is no separation of powers and both executive and legislative powers are contained in a single governing body.

Each city within the Hill AFB local area has some variation of a community leader, such as a mayor, as well as a planning commission, planning and zoning department, and/or economic and development division. These organizations have prepared General Plans that guide planning and development within each jurisdiction.

In addition to local comprehensive planning efforts, the Wasatch Front Regional Council (WFRC) provides overall transportation planning and economic development guidance to the area surrounding Hill AFB. They also published the *Compatible Land Use Planning Guide for Utah Airports* that addresses compatibility issues such as safety and noise (WFRC 2000).

6.3 Land Use and Proposed Development

The land use compatibility analysis identifies existing and future land uses near Hill AFB to determine compatibility conditions. Existing land use is assessed to determine current land use activity, while future land plans are used to project development and potential growth areas. Existing land use and parcel data provided by local communities were evaluated to ensure an actual account of land use activity regardless of conformity to zoning classification or designated planning or permitted use. Additionally, local management plans, policies, ordinances, and zoning regulations were evaluated to determine the type and extent of land use allowed in specific areas.

6.3.1 Existing Land Uses

Hill AFB is located in Davis and Weber Counties, where the majority of the land is incorporated and the area is experiencing some of the fastest growth in the state of Utah. Each of the six municipalities surrounding Hill AFB have transformed from primarily agricultural communities to cities that are a mixture of residential, commercial and industrial land uses. Interstate 15 forms the boundary along the western portion of the base while SR-193 (Bernard Fisher Highway) forms the southern boundary between the base and the city of Layton. The city of South Weber, which has remained rural/agriculture in nature until recently, is located along the northeastern boundary of the base.

Existing land uses within the Hill AFB 2018 AICUZ noise contours and APZs are illustrated on Figure 6-1 and Figure 6-2, respectively. The predominant land uses within the Hill AFB 2018 AICUZ noise contours and APZs on the north side of the base are open/agriculture/low density uses, including Schneiters Riverside Golf Course, along with commercial development in APZ II. There is a pocket of mixed residential, commercial and public land uses in the 65- to 70-dB DNL and 70- to 75-dB DNL noise contours in the city of Washington Terrace. Within this area are the Ogden Regional Medical Center and the Weber County Library Pleasant View Branch. A portion of the 65- to 70-dB DNL area is over South Ogden City and includes H. Guy Child Elementary School, the South Ogden Junior High School, and Friendship Park.

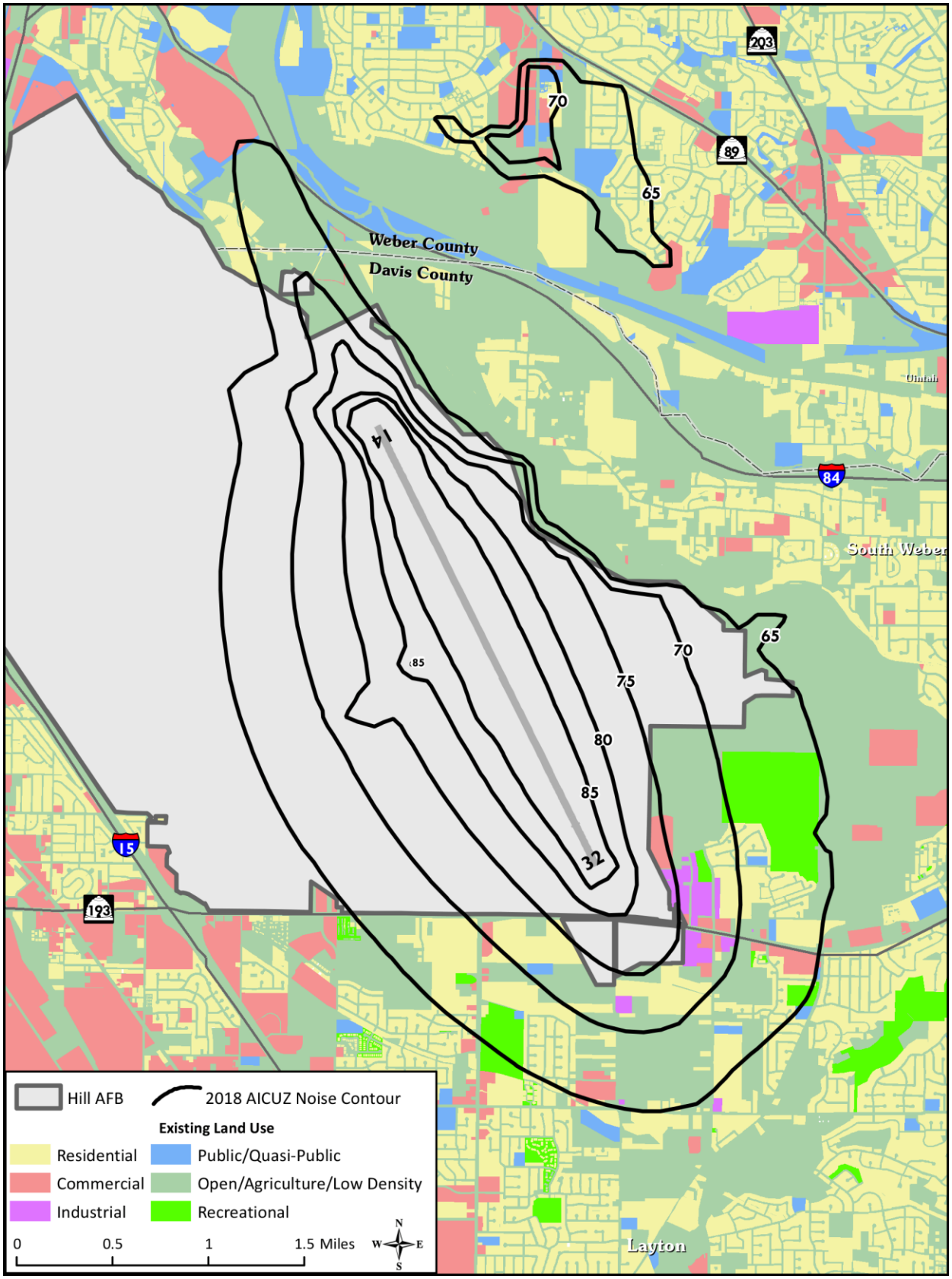


Figure 6-1. Existing Land Use and 2018 AICUZ Noise Contours

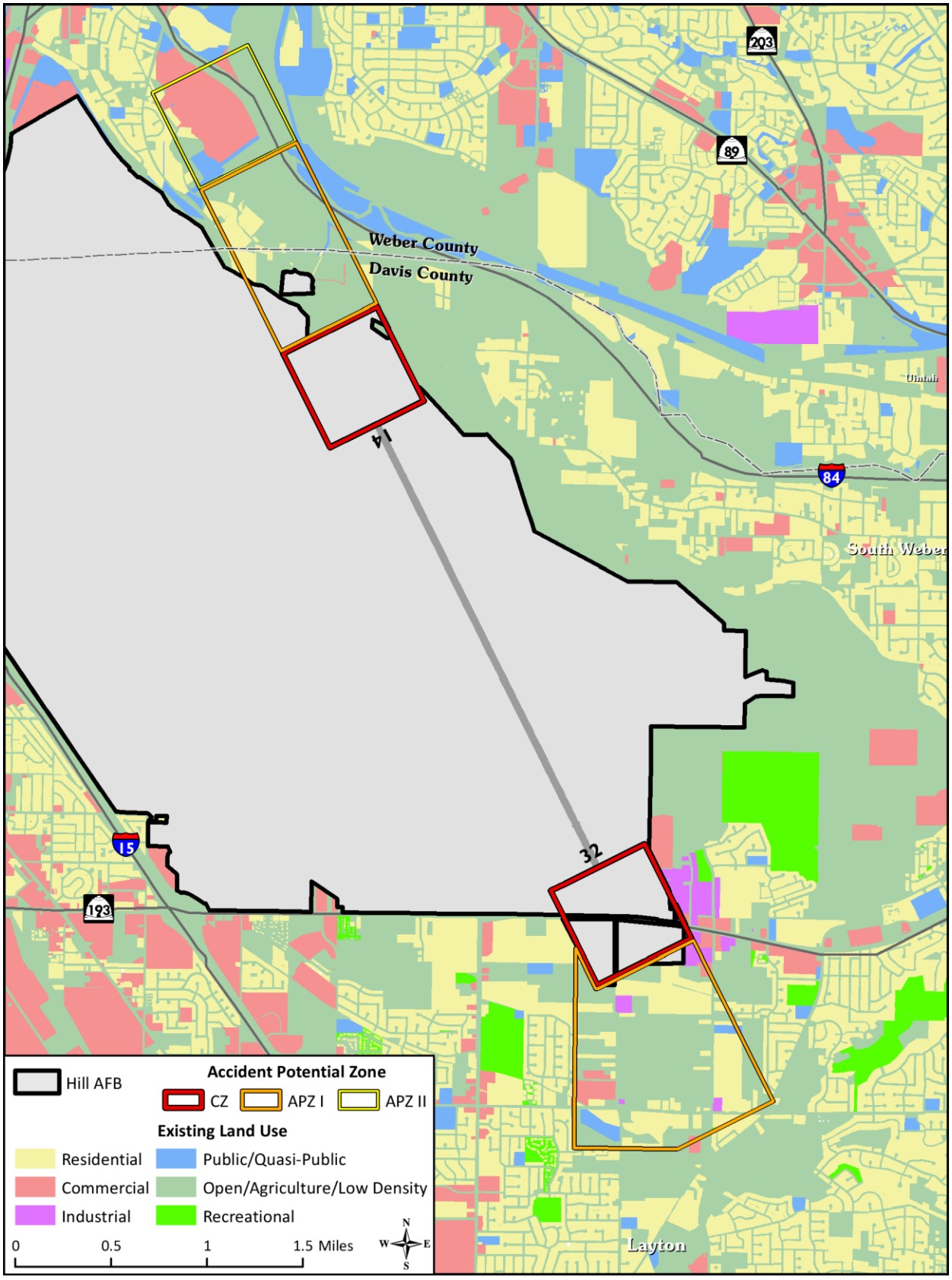


Figure 6-2. Existing Land Use and 2018 AICUZ Clear Zones and Accident Potential Zones

Within the southern APZ and the noise contours to the east and south, the land use is a mixture of open/agriculture/low density and industrial uses with interspersed residential subdivisions. Along the southeastern base boundary are the Sun Hills Golf Course and the East Ridge Estates and North Hill Estates subdivisions. Along Hill Field Road is Northridge High School (65- to 70-dB DNL noise contour). Areas of specific land use compatibility concerns within the Hill AFB AICUZ APZs and noise contours are further evaluated in Section 6.4, Compatibility Concerns.

6.3.2 Current Zoning

Zoning is the legal regulation of property use to protect the health, safety, and welfare of citizens; protect property rights; conserve resources; and avoid incompatible uses. In Utah, counties and cities enact zoning ordinances to implement respective comprehensive plan objectives.

Current zoning data for each of the cities surrounding Hill AFB were gathered from the city offices responsible for the enforcement of the zoning ordinances. The state has, with the various planning and zoning statues and resolutions, encouraged the political jurisdictions to use airport land use studies to develop compatible land use plans and zoning regulations. Comprehensive or master plans developed for cities surrounding Hill AFB have recommended or included the noise-sensitive areas identified by previous AICUZ studies. The cities of Layton and South Weber have prepared specific maps identifying current published noise contours and CZ/APZ areas to assist development interest in understanding the potential areas of concern associated with Hill AFB. The Utah State Legislature, in 1976 and again in 1994, set aside funds that were used to acquire use/avigation easements to lands in the southern APZ. Figure 6-3 illustrates the zoning and AICUZ noise contours in the areas surrounding Hill AFB. Figure 6-4 presents the zoning within the Hill AFB's CZs and APZ I and II.

For AICUZ planning purposes, similar zoning categories were consolidated into the seven generalized categories as discussed in upcoming Section 6.4. See Appendix A for additional details.

6.3.3 Future Land Use

Future land use data was provided by reviewing General and Master Plans for the cities surrounding Hill AFB. For AICUZ planning purposes, similar land use categories were consolidated into the seven generalized categories as discussed in upcoming Section 6.4.

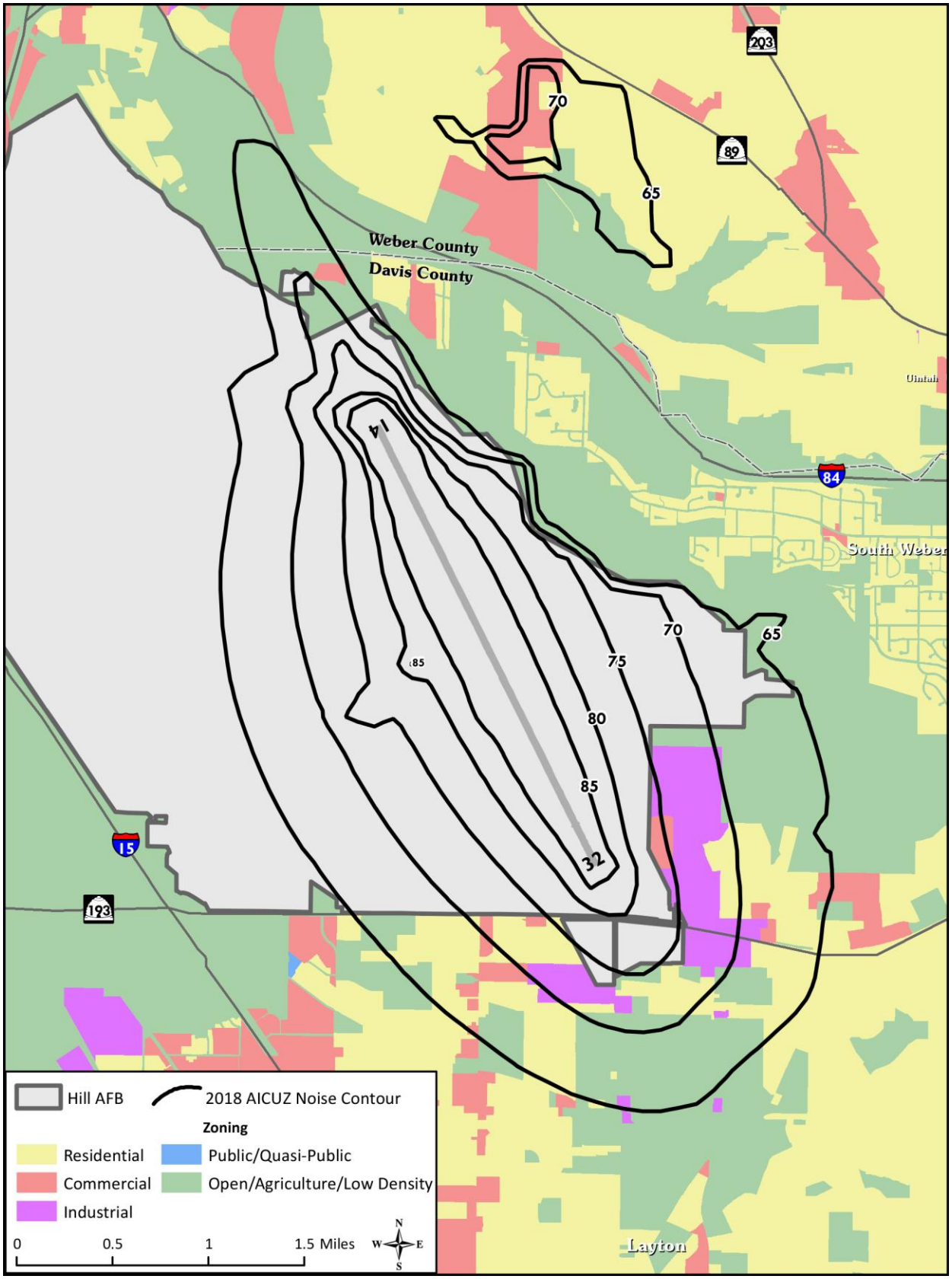


Figure 6-3. Existing Zoning and 2018 AICUZ Noise Contours

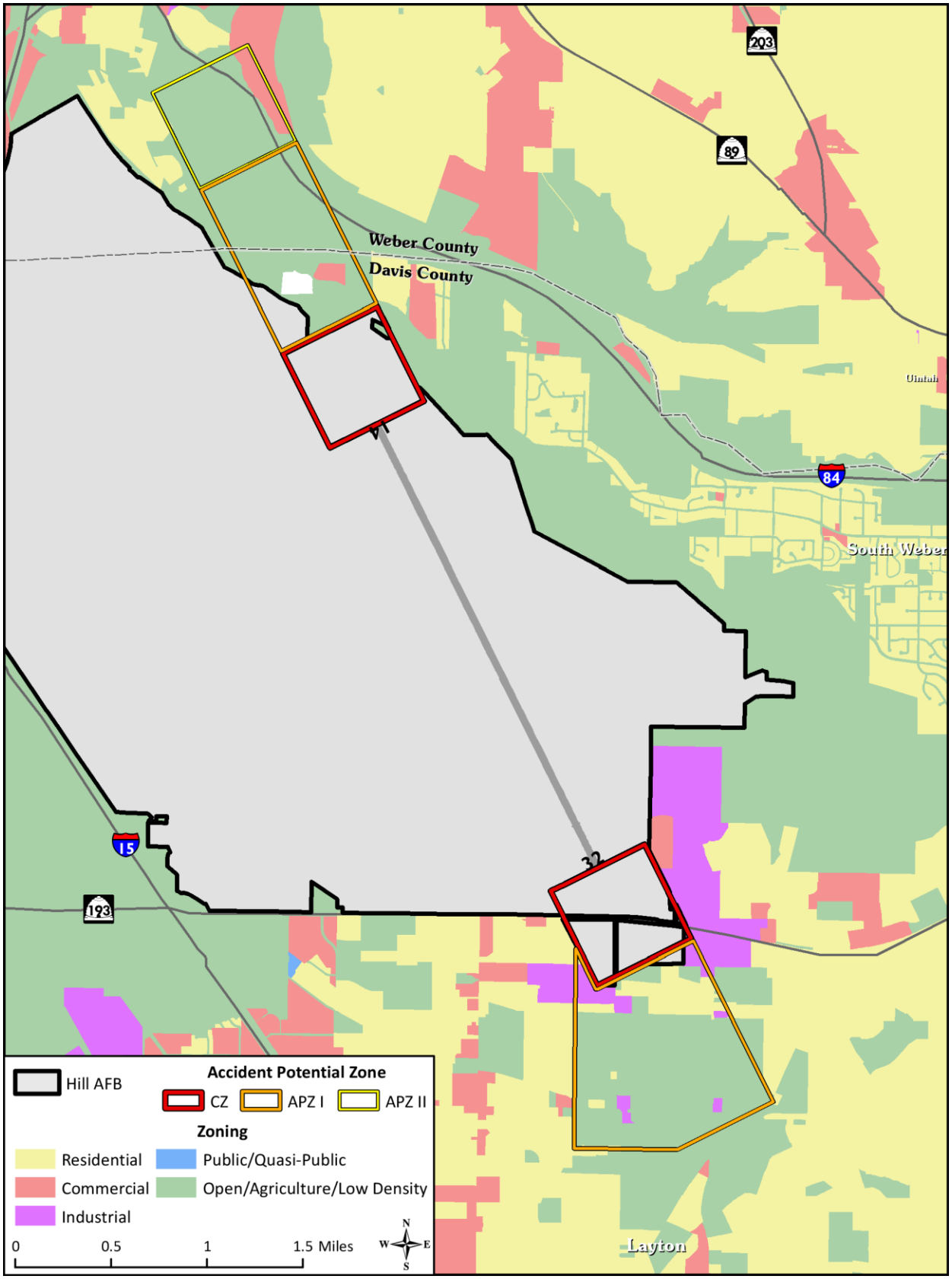


Figure 6-4. Existing Zoning and Clear Zones and Accident Potential Zones

6.4 Compatibility Concerns

6.4.1 Land Use Analysis

Land use describes how land is developed and managed, and is characterized by the dominant function occurring within an area. To compare land use consistently across jurisdictions, this analysis uses generalized land use classifications illustrating land use compatibility across common land use types. These generalized land use categories do not exactly represent the local community's land use designations, but combine similar uses into one of the following seven categories:

- **Residential:** All types of residential activity, such as single and multi-family residences and mobile homes, at a density greater than one dwelling unit per acre
- **Commercial:** Offices, retail stores, restaurants and other types of commercial establishments
- **Industrial:** Manufacturing, warehouses and other similar uses
- **Public/Quasi-Public:** Publicly owned lands and land to which the public has access, including military reservations and training grounds, public buildings, schools, churches, cemeteries, and hospitals
- **Recreational:** Land areas designated for recreational activity, such as parks, wilderness areas and reservations, conservation areas, and areas designated for trails, hikes, camping, etc.
- **Open/Agriculture/Low Density:** Undeveloped land areas, agricultural areas, grazing lands and areas with residential activity at densities less than or equal to one dwelling unit per acre
- **Undesignated:** Applies to parcels that had no indicated value or were listed as "undesignated" in the original datasets

For the purpose of this analysis, the DoD AICUZ compatibility guidelines (Tables A-1 and A-2 of Appendix A) have been consolidated into the seven generalized land use classifications. Table 6-1 provides generalized compatibility guidelines. Land use compatibility falls into one of four categories: (1) Compatible, (2) Compatible with Restrictions, (3) Not Compatible, and (4) Not Compatible with Exceptions. The conditionally compatible land use, i.e., categories 2 and 4, may require incorporation of noise attenuation measures into the design and construction of structures and further evaluation to be considered "compatible" and may require density limitations for land in APZs.

Table 6-1. Generalized Land Use Categories and Noise/Safety Compatibility

Generalized Land Use Category[3]	Noise Zone (dB DNL)						CZ	APZ I	APZ II
	<65	65–69	70–74	75–79	80–84	85+			
Residential	Yes	No[1]	No[1]	No	No	No	No	No	No
Commercial	Yes	Yes	Yes[2]	Yes[2]	No	No	No	Yes[2]	Yes[2]
Industrial	Yes	Yes	Yes	Yes	Yes[2]	No	No	Yes[2]	Yes[2]
Public/Quasi-Public	Yes	Yes[2]	Yes[2]	Yes[2]	No	No	No	No	Yes[2]
Recreation	Yes	Yes[2]	Yes[2]	No	No	No	No	Yes[2]	Yes[2]
Open/Agriculture/Low Density	Yes	Yes[2]	Yes[2]	Yes[2]	Yes[2]	Yes[2]	No	Yes[2]	Yes[2]
Undesignated	Yes	No	No	No	No	No	No	No	No

[1] Incompatible with exceptions
[2] Compatible with restrictions
[3] Refer to Appendix A for details
APZ = Accident Potential Zone; CZ = Clear Zone; dB = decibels; DNL = Day-Night Average Sound Level

6.4.2 Existing Land Use Compatibility Concerns

Existing land use compatibility acreages for areas exposed to DNL greater than or equal to 65 dB for Hill AFB are provided in Table 6-2. CZ and APZ related land use acreages are provided in Table 6-3. Figure 6-5 shows the location of all incompatible existing land uses with the 2018 AICUZ noise contours and the CZs and APZs. The values shown on the figure do not double count the existing incompatible development acreage within both a CZ/APZ and a 2018 AICUZ noise contour.

6.4.2.1 City of South Weber

Incompatible residential land use within the 65- to 70-dB DNL AICUZ noise contour lies within the northwestern corner of the city between the base boundary and South Weber Drive (Route 60). This area is also in APZ I.

6.4.2.2 City of Riverdale

Incompatible residential land use within the AICUZ noise contour lies between the base boundary and Weber Drive. This area is also in APZ I. There is also a small incompatible residential area in the northwest corner of APZ II west of Schneiters Riverside Golf Course.

6.4.2.3 City of Washington Terrace

Within the 65- to 70-dB DNL AICUZ noise contour, there is incompatible residential development between Ridgeline Drive and 5600 South. Also, the Ogden Regional Medical Center and Weber County Library Pleasant View Branch on Adams Avenue Parkway are located in the 70- to 75-dB DNL AICUZ noise contour.

6.4.2.4 South Ogden City

Within the 65- to 70-dB DNL AICUZ noise contour, there is incompatible residential development between U.S. Highway 89 and 5700 South. Also located within this noise contour are the H. Guy Child Elementary School and the South Ogden Junior High School.

6.4.2.5 City of Layton

Within the city of Layton, there are 305.8 acres of incompatible residential land use in the 65- to 70-dB DNL noise contour; 97.4 acres in the 70- to 75-dB DNL noise contour and 3.4 acres in the 75- to 80-dB DNL noise contour. This residential development is found in three generalized areas. One area is located east of the base and north of SR 193 and contains three subdivisions (East Ridge Estates, North Hill Estates, and Sun Hills Park). The second area is south of SR 193 and east of the APZ, and includes Wyndom Highlands, Wyndom Square, Love Estates, and Chapel Hill. The third area, located south of SR 193 and west of the APZ, includes the subdivisions of Quail Crest, Antelope Hill, Lakeview Meadows, Windsor Square, Sahara Village, and 11 small subdivisions west of Hill Field Road. The 65- to 70-dB DNL area also includes Northridge High School.

Other incompatible land uses located within the APZ include residential and public/quasi-public.

Table 6-2. Off-Base Existing Land Use Acreage within the AICUZ Noise Contours

Designation	Generalized Land Use Category[3]	Noise Zone (dB DNL)										Total
		65–69	Note	70–74	Note	75–79	Note	80–84	Note	85+	Note	
Incompatible	Residential	494	(1)	176	(1)	7.6		0		0		678
	Commercial							0		0		0
	Industrial									0		0
	Public/Quasi-Public							0		0		0
	Recreation					0		0		0		0
	Open/Agriculture /Low Density											
Compatible	Residential											
	Commercial	64.5		43.3	(2)	16.3	(2)					124
	Industrial	0.6		48.8		8.6		0	(2)			58
	Public/Quasi-Public	42.1	(2)	18.8	(2)	0	(2)					60.9
	Recreation	206.9	(2)	11.5	(2)							218.4
	Open/Agriculture /Low Density	831	(2)	315	(2)	23	(2)	0.5	(2)	0	(2)	1,169
Subtotals	Incompatible	494		176		8		0		0		678
	Compatible	1,145		438		47		1		0		1,631
Total		1,639		614		55		1		0		2,308

Note: All contour areas on-base are excluded from the counts

[1] Incompatible with exceptions

[2] Compatible with restrictions

[3] Refer to Appendix A for details

dB = decibels; DNL = Day-Night Average Sound Level

Table 6-3. Off-Base Existing Land Use Acreage within the Accident Potential/Clear Zone

Designation	Generalized Land Use Category[2]	CZ	Note	APZ I	Note	APZ II	Note	Total
Incompatible	Residential	0		237.9		8.5		246.4
	Commercial	0.1						0.1
	Industrial	3.1						3.1
	Public/Quasi-Public	0		23.3				23.3
	Recreation	0						0
	Open/Agriculture /Low Density	19.8						19.8
	Undesignated	-		-		-		-
Compatible	Residential							
	Commercial			22.2	(1)	92	(1)	114.2
	Industrial			14.5	(1)	0	(1)	14.5
	Public/Quasi-Public					14.2	(1)	14.2
	Recreation			0.2	(1)	0	(1)	0.2
	Open/Agriculture /Low Density			521.7	(1)	91.9	(1)	613.6
	Undesignated							
Subtotals	Incompatible	23.0		261.2		8.5		292.7
	Compatible	-		558.6		198.1		756.7
	Total	23.0		819.8		206.6		1,049.49

Note: All contour areas on-base are excluded from the counts

[1] Compatible with restrictions

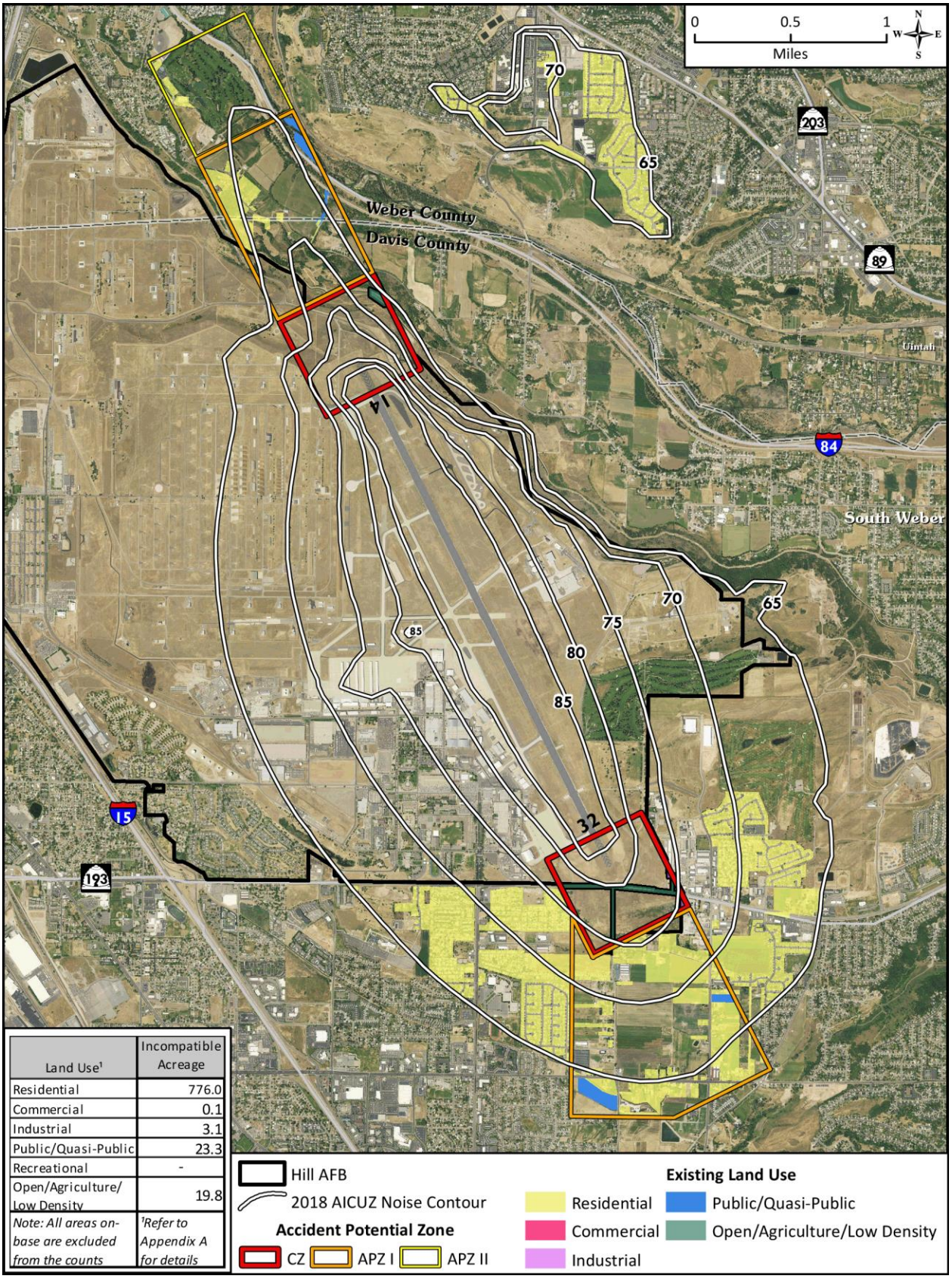
[2] Refer to Appendix A for details

APZ = Accident Potential Zone; CZ = Clear Zone

6.4.3 Future Land Use Compatibility Concerns

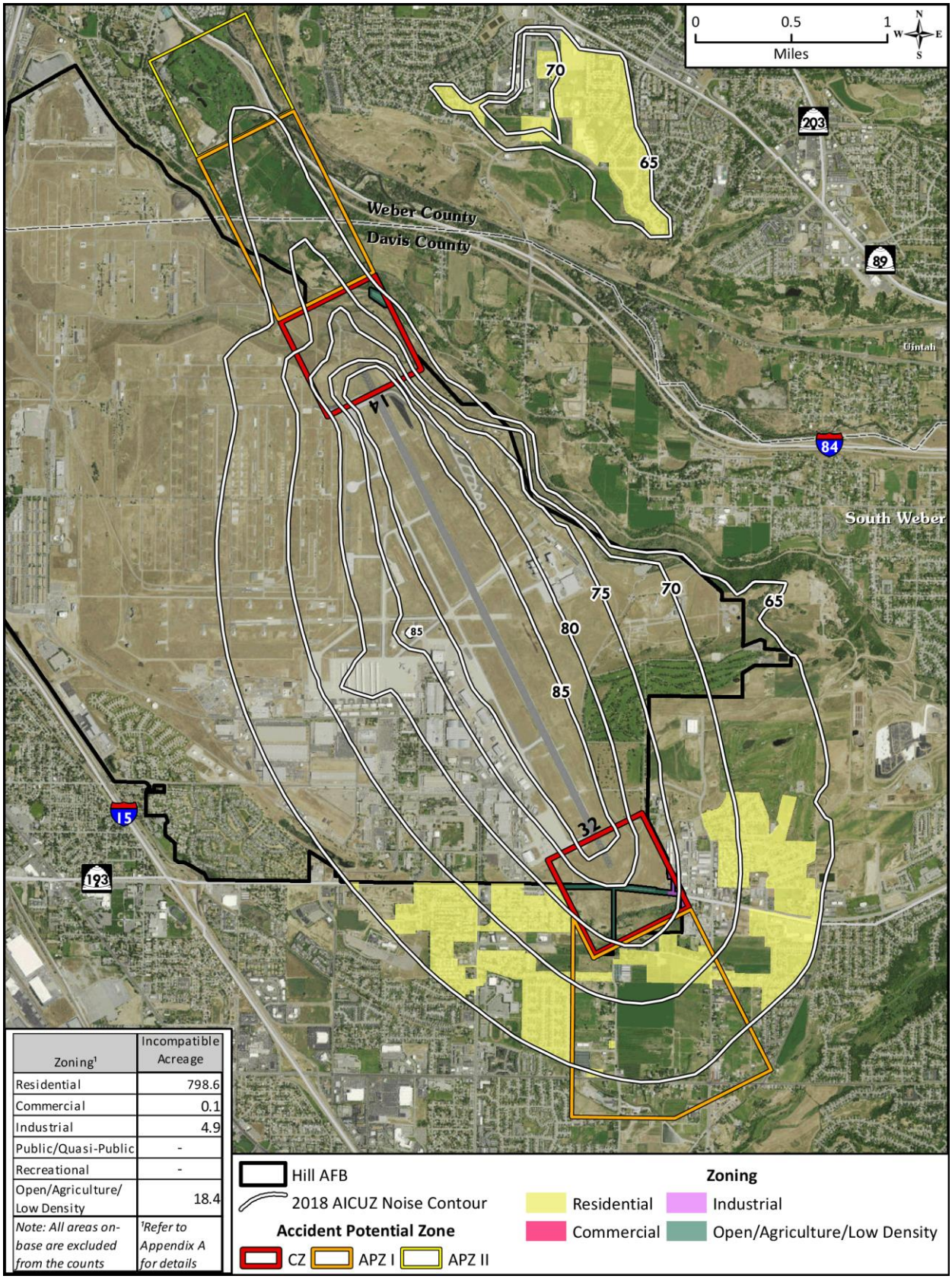
The generalized AICUZ compatibility guidelines in Table 6-1 were compared to future land use plans to determine what type of compatibility was associated with aircraft-generated noise and CZs/APZs at Hill AFB. Future land use compatibility acreages are provided in Table 6-4 and Table 6-5. Figure 6-6 shows the location of incompatible future land uses.

Many of the existing incompatible land uses within the cities of Layton, Riverdale, South Weber, South Ogden, and Washington Terrace will not change under future conditions unless significant redevelopment of existing residential areas is proposed. Also there are undeveloped parcels zoned for residential use that are within the 2018 AICUZ noise contours.



Land Use[1]	Incompatible Acreage
Residential	776.0
Commercial	0.1
Industrial	3.1
Public/Quasi-Public	23.3
Recreational	-
Open/Agriculture/ Low Density	19.8
Note: All areas on-base are excluded from the counts	*[1]Refer to Appendix A for details*

Figure 6-5. Incompatible Existing Land Use



Zoning[1]	Incompatible Acreage
Residential	798.6
Commercial	0.1
Industrial	4.9
Public/Quasi-Public	-
Recreational	-
Open/Agriculture/ Low Density	18.4
Note: All areas on-base are excluded from the counts	*[1]Refer to Appendix A for details*

Figure 6-6. Incompatible Future Land Use

Table 6-4. Off-Base Future Land Use Acreage within the AICUZ Noise Contours

Designation	Generalized Land Use Category[3]	Noise Zone (dB DNL)										Total
		65–69	Note	70–74	Note	75–79	Note	80–84	Note	85+	Note	
Incompatible	Residential	614.3		172.4		4.7		0		0		791.4
	Commercial											
	Industrial											
	Public/Quasi-Public							-		-		
	Recreation									-		
	Open/Agriculture /Low Density											
	Undesignated	-		-		-		-		-		-
Compatible	Residential											
	Commercial	89.8		67.6		16.3						173.7
	Industrial	24.2		246.1		19.3		0				289.6
	Public/Quasi-Public											
	Recreation											
	Open/Agriculture /Low Density	910.9		127.5		14.7		0.5				1053.6
	Undesignated											
Subtotals	Incompatible	614.3		172.4		4.7		0		0		791.4
	Compatible	1024.9		441.2		50.3		0.5		0		1516.9
	Total	1639.2		613.6		55		0.5		0		2308.3

Note: All contour areas on-base are excluded from the counts
[1] Incompatible with exceptions
[2] Compatible with restrictions
[3] refer to Appendix A for Details
dB = decibels; DNL = Day-Night Average Sound Level

Table 6-5. Off-Base Future Land Use Acreage within the Accident Potential/Clear Zone

Designation	Generalized Land Use Category[2]	CZ	Note	APZ I	Note	APZ II	Note	Total
Incompatible	Residential	0.1		72.9		1.7		74.7
	Commercial	0.1						0.1
	Industrial	4.9						4.9
	Public/Quasi-Public	0		0				0
	Recreation	0						0
	Open/Agriculture/Low Density	18.4						18.4
	Undesignated	0		0		0		0
Compatible	Residential							
	Commercial			9.4		27.4		36.8
	Industrial			41.9		0		41.9
	Public/Quasi-Public					0		0
	Recreation			0		0		0
	Open/Agriculture/Low Density			695.6		177.6		873.2
	Undesignated							
Subtotals	Incompatible	23.5		72.9		1.7		98.1
	Compatible	0		746.9		205.0		951.9
	Total	23.5		819.8		206.7		1050.0

Note: All contour areas on-base are excluded from the counts
[1] Compatible with restrictions
[2] Refer to Appendix A for Details
APZ = Accident Potential Zone; CZ = Clear Zone

7.0 Implementation

Implementation of the AICUZ Study must be a joint effort between Hill AFB and the surrounding communities. This AICUZ Study provides the best source of information to ensure land use planning decisions made by the local municipalities are compatible with a future installation presence. This chapter discusses the roles of all the partners in the collaborative planning.

7.1 Air Force Role

The goal of the Air Force AICUZ Program is to minimize the noise and safety concerns on the surrounding communities and to advise these communities on potential impacts from base operations on the safety, welfare, and quality of life of their citizens.

Hill AFB's AICUZ responsibilities encompass the areas of flight safety, noise abatement, and participation in the land use planning process.

Air Force policy and guidance requires that base leadership periodically review existing practices for flight operations and evaluate these factors in relationship to populated areas and other local situations.

- Hill AFB should ensure that wherever possible, flights are routed over sparsely populated areas as to reduce the exposure of lives and property to a potential accident.
- Hill AFB should periodically review existing traffic patterns, instrument approaches, weather conditions, and operating practices and evaluate these factors in relationship to populated areas and other local situations. This is done in order to limit, reduce, and control the impact of noise from flying operations on surrounding communities.
- Hill AFB should establish a community forum between the installation and surrounding stakeholders to discuss land use and other issues of concern; these meetings should be held on a quarterly basis.
- Hill AFB should schedule land use planning meetings to provide a forum for agencies to meet and discuss future developments and to address issues that may surface as a result of new proposals. In an effort to further facilitate and promote straightforward, consistent two-way discussion and information sharing.
- Hill AFB should provide copies of AICUZ studies to local, county, tribal, and regional planning departments and zoning administrators to aid in the planning process and also provide copies of the AICUZ Study to appropriate state and federal agencies.
- Hill AFB, in accordance with DoD Instruction 4165.57, *Air Installations Compatible Use Zones (AICUZ)*, and AFI 32-7063, *Air Installation Compatible Use Zone Program*, continue to pursue acquisition, whenever practicable, interest in fee or through appropriate restrictive easements for the 12 remaining parcels

within Hill AFB's CZ that are not owned by the installation and do not have any protection against incompatible use. Establishing land use controls on these parcels would protect Hill AFB missions and support future compatible land uses.

- Hill AFB should pursue a nomination for a JLUS during the annual call for JLUS nominations. The Wasatch Front, including the Ogden-Layton-Clearfield metropolitan area, is one of the fastest growing regions in the nation, and pressure from urban growth is unlikely to decrease. The JLUS program is a planning process designed to complement the AICUZ program by identifying encroachment issues. It also recommends strategies to address the issues through local comprehensive and general plans. Though AICUZ recommendations are acknowledged in the general plans of Layton, Riverdale, and South Weber, they have not been formally adopted into local ordinances and several incompatibilities have been identified. Technical and financial assistance is available through the DoD's Office of Economic Adjustment. Involving and engaging stakeholders through a formal JLUS will help enhance commonality, compatibility, and unity of purpose with land use policies and regulations from multiple jurisdictions that affect Hill AFB's missions.

Preparation and presentation of this Hill AFB AICUZ Study is one phase of continuing Air Force participation in the local planning process. The Air Force recognizes that as the local community updates its land use plans, Hill AFB must be ready to provide additional input as needed.

7.2 State / Regional Roles

In 1995, when Hill AFB was first placed on the Base Realignment and Closure list, community members, such as the Utah Defense Alliance, local chambers of commerce, legislators, and elected officials organized to protect the missions of Hill AFB. Typical state and local actions included, but were not limited to, the following:

- Drafting state legislation that requires compatible land use around installations; Utah Code Title 63M Chapter 6 Section 201-203 authorizes the Governor's Office of Economic Development to "acquire, by purchase or condemnation, easements for the establishment, maintenance, and operation of a restrictive use area for the operation of aircraft to and from Hill Air Force Base."
- Participating in collaborative frameworks such as the Hill AFB Restoration Advisory Board to address areas of mutual concern.
- Using existing statutory authority at the local level to designate the land surrounding military installations as areas of critical state concern.
- Engaging with local planners and planning boards to be aware of potentially harmful rezoning, development decisions, and policy or regulation changes.
- Incorporating AICUZ criteria into comprehensive plans and zoning ordinances; Hill AFB's commitment to surrounding communities necessitates (1) considering how the installation's current and future missions directly affect members of the

surrounding community, and (2) understanding the community's interest in safety and the effects of noise associated with flying missions.

These activities have continued as the state of Utah and the WFRC have provided support to Hill AFB.

7.3 Local Government Role

The role of the local government is to enact planning, zoning, and development principles and practices that are compatible with the base and which protect the base's mission. The residents of the surrounding community have a long history of working with personnel from Hill AFB. Adoption of the following recommendations during the revision of relevant land use planning or zoning regulations will strengthen this relationship, increase the health and safety of the public, and protect the integrity of the installation's flying mission:

- Recommend local government planners consider AICUZ policies and guidelines when developing or revising city comprehensive plans and use AICUZ overlay maps and Air Force Land Use Compatibility Guidelines (see Appendix A) to evaluate existing and future land use proposals.
- Ensure that new development applications or "changed use of property" are submitted to Hill AFB to afford the opportunity to assess those applications for potential impacts on defense missions. The Hill AFB Public Affairs Office can provide a land use planning point of contact.
- Recommend zoning ordinances be adopted or modified to reflect the compatible land uses outlined in the AICUZ report, including the creation of military airport overlay zones.
- Recommend local government and county planners establish procedures to consult on land use matters within overlapping extra-territorial jurisdictions near Hill AFB**.**
- Recommend local governments review their capital improvement plan, infrastructure investments and development policies to ensure they do not encourage incompatible land use patterns near Hill AFB, with particular emphasis on utility extension and transportation planning.
- Recommend local governments implement height and obstruction ordinances that reflect current Air Force and 14 CFR part 77 requirements, presented in this study as HAFZs.
- Recommend fair disclosure ordinances be enacted to require disclosure to the public for those AICUZ items that directly relate to aircraft operations at Hill AFB.
- Recommend local governments, where allowed, require real estate disclosure for individuals purchasing property within noise contours or CZs/APZs.

- Enact or modify building/residential codes to ensure that any new construction near Hill AFB has the recommended noise-level reduction measures incorporated into the design and construction of structures.
- Recommend government planning bodies monitor proposals for tall structures such as wind turbines and communication towers to ensure that new construction does not pose a hazard to navigable airspace around Hill AFB. Where appropriate, coordinate with the FAA on the height of structures.
- Recommend that local government land use plans and ordinances reflect AICUZ recommendations for development in CZs/APZs and noise zones.
- Recommend that local governments consult with Hill AFB on planning and zoning actions that have the potential to affect base operations.
- Invite the Air Force leadership to sit on as an ex officio member on boards, commissions, and regional councils addressing long-range development and other planning policies.
- Encourage the development of a working group of city, county, and Hill AFB representatives to discuss land use concerns and major development proposals that could affect aircraft operations.

7.4 Community Roles

Neighboring residents and base personnel have a long-established history of working together for the mutual benefit of the Hill AFB mission and local community. Adoption of the following recommendations will strengthen this relationship, protect the health and ensure the safety of the public, and help protect the integrity of the installation‘s flying mission:

Real Estate Professionals and Brokers:

- Know where the noise zones and CZs/APZs encumber land near the air base and invite base representative to brokers’ meeting to discuss the AICUZ Program with the real estate professionals.
- Disclose noise impact to all prospective buyers of properties within areas greater than 65 dB DNL or within the CZs/APZs.
- Require the Multiple Listing Service to disclose noise zones and CZs/APZs on all listings.

Developers:

- Know where the noise zones and CZs/APZs encumber land near the air base. Consult with Hill AFB on proposed developments within the AICUZ.
- Make recommendations regarding existing zoning ordinances and subdivision regulations to support the compatible land uses outlined in this study through implementation of a zoning overlay district based on noise contours and CZs/APZs.

Local Citizens:

- Participate in local forums with the base to learn more about the base's missions.
- Become informed about the AICUZ Program and learn about the program's goals, objectives, and value in protecting the public's health, safety, and welfare.
- When considering property purchases, ask local real estate professionals, city planners, and base representatives about noise and accident potential.

Whereas the base and community are separated by a fence, what the Air Force does affects the community and conversely what the community does, can affect the Air Force mission. Collaborative planning, forging partnerships, open communications, and close relationships help the Air Force and its neighbors achieve their mutual goals.

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8.0 References

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Appendix A Land Use Compatibility Tables

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]
10	Residential				
11	Household Units				
11	Single units: detached	N	N	Y[2]	Maximum density of 2 Du/Ac
11	Single units: semi-detached	N	N	N	
11	Single units: attached row	N	N	N	
11	Two units: side-by-side	N	N	N	
11	Two units: one above the other	N	N	N	
11	Apartments: walk-up	N	N	N	
11	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	Manufacturing [3]				
21	Food and kindred products; manufacturing	N	N	Y	Maximum Floor Area Ratio (FAR) 0.56 IN APZ II
22	Textile mill products; manufacturing	N	N	Y	Maximum FAR 0.56 IN APZ II
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	N	N	N	
24	Lumber and wood products (except furniture); manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
26	Paper and allied products; manufacturing	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
27	Printing, publishing, and allied industries	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]
28	Chemicals and allied products; manufacturing	N	N	N	
29	Petroleum refining and related industries	N	N	N	
30	**Manufacturing[3] (continued)**				
31	Rubber and miscellaneous plastic products; manufacturing	N	N	N	
32	Stone, clay, and glass products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
34	Fabricated metal products; manufacturing	N	N	Y	Maximum FAR 0.56 in APZ II
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 I & 0.56 in APZ II
40	**Transportation, communication, and utilities[3, 4]**				
41	Railroad, rapid rail transit, and street railway transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
42	Motor vehicle transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
43	Aircraft transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
44	Marine craft transportation	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
45	Highway and street right-of-way	Y[5]	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
46	Automobile parking	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
47	Communication	N	Y[6]	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
48	Utilities[7]	N	Y[6]	Y[6]	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
49	Solid waste disposal (landfills, incinerators, etc.)	N	N	N	
49	Other transportation, communication, and utilities	N	Y[6]	Y	See Note 6 below

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]
50	**Trade**				
51	Wholesale trade	N	Y	Y	Maximum FAR of 0.28 in APZ I & 0.56 in APZ II
52	Retail trade – building materials, hardware and farm equipment	N	Y	Y	See Note 8 below
53	Retail trade – including, discount clubs, home improvement stores, electronics superstores, etc.	N	N	Y	Maximum FAR of 0.16 in APZ II
53	Shopping centers-Neighborhood, Community, Regional, Super-regional[9]	N	N	N	
54	Retail trade – food	N	N	Y	Maximum FAR of 0.24 in APZ II
55	Retail trade – automotive, marine craft, aircraft, and accessories	N	Y	Y	Maximum FAR of 0.14 in APZ I & 0.28 in APZ II
56	Retail trade – apparel and accessories	N	N	Y	Maximum FAR of 0.28 in APZ II
57	Retail trade – furniture, home, furnishings and equipment	N	N	Y	Maximum FAR of 0.28 in APZ II
58	Retail trade – eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y	Maximum FAR of 0.16 in APZ II
60	**Services[10]**				
61	Finance, insurance and real estate services	N	N	Y	Maximum FAR of 0.22 in APZ II
62	Personal services	N	N	Y	Office uses only. Maximum FAR of 0.22 in APZ II.
62	Cemeteries	N	Y[11]	Y[11]	
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Maximum FAR of 0.22 in APZ II
64	Warehousing and storage services[12]	N	Y	Y	Maximum FAR of 1.0 in APZ I; 2.0 in APZ II
64	Repair Services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Maximum FAR of 0.22 in APZ II

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]
65	Hospitals, nursing homes	N	N	N	
65	Other medical facilities	N	N	N	
66	Contract construction services	N	Y	Y	Maximum FAR of 0.11 APZ I; 0.22 in APZ II
67	Government Services	N	N	Y	Maximum FAR of 0.24 in APZ II
68	Educational services	N	N	N	
68	Child care services, child development centers, and nurseries	N	N	N	
69	Miscellaneous Services	N	N	Y	Maximum FAR of 0.22 in APZ II
69	Religious activities (including places of worship)	N	N	N	
70	**Cultural, entertainment and recreational**				
71	Cultural activities	N	N	N	
71	Nature exhibits	N	Y[13]	Y[13]	
72	Public assembly	N	N	N	
72	Auditoriums, concert halls	N	N	N	
72	Outdoor music shells, amphitheaters	N	N	N	
72	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements – fairgrounds, miniature golf, driving ranges; amusement parks, etc.	N	N	Y[20]	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y[13]	Y[13]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
75	Resorts and group camps	N	N	N	
76	Parks	N	Y[13]	Y[13]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
79	Other cultural, entertainment and recreation	N	Y[11]	Y[11]	Maximum FAR of 0.11 in APZ I; 0.22 in APZ II
80	**Resource production and extraction**				
81	Agriculture (except live- stock)	Y[4]	Y[14]	Y[14]	
81.5-81.7,	Agriculture-Livestock farming, including grazing and feedlots	N	Y[14]	Y[14]	

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]
82	Agriculture related activities	N	Y[15]	Y[15]	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
83	Forestry activities[16]	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
84	Fishing activities[17]	N[17]	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
85	Mining activities[18]	N	Y[18]	Y[18]	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
89	Other resource production or extraction	N	Y	Y	Maximum FAR of 0.28 in APZ I; 0.56 in APZ II, no activity which produces smoke, glare, or involves explosives
90	**Other**				
91	Undeveloped land	Y	Y	Y	
93	Water areas[19]	N[19]	N[19]	N[19]	

1. A "Yes" or a "No" designation for compatible land use is to be used only for general comparison. Within each, uses exist where further evaluation may be needed in each category as to whether it is clearly compatible, normally compatible, or not compatible due to the variation of densities of people and structures. In order to assist air installations and local governments, general suggestions as to Floor Area Ratios (FARs) are provided as a guide to density in some categories. In general, land use restrictions that limit occupants, including employees, of commercial, service, or industrial buildings or structures to 25 an acre in APZ I and 50 an acre in APZ II are considered to be low density. Outside events should normally be limited to assemblies of not more than 25 people an acre in APZ I, and maximum assemblies of 50 people an acre in APZ II. Recommended FARs are calculated using standard parking generation rates for various land uses, vehicle occupancy rates, and desired density in APZ I and II. For APZ I, the formula is FAR = 25 people an acre/ (Average Vehicle Occupancy x Average Parking Rate x (43560/1000)). The formula for APZ II is FAR = 50/ (Average Vehicle Occupancy x Average Parking Rate x (43560/1000)).

2. The suggested maximum density for detached single-family housing is two detached units per acre (Du/Ac). In a planned unit development (PUD) of single family detached units, where clustered housing development results in large open areas, this density could possibly be increased slightly provided the amount of surface area covered by structures does not exceed 20 percent of the PUD total area. PUD encourages clustered development that leaves large open areas.

3. Other factors to be considered: labor intensity, structural coverage, explosive characteristics, air-pollution, electronic interference with aircraft, height of structures, and potential glare to pilots.

4. No structures (except airfield lighting and navigational aids necessary for the safe operation of the airfield when there are no other siting options), buildings, or above-ground utility and communications lines should normally be located in Clear Zone areas on or off the air installation. The Clear Zone is subject to the most severe restrictions.

5. Roads within the graded portion of the Clear Zone are prohibited. All roads within the Clear Zone are discouraged, but if required, they should not be wider than two lanes and the rights-of-way should be fenced (frangible) and not include sidewalks or bicycle trails. Nothing associated with these roads should violate obstacle clearance criteria.

6. No above ground passenger terminals and no above ground power transmission or distribution lines. Prohibited power lines include high-voltage transmission lines and distribution lines that provide power to cities, towns, or regional power for unincorporated areas.

Table A-1. Land Use Compatibility Recommendations in APZs and CZs

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation[1]	APZ-I Recommendation[1]	APZ-II Recommendation[1]	DENSITY Recommendation[1]

[7.] Development of renewable energy resources, including solar and geothermal facilities and wind turbines, may impact military operations through hazards to flight or electromagnetic interference. Each new development should to be analyzed for compatibility issues on a case-by-case basis that considers both the proposal and potentially affected mission.

[8.] Within SLUCM Code 52, maximum FARs for lumberyards (SLUCM Code 521) are 0.20 in APZ-I and 0.40 in APZ-11; the maximum FARs for hardware, paint, and farm equipment stores (SLUCM Code 525), are 0.12 in APZ I and 0.24 in APZ II.

[9.] A shopping center is an integrated group of commercial establishments that is planned, developed, owned, or managed as a unit. Shopping center types include strip, neighborhood, community, regional, and super-regional facilities anchored by small businesses, a supermarket or drug store, discount retailer, department store, or several department stores, respectively.

[10.] Ancillary uses such as meeting places, auditoriums, etc. are not recommended.

[11.] No chapels or houses of worship are allowed within APZ I or APZ II.

[12.] Big box home improvement stores are not included as part of this category.

[13.] Facilities must be low intensity and provide no playgrounds, etc. Facilities such as club houses, meeting places, auditoriums, large classes, etc., are not recommended.

[14.] Activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded.

[15.] Factors to be considered: labor intensity, structural coverage, explosive characteristics, and air pollution.

[16.] Lumber and timber products removed due to establishment, expansion, or maintenance of Clear Zone lands owned in fee will be disposed of in accordance with applicable DoD guidance.

[17.] Controlled hunting and fishing may be permitted for the purpose of wildlife management.

[18.] Surface mining operations that could create retention ponds that may attract waterfowl and present bird/wildlife aircraft strike hazards (BASH), or operations that produce dust or light emissions that could affect pilot vision are not compatible.

[19.] Naturally occurring water features (e.g., rivers, lakes, streams, wetlands) are pre-existing, nonconforming land uses. Naturally occurring water features that attract waterfowl present a potential BASH. Actions to expand naturally occurring water features or construction of new water features should not be encouraged. If construction of new features is necessary for storm water retention, such features should be designed so that they do not attract waterfowl.

[20.] Amusement centers, family entertainment centers, or amusement parks designed or operated at a scale that could attract or result in concentrations of people, including employees and visitors, greater than 50 people per acre at any given time are incompatible in APZ II.

Table A-2. Recommended Land Use Compatibility for Noise Zones

LAND USE		SUGGESTED LAND USE COMPATIBILITY				
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
10	**Residential**					
11	Household units	N[1]	N[1]	N	N	N
11.1	Single units: detached	N[1]	N[1]	N	N	N
11.1	Single units: semidetached	N[1]	N[1]	N	N	N
11.1	Single units: attached row	N[1]	N[1]	N	N	N
11.2	Two units: side-by-side	N[1]	N[1]	N	N	N
11.2	Two units: one above the other	N[1]	N[1]	N	N	N
11.3	Apartments: walk-up	N[1]	N[1]	N	N	N
11.3	Apartment: elevator	N[1]	N[1]	N	N	N
12	Group quarters	N[1]	N[1]	N	N	N
13	Residential hotels	N[1]	N[1]	N	N	N
14	Mobile home parks or courts	N	N	N	N	N
15	Transient lodgings	N[1]	N[1]	N[1]	N	N
16	Other residential	N[1]	N[1]	N	N	N
20	**Manufacturing**					
21	Food and kindred products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
22	Textile mill products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
23	Apparel and other finished products; products made from fabrics, leather, and similar materials; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
24	Lumber and wood products (except furniture); manufacturing	Y	Y[2]	Y[3]	Y[4]	N
25	Furniture and fixtures; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
26	Paper and allied products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
27	Printing, publishing, and allied industries	Y	Y[2]	Y[3]	Y[4]	N
28	Chemicals and allied products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
29	Petroleum refining and related industries	Y	Y[2]	Y[3]	Y[4]	N
30	**Manufacturing (continued)**					
31	Rubber and misc. plastic products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
32	Stone, clay and glass products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
33	Primary metal products;	Y	Y[2]	Y[3]	Y[4]	N

Table A-2. Recommended Land Use Compatibility for Noise Zones

LAND USE			SUGGESTED LAND USE COMPATIBILITY			
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
	manufacturing					
34	Fabricated metal products; manufacturing	Y	Y[2]	Y[3]	Y[4]	N
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y[2]	Y[3]	Y[4]	N
40	**Transportation, communication and utilities**					
41	Railroad, rapid rail transit, and street railway transportation	Y	Y[2]	Y[3]	Y[4]	N
42	Motor vehicle transportation	Y	Y[2]	Y [3]	Y[4]	N
43	Aircraft transportation	Y	Y[2]	Y[3]	Y[4]	N
44	Marine craft transportation	Y	Y[2]	Y[3]	Y[4]	N
45	Highway and street right-of-way	Y	Y	Y	Y	N
46	Automobile parking	Y	Y	Y	Y	N
47	Communication	Y	25[5]	30[5]	N	N
48	Utilities	Y	Y[2]	Y[3]	Y[4]	N
49	Other transportation, communication and utilities	Y	25[5]	30[5]	N	N
50	**Trade**					
51	Wholesale trade	Y	Y[2]	Y[3]	Y[4]	N
52	Retail trade – building materials, hardware and farm equipment	Y	25	30	Y[4]	N
53	Retail trade – including shopping centers, discount clubs, home improvement stores, electronics superstores, etc.	Y	25	30	N	N
54	Retail trade – food	Y	25	30	N	N
55	Retail trade – automotive, marine craft, aircraft and accessories	Y	25	30	N	N
56	Retail trade – apparel and accessories	Y	25	30	N	N
57	Retail trade – furniture, home, furnishings and equipment	Y	25	30	N	N
58	Retail trade – eating and drinking establishments	Y	25	30	N	N
59	Other retail trade	Y	25	30	N	N

Table A-2. Recommended Land Use Compatibility for Noise Zones

LAND USE		SUGGESTED LAND USE COMPATIBILITY				
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
60	**Services**					
61	Finance, insurance and real estate services	Y	25	30	N	N
62	Personal services	Y	25	30	N	N
62.4	Cemeteries	Y	Y[2]	Y[3]	Y[4,11]	Y[6,11]
63	Business services	Y	25	30	N	N
63.7	Warehousing and storage	Y	Y[2]	Y[3]	Y[4]	N
64	Repair services	Y	Y[2]	Y[3]	Y[4]	N
65	Professional services	Y	25	30	N	N
65.1	Hospitals, other medical facilities	25	30	N	N	N
65.2	Nursing homes	N[1]	N[1]	N	N	N
66	Contract construction services	Y	25	30	N	N
67	Government services	Y[1]	25	30	N	N
68	Educational services	25	30	N	N	N
68.1	Child care services, child development centers, and nurseries	25	30	N	N	N
69	Miscellaneous Services	Y	25	30	N	N
69.1	Religious activities (including places of worship)	Y	25	30	N	N
70	**Cultural, entertainment and recreational**					
71	Cultural activities	25	30	N	N	N
71.2	Nature exhibits	Y[1]	N	N	N	N
72	Public assembly	Y	N	N	N	N
72.1	Auditoriums, concert halls	25	30	N	N	N
72.1	Outdoor music shells, amphitheaters	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y[7]	Y[7]	N	N	N
73	Amusements	Y	Y	N	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	25	30	N	N
75	Resorts and group camps	Y	25	N	N	N
76	Parks	Y	25	N	N	N
79	Other cultural, entertainment and recreation	Y	25	N	N	N
80	**Resource production and extraction**					
81	Agriculture (except live-stock)	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
81.5-81.7	Agriculture-Livestock farming	Y[8]	Y[9]	N	N	N

Table A-2. Recommended Land Use Compatibility for Noise Zones

LAND USE			SUGGESTED LAND USE COMPATIBILITY			
SLUCM NO.	LAND USE NAME	DNL or CNEL 65-69	DNL or CNEL 70-74	DNL or CNEL 75-79	DNL or CNEL 80-84	DNL or CNEL 85+
	including grazing and feedlots					
82	Agriculture related activities	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
83	Forestry activities	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
84	Fishing activities	Y	Y	Y	Y	Y
85	Mining activities	Y	Y	Y	Y	Y
89	Other resource production or extraction	Y	Y	Y	Y	Y

1. General

a. Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in 65- to 69-dB DNL areas (i.e., "DNL 65-69") and strongly discouraged in DNL 70-74. The absence of viable alternative development options should be determined and an evaluation should be conducted locally prior to local approvals indicating that a demonstrated community need for the residential use would not be met if development were prohibited in these zones. Existing residential development is considered as pre-existing, non-conforming land uses.

b. Where the community determines that these uses must be allowed, measures to achieve outdoor to indoor noise level reduction (NLR) of at least 25 decibels (dB) in DNL 65-69 and 30 dB in DNL 70-74 should be incorporated into building codes and be considered in individual approvals; for transient housing, an NLR of at least 35 dB should be incorporated in DNL 75-79.

c. Normal permanent construction can be expected to provide an 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, upgraded sound transmission class ratings in windows and doors, and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels or vibrations.

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

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. Buildings are not permitted.

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

8. Residential buildings require an NLR of 25.

9. Residential buildings require an NLR of 30.

10. Residential buildings are not permitted.

11. Land use that involves outdoor activities is not recommended, but if the community allows such activities, hearing protection devices should be worn when noise sources are present. Long-term exposure (multiple hours per day over many years) to high noise levels can cause hearing loss in some unprotected individuals.

Appendix B Key Terms

- **Day-Night Average Sound Level (DNL)** – DNL is a composite noise metric accounting for the sound energy of all noise events in a 24-hour period. In order to account for increased human sensitivity to noise at night, DNL includes a 10-dB penalty to events occurring during the acoustical nighttime period (10 PM through 7 AM). See Section 4.3 for additional information.
- **Decibel (dB) –** Decibel is the unit used to measure the intensity of a sound.
- **Flight Profiles –** Flight profiles consist of aircraft conditions (i.e., altitude, speed, power setting, etc.) defined at various locations along each assigned flight track.
- **Flight Track –** The flight track locations represent the various types of arrivals, departures, and closed patterns accomplished at air installations. The location for each track is representative for the specific track and may vary due to air traffic control, weather, and other reasons (e.g., one pilot may fly on one side of the depicted track, while another pilot may fly slightly to the other side of the track).
- **Operation –** An aircraft operation is defined as one takeoff or one landing. A complete closed pattern or circuit is counted as two operations because it has a takeoff component and a landing component. A sortie is a single military aircraft flight from the initial takeoff through the termination landing. The minimum number of aircraft operations for one sortie is two operations, one takeoff (departure) and one landing (approach).

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