Air Installations Compatible Use Zones Update
for
MCAS Yuma, Arizona

Final
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ES

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EXECUTIVE SUMMARY

The Marine Corps Air Station (MCAS) Yuma Air Installations Compatible Use Zones (AICUZ) Study update to the 1977 AICUZ has been prepared in accordance with federal regulations and United States (U.S.) Office of the Chief of Naval Operations Instruction [OPNAVINST] 11010.36C and Marine Corps Order [MCO] 11010.16 (USMC 2008).

ES.1 PURPOSE OF AN AICUZ STUDY

In accordance with MCO 11010.16, the Marine Corps implements the AICUZ Program to protect the health, safety, and welfare of those living and working in the vicinity of a military installation while sustaining the operational mission. The objectives of the AICUZ Program are to:

- Protect the health, safety, and welfare of civilians and military personnel by encouraging land use that is compatible with aircraft operations;
- Protect United States Marine Corps (USMC) installation investments by safeguarding the installations' operational capabilities;
- Reduce noise impacts caused by aircraft operations while meeting operational, training, and flight safety requirements, both on and in the vicinity of air installations; and
- Inform the public and seek cooperative efforts to minimize noise and aircraft accident impacts by promoting compatible development.

Under the AICUZ Program, the Marine Corps develops AICUZ studies that define high noise zones, clear zones (CZs), and accident potential zones (APZs) surrounding military airfields and recommends land uses that are compatible within these zones. Local governments are encouraged to incorporate AICUZ Program compatibility guidelines as an element of land use planning and development practices.

ES.2 MCAS YUMA

MCAS Yuma is located in the southwest part of Arizona, near California (to the west) and Mexico (to the south). See **Figure ES-1,** which shows the layout and labeling of the runways. Also included in this study is the Auxiliary Landing Field (ALF) located to the southeast, within the Barry M. Goldwater Range – West (BMGR-W). Within BMGR-W is another, older runway known as AUX-2. (Shown later in **Figure ES-6**).

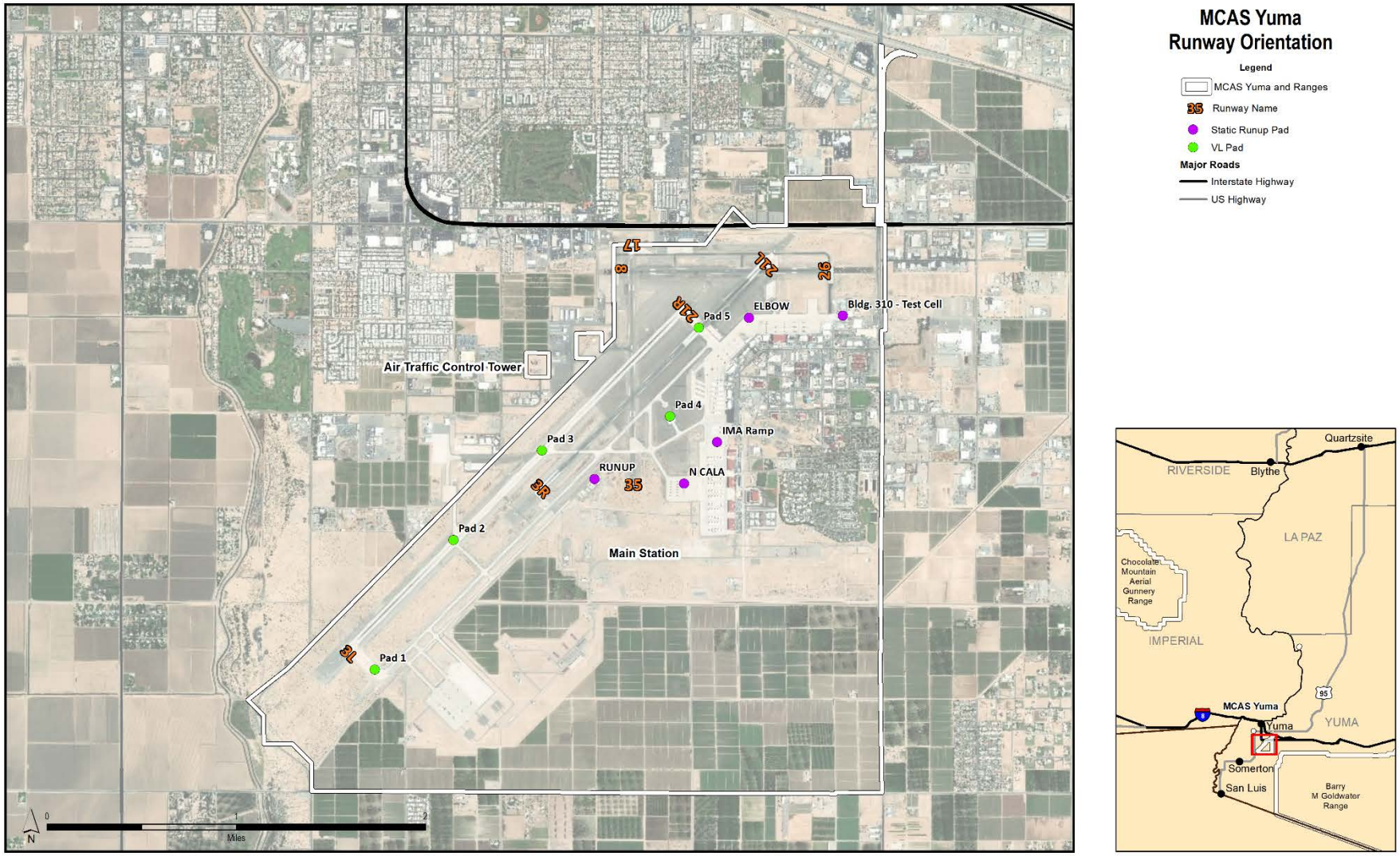


Figure ES-1. MCAS Yuma Runway Orientation

Nestled in five square miles southeast of the City of Yuma, the air station is home to a number of tenant units. These include Marine Aviation Weapons and Tactics Squadron 1 (MAWTS-1), Marine Operational Test and Evaluation Squadron 1 (VMX-1), Marine Aircraft Group 13 (MAG-13), Marine Air Control Squadron 1 (MACS-1), Marine Fighter Training Squadron 401 (VMFT-401), and Combat Logistics Company 16 (CLC-16). Ideal weather in this part of the Sonoran Desert allows for year round training opportunities. MCAS Yuma is the busiest air station in the Marine Corps.

ES.3 AIRCRAFT OPERATIONS

Aircraft operations for this AICUZ update are those projected for 2025, and include all known and projected changes to the MCAS Yuma operational environment. This includes complete transition from the AV-8B to the F-35B, and inclusion of a single notional squadron of F-35C stationed at MCAS Yuma, which would involve field carrier landing practice (FCLP) at MCAS Yuma. Transient operations from MCAS Miramar and other locations are also included. Previous actions, such as the standup of VMX-1 at Yuma are included.

The modeled airfield operations for MCAS Yuma are summarized in **Table ES-1**.

Table ES-1. AICUZ Scenario Annual Aircraft Operations

Aircraft Type	TOTAL		
	Day (0700-2159)	Night (2200-0659)	Total
BASED			
F-35B	30,686	280	30,966
F-35C	5,945	78	6,023
MV-22	1,428	34	1,462
CH-53E	1,125	12	1,137
AH-1W	562	146	708
F-5E	9,398	-	9,398
C-12	2,565	209	2,774
Based Subtotal	51,709	759	52,468
CIVIL			
DASH-8	5,852	362	6,214
CRJ-700	5,851	361	6,212
GASEPF	29,330	3,045	32,375
King Air	8,556	887	9,443
Citation	2,853	296	3,149
Civil Subtotal	52,442	4,951	57,393
TRANSIENT			
F-35B	5,005	445	5,450
F-35C	2,503	223	2,726
FA-18E/F	39	3	42
KC-130J	850	-	850
Helicopters (mixed)	9,132	1,079	10,211
Transient Subtotal	17,529	1,750	19,279
TOTALS	***121,680***	***7,460***	***129,140***

Note: Only included operations during published airfield hours.

The modeled airfield operations for AUX-2 are summarized in **Table ES-2**.

Table ES-2. AICUZ Scenario Annual Aircraft Operations at AUX-2

AIRCRAFT	TOTAL		
	Day (0700-2159)	Night (2200-0659)	Total
MCAS YUMA - BASED			
MV-22	358	24	382
CH-53E	750	34	784
AH-1W	414	216	630
Based Subtotal	1,522	274	1,796
TRANSIENT			
MV-22	1,898	250	2,148
CH-53E	100	40	140
AH-1/UH-1	434	54	488
KC-130J	252	-	252
Transient Subtotal	2,684	344	3,028
TOTALS	***4,206***	***618***	***4,824***

The modeled airfield operations for the ALF are summarized in **Table ES-3**.

Table ES-3. AICUZ Scenario Annual Aircraft Operations at ALF

AIRCRAFT	TOTAL		
	Day (0700-2159)	Night (2200-0659)	Total
MCAS YUMA - BASED			
F-35B	2,701	3	2,704
MCAS MIRAMAR - BASED			
F-35B	2,011	3	2,014
TOTALS	***4,712***	***6***	***4,718***

ES.4 AIRCRAFT NOISE

Aircraft noise is of concern to many in communities surrounding airports. The impact of aircraft noise is also a factor in the planning of future land use near air facilities. Because the noise from these operations can affect surrounding land uses, MCO 11010.16 defines certain noise zones and provides associated recommendations regarding compatible land use.

The modeled AICUZ scenario includes all changes made recently to the environment in and around MCAS Yuma, AZ. This includes the transition from AV-8B Harrier II and the F/A-18C/D Hornet to the F-35B Lightning II. The recent establishment of an Operational Test and Evaluation Center at MCAS Yuma also resulted in an increase in MV-22B operations.

Additional anticipated changes to future operations at MCAS Yuma include:

- The use of local facilities by transient F-35C,
- The probability of NOT building an additional runway at the ALF (Runway 25, or phase III of the ALF Military Construction [MILCON] plan),
- A re-organization of the types of takeoffs and landings at MCAS Yuma by the F-35B and F-35C, which was based on interviews with pilots flying those aircraft that are now present in Yuma, and
- While not yet decided, the basing of one F-35C squadron at MCAS Yuma is included here notionally to allow for possible future growth.

The AICUZ scenario incorporates the future proposed aircraft operations out to 2025. Noise contours were developed for both the air station and the auxiliary fields.

Since the late 1970s, the City and County of Yuma have recognized the results of a 1978 aircraft noise study (Van Houten 1978) to guide local land use planning and other activities in the vicinity of MCAS Yuma. Although airframes and operations have changed since 1978, the Joint Land Use Plan noise contours adopted by the City and County in 1996 have not changed from the Van Houten contours. The communities have declined to succumb the “accordion contour effect” caused by restudying noise data for operational changes over time. These Van Houten noise contours represent the level of operations the community is willing to protect in everyday planning and zoning decisions and into the future. Therefore, the Van Houten study contours provide a perspective on baseline conditions and understanding of impacts to land use when compared with the updated noise analysis. **Figure ES-2** provides the comparison between the updated 2019 noise contours and the Van Houten noise contours.

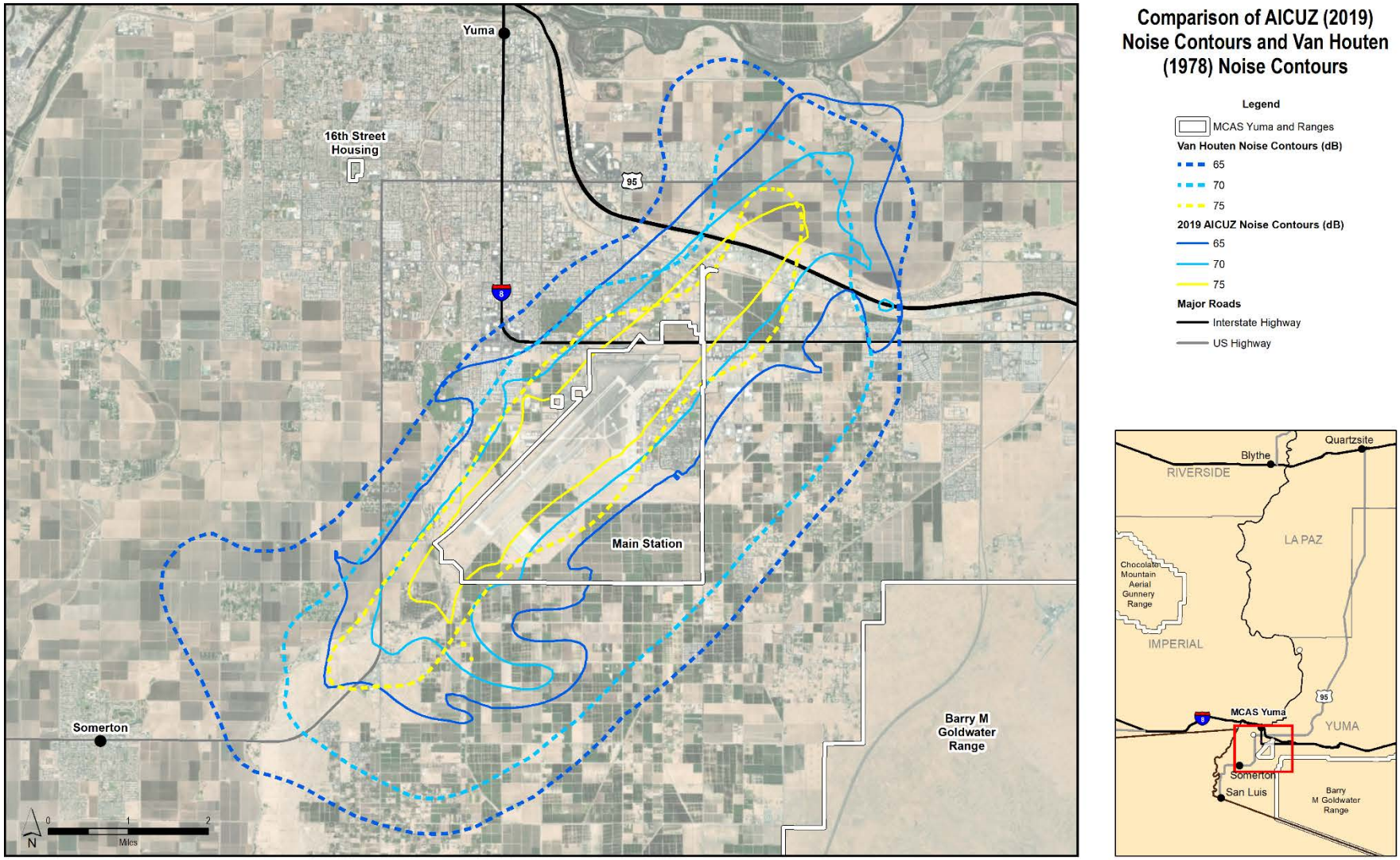


Figure ES-2. Comparison Between 2019 AICUZ Noise Contours and 1978 Van Houten Noise Contours

ES.5 AIRFIELD SAFETY

Based on analysis, there is justification for CZs and APZs at MCAS Yuma. As directed in MCO 11010.16, all runways will need CZs, and only those flight tracks that have over 5,000 annual military arrival or departure operations are required to have APZs (USMC 2008). For flight tracks that are concurrent over the length of the potential safety zones, these are summed together. **Table ES-4** shows the summary of average annual number of operations for each runway at MCAS Yuma (totaling operations for the applicable flight tracks).

Table ES-4. Summary of Total Average Annual Operations by Runway at MCAS Yuma

Runway	Military		Civilian		Total Operations
	Arrivals	Departures	Arrivals	Departures	
17	137	140	10,000	10,331	20,608
35	145	151	10,973	10,635	21,904
8	1,410	1,035	1,432	1,561	5,438
26	2,061	1,734	6,427	6,551	16,773
3L	4,224	4,042	-	-	8,266
21R	1,739	1,641	266	-	3,646
3R	18,421	18,855	-	-	37,276
21L	8,234	8,780	-	-	17,014

Source: 5 year average operations (Cardno 2016)

As shown in **Table ES-4**, only two runways have flight tracks that exceed the 5,000 annual military operation threshold for arrivals and departures, Runway 3R and 21L. Flight tracks on Runways 17/35 and 8/26 are also above the 5,000 annual operation threshold, however the operations for these runways are predominately by civilian aircraft and would not normally warrant military APZs. Tracks at the arrival and departure ends of 3L do not break the 5,000 military operation threshold, but are both fairly close (at over 4,000).

MCAS Yuma is a unique airfield with shared capabilities for military and civilian aircraft operations. Since the development of the airfield in 1928 with use for private aircraft, to 1943 when it became a Yuma Army Air Base, to reactivation in 1951 for the Air Force, and from 1959 to its current use as a MCAS, the airfield has gone through many transitions and upgrades. The community has grown around the MCAS since that time, as well. When a Department of Defense (DoD) Airfield facility is designed, the geometric layout, design and construction of runways, taxiways, aprons, and related permanent facilities to meet sustained operations are standardized in accordance with specific regulations. UFC-2-000-05N provides the current specifications for the standardized design of DoD airfields; however, it does not apply to facilities constructed under previous standards (Navy 2012).

MCO 11010.16 further defines the CZs as the area immediately beyond the usual runway threshold. It is the area with the greatest potential for occurrence of aircraft accidents. CZs should remain undeveloped. The order states the Marine Corps' first priority is for the acquisition in fee or by restrictive easements by the Government, to keep it clear of obstructions to flight. MCO 11010.16 also requires CZs for all active runway ends (USMC 2008). However, once safety clearances have been established for an aviation facility, there may be occasions where it is not feasible to meet the CZ and APZ standards per MCO 11010.16. In these cases a waiver must be obtained from the Naval Air Systems Command. The waiver and its relation to the site approval process are defined in Unified Facilities Criteria 3-260-01 (DoD 2008). Also, local

planning and zoning authorities may desire to implement different criteria than those included herein, to reflect specific local conditions. Chief of Naval Operations / Commandant of the Marine Corps approval is required prior to an installation's public support of any criteria other than that contained in this instruction (Navy 2001).

For purposes of this report, APZs are being shown on all runways to portray a conservative approach for the protection of all runways from incompatible development in the future. The air station has a NAVAIR airfield safety waiver in place that waives the requirement for a CZ for Runway 8/26 and Runway 17 since development already exists at the ends of these runways. This waiver only provides that the design standards are unable to be met but does not preclude the potential for an accident to occur at the site. MCAS Yuma is concerned with personnel safety within the CZs and APZs. The City of Yuma in an effort to protect the ends of Runways 8/26 has developed the Runway Approach Departure Safety Area (RADSA)/Airport Industrial Overlay District (AIOD).

Runway 3L/21R does not have enough annual military aircraft operations to require APZs, however, there are two reasons why the air station is incorporating the APZs. First, during periods when 3R/21L is unusable (maintenance, fouled deck), the traffic shifted to 3L/21R will be at a rate that could justify the use of APZs on that runway, especially if those conditions happened at a time of year with high operational tempo at MCAS Yuma. Second, if an aircraft with any type of mechanical difficulties were to recover at Yuma, it often would recover to 3L/21R since it is a significantly longer runway.

CZs and APZs for MCAS Yuma are shown in **Figure ES-3.** Safety zones were also developed for the AUX-2 and ALF airfield, and can be found in **Figure ES-6**. The safety zones for AUX-2 and the ALF fall well within the range boundaries; therefore, no compatible land use concerns are warranted.

ES.5.1 Comparison with Existing APZs

Figure ES-4 provides a comparison of recommended APZs with existing APZs.

ES.6 LAND USE COMPATIBILITY

The foundation of the AICUZ Program is an active local command effort to work with local, State, regional, other Federal agencies, and community leaders to encourage compatible development of land adjacent to a military airfield. By identifying land areas that may be incompatible with military operations or that will, in time, hinder the sustainability of such operations, the command personnel are able to communicate preferences and work with the appropriate planning entities to achieve encroachment mitigation to the maximum extent possible.

A land use analysis was completed using the AICUZ Composite footprint and land use recommendations detailed in MCO 11010.16. **Table ES-5** provides a synopsis of MCO 11010.16 land use recommendations.

ES.6.1 AICUZ Composite Footprint

Figure ES-5 provides the AICUZ footprint for MCAS Yuma; the combination of noise contours and safety zones. **Figure ES-6** provides the AICUZ footprint for the AUX-2 and ALF.

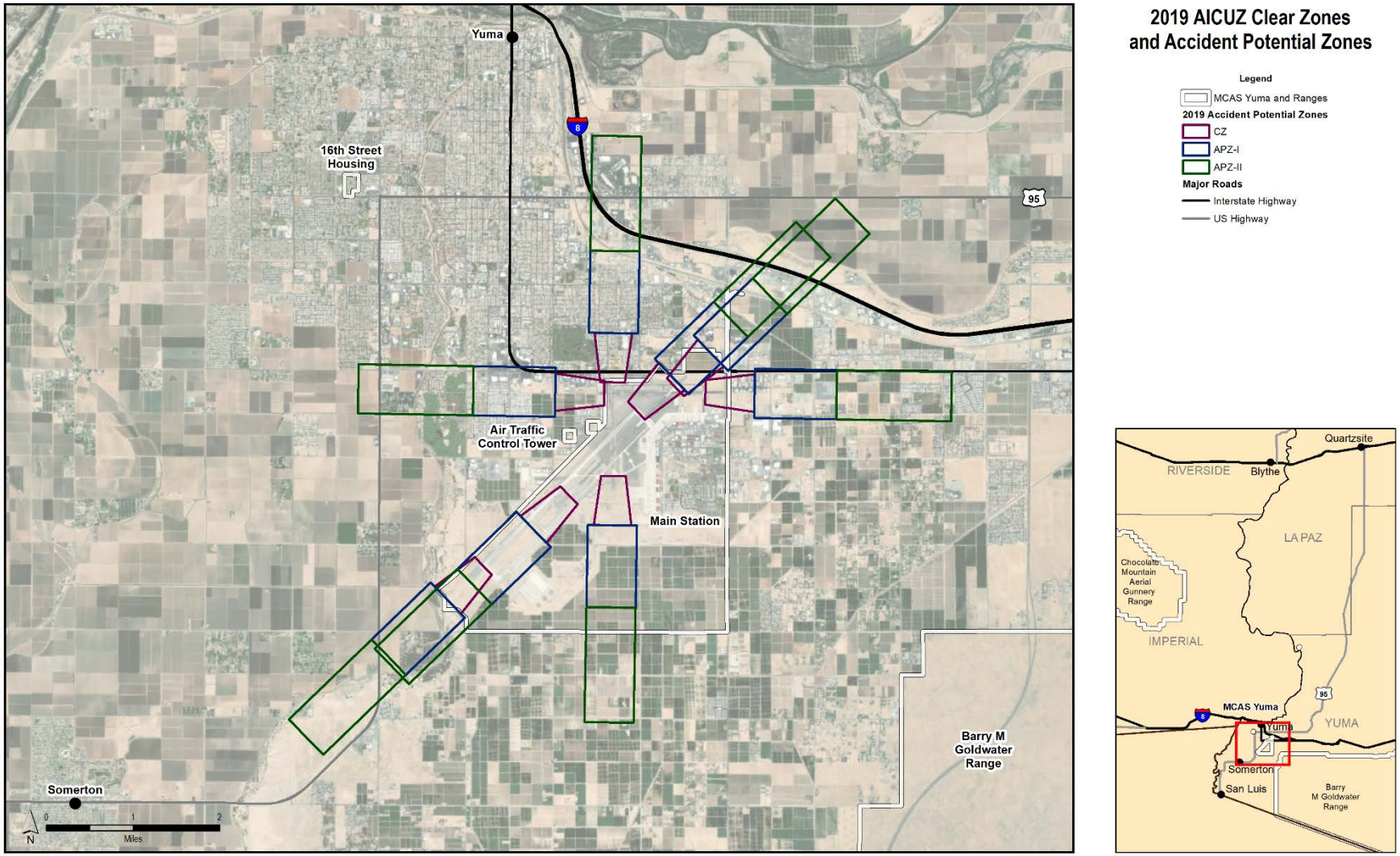


Figure ES-3. 2019 AICUZ Clear Zones and Accident Potential Zones

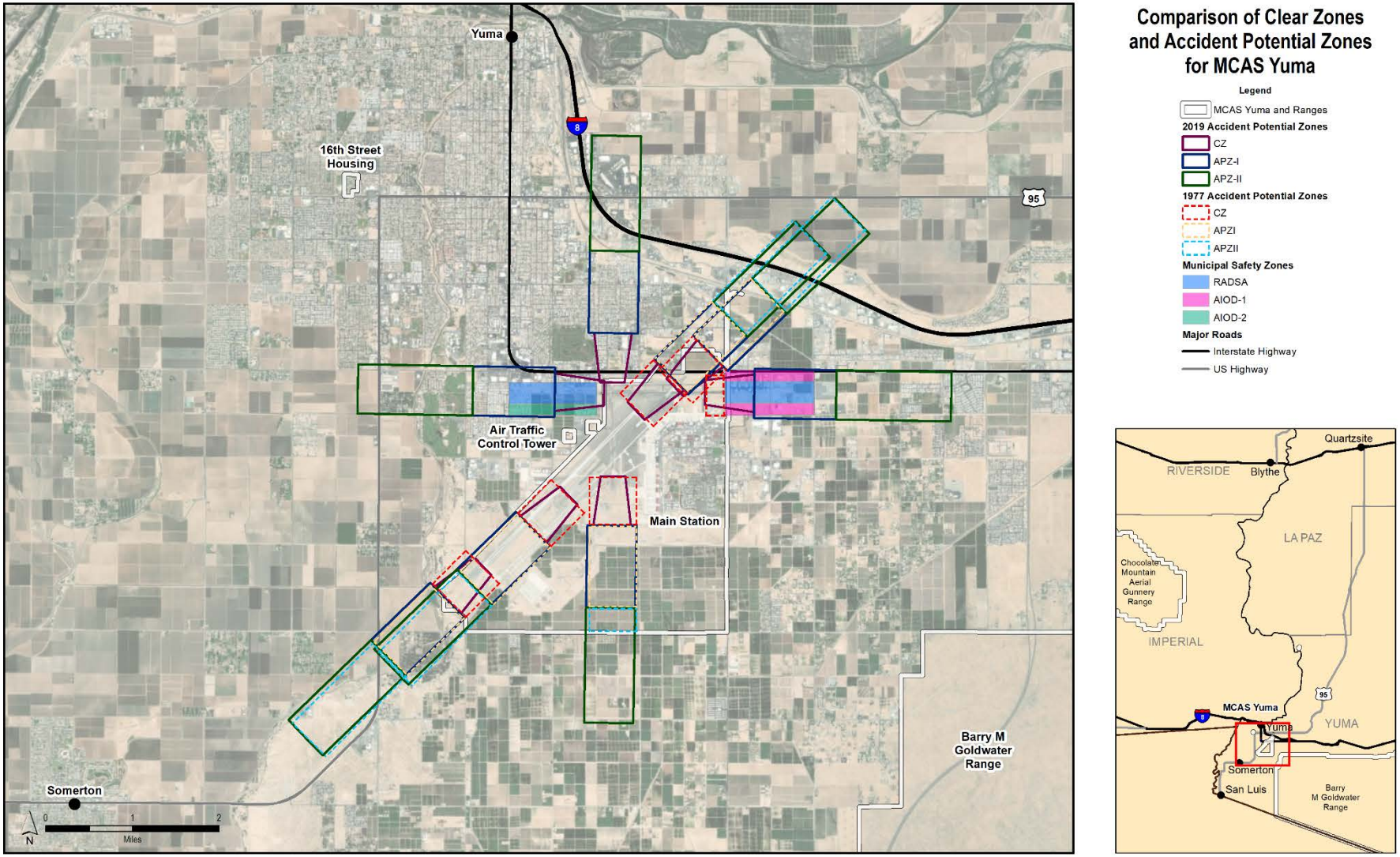


Figure ES-4. Comparison of Clear Zones and Accident Potential Zones for MCAS Yuma

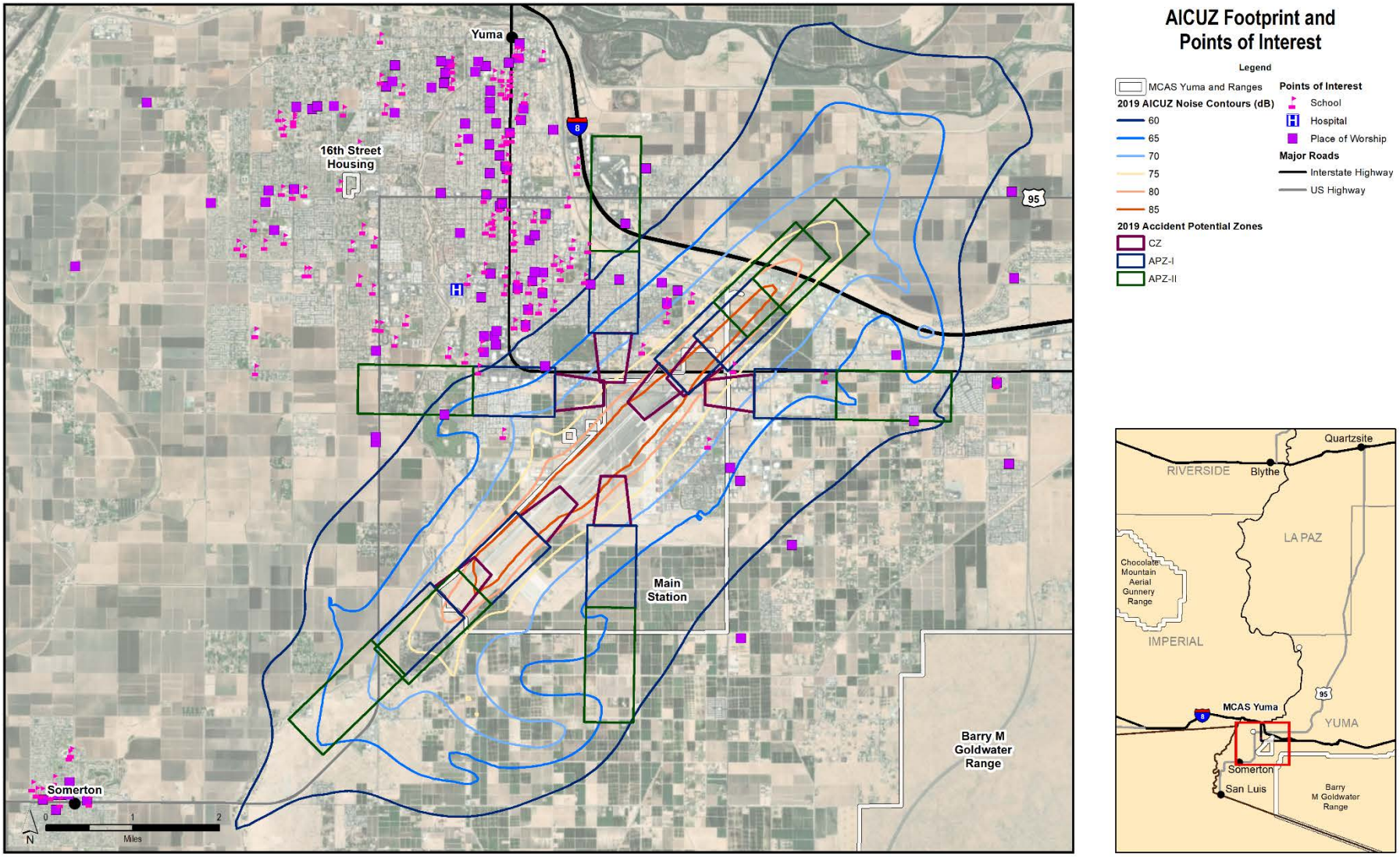


Figure ES-5. MCAS Yuma AICUZ Footprint

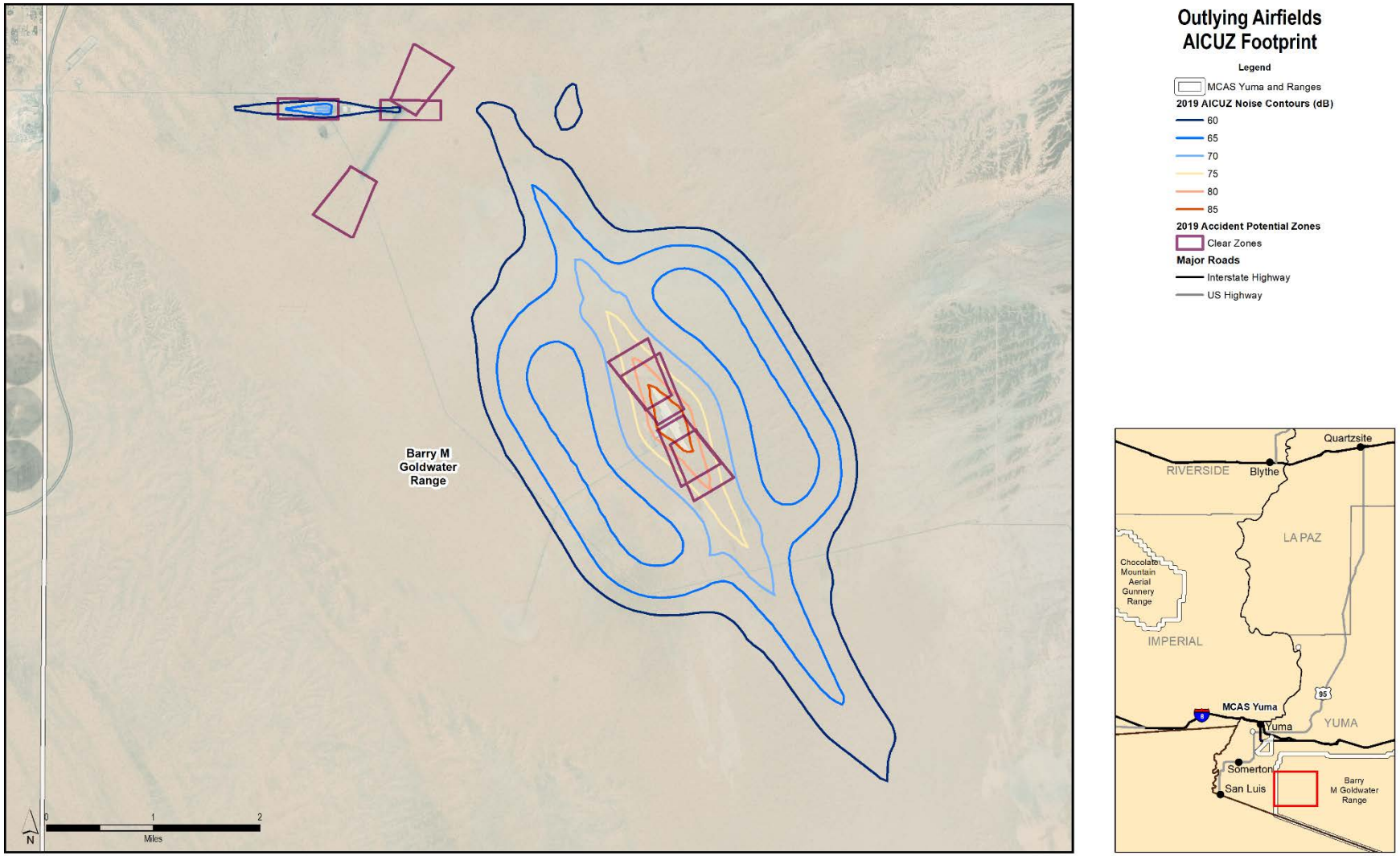


Figure ES-6. Outlying Airfields AICUZ Footprint

Table ES-5. Land Use Compatibility for Noise Zones and APZs										
	Land Use Compatibility Noise Zone (DNL)							Land Use Compatibility with APZs		
	Noise Zone 1		Noise Zone 2		Noise Zone 3					
Land Use	<55	55-65	65-70	70-75	75-80	>80	>85	CZ	APZ-I	APZ-II
Agriculture or Ag/Rural Preservation										
Agriculture/Industrial										
Business Park										
Commercial										
Industrial										
High Density Residential										
Low Density Residential										
Medium Density Residential										
Mixed Use Residential										
Public/Quasi-Public										
Open Space/Resort/Recreation										
Suburban Density Residential										

**Adapted from MCO 11010.16*

This use is compatible in these noise and safety zones.

Though this use is generally compatible in these noise zones, Noise Level Reduction (NLR) measures must be implemented in part or all of the structure to achieve a maximum interior noise level of 25-35 dB.

Though this use is generally compatible in these safety zones, land use restrictions including density, use and intensity limitations must be implemented to ensure safety.

This use is not compatible in these noise and safety zones.

ES.6.2 Land Use Compatibility Concerns

Figure ES-7 provides a summary map, based on analysis of noise and APZs, of those areas of incompatibility and conditional compatibility within the updated noise contours and APZs.

Because the safety zones for AUX-2 and the ALF fall well within the range boundaries and there are no plans for development, no compatible land use concerns are warranted. Per MCO 11010.16, if any on-base development is to be planned, it will be consistent with this AICUZ Study.

ES.7 RECOMMENDATIONS AND STRATEGIES

This section provides tools and recommendations that, when implemented, will continue to advance MCAS Yuma and community partners to achieve their shared goal, "to protect the health, safety, and welfare of those living near military airfields, while preserving the defense flying mission". Detailed recommendations, land use tools and alternative techniques are presented in Chapter 7. There are options to implement, retain and sustain land use compatibility where possible. There is also suggestions and proven techniques for managing existing and future development within and around the AICUZ footprint. Successfully implementing AICUZ land use compatibility is the collective responsibility of the Marine Corps, federal, state, and regional governments, citizens, business owners, and real estate professionals. Suggestions on ways for the various stakeholders to participate are also provided.

ES.7.1 RECOMMENDATIONS

ES.7.1.1 Continue community outreach and engagement

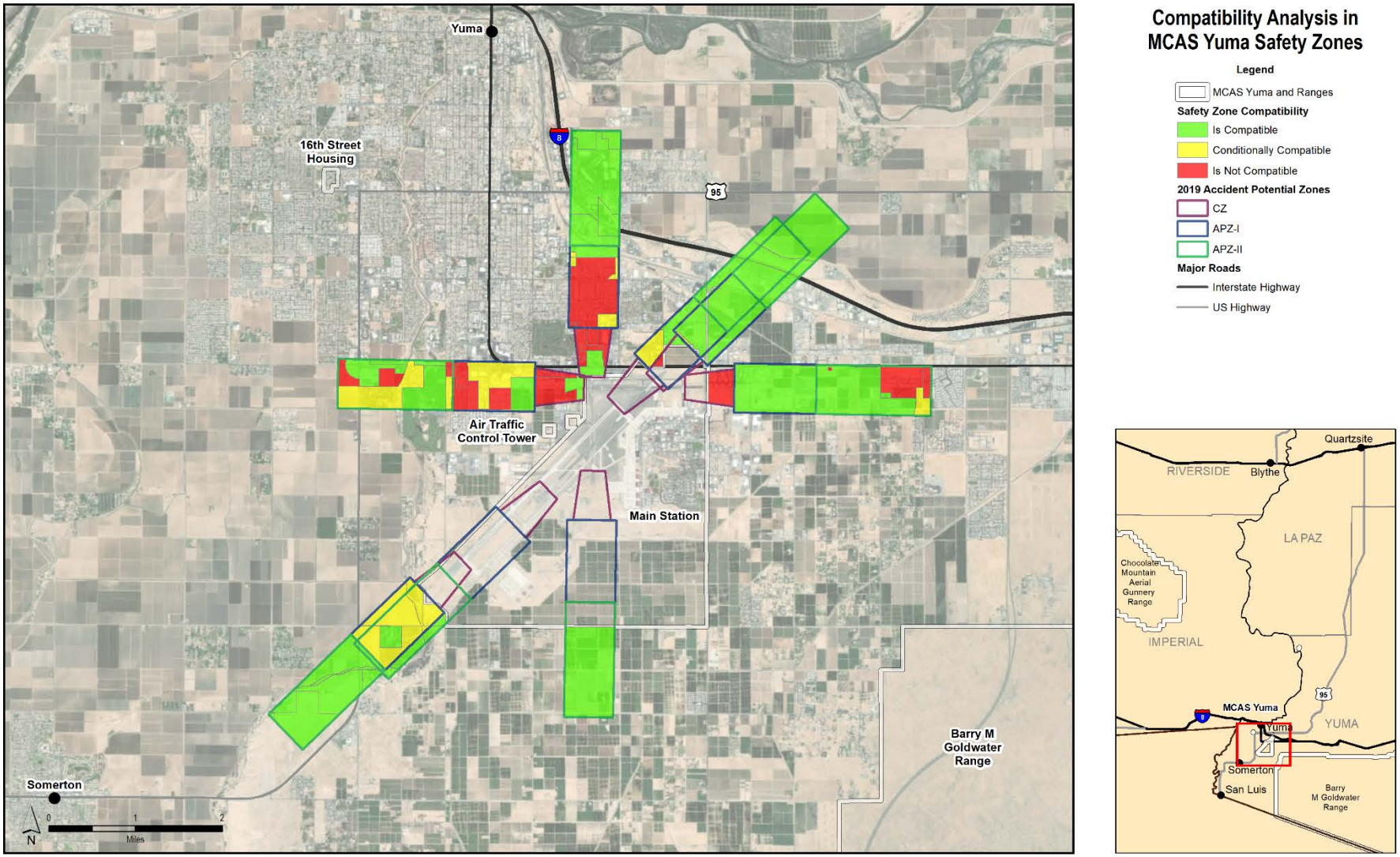
The MCAS Yuma Community Planning and Liaison Officer (CPLO) has long-standing experience conducting outreach and educating local and regional stakeholders and should continue these efforts going forward. Engagement with the community on compatible land use is crucial.

ES.7.1.2 Initiate easement and land acquisition where opportunities exist

Future efforts and programs should focus on lands within safety and high noise zones. The acquisition of fee title or restrictive easements on the impacted lands should support the efforts of the updated 2019 AICUZ by addressing problematic areas outlined in Chapter 6, Section 6.5.

MCAS Yuma completed an Encroachment Control Plan (ECP) in 2017 to provide a prioritized action plan for achieving that end state that would protect and maintain mission capabilities. A part of the ECP, the Real Estate Acquisition Strategy (REAS), is an internal document that identifies the extent and scope of land protection required to prevent, mitigate, or repair factors that degrade or have the potential to degrade the installation's mission capabilities. The most recent REAS for MCAS Yuma was also completed in 2017. Strategies presented in the REAS consider a holistic planning approach with a combination of various encroachment buffering tools. That effort was coordinated with this AICUZ update to ensure a seamless effort for any easement or land acquisition strategies.

As part of MCAS Yuma's overall strategy for minimizing incompatible land use, the installation should work with Yuma County and the City of Yuma in support of any work related to changes to zoning, ordinances, and any Federal Government actions toward land acquisition or conservation.



ES-7. Compatibility Analysis in MCAS Yuma Safety Zones

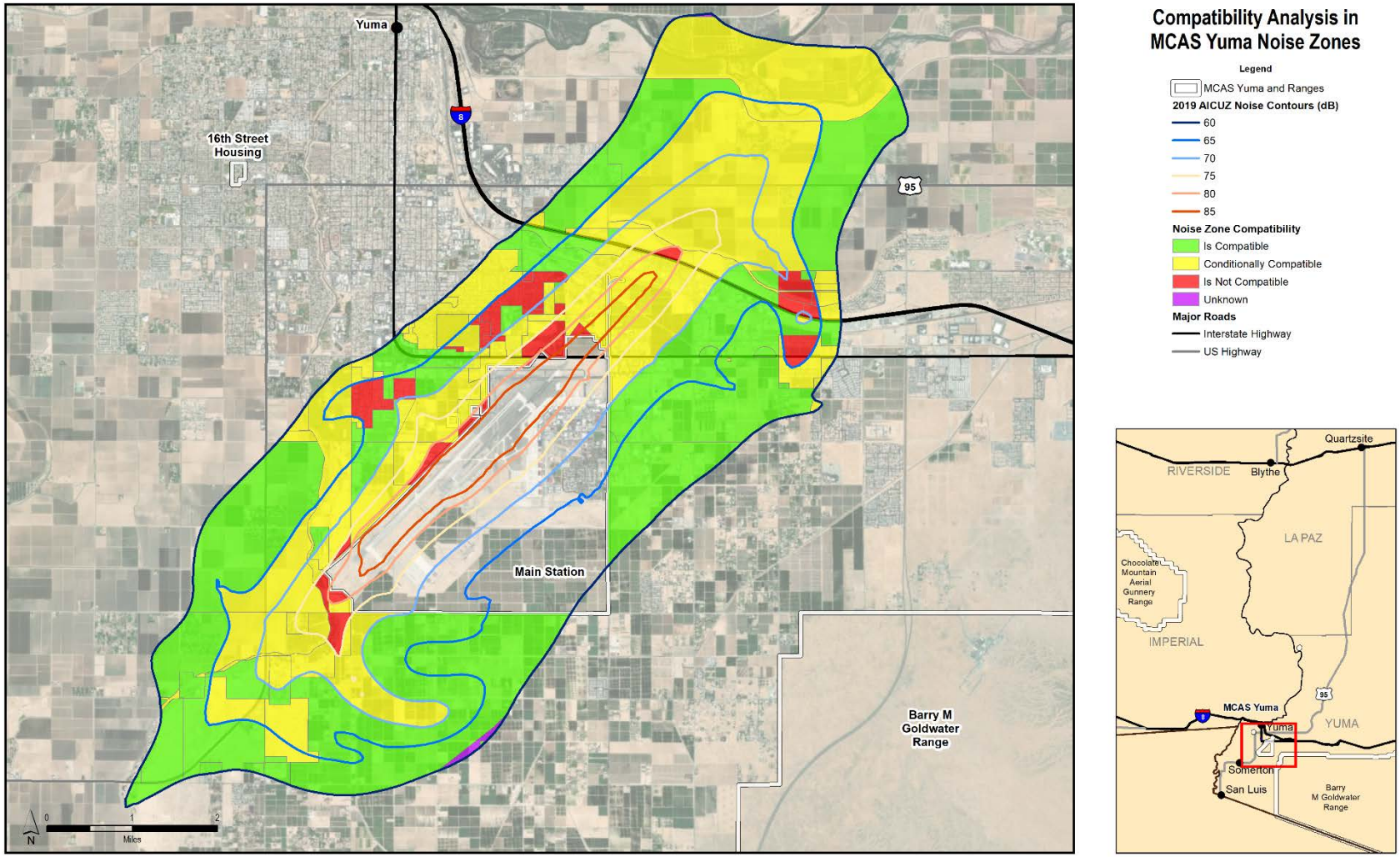


Figure ES-8. Compatibility Analysis in MCAS Yuma Noise Zones

ES.7.1.3 Continue to engage in local planning processes

The MCAS Yuma CPLO should continue to be active and engaged with comprehensive and other local planning efforts to have full discussion and, to the extent possible, ensure compatible land uses within the AICUZ footprint.

The CPLO should take full advantage of opportunities to attend planning meetings and similar venues so that the air station has every opportunity to provide input on promoting compatible land uses near the installation. Providing input does not guarantee that it is accepted or agreed to; however, the potential for any mutual collaboration is improved with participation than without.

ES.7.1.4 Actively participate in partnerships

Another aspect of the AICUZ process is to develop partnerships with the intention of working to mitigate or minimize encroachment impacts to mission. This can occur in tandem with certain real estate acquisition strategies such as encroachment partnering projects. These partnerships include local, state and regional efforts to cooperate and coordinate in managing urban growth, energy, water, transportation and other cross-jurisdictional and regional issues to ensure impacts to military mission are considered and mitigated to the maximum extent possible.

ES.7.1.5 Continue noise-inquiry-monitoring and response system

MCAS Yuma maintains a noise complaint hotline and keeps track of the location and other details of the complaints. The installation should continue to record all noise complaints and periodically review them to see whether there are locational trends in the complaints. Responding to complainants allows the installation to continue to inform the complainant about future expected noise events, and to gather information about the noise event, such as whether the installation was responsible for the noise impact and whether it was a one-time or recurring impact.

ES.7.2 STRATEGIES

ES.7.2.1 Marine Corps Air Station Yuma

MCAS Yuma is adopting the Van Houten noise contours and identifying DoN clear zones and accident potential zones for each runway. This AICUZ footprint and MCO 11010.16 will be utilized for evaluating land use compatibility in noise and safety zones.

ES.7.2.2 Local and State/Regional Government

MCAS Yuma recommends local municipalities retain the current Van Houten noise contours and adopt within their respective Comprehensive/General Plans and Zoning regulations the DoN CZs and APZs for all runways as identified in this AICUZ Study. Retaining the Van Houten noise contours will avoid the 'accordion effect' of modifying contours with future aircraft platforms and avoids the potential for future incompatible development within the noise contours, CZs and APZs. These recommendations, if adopted by local municipalities, would only affect future approvals on land use and/or modifications on existing development. The intent is to avoid compounding any current land use incompatibilities while recognizing that such incompatibilities currently exist.

ES.8 APPENDICES

The following appendix is provided as reference at the end of this AICUZ Study:

- **Appendix A:** Compatibility Guidance

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ACRONYMS AND ABBREVIATIONS

ACS	American Community Survey
AICUZ	Air Installations Compatible Use Zones
AIOD	Airport Overlay Industrial District
ALF	Auxiliary Landing Field
APZ	Accident Potential Zone
ATC	Air Traffic Control
AUX	Auxiliary
CIP	Capital Improvements Plan
CLC	Combat Logistics Company
CPLO	Community Planning and Liaison Officer
CZ	Clear Zone
dB	decibels
dBA	A-Weighted decibels
DEMA	Department of Emergency and Military Affairs
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DoN	Department of the Navy
ECP	Encroachment Control Plan
FAA	Federal Aviation Administration
HQ	Headquarters
KNFG	Camp Pendleton Airport
KNKX	Miramar MCAS Airport
KNYL	Yuma MCAS/Yuma International Airport
MACS	Marine Air Control Squadron
MAG	Marine Aircraft Group
MCAS	Marine Corps Air Station
MAWTS	Marine Aviation Weapons and Tactics Squadron One
MCGRTG	Marine Corps Crew Readiness Training Group
MCICOM	Marine Corps Installations Command
MCIWEST	Marine Corps Installations West
MCO	Marine Corps Order
MOU	Memorandum of Understanding
MTR	Military Training Route
NAVAIR	Naval Air Systems Command
OPNAVINST	Chief of Naval Operations Instruction
RADSA	Runway Approach Departure Safety Area
REAS	Real Estate Acquisition Strategy
STOVL	short take-off and vertical landing
USMC	United States Marine Corps
VMFA	Marine Fighter Attack Squadron
VMA	Marine Attack Squadron
VMU	Marine Unmanned Aerial Vehicle Squadron
VMX	Marine Operational Test and Evaluation Squadron
WTI	Weapons and Tactics Instructor
YPG	Yuma Proving Ground

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1

1.1 AICUZ Program

1.2 Purpose, Scope and Authority

1.3 Responsibility for Compatible Land Use

1.4 Previous AICUZ Efforts and Related Studies

1.5 Changes that Require an AICUZ Update

CHAPTER 1 INTRODUCTION

1.1 AICUZ PROGRAM

The United States (U.S.) Department of Defense (DoD) initiated the Air Installations Compatible Use Zones (AICUZ) Program in 1973 to assist local governments and communities in identifying and planning for compatible land use and development in the vicinity of military air installations. The goal of this program is to protect the health, safety, and welfare of the public while also protecting military operational capabilities. This goal is accomplished by working to achieve compatible land use around the air installation.

The Navy/Marine Corps AICUZ Program recommends that noise exposure contours, clear zones (CZ), accident potential zones (APZs), height and obstruction requirements, and associated land use recommendations be incorporated into local community planning to the best extent possible in order to minimize the impacts to the mission and residents in the surrounding community. Mutual cooperation between the military installation and its neighbors is a key component of the AICUZ Program. As the communities surrounding an airfield grow and develop, the United States Marine Corps (USMC) has the responsibility to communicate and collaborate with local governments on land use planning, zoning, and associated mission impacts.

1.2 PURPOSE, SCOPE, AND AUTHORITY

This AICUZ Study is prepared in accordance with Marine Corps Order (MCO) 11010.16 (USMC 2008). The AICUZ Program was developed to promote compatible land use near military airfields. The objectives of the AICUZ Program are to:

- Protect the health, safety, and welfare of civilians and military personnel by encouraging land use that is compatible with aircraft operations;
- Protect USMC installation investments by safeguarding the installations' operational capabilities;
- Reduce noise impacts caused by aircraft operations while meeting operational, training, and flight safety requirements, both on and in the vicinity of air installations; and
- Inform the public and seek cooperative efforts to minimize noise and aircraft accident impacts by promoting compatible development.

Under the AICUZ Program, the Department of the Navy (DoN) identifies noise zones as a land use planning tool for local planning agencies. The DoN also identifies APZs as a planning tool for local community planning agencies.

APZs are areas where an aircraft mishap is most likely to occur, if it were to occur. Based on DoN nationwide historical records of accidents, aircraft mishaps are more likely to occur in close proximity to the airfield.

The Federal Aviation Administration (FAA) and DoN also encourage local communities to restrict development or land uses that could endanger aircraft in the vicinity of the airfield, including the following as appropriate:

- Lighting (direct or reflected) that would impair pilot vision;
- Towers, tall structures, and vegetation that could penetrate navigable airspace or are planned for construction near the airfield;
- Uses that would generate smoke, steam, or dust;
- Uses that would attract birds, especially waterfowl; and
- Electromagnetic interference with aircraft communications, navigation, or other electrical systems.

MCO 11010.16 refers in many places to a base or facility as an "installation". In this case, the installation in question is MCAS Yuma. This document will use "installation" and "air station" interchangeably.

1.3 RESPONSIBILITY FOR COMPATIBLE LAND USE

Many actors share the responsibility for maintaining land use compatibility around MCAS Yuma. The installation is responsible for conducting studies of noise and safety impacts associated with its operations and communicating those findings to local and state governments, as well as informing local governments when land use changes will affect military operations. Local, state and tribal governments use zoning and comprehensive planning to prevent incompatible uses and protect public health and welfare. Developers and real estate professionals should educate themselves about development restrictions, and understand how the use of appropriate design materials and other strategies can mitigate noise and safety impacts. It is good business practice to inform buyers about AICUZ-related impacts. Individual citizens can seek information about AICUZ effects before participating in property transfers.

The City and County of Yuma use the 1978 aircraft noise study (Van Houten 1978) to guide local land use planning and other activities in the vicinity of MCAS Yuma. The communities have declined to adopt the "accordion contour effect" caused by restudying noise data for operational changes over time. These Van Houten noise contours represent the level of operations the community has been willing to protect in everyday planning and zoning decisions. *Therefore, the Van Houten study will be used in this study to provide a perspective on baseline conditions and to understand and analyze changes in impacts to land uses.* The Van Houten study in 1978 was used to update the base's original AICUZ assessment. The Van Houten study focused on aircraft operations at the main airfield. The City and County adopted the Van Houten noise contours into their general plans and use these contours today in their land use planning and zoning decisions. While the Van Houten study provides for land use guidance, baseline noise must reflect existing conditions at the airfield.

1.4 CHANGES THAT REQUIRE AN AICUZ UPDATE

1.4.1 Change in Operations Levels, Aircraft Mix, Flight Tracks and Procedures

The primary change occurring at MCAS Yuma driving an update to the AICUZ is the introduction of the F-35. The first operational F-35 Squadron arrived at MCAS Yuma in November 2012. Updated noise contours and associated changes in the AICUZ footprint reflect this new basing for the air station.

1.4.2 Changing Population

The changing character of the region around MCAS Yuma greatly influences the effectiveness and functionality of the installation, especially as it relates to mission-compatible land uses. The population of the Yuma region has increased exponentially since the last AICUZ. From 1990 to 2000, the Yuma Metropolitan Statistical Area (MSA) grew by 49.7 percent and was the third fastest growing metropolitan region in the country (U.S. Census Bureau 2001). As shown in **Table 1-1**, much of this growth has occurred in Yuma County, outside the City of Yuma. Growth slowed from 2000 to 2010, constituting a 22.2 percent increase in the MSA. Though growth during this decade was more balanced between the city and the county, the county claimed a greater percentage of the growth.

Table 1-1. Population Change, 1990-2010

	1990 Pop	2000 Pop	Change	2010 Pop	Change
Yuma County (MSA), AZ	106,895	160,026	49.7%	195,751	22.2%
City of Yuma, AZ	62,141	77,515	24.7%	93,064	20.1%
Rest of Yuma County, AZ	44,754	82,511	84.4%	102,687	24.5%
State of Arizona	*3,665,228*	*5,130,632*	*40.0%*	*6,392,017*	*24.6%*

Source: U.S. Census Bureau 1995a, 1995b, 2016, and Fact Finder

The population of Yuma County is projected to continue growing at a similar rate until 2050. The City of Yuma expects to experience a larger share of that growth, around 60 percent compared to the rest of the county's 39 percent growth rate, as shown in **Table 1-2**.

Table 1-2. Population Change, 2020-2050

	2020	2030	2040	2050	Change
Yuma County (MSA), AZ	232,772	269,702	307,708	345,661	48.5%
City of Yuma, AZ	105,490	123,379	144,302	168,773	60.0%
Rest of Yuma County, AZ	127,282	146,323	163,406	176,888	39.0%
State of Arizona	*7,346,787*	*8,535,913*	*9,706,815*	*10,820,872*	*47.3%*

Source: Arizona Department of Administration 2015, California Department of Finance 2014

1.4.3 Updated Land Use within the Noise Zones and APZs

The growing population in the Yuma region resulted in additional residential, industrial, and commercial growth around the air station, requiring additional efforts to encourage compatible land uses. The City of Yuma, Yuma County, City of Somerton, Town of Wellton, City of San Luis, and MCAS Yuma have worked together to prevent incompatible land uses as much as possible, but a few areas of incompatible land use remain.

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2

2.1 Location and History
2.2 Mission
2.3 Installation Activities
2.4 Outlying Fields
2.5 Economic Impacts

CHAPTER 2 INSTALLATION AND ASSOCIATED OUTLYING AIRFIELDS

2.1 LOCATIONS AND HISTORY

MCAS Yuma is located in the southwest part of Arizona, near California (to the west) and Mexico (to the south). Also included in this study are the new Auxiliary Landing Field (ALF) located to the southeast, within the Barry M. Goldwater Range – West (BMGR-W), and another, older runway known as AUX-2. See **Figure 3-1** for a general orientation.

Nestled in five square miles just southeast of the City of Yuma, the air station is home to a number of tenant units including Marine Aviation Weapons and Tactics Squadron 1 (MAWTS-1), Marine Operational Test and Evaluation Squadron 1 (VMX-1), Marine Aircraft Group 13 (MAG-13), Marine Air Control Squadron 1 (MACS-1), Marine Fighter Training Squadron 401 (VMFT-401), and Combat Logistics Company 16 (CLC-16). Ideal weather in this part of the Sonoran Desert allows for year round training opportunities.

In 1928, Col. Benjamin Fly persuaded the Federal Government to lease 640 acres of cactus, brush and desert wildlife from Yuma County. For the low price of $1 per year, the government leased Fly Field for 20 years with an option for an additional 20 years.

The air base was erected when the United States entered World War II. By early 1943, Yuma Army Air Base began graduating classes of pilots. The base became one of the busiest flying schools in the nation, training pilots of AT-6 single-engine trainers, T-17 multiengine trainers and B-17s.

At the end of the war, all flight activity here ceased and the area was partially reclaimed by the desert. During the period of inactivity, it was controlled successively by the War Assets Administration and the Department of the Interior's Bureau of Reclamation, which used it as a headquarters for its irrigation projects.

On July 7, 1951, the Air Force reactivated the base and the 4750th Air Base Squadron resumed training as part of the Western Air Defense Forces. The airfield was renamed Vincent Air Force Base in 1956 in memory of Brig. Gen. Clinton D. Vincent, a pioneer of bombing techniques who died in 1955.

The DoN signed for control of the base on January 1, 1959, and nine days later, Col. L.K. Davis became the first commanding officer of the newly designated Marine Corps Auxiliary Air Station. On July 20, 1962, the designation was changed to Marine Corps Air Station (MCAS).

From 1969 until 1987, the air station served primarily as a training base for pilots assigned to Marine Corps Crew Readiness Training Group 10 (MCGRTG-10), flying the F-4 Phantom, A-4 Skyhawk and AV-8A Harrier. In 1978, Marine Aviation Weapons and Tactics Squadron 1 was commissioned to assist in increasing combat readiness of fleet aviation units.

In 1987, Marine Aircraft Group 13, with Marine Attack Squadrons 211, 214, 311 and 513, replaced MCCRTG-10 as the major tenant command on the station. The move also brought Marine Wing Support Squadron 371 to Yuma, joining Marine Air Control Squadron 7 and 2nd Light Anti-Aircraft Missile Battalion.

Throughout the fall of 1990, virtually every Marine Corps fixed-wing squadron that participated in Operations Desert Shield and Desert Storm underwent pre-deployment training on MCAS Yuma's ranges.

In November 2012, Marine Fighter Attack Squadron 121 (VMFA-121) became the world's first operational F-35 Squadron at MCAS Yuma. In the summer of 2015 Marine Operational Test and Evaluation Squadron 22 (VMX-22) arrived at MCAS Yuma for integrated operational testing and was later re-designated to VMX-1. VMX-1 is primarily responsible for conducting operational tests in support of newly developed aircraft and programs.

Marine Unmanned Aerial Vehicle Squadron 1 (VMU-1) found a new home at MCAS Yuma in January 2016 and Marine Attack Squadron 211 (VMA-211) has begun their transition from the AV-8B Harrier to the F-35.

2.2 MISSION

The mission of MCAS Yuma is to provide aviation ranges, support facilities and services that enable the tenants, other Marine Corps commands, visiting military and interagency forces to enhance their mission capability and combat readiness.

MCAS Yuma is the Marine Corps' premier aviation training base. With access to 10,000 square miles of special use airspace and superb flying weather, MCAS Yuma supports 80 percent of the Corps' air-to-ground aviation training. Each year, the air station hosts numerous units and aircraft from U.S. and NATO forces.

2.3 INSTALLATION ACTIVITIES

2.3.1 Aircraft Types

Predominant aircraft types used in modeling the noise at MCAS Yuma were:

- F-35B/C
- MV-22B
- F-5N
- KC-130J
- CH-53E

- AH-1Z / UH-1Y

Other civilian and transient aircraft were also captured and further detail can be found in Chapter 3.

2.3.2 Base Loading

This AICUZ update is based on projected loading in 2025, which will be after MAG-13 has completed transition from the AV-8B Harrier II to the F-35B/C "Lightning". Other resident aircraft will include those assigned to VMX-1. The Noise Study also included transient aircraft from throughout the USMC and other services which participate in the semiannual Weapons and Tactics Instructor (WTI) Course. Other civilian and transient aircraft were also captured and further detail can be found in Chapter 3. The full 2019 AICUZ scenario includes one notional resident F-35C squadron, per the 2018 Marine Aviation Plan (USMC 2018). The ability for that squadron to conduct FCLP training at MCAS Yuma is included in the 2019 AICUZ footprint.

2.4 OUTLYING AIRFIELDS

While no aircraft are based at either outlying field ("AUX-2" and the new ALF), both were included in the noise and APZ analyses for flight activity in the MCAS Yuma area. The ALF was built specifically for the introduction of the F-35, and AUX-2 has been retained for other uses. Currently, the ALF is used for fixed-wing short take-off and vertical landing (STOVL) jet activity, while AUX-2 is used for helicopter, tiltrotor, and turboprop training.

2.5 ECONOMIC IMPACTS

MCAS Yuma provides constant contributions to the local and regional economy throughout the year and is not influenced by seasonal fluctuations like private industries. In 2017, MCAS Yuma contributed about $635 million to the local and state economies (MCAS Yuma 2017), up from nearly $336.5 million in 2007 (USMC 2008). These contributions take place in the forms of military construction, contract services, civilian employment, and local spending by military employees and base visitors.

MCAS Yuma is the seventh largest employer in Yuma County, employing 4,460 active duty military and 2,226 civilian employees, and contributing almost $490 million in salaries annually. Agriculture, defense, and tourism are the top three earning industries in the county (MCAS Yuma 2017).

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3

3.1 Airfield Description

3.2 Auxiliary Fields

3.3 Airspace Description

3.4 Aircraft Flight Operations

CHAPTER 3 AIRCRAFT OPERATIONS

3.1 AIRFIELD DESCRIPTION

MCAS Yuma has four, bi-directional runways. The long runways (3L/R and 21L/R) mainly serve military jet traffic. The shorter runways (17/35 and 8/26) mainly serve civilian traffic and military rotorcraft. The airfield is shared-use and all of the runways can be used for various aircraft.

In addition to the runways, there are five Vertical Take-off & Landing (VTOL) pads, called "Pad 1" through "Pad 5", used for vertical landings (VL) by AV-8B and F-35B aircraft. **Figure 3-1** depicts MCAS Yuma's main airfield, its runways, and the VTOL pads. Also marked on **Figure 3-1** are the locations of static pads, used for modeling the noise contribution of the aircraft engine maintenance run-ups.

Yuma International Airport is a commercial service airport at a shared-use airfield with MCAS Yuma, which makes MCAS Yuma the only shared-use air station in the Marine Corps. Yuma International Airport is owned by the County of Yuma, and operated by the Yuma County Airport Authority, Inc. (YCAA). A 1956 patent grants to the Yuma County an easement for public airport purposes the right to use for the landing, takeoff, and parking of civil aircraft, in common with aircraft owned by the Government, the runways and taxiways. Additionally, through an agreement between the Marine Corps and Yuma County, MCAS Yuma provides air traffic control, crash crew services, security, and maintenance of the runways and taxiways, as outlined in the patent, for both MCAS Yuma and Yuma International Airport.

3.2 OUTLYING AIRFIELDS

The auxiliary airfield "AUX-2" is located to the east of the MCAS Yuma, within the BMGR-W. Its runway is oriented 9/27, and includes a simulated Landing Helicopter Assault (LHA) deck that has traditionally been used for AV-8B field carrier landing practice (FCLP) training. In the future, it will be maintained for helicopter, tiltrotor, and KC-130 operations.

A new ALF was recently constructed for the F-35B about 11 miles from MCAS Yuma, just southeast of AUX-2. It has two Landing Helicopter Dock (LHD) decks, one each oriented in the 15 and 33 directions. It will be used by F-35B from MCAS Yuma, as well as transient F-35B, primarily from MCAS Miramar, in the future.

Figure 3-2 shows the two airfields located within the BMGR-W and their runways. The location of the modeled vertical landing touchdown points are also depicted.

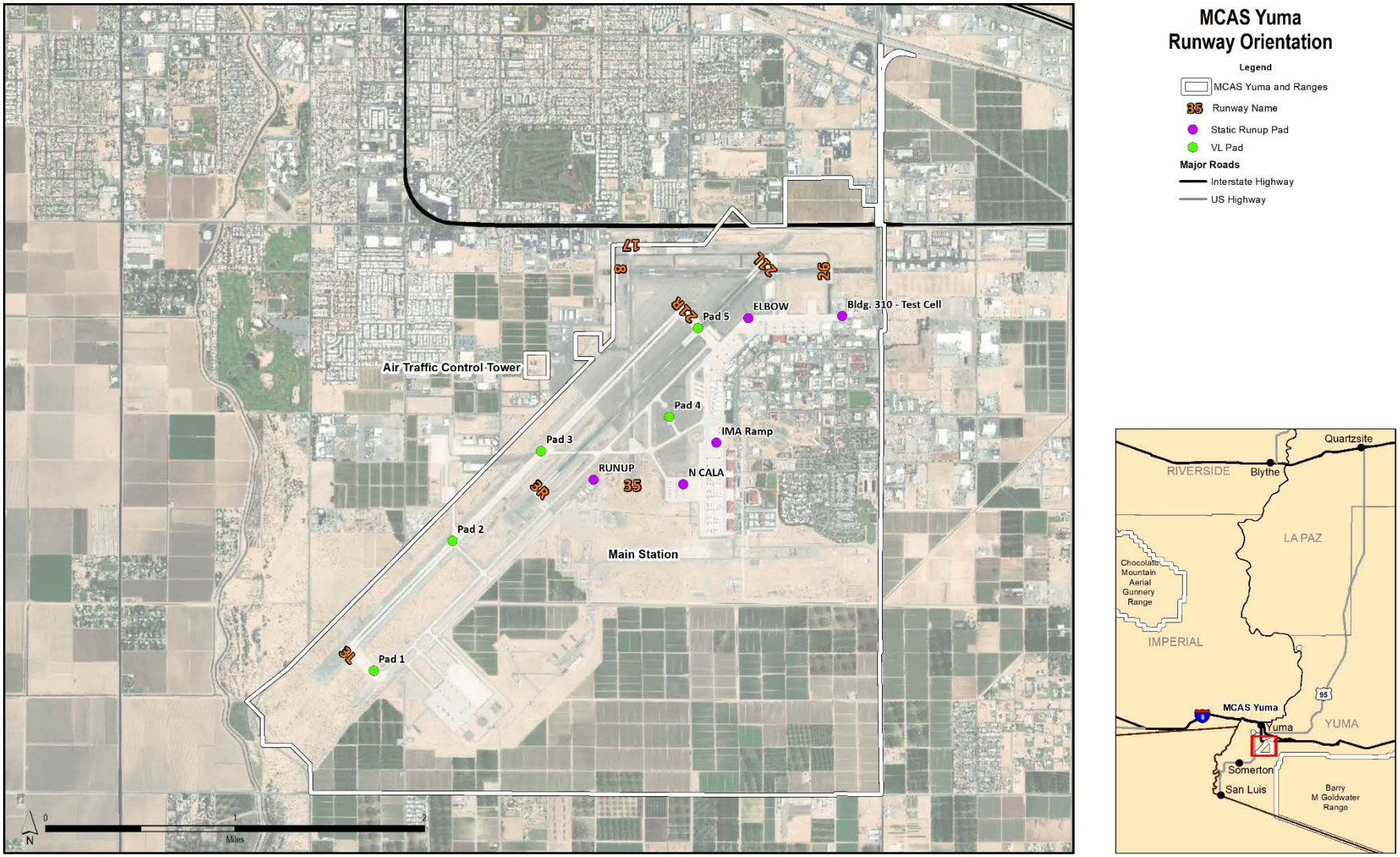

Figure 3-1. MCAS Yuma Runway Orientation

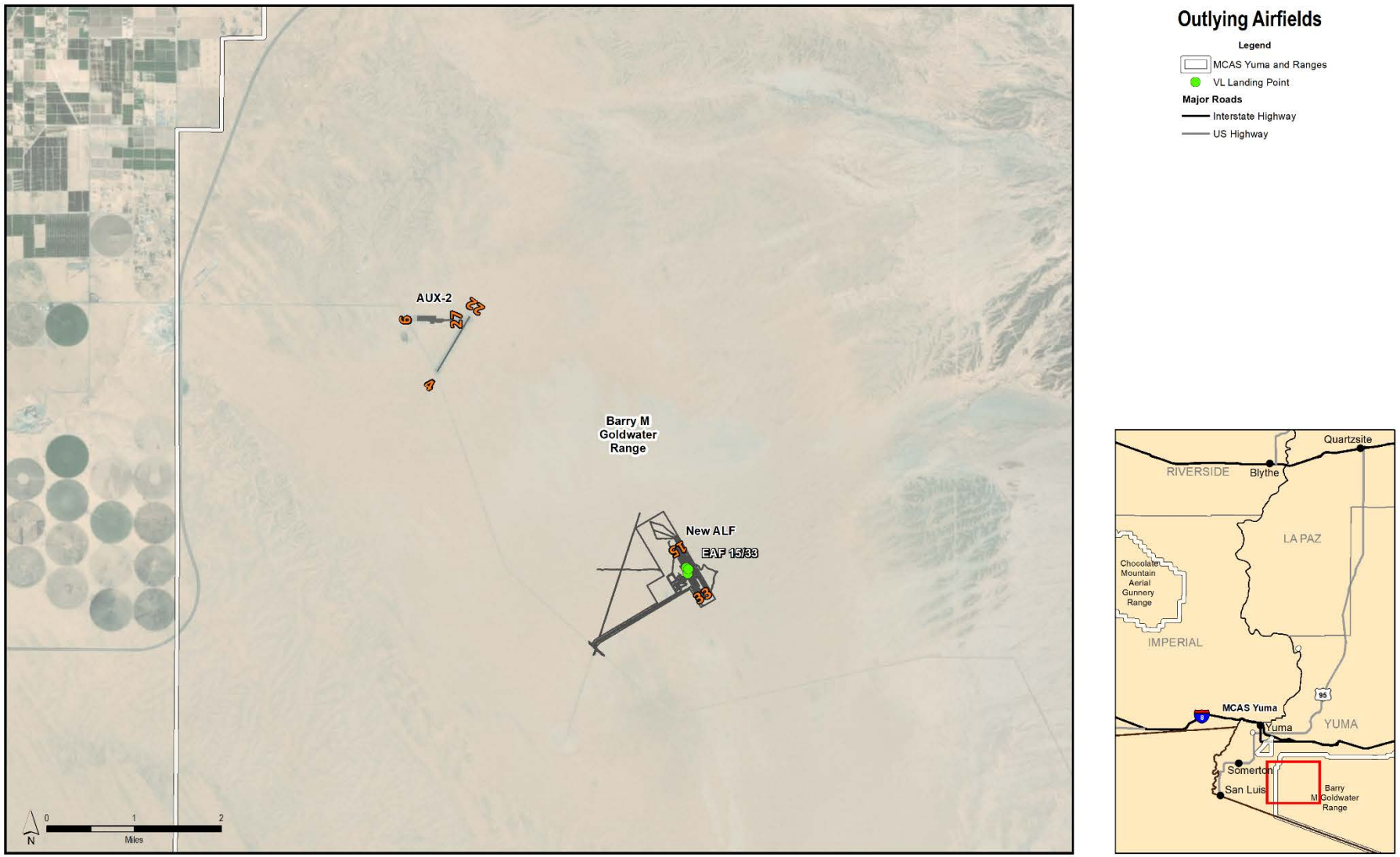

Figure 3-2. Outlying Airfields

3.3 AIRSPACE DESCRIPTION

As shown in **Figure 3-3**, the core airspace for MCAS Yuma aircraft operations and training include:

- Bob Stump Training Range Complex
  - Chocolate Mountain Aerial Gunnery Range (R-2507N/S/E/W) and associated Military Operations Areas (MOA), California
  - Barry M. Goldwater Range – West (R-2301W), Arizona
  - Yuma Proving Ground (R-2306A/B/C and R-2308A/B), Arizona
  - El Centro Range Complex (R-2512), California
  - Imperial Air Traffic Control Assigned Airspace (ATCAA) in Yuma County, Arizona and Imperial and Riverside counties in California
  - Dome MOA/ATCAA in Yuma County, Arizona
- Barry M. Goldwater Range – East (R-2301E) in Arizona managed by the United States Air Force and adjacent to R-2301W

3.4 AIRCRAFT FLIGHT OPERATIONS

Table 3-1 details the modeled annual flight operations at MCAS Yuma. **Table 3-2** details the modeled annual flight operations for the ALF. **Table 3-3** details the modeled annual flight operations for the AUX-2 airfield. Note that the "interfacility" tracks and profiles contribute to the contours at both airfields, and are only included in the model once – the results of all the modeling were added together to give an overall grid covering MCAS, ALF, and AUX-2. Contours were built from the combination of all those results.

3.4.1 ALF and AUX-2 Operations

Only F-35B operations will occur at the ALF. F-35B pilots will conduct around 5,000 annual operations at the ALF, with 86 percent consisting of FCLPs. About 1 percent of these new operations would occur during environmental night (10:00 p.m. to 7:00 a.m.).

AUX-2 will see its numbers of operations reduced significantly by the 2025 timeframe used for this analysis. With the elimination of almost 11,000 annual AV-8B FCLPs and other operations, use of AUX-2 would decrease to under 5,000 operations per year, mostly by helicopter, MV-22, and KC-130. No F-35B operations occur at AUX-2.

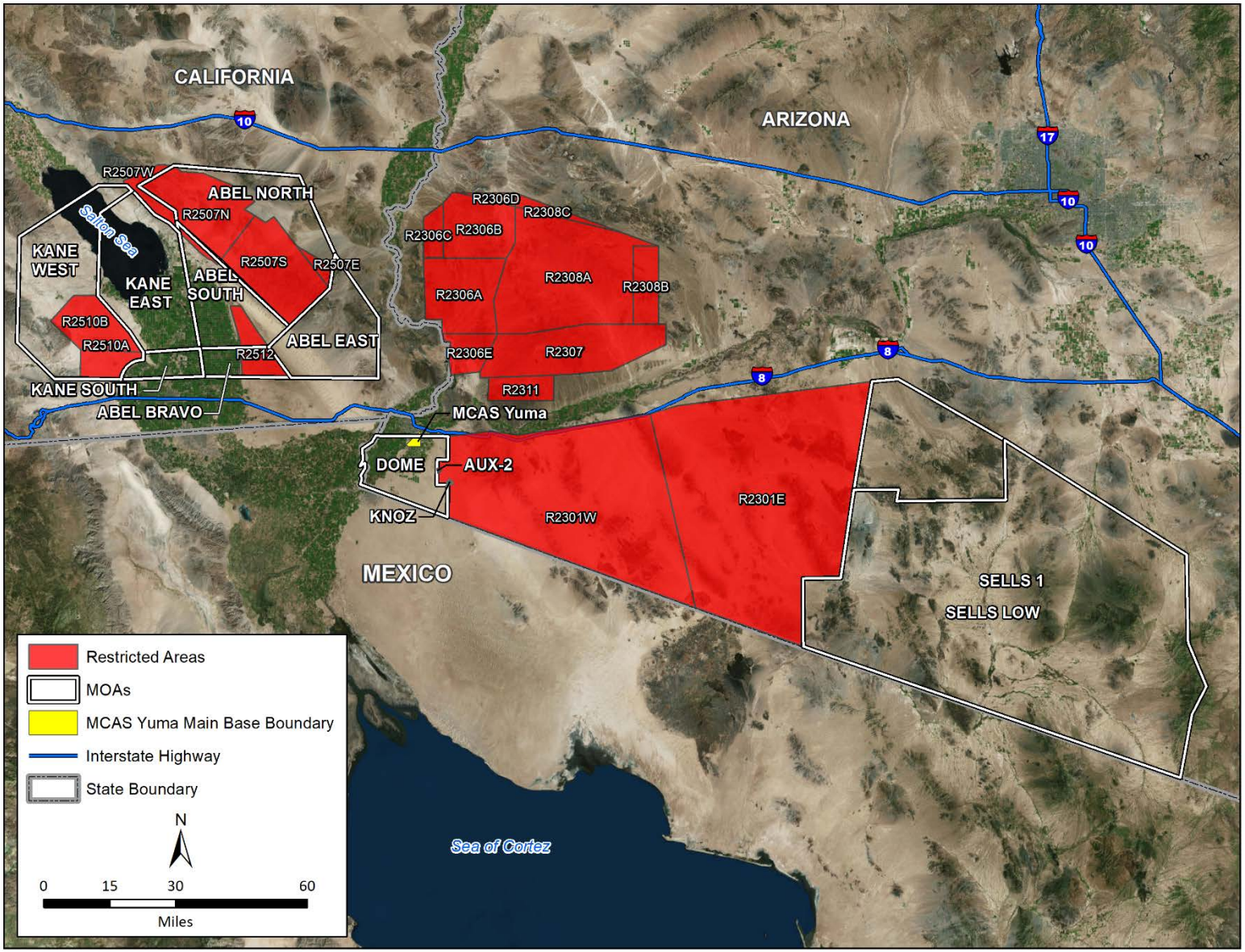

Figure 3-3. MCAS Yuma Core Airspace

Table 3-1. Modeled Air Operations at MCAS Yuma

Aircraft Type	ARRIVALS																				
	Other Arrival to Pad [1]			Instrument Straight-In Arrival [2]			Overhead Break Arrival to RUNWAY [3]			Overhead Break Arrival to PADS [1]			Non-Break Visual Arrival to RUNWAY [3]			Non-Break Visual Arrival to PADS [1]			Interfacility from ALF or Aux2		
	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total
BASED																					
F-35B	-	-	-	684	7	691	9,342	7	9,349	924	-	924	2,491	124	2,616	246	-	246	274	2	277
F-35C	-	-	-	95	1	96	1,320	1	1,321	144	-	144	380	17	398	-	-	-	-	-	-
MV-22	-	-	-	150	6	156	392	6	398	-	-	-	100	6	106	-	-	-	39	2	41
CH-53E	429	3	432	15	2	17	-	-	-	-	-	-			-	-	-	-	100	2	102
AH-1W	-	-	-	23	12	35	-	-	-	-	-	-	206	40	246	-	-	-	23	12	35
F-5E	-	-	-	194	-	194	3,900	-	3,900	-	-	-	205	-	205	-	-	-	-	-	-
C-12	-	-	-	-	-	-	-	-	-	-	-	-	1,209	178	1,387	-	-	-	-	-	-
Based Subtotal	429	3	432	1,161	28	1,189	14,954	15	14,969	1,068	-	1,068	4,592	366	4,957	246	-	246	436	18	455
CIVIL																					
DASH-8	-	-	-	295	36	331	-	-	-	-	-	-	2,536	240	2,776	-	-	-	-	-	-
CRJ-200	-	-	-	295	36	331	-	-	-	-	-	-	2,535	240	2,775	-	-	-	-	-	-
GASEPF	-	-	-	178	9	187	-	-	-	-	-	-	3,088	280	3,368	-	-	-	-	-	-
King Air	-	-	-	52	2	54	-	-	-	-	-	-	901	82	983	-	-	-	-	-	-
Citation	-	-	-	18	1	19	-	-	-	-	-	-	300	27	327	-	-	-	-	-	-
Civil Subtotal	-	-	-	838	84	922	-	-	-	-	-	-	9,360	869	10,229	-	-	-	-	-	-
TRANSIENT																					
F-35B	-	-	-	-	-	-	2,257	239	2,496	-	-	-	187	42	229	-	-	-	-	-	-
F-35C	-	-	-	-	-	-	1,128	120	1,248	-	-	-	94	21	115	-	-	-	-	-	-
FA-18E/F	-	-	-	-	-	-	17	2	19	-	-	-	2	-	2	-	-	-	-	-	-
KC-130J	-	-	-	425	-	425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Helicopters (mixed)	-	-	-	-	-	-	-	-	-	-	-	-	4,163	665	4,828	-	-	-	204	74	278
Transient Subtotal	-	-	-	-	-	-	3,402	361	3,763	-	-	-	4,446	728	5,174	-	-	-	204	74	278
TOTALS	***429***	***3***	***432***	***1,999***	***112***	***2,111***	***18,356***	***376***	***18,732***	***1,068***	***-***	***1,068***	***18,398***	***1,963***	***20,360***	***246***	***-***	***246***	***640***	***92***	***733***

Table 3-1. Modeled Air Operations at MCAS Yuma (cont.)

Aircraft Type	DEPARTURES									CLOSED PATTERNS												TOTAL		
	Departure from Runways			Departure from Pad			Interfacility to ALF or Aux2 [4]			Visual Touch and Go (Conventional) [5]			Visual Touch & Go (Non-conventional) [6]			FCLP			GCA Box [6]					
	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total
BASED																								
F-35B	13,688	138	13,826	-	-	-	277	-	277	664	-	664	1,549	-	1,549	-	-	-	547	-	547	30,686	280	30,966
F-35C	1,940	19	1,959	-	-	-	-	-	-	307	-	307	-	-	-	1,683	39	1,722	76	-	76	5,945	78	6,023
MV-22	596	12	608	52	-	52	39	2	41	-	-	-	-	-	-	-	-	-	60	-	60	1,428	34	1,462
CH-53E	45	-	45	401	3	404	100	2	102	-	-	-	-	-	-	-	-	-	35	-	35	1,125	12	1,137
AH-1W	229	52	281	-	-	-	23	12	35	48	12	60	-	-	-	-	-	-	10	6	16	562	146	708
F-5E	4,299	-	4,299	-	-	-	-	-	-	800	-	800	-	-	-	-	-	-	-	-	-	9,398	-	9,398
C-12	1,356	31	1,387	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,565	209	2,774
Based Subtotal	22,153	252	22,405	453	3	456	439	16	455	1,819	12	1,831	1,549	-	1,549	1,683	39	1,722	728	6	734	51,709	759	52,468
CIVIL																								
DASH-8	3,021	86	3,107	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,852	362	6,214
CRJ-200	3,021	85	3,106	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,851	361	6,212
GASEPF	3,245	310	3,555	-	-	-	-	-	-	22,819	2,446	25,265	-	-	-	-	-	-	-	-	-	29,330	3,045	32,375
King Air	947	90	1,037	-	-	-	-	-	-	6,656	713	7,369	-	-	-	-	-	-	-	-	-	8,556	887	9,443
Citation	316	30	346	-	-	-	-	-	-	2,219	238	2,457	-	-	-	-	-	-	-	-	-	2,853	296	3,149
Civil Subtotal	10,550	601	11,151	-	-	-	-	-	-	31,694	3,397	35,091	-	-	-	-	-	-	-	-	-	52,442	4,951	57,393
TRANSIENT																								
F-35B	2,561	164	2,725	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5,005	445	5,450
F-35C	1,281	82	1,363	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,503	223	2,726
FA-18E/F	20	1	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	39	3	42
KC-130J	425	-	425	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	850	-	850
Helicopters (mixed)	4,561	266	4,827	-	-	-	204	74	278	-	-	-	-	-	-	-	-	-	-	-	-	9,132	1,079	10,211
Transient Subtotal	8,848	513	9,361	-	-	-	204	74	278	-	-	-	-	-	-	-	-	-	-	-	-	17,529	1,750	19,279
TOTALS	***41,551***	***1,366***	***42,917***	***453***	***3***	***456***	***643***	***90***	***733***	***33,513***	***3,409***	***36,922***	***1,549***	***-***	***1,549***	***1,683***	***39***	***1,722***	***728***	***6***	***734***	***121,680***	***7,460***	***129,140***

Sources: U.S. Navy 2014, Cardno 2016

Notes:
1. All F-35B arrivals to Pads modeled as VL.
2. All non-F-35 TACAN arrivals modeled as conventional landing to runways.
3. F-35B landing types broken out elsewhere.
4. Interfacilities are modeled to and from runways (no pad usage); All F-35B interfacilities are short take-off and vertical landing (STOVL); counted as one operation per one-way trip.
5. F-35B conventional takeoffs and landings to runways. Counted as two operations per Touch&Go.
6. Counted as two operations per pattern. Types of landings broken out elsewhere.

Table 3-2. Modeled Air Operations at the ALF

AIRCRAFT	Interfacility Arrivals from NYL or NKX			FCLP (1)			Interfacility Departures to NYL or NKX			TOTAL		
	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total
MCAS YUMA - BASED												
F-35B	338	-	338	2,008	20	2,028	334	4	338	2,680	24	2,704
MCAS MIRAMAR - BASED												
F-35B	252	-	842	1,495	15	1,510	248	4	842	1,995	19	2,014
TOTALS	***590***	***-***	***1,180***	***3,503***	***35***	***3,538***	***582***	***8***	***1,180***	***4,675***	***43***	***4,718***

Sources: U.S. Navy 2014, Cardno 2016.
Note: All FCLP closed patterns count as two operations. All are modeled as VLs to LHD deck.

Table 3-3. Modeled Air Operations at AUX-2

AIRCRAFT	ARRIVALS			CLOSED PATTERNS						DEPARTURES			TOTAL		
	Interfacility from NYL or NKX/NFG			Touch and Go (1)			FCLP (1)			Interfacility to NYL or NKX/NFG					
	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total	Day (0700-2159)	Night (2200-0659)	Total
MCAS YUMA - BASED															
MV-22	39	2	41	230	20	250	50	-	50	39	2	41	358	24	382
CH-53E	100	2	102	500	30	530	50	-	50	100	2	102	750	34	784
AH-1W	23	12	35	368	192	560	-	-	-	23	12	35	414	216	630
Based Subtotal	162	16	178	1,098	242	1,340	100	-	100	162	16	178	1,522	274	1,796
TRANSIENT															
MV-22	210	43	253	-	-	-	1,478	164	1,642	210	43	253	1,898	250	2,148
CH-53E	50	20	70	-	-	-	-	-	-	50	20	70	100	40	140
AH-1/UH-1	92	27	119	250	-	250	-	-	-	92	27	119	434	54	488
KC-130J	32	-	32	188	-	188	-	-	-	32	-	32	252	-	252
Transient Subtotal	384	90	474	438	-	438	1,478	164	1,642	384	90	474	2,684	344	3,028
TOTALS	***546***	***106***	***652***	***1,536***	***242***	***1,778***	***1,578***	***164***	***1,742***	***546***	***106***	***652***	***4,206***	***618***	***4,824***

Sources: U.S. Navy 2014, Cardno 2016.
Note: [1]All closed patterns count as two operations.
NYL = Yuma MCAS/Yuma International Airport; NKX = Miramar MCAS Airport; NFG = Camp Pendleton Airport

4

4.1 What is Sound/Noise?

4.2 Airfield Noise Metrics and Noise Modeling

4.3 AICUZ Noise Contours for MCAS Yuma

4.4 AICUZ Noise Contours for Auxiliary Landing Fields

4.5 Comparison with Previous AICUZ

CHAPTER 4 AIRCRAFT NOISE

4.1 WHAT IS SOUND/NOISE

Sound is a physical phenomenon consisting of minute vibrations that travel through air and are sensed by the ear. Whether that sound is interpreted as pleasant (e.g., music) or unpleasant (e.g., jackhammers) depends largely on the listener's current activity, past experience, and attitude toward the source of that sound. Sound is all around us; sound becomes noise when it becomes invasive and/or unwanted and interferes with normal activities such as sleep and conversation.

Aircraft noise is of concern to many in communities surrounding airports. The impact of aircraft noise is also a factor in the planning of future land use near air facilities. Because the noise from these operations can impact surrounding land use, the DoN has defined certain noise zones and provided associated recommendations regarding compatible land use in the AICUZ Program guidance.

The measurement and human perception of sound involves three basic physical characteristics—intensity, frequency, and duration. Intensity is a measure of the acoustic energy of the sound vibrations. The higher the sound pressure, the more energy carried by the sound and the louder the perception of that sound. Frequency is the number of times per second the air vibrates or oscillates. Low-frequency sounds are characterized as rumbles or roars, while sirens or screeches are examples of high-frequency sounds. Duration is the length of time the sound can be detected.

A logarithmic unit known as decibel (dB) is used to represent the intensity of sound, compared to other levels. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort and above 140 dB as pain.

4.2 AIRFIELD NOISE METRICS AND NOISE MODELING

4.2.1 Noise Metrics

Day-Night Average Sound Level (DNL) is the relevant noise metric for this study and is based on annual average daily aircraft operations. DNL is the United States (U.S.) Government standard for modeling cumulative noise exposure and assessing community noise impacts. DNL has two time periods of interest: daytime and nighttime. Daytime hours are from 7:00 a.m. to 10:00 p.m. local time. Nighttime hours are from 10:00 p.m. to 7:00 a.m. local time. DNL weighs operations occurring during its nighttime period by adding 10 dB to their single-event sound level. Note that "daytime" and "nighttime" in

calculation of DNL are sometimes referred to as "acoustic" or "environmental" day and night and always correspond to the times given above. This is often different from the "day" and "night" used commonly in military aviation, which are directly related to the times of sunrise and sunset, and vary throughout the year with the seasonal changes.

DNL is based on annual average daily aircraft operations. The operations level on an average annual daily is calculated by dividing the total annual airfield operations by 365 days. While annual operations will change from year to year, if other variables (aircraft type, location of flight paths, altitudes, times of day, power settings, etc.) remain the same, a doubling of annual operations would result in a 3 dB increase in DNL.

The accumulation of noise computed in this manner provides a quantitative tool for comparing overall noise environments and for use in developing compatible land use plans and zoning regulations in the airfields' environs. The AICUZ Program generally divides noise exposure into three categories:

- Noise Zone 1: Less than 65 DNL; low or no noise impact
- Noise Zone 2: 65-75 DNL; moderate impact where some land use controls are suggested
- Noise Zone 3: Greater than 75 DNL; greater impacts requiring a higher degree of land use control

Land use recommendations within these noise zones are provided in Chapter 6. Development of noise contours is discussed below.

4.2.2 Noise Modeling

Modeling of noise, using the NOISEMAP software suite, is accomplished by determining and building each aircraft's flight tracks (paths over the ground) and profiles (which include data such as altitude, airspeed, power settings, and other flight conditions). This is combined with information about the numbers of each type of operation by aircraft/track/profile, local climate, ground surrounding the airfield, and similar data related to ground run-up of aircraft engines to sum the total noise energy experienced annually at a grid of points on the ground. Noise exposure is presented in terms of contours, i.e., lines of equal value of DNL. DNL contours of 60 to 85 dB, presented in 5-dB increments, provide a graphical depiction of the overall average aircraft noise environment.

NOISEMAP's ability to account for the effects of sound propagation includes consideration of terrain elevation and ground impedance conditions at MCAS Yuma. This noise modeling does not include the effect of shielding by man-made structures, such as buildings.

4.3 AICUZ NOISE CONTOURS FOR MCAS YUMA

Noise contours provide MCAS Yuma, local community planning organizations, and the general public with maps of the noise and potential noise related impacts of aircraft operations. The ability to view the noise contours with respect to land use creates a useable tool to help understand and assess any potential incompatible land uses and plan future development around the air station.

Noise contours presented in this AICUZ Study are identified as the "2019 noise contours". Since an AICUZ is supposed to project airfield use in the future, these represent the best projection of flight operations that will be occurring in 2025. Aircraft operations are projected to help ensure that the future operational capability of the air installation is accounted for.

The AICUZ scenario modeled includes all of the previous changes made recently to the environment in and around MCAS Yuma, AZ. This includes the change from AV-8Bs Harrier II and the F/A-18C/D Hornet to the F-35B Lightning II. Also, the recent establishment of an Operational Test and Evaluation Center at MCAS Yuma resulted in an increase in MV-22B operations.

Additional changes to the future operations at MCAS Yuma anticipated for this AICUZ include the use of local facilities by transient F-35C, the notional basing of one F-35C squadron at MCAS Yuma, the probability of NOT building an additional runway at the ALF (Runway 25, or phase III of the ALF Military Construction [MILCON] plan), and a re-organization of the types of takeoffs and landings at MCAS Yuma by the F-35B and F35C, which was based on interviews with pilots flying those aircraft that are now present in Yuma. The overall AICUZ scenario incorporates the future proposed aircraft operations out to 2025.

The 2019 AICUZ noise contours for MCAS Yuma are presented in the following sections along with a detailed description of the noise environment for the airfield. Also provided are comparisons between the 1978 Van Houten contours and the 2019 AICUZ noise contours. The comparison helps identify changes to noise exposure based on projected changes in aircraft operations and allows the targeting of land use recommendations to mitigate noise impacts. Land use and recommendations within noise zones for the airfield are provided and discussed in Chapter 6.

Figure 4-1 shows the DNL noise contours for MCAS Yuma based on the noise metrics and modeling described above.

4.4 AICUZ NOISE CONTOURS FOR AUX-2 AND ALF

Noise contours for ALF and AUX-2 are shown in **Figure 4-2**.

4.5 COMPARISON WITH PREVIOUS AICUZ

The Van Houten study (1978) is used in this analysis to provide a perspective for existing conditions and to understand and describe impacts to land use from the updated noise analysis.

Figure 4-3 depicts the 2019 AICUZ noise contours overlaid on the Van Houten noise contours, on which current planning by the City and County are based. These are shown out to 65 dB DNL, as the Van Houten noise study did not calculate to 60 dB. Note that there are only a few small areas where the 2019 AICUZ contours exceed the Van Houten contours. For most of the area, the 2019 AICUZ contours are well inside those of the Van Houten study.

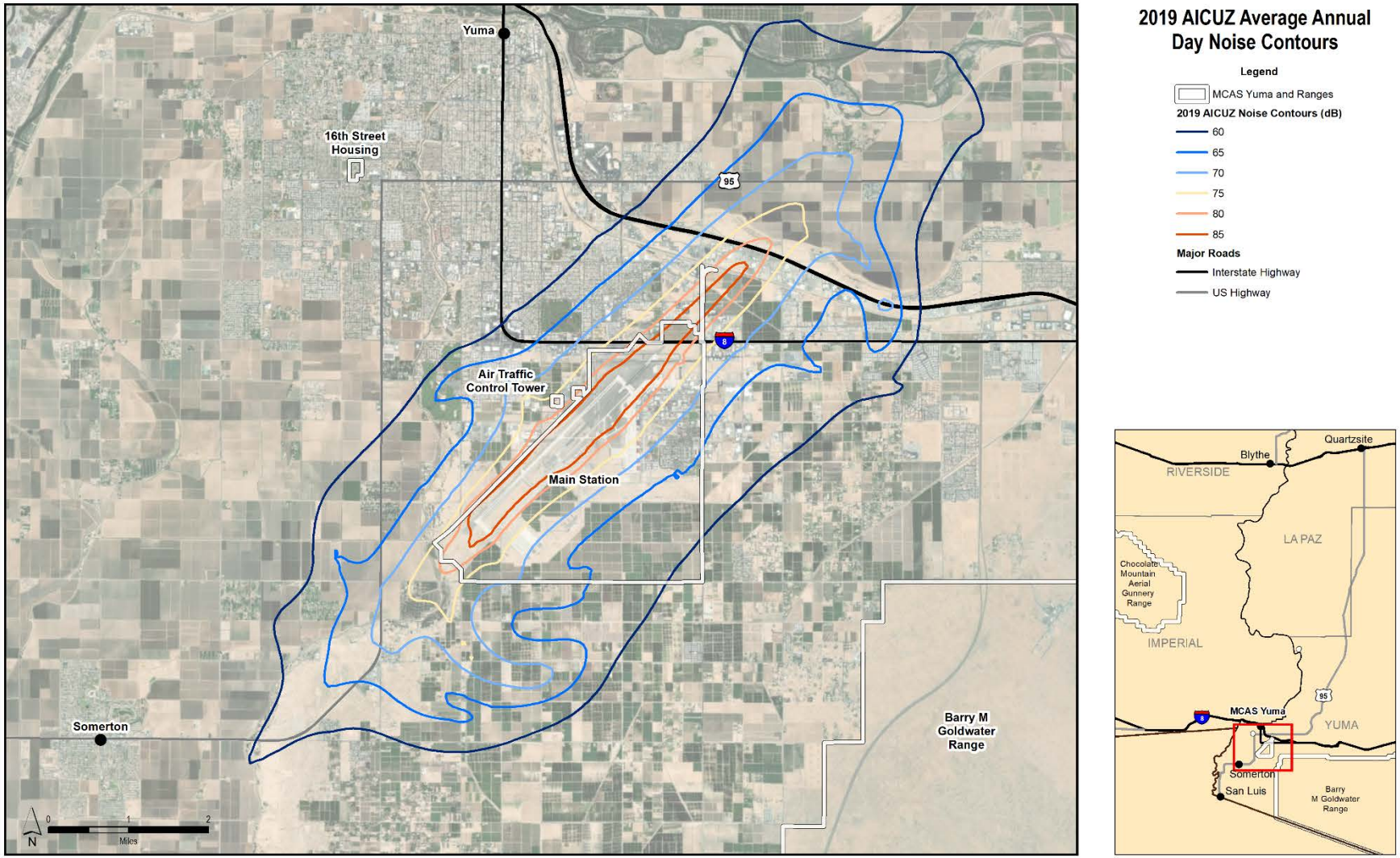

Figure 4-1. 2019 AICUZ Average Annual Day Noise Contours for MCAS Yuma

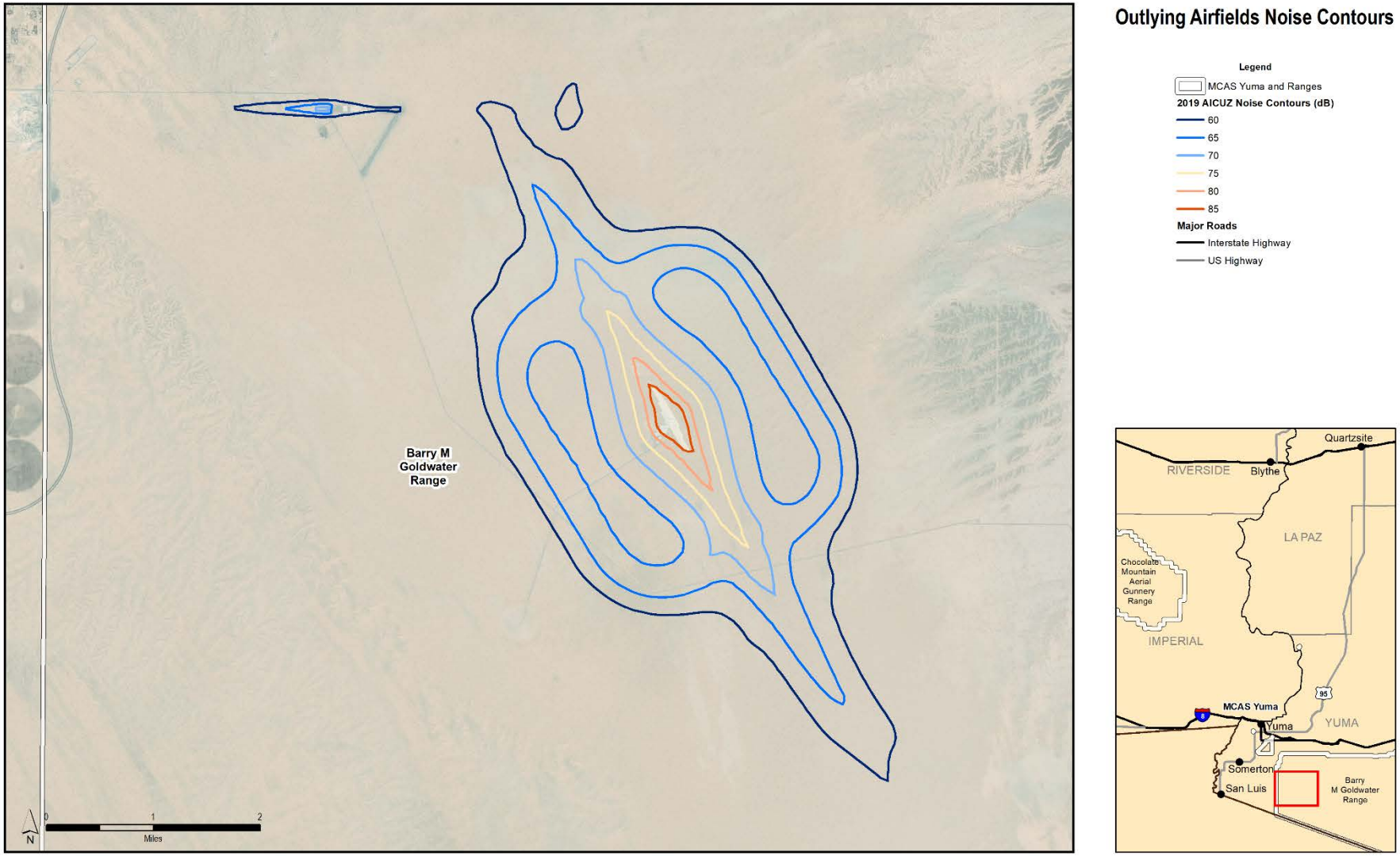

Figure 4-2. Noise Contours for Outlying Airfields

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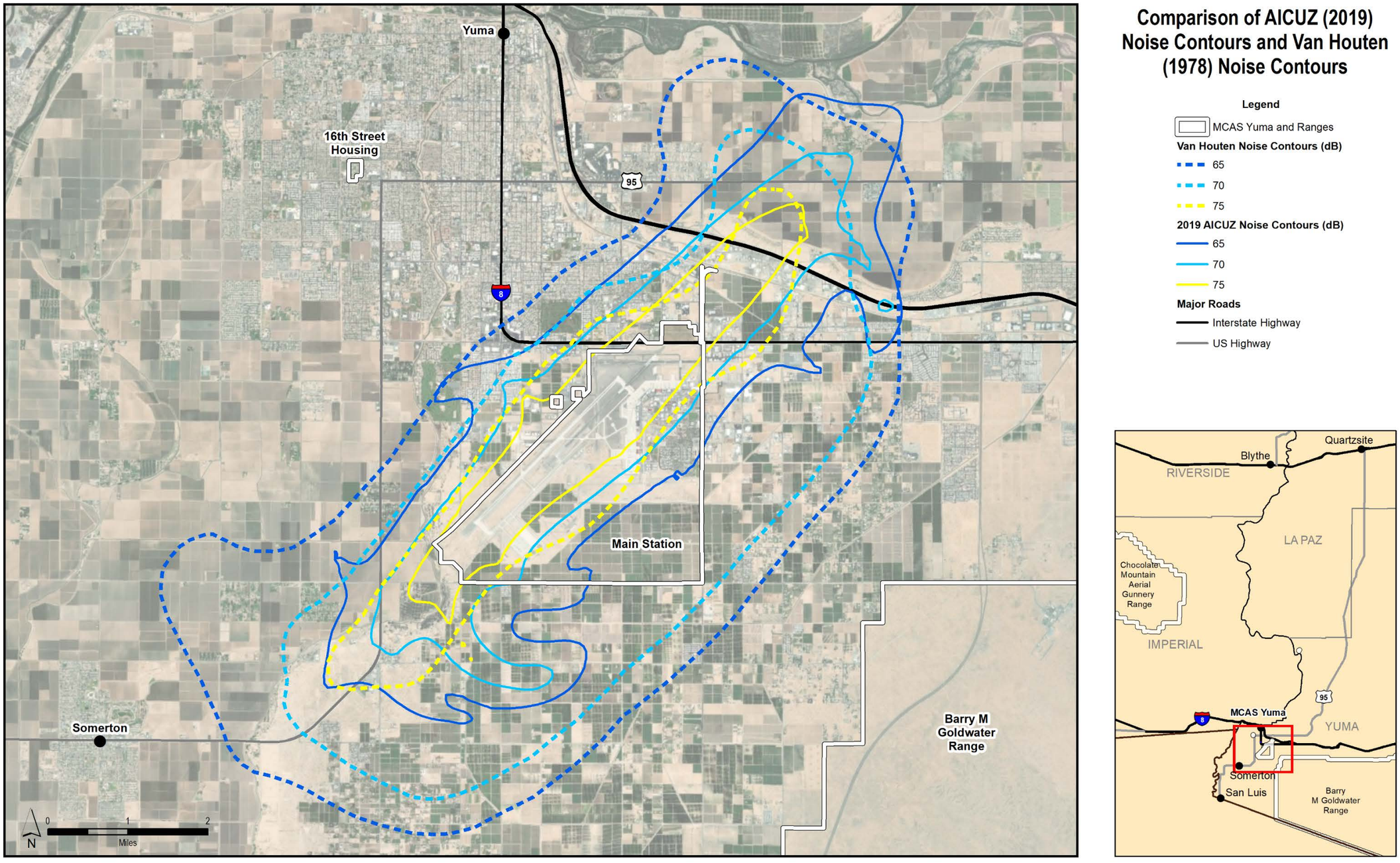

Figure 4-3. Comparison Between 2019 AICUZ Noise Contours and 1978 Van Houten Noise Contours

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5

5.1 Accident Potential Zones

5.2 MCAS Yuma

5.3 Flight Safety and Aircraft Mishaps

CHAPTER 5 AIRFIELD SAFETY

5.1 ACCIDENT POTENTIAL ZONES

The accident potential concept describes the probable impact area if an accident were to occur. This probable impact information is based on historical accident data. The data is used to determine the size of these zones as well as the suggested land use guidelines for each zone. Refer to MCO 11010.16 for further detail.

The MCO identifies three types of APZ for fixed-wing runways: the CZ, APZ-I, and APZ-II. The CZs have the greatest potential for occurrence of aircraft accidents. The dimensions of the three zones are as follows:

- CZ – the area immediately beyond the end of the runway and outward along the primary flight paths for a distance of 3,000 feet and is trapezoidal in shape. The CZ is required for all active runway ends.
- APZ-I – the area beyond the CZ which has measurable potential for accidents relative to the CZ. APZ-I is provided under flight tracks which experience 5,000 or more annual fixed-wing military operations (departures or approaches; not both).
- APZ-II is an area beyond APZ-I with measurable potential for aircraft accidents relative to APZ-I or the CZ.
- Modifications of APZ-I or APZ-II as described above may be considered for certain situations as discussed in 4(c) of the MCO.

The CZ for rotary wing aircraft is provided for all Visual Flight Rules (VFR) landing pads/runways. The use of APZ-I is provided for VFR landing pads/runways located at air installations that support daily training and operational missions.

5.2 MCAS YUMA

In order to determine the appropriate CZs and APZs for MCAS Yuma, an analysis of the flight operation and flight track data used to develop the DNL contours provided in the MCAS Yuma Noise Report (Cardno 2017) was done. Each track was screened for the number of operations, and those tracks with more than 5,000 operations per year were used to develop the CZs and APZs.

Presented below is an analysis of each paired runway. The summary table, **Table 5-1** includes a breakout of the military and civilian totals, with the military operations further divided into fixed-wing and rotary wing. Note: for these purposes, the MV-22B is counted with the fixed-wing totals.

As shown in **Table 5-1**, only Runways 3R and 21L have sufficient arrivals or departures to meet the 5,000 military operation criteria. Runway 3L/21R does not have enough annual military aircraft operations to require APZs, however, there are two reasons why the air station is incorporating APZs there. First, during periods when 3R/21L is unusable (maintenance, fouled deck), the traffic shifted to 3L/21R will be at a rate that could justify the use of APZs on that runway, especially if those conditions happened at a time of year with high operational tempo at MCAS Yuma. Second, if an aircraft with any type of mechanical difficulties were to recover at Yuma, it often would recover to 3L/21R since it is a significantly longer runway at 13,300 feet in length.

Table 5-1. Runway Summaries of Annual Military Operations

Runway 3R Operation Type	Fixed-Wing	Rotary Wing	Totals
Arrivals	18,254	167	18,421
Departures	18,025	830	18,855
Totals	***36,279***	***997***	***37,276***

Runway 21L Operation Type	Fixed-Wing	Rotary Wing	Totals
Arrivals	7,775	459	8,234
Departures	7,963	817	8,780
Totals	***15,738***	***1,276***	***17,014***

Based on the above analysis there is justification for CZs and APZs at MCAS Yuma. As directed in the MCO 11011.16, all runways will need CZs, and only those runways that have over 5,000 annual military arrival or departure operations are required to have APZs. **Table 5-2** shows the summary of average annual number of operations for each runway at MCAS Yuma.

Table 5-2. Summary of Total Average Annual Operations by Runway at MCAS Yuma

Runway	Military		Civilian		Total Operations
	Arrivals	Departures	Arrivals	Departures	
17	137	140	10,000	10,331	20,608
35	145	151	10,973	10,635	21,904
8	1,410	1,035	1,432	1,561	5,438
26	2,061	1,734	6,427	6,551	16,773
3L	4,224	4,042	-	-	8,266
21R	1,739	1,641	266	-	3,646
3R	18,421	18,855	-	-	37,276
21L	8,234	8,780	-	-	17,014

As shown above, only two runways exceed the 5,000 annual operation threshold for arrivals and departures; Runway 3R and 21L. Runways 17/35 and 8/26 are also above the 5,000 annual operation threshold; the operations for these runways are predominately by civilian aircraft, and would normally not warrant APZs. The arrival and departure ends of 3L do not break the 5,000 threshold, but are both fairly close (at over 4,000).

The decision was made by MCAS Yuma staff to require all runways to have APZs. This is a very conservative approach by the air station in justifying APZs; particularly for Runways 17/35 and 8/26 where the majority of the operations are predominantly civilian aircraft. MCO 11010.16 allows for discretion on establishing APZs. While runways with over 5,000 arrivals or departures are required to have APZs, it is not uncommon to establish them on runways that either have close to that number, or have other safety considerations.

The Proposed CZ and APZs for MCAS Yuma are shown in **Figure 5-1**.

5.2.1 Auxiliary Landing Fields

Auxiliary Landing Field-2 ("AUX-2") is used primarily for helicopters and tiltrotors in the 9 direction, and for KC-130s in the 22 direction. The two simulated LHA/D decks at the new ALF are oriented in the 15 and 33 directions. They will primarily be used by F-35B aircraft.

Table 5-3 contains a listing of the annual flight operations for each runway, broken down by arrivals and departures. Closed patterns are counted as one of each. There are no civilian operations to these runways.

Table 5-3. Summary of Total Annual Operations by Runway for Auxiliary Landing Fields

Aux Field	Runway	Arrivals	Departures	Total Operations
AUX-2	9	2,102	2,102	4,204
	4	4	4	8
	22	122	122	244
New ALF	15	1,734	1,734	3,468
	33	2,394	2,394	4,789

Since each of these runways is in regular use, CZs are established for each. None of the auxiliary field runways reaches the threshold of 5,000 arrivals or departures that would be required for establishment of APZs.

Figure 5-2 shows the layout of the recommended CZs for the two auxiliary fields. Both directions at the new ALF are used by F-35B, and the CZs for those locations are expected to be of the fixed-wing class B dimensions. Runway 4/22 at AUX-2 is used nearly exclusively by KC-130 aircraft, and are also depicted as class B CZs due to use by heavy aircraft. While there are options for Runway 9 direction at AUX-2, they are depicted here as fixed-wing class A CZs, due mainly to the MV-22 usage. There are additional helicopter operations on Runway 9, but the normal patterns there are not "direct-to-spot" tracks that would perhaps lead to strict helicopter CZs, but more of the shipboard, disciplined pattern, approaching from a fixed direction. In such cases at other bases, fixed-wing class "A" CZs are often used, especially when the operations are mixed between rotary wing and tiltrotor.

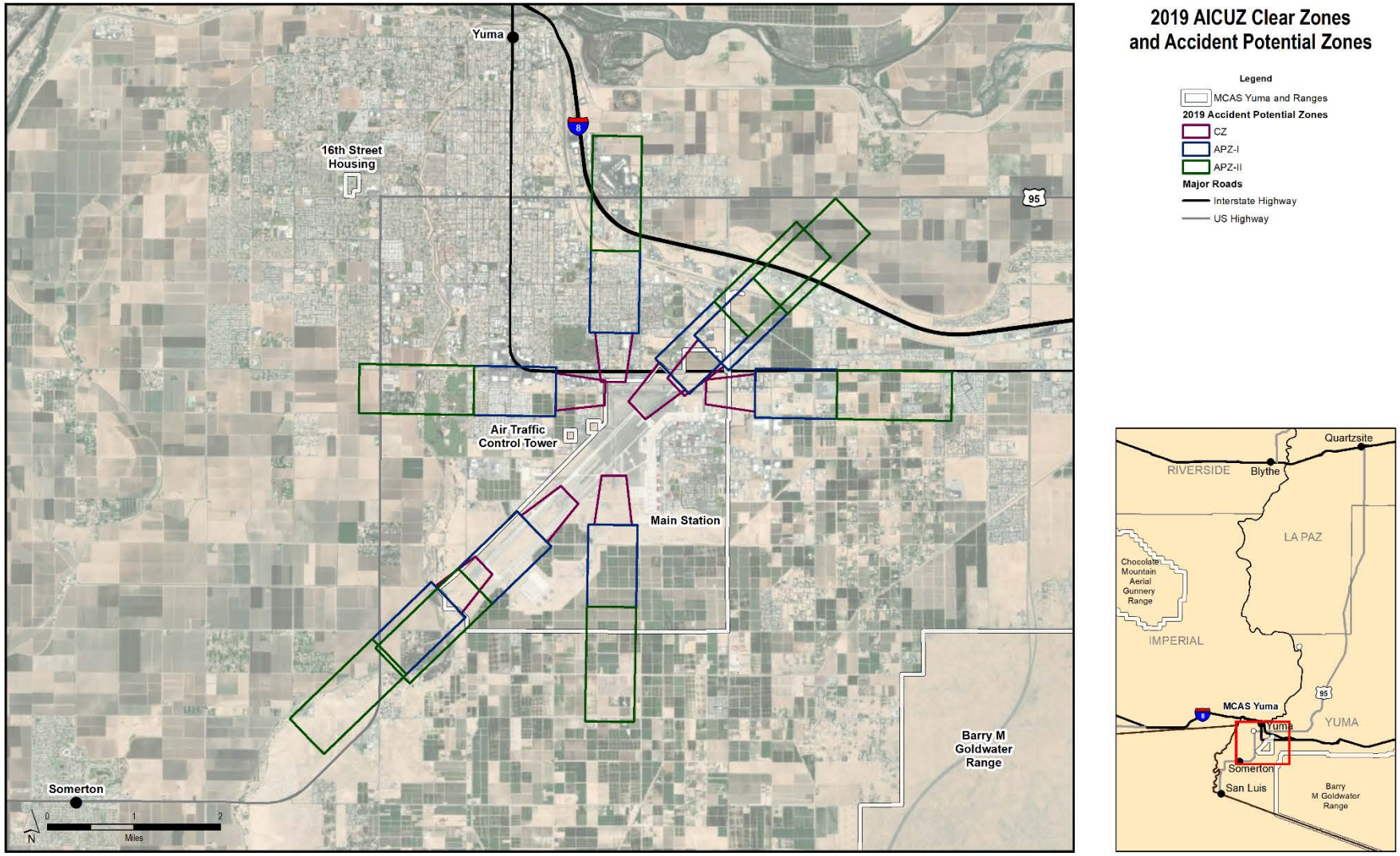


Figure 5-1. 2019 AICUZ Clear Zones and Accident Potential Zones for MCAS Yuma

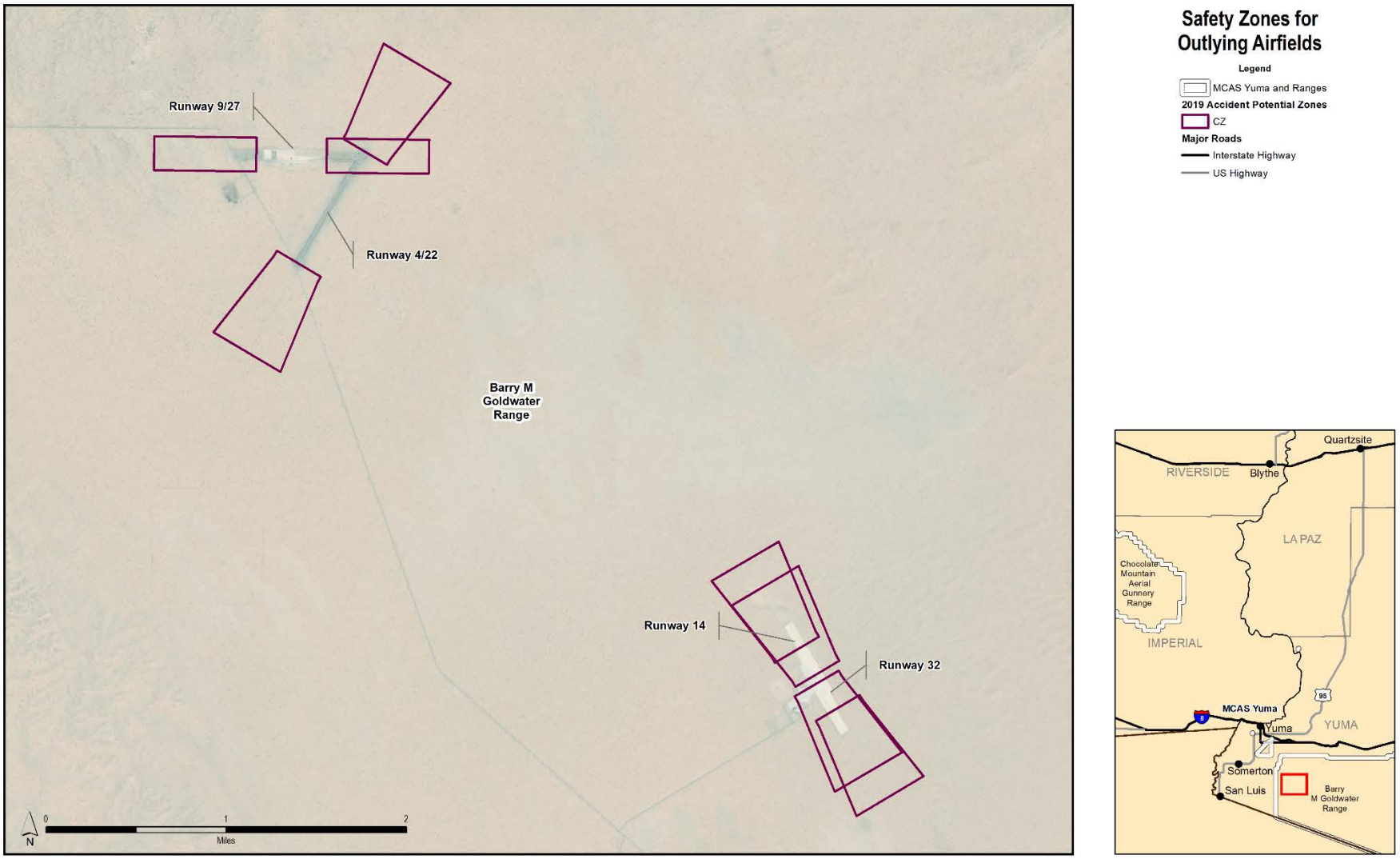


Figure 5-2. Safety Zones for Outlying Airfields

An accident is more likely to occur in APZ-I than in APZ-II, and is more likely to occur in the CZ than in either APZ. APZs extend from the end of the runway, but apply to the predominant arrival and departure flight tracks used by the aircraft. Therefore, if an airfield has more than one predominant flight track to or from the runway, APZs can extend in the direction of each flight track, as shown on **Figure 5-1** and **Figure 5-2**.

Within the CZ, most uses are incompatible with military aircraft operations. AICUZ guidelines recommend that all CZs should remain undeveloped. Traditionally, the clear zone has been acquired by the Government in fee, or by restrictive use easements, to keep it clear of obstructions to flight. Approximately 359 acres of CZ areas for MCAS Yuma are located off-station (**Table 5-4**). Compatible land uses in CZs are extremely limited and typically encourage reduced or minimal access. For this reason, the USMC's policy, where possible, is to acquire real property interests in land within the CZ to ensure that incompatible development is minimized. Chapter 6 provides further analysis of the existing land uses within the CZs and follow on recommendations.

Within APZ-I and APZ-II, a variety of land uses are compatible or conditionally compatible; however, people-intensive uses (e.g., schools, apartments, etc.) should be restricted because of greater risk in these areas. Existing land uses, compatibility and accomplishments related to land use in the APZs for each airfield are provided and discussed in Chapter 6, Land Use Analysis.

Table 5-4. Summary of Total Off-Station Acreage by Runway at MCAS Yuma

Runway	CZs	APZ-I	APZ-II
3L	8.7	337.2	482.1
3R	0.0	13.1	357.8
3L/R (without overlap)	8.7	349.3	544.9
8	130.3	344.4	482.1
17	127.4	344.4	482.1
21L	15.5	331.7	482.1
21R	2.3	234.9	476.2
21L/R (without overlap)	17.8	434.7	580.7
26	74.8	344.4	482.1
35	0.0	0.0	378.6

5.3 FLIGHT SAFETY

The FAA and DoD maintain a number of programs and requirements to reduce hazards to aircraft operations and aircraft mishaps. Mishaps are classified by the severity of property damage and injuries.

BASH

The Bird Aircraft Strike Hazard (BASH) program reduces the risk of birds or animals colliding with aircraft by locating habitat and other attractive land uses at least 10,000 feet from active movement areas of airfields. Though bird and animal strikes usually take place at low altitudes and do not typically cause aircraft crashes, they can result in significant structural and mechanical damages to aircraft.

Habitats that attract birds and animals include wetlands, water features, forests, and grassy areas. Certain land uses, such as landfills, wetlands, stormwater retention ponds, cooling ponds, and transfer stations, also attract birds and animals. These habitats and land uses can be made less hazardous through design modifications.

Lighting

Bright lights or flashes of light can risk operational safety by distracting pilots and/or temporarily inhibiting a pilot's vision. Vision impairments caused by bright lights can last up to 45 minutes; this is a particular hazard at night when it takes longer for the pilot's eye to adjust to darkness. Vision impairments are most dangerous when they occur during crucial phases of flight, such as landings, takeoffs, and emergency maneuvers.

More recently, visible lasers used in laser pointers and seasonal lighting displays have increasingly interfered with flight operations. It can be hard for the installation to identify and address the source of the lasers, especially if the source is mobile or temporary.

Smoke, Dust, Steam

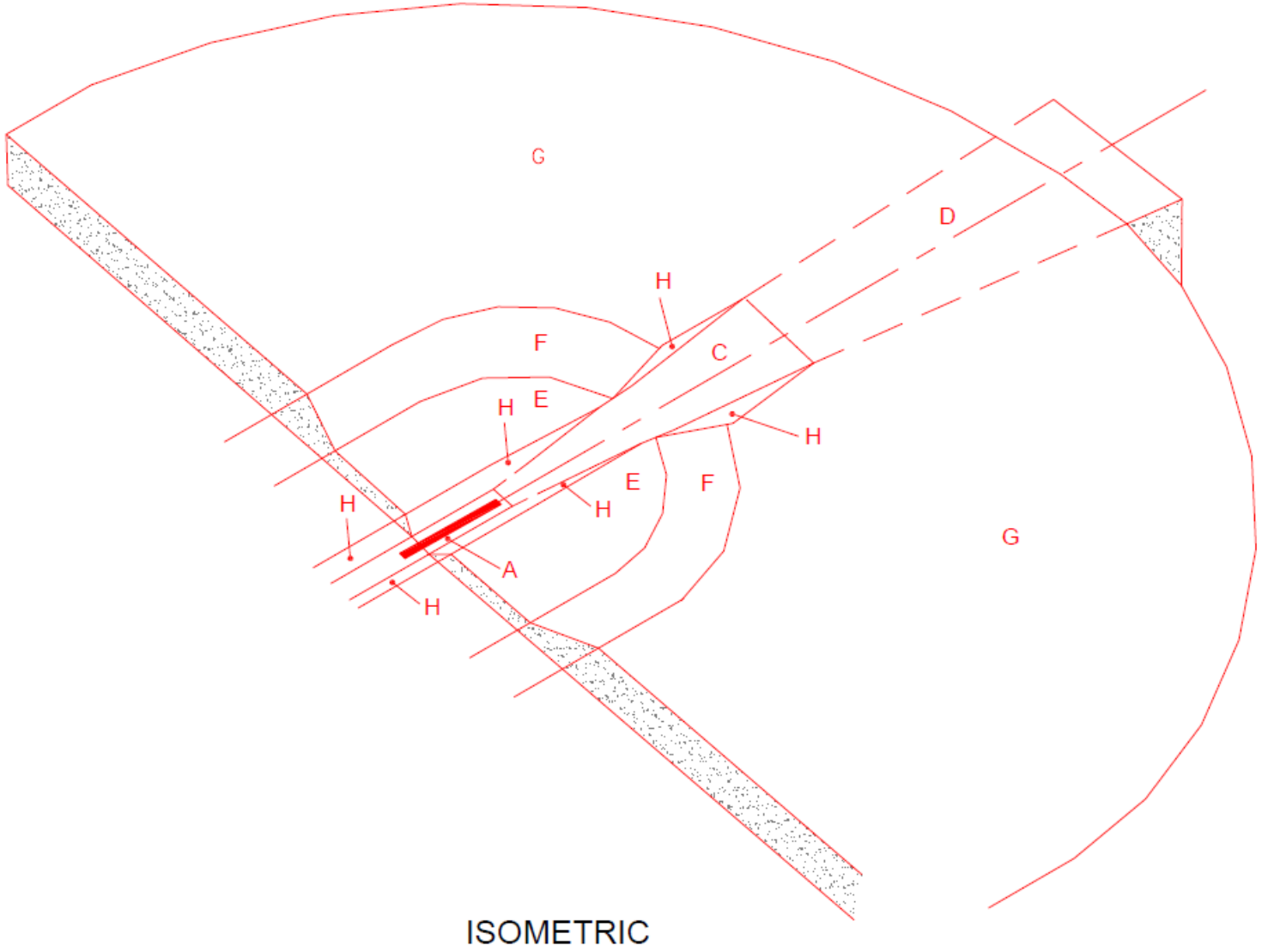
Sources of smoke, dust and steam should not be located near airfields, as they can limit visibility for aircraft operators during low-altitude flight.

Electromagnetic Interference (EMI)

Electromagnetic interference is any electromagnetic disturbance that interrupts or interferes with the performance of electronics/electrical equipment. EMI can be intentional, as in the case of electronic warfare, or unintentional, such as interferences caused by mega-watt wind turbines. Common sources of EMI include television and radio transmissions, vehicles, industrial machinery, and atmospheric phenomena like lighting or solar magnetic storms.

Imaginary Surfaces

Limiting height obstructions of natural features and man-made structures in the area surrounding an airfield reduces the potential for aircraft mishaps during approaches, departures and pattern operations. "Imaginary surfaces" refer to imaginary planes and transition surfaces designated by the FAA in which vertical obstructions like towers, tall buildings, or wind turbines are restricted. The FAA also reviews construction proposals in these areas to prevent new vertical obstructions. Imaginary surfaces are assigned to each approach or departure corridor and around the airfield; height restrictions are more stringent closest to the runways and become less stringent moving away from the runways. No aboveground structures may occur in CZs or primary surface zones. The imaginary surfaces for MCAS Yuma's runways are defined by the Unified Facilities Criteria (UFC) 3-260-01 "Airfield and Heliport Planning and Design", using Navy Class "B" runway criteria. **Figure 5-3** shows the 3-dimensional view of the various surfaces, as shown in the reference, and **Figures 5-4** and **5-5** show these criteria applied to the MCAS Yuma runways. When an obstruction violates this criteria, an airfield safety waiver is required from NAVAIR. For specific waivers, the CPLO at MCAS Yuma is the Command point of contact.



Source DoD 2008

Figure 5-3. Generic Airspace Imaginary Surfaces for Navy Class "B" Runway

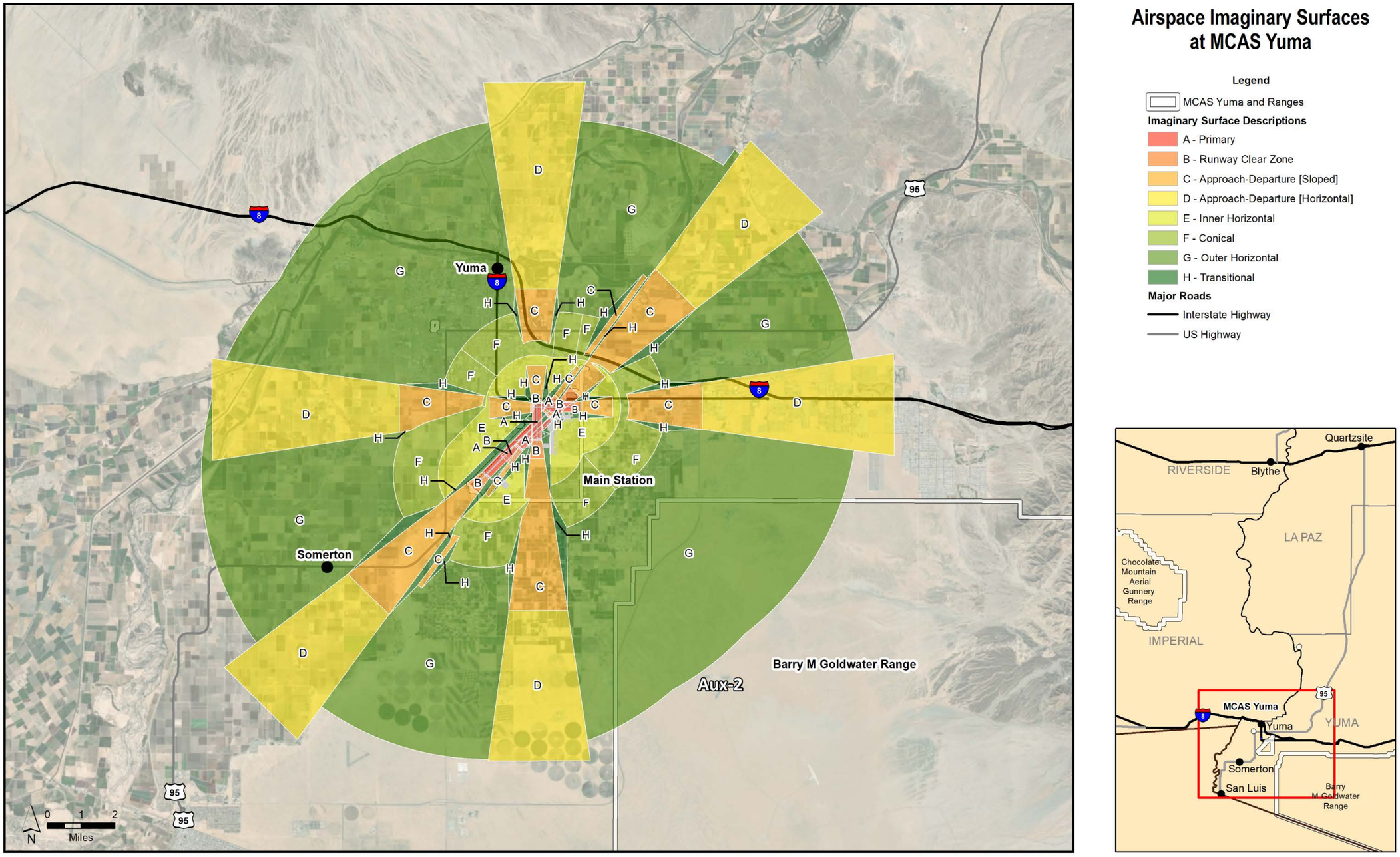


Figure 5-4. Airspace Imaginary Surfaces at MCAS Yuma

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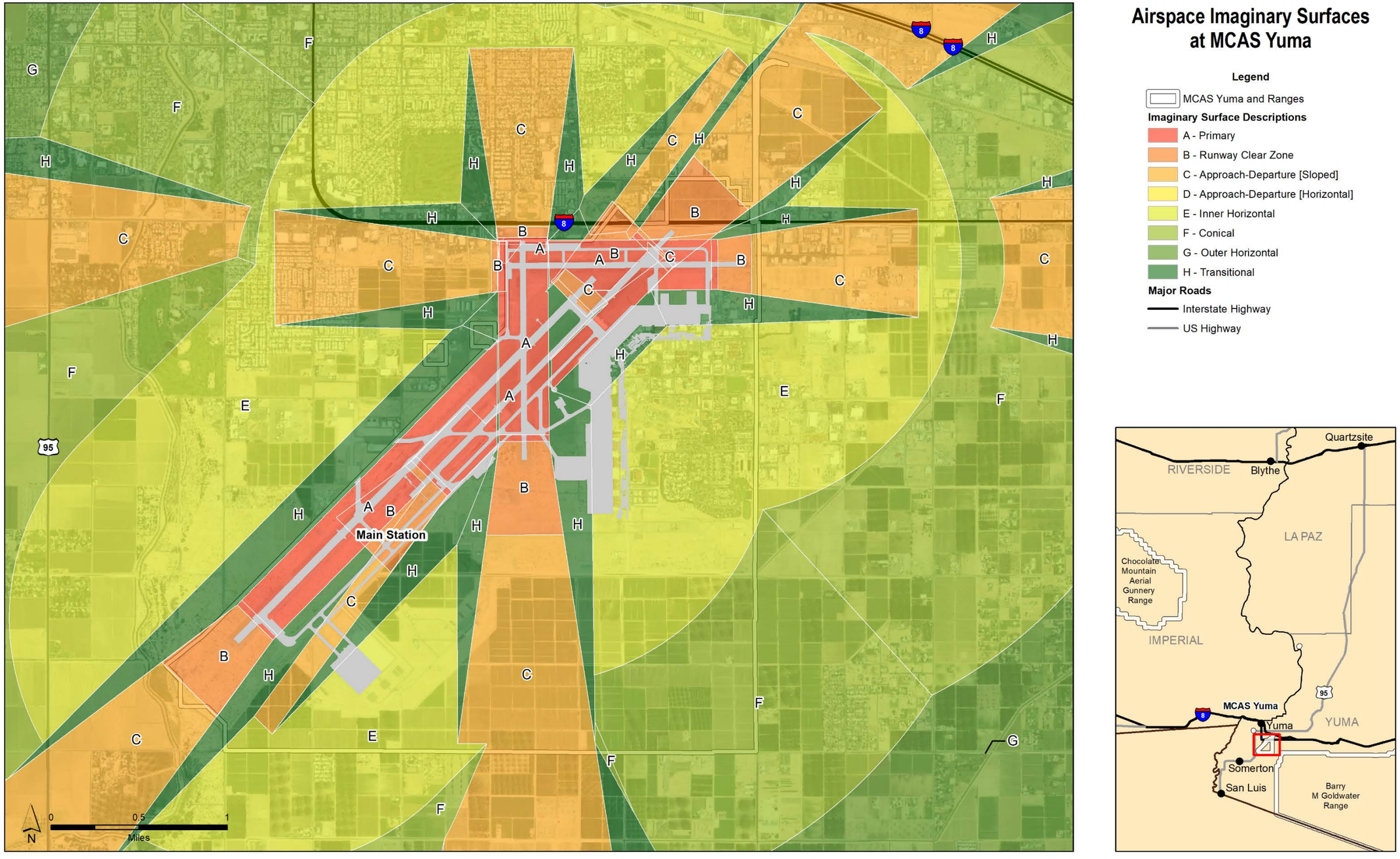

Figure 5-5. Airspace Imaginary Surfaces at MCAS Yuma (Close-Up)

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6

6.1 Land Use Compatibility Guidelines and Classifications

6.2 Planning Authority

6.3 Existing Land Use

6.4 Future Land Use

6.5 Compatibility Concerns

CHAPTER 6 LAND USE COMPATIBILITY ANALYSIS

The AICUZ Program recommends land uses in the vicinity of a military airfield that will be compatible with noise levels, Accident Potential and obstruction clearance criteria associated with these airfield operations.

The noise contours, CZs, and APZs make up the AICUZ footprint for an air installation. The AICUZ footprint defines the minimum area within which land use controls are recommended to protect the public health, safety, and welfare and to preserve the military flying mission.

Suggested land use compatibility guidelines for noise zones, CZs, and APZs are detailed in MCO 11010.16. Land use analysis for the updated footprint follows along with any resulting compatibility concerns.

6.1 LAND USE COMPATIBILITY GUIDELINES AND CLASSIFICATIONS

AICUZ Composite Footprint - Figure 6-1 provides the AICUZ footprint for the air station; the combination of noise contours, CZs, and APZs, overlaid onto a land use map. Noise sensitive points of interest are shown as well. **Figure 6-2** provides the AICUZ footprint for ALF and AUX-2.

6.1.1 Estimated Population within AICUZ Footprint

The estimated off-base population within the MCAS Yuma AICUZ footprint is 7,631 (**Table 6-1**) in 2017. This estimate was calculated using United States Census Bureau American Community Survey (ACS) data. The ACS is conducted every year to provide up-to-date information about the social and economic needs of a community. The U.S. Census is conducted once every 10 years to provide an official count of the entire U.S. population to Congress. For estimating population, the 2017 ACS data will provide a more up-to-date source than the 2010 Census.

There is no population within either of the auxiliary fields AICUZ footprints.

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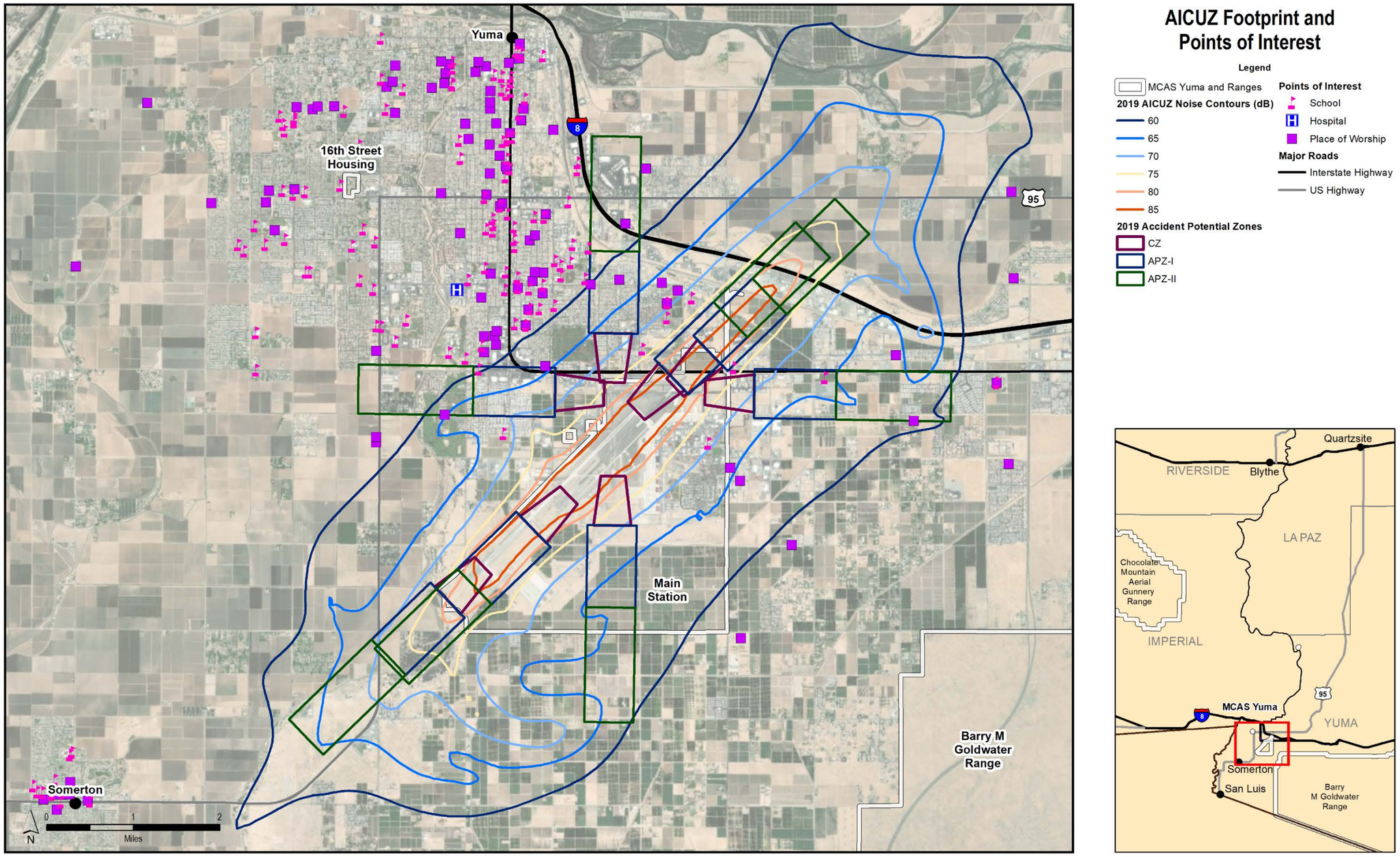

Figure 6-1. MCAS Yuma 2019 AICUZ Footprint

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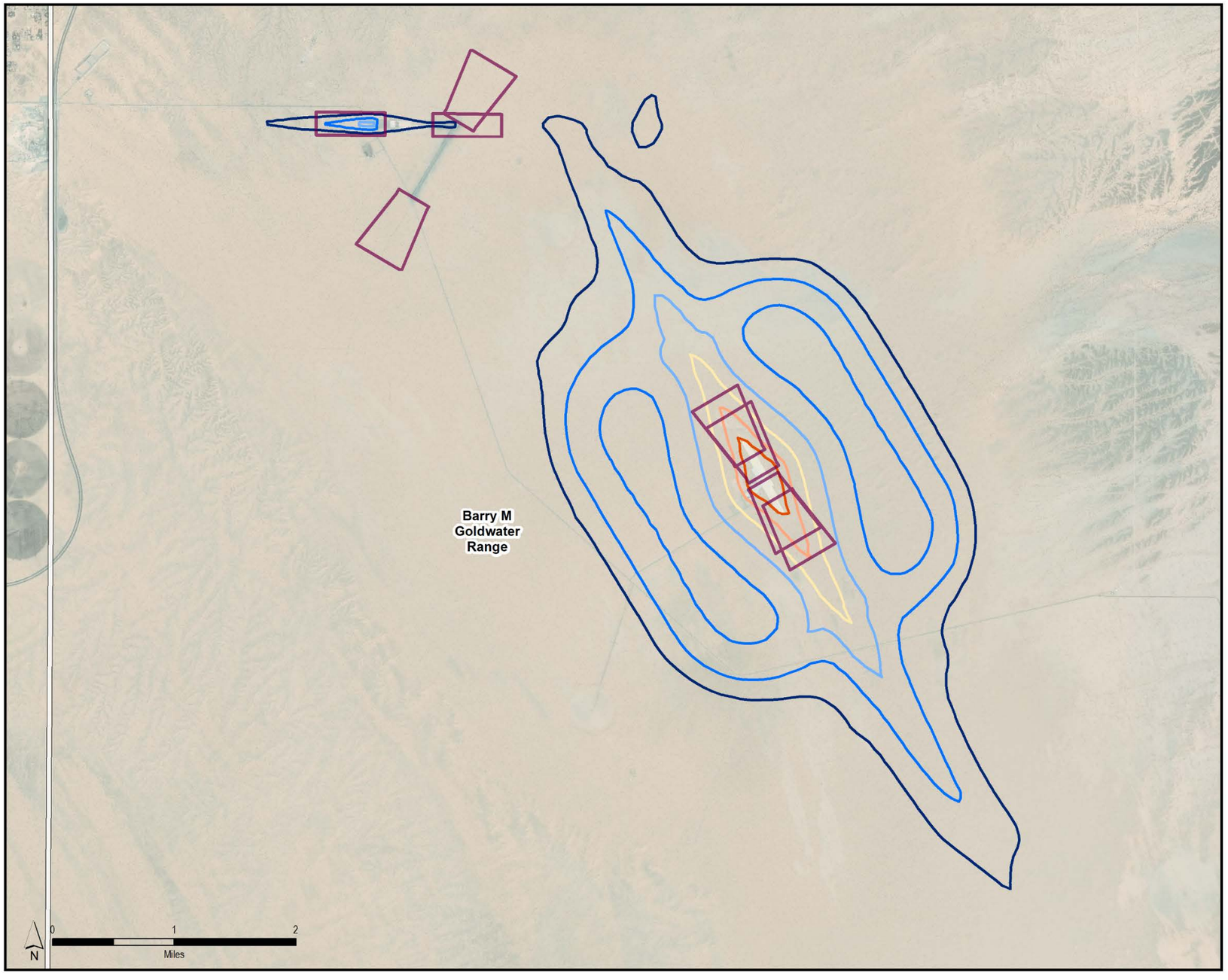

Outlying Airfields AICUZ Footprint

Legend

MCAS Yuma and Ranges

2019 AICUZ Noise Contours (dB)

60
65
70
75
80
85

2019 Accident Potential Zones

Clear Zones

Major Roads

Interstate Highway
US Highway

Figure 6-2. Outlying Airfields AICUZ Footprint

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Table 6-1. Population and Noise Zones, Yuma, AZ		
DNL Noise Zone	**Acres**	**Population (2017)**
65 to 70 dB DNL	8,600	6,172
70 to 75 dB DNL	3,524	1,437
Greater than 75 dB DNL	2,195	22
Total	14,319	7,631

Source: U.S. Census Bureau 2017.

6.1.2 Changes since Last AICUZ

The most recent AICUZ for MCAS Yuma was completed in 1977. There have been numerous changes since that time to include:

- Base loading and the introduction of the F-35-B/C
- Arizona Revised Statute (ARS) §28-8481
- Van Houten Noise Study in 1978
- AICUZ for AUX-2 in 1993
- Joint Land Use Plan for City of Yuma and Yuma County in 1996
- ARS §28-8481 for MCAS Yuma and Update to include Auxiliary Airfields in 2000 and 2004
- Joint Land Use Study for Barry M. Goldwater Range in 2005
- Regional Development Plan in 2010

6.1.3 Affected Areas

6.1.3.1 Noise Contours

The noise contours calculated for MCAS Yuma vary considerably from the contours last adopted by the City of Yuma and Yuma County for land use planning (known as the "Van Houten contours" after the firm that completed them in 1978). **Figure 6-3** shows the comparison with current noise contours at MCAS Yuma. Note that the Van Houten contours only included lines for the DNL values 65, 70, and 75 dB, while the 2019 AICUZ contours go out to 60 dB, per the AICUZ Order. It is clear that in most places, the new contours are well within the older Van Houten contours, with the exception of some very small areas to the east-northeast of the base. There is a sliver of the new 65 DNL contour that is outside the Van Houten 65 DNL contour near Interstate 8. There is also a small pocket of 70+ DNL in that area (over the Interstate) and a small finger of 70+ DNL over agricultural land north of the interstate. Of note are the "bumps" to the northwest of the airfield that are a result of the FCLP training that could occur.

6.1.3.2 CZs and APZs

The APZs are also considerably different than the 1978 footprint adopted by the City and County of Yuma (**Figure 6-4**). The primary difference is that all eight runways now have CZs and APZs. This difference is a result of the updated operational and safety zone modeling and analysis. Additionally, Navy CZs are trapezoidal in shape, while the Arizona CZs are rectangular.

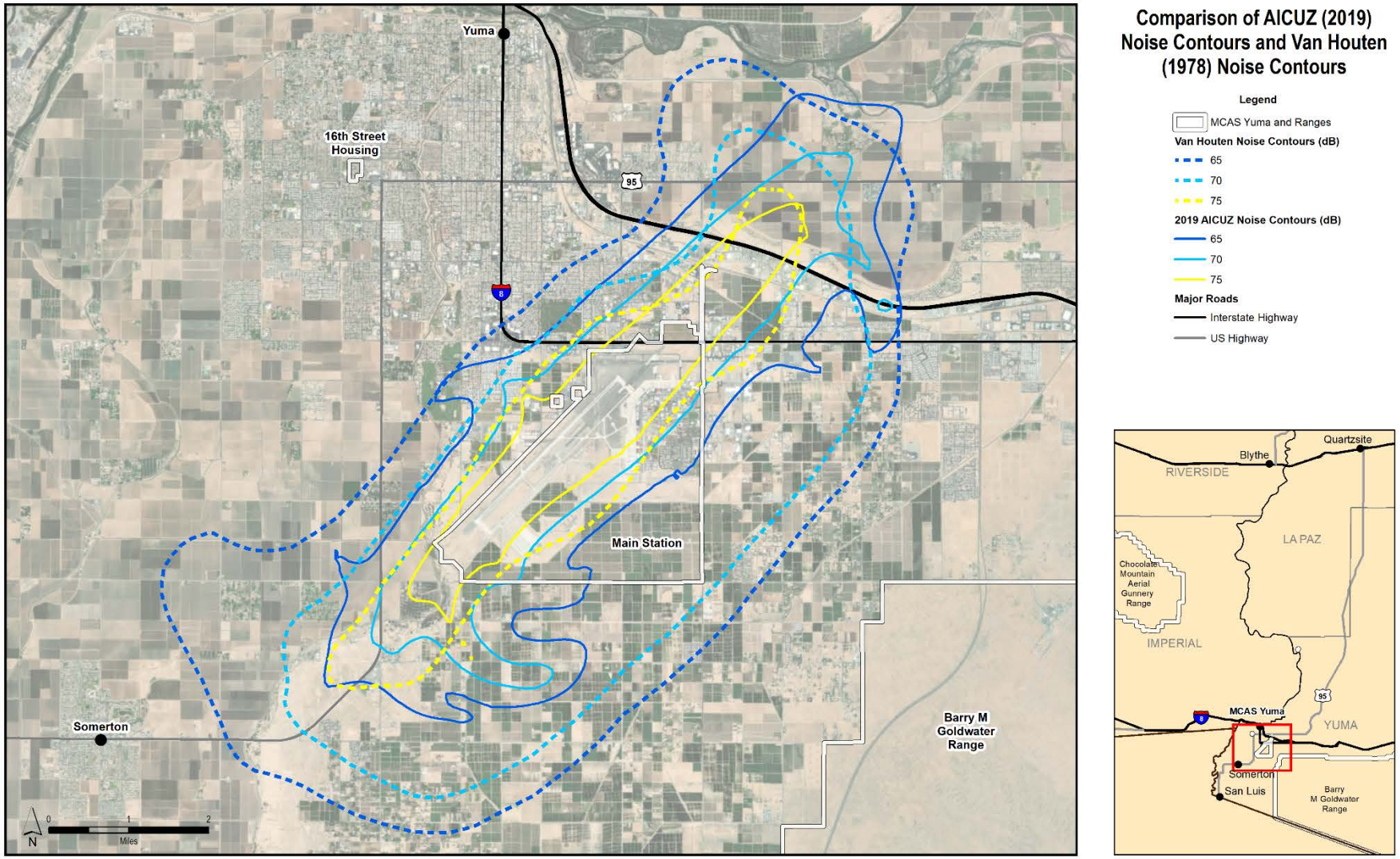

Figure 6-3. Comparison of 2019 AICUZ Noise Contours with 1978 Van Houten Contours

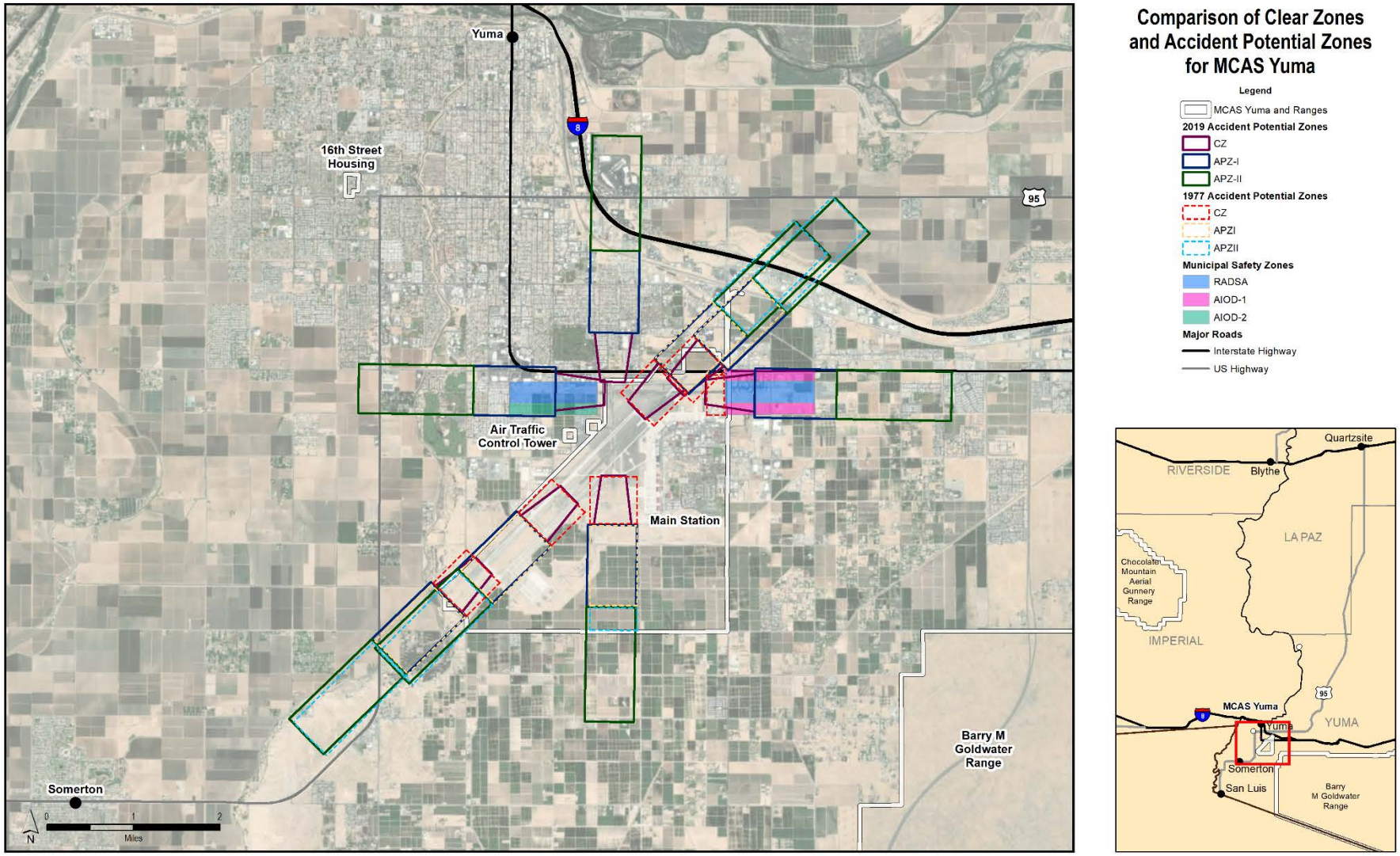

Figure 6-4. Comparison of 2019 CZ/APZs with existing CZ/APZs

6.2 PLANNING AUTHORITIES

The City of Yuma and County of Yuma are the primary planning authorities with respect to MCAS Yuma. The City of Somerton does provide some land use impacts to the south of the airfield. ARS §28-8461 defines the military auxiliary airfields and related CZs, high noise zones, and APZs in Arizona. The statute defines "territory within the vicinity" of MCAS Yuma as 5 miles to the north, south, and west, and 10 miles to the east, from the center of the main runway of a military airport (**Figure 6-5**). It also includes auxiliary airfield 2 (AUX-2) on BMGR-W as an "ancillary military facility". The Arizona Revised Statutes use these definitions to clarify intent to protect public health, public safety, and general welfare and define conditions under which compatibility of land uses are established (State of Arizona 2016).

The City of Yuma, Yuma County, City of Somerton, Town of Wellton, City of San Luis, MCAS Yuma, and Yuma Proving Ground (YPG) worked together on the Yuma Regional Development Plan in December 2010. The plan was built on the previous planning efforts of the area agencies, including the Yuma County Comprehensive Plan; the General Plans for Somerton, San Luis, Wellton, and Yuma; the City/County Joint Land Use Plan; and the Joint Land Use Study (JLUS) for the BMGR-W. The regional development plan was designed to achieve the following:

1. A common set of land use development policies for the future economic growth and development of lands within the incorporated and unincorporated areas in Yuma County,
2. A foundation for the compatibility of land use activities in the vicinity of MCAS Yuma/Yuma International Airport, the BMGR-W, and YPG, and
3. A means to promote and preserve agriculture, the military, and tourism as the primary economic assets of the area.

The Yuma Metropolitan Planning Organization (YMPO) exists to manage regional transportation projects in Yuma County. The YMPO brings together the local, tribal, and county governments within Yuma County, and the Arizona Department of Transportation, to conduct regional studies and plans, administer grant programs, and collect and analyze regional transportation, air quality, and economic data.

Comprehensive (General) Plans. The Arizona Growing Smarter Act requires localities to update and receive voter approval on their general plans every 10 years. The City of Yuma adopted a general plan in 2012 and Yuma County adopted theirs' in 2010. Both plans outline a community vision and related goals and policies, along with assessments of existing conditions and future needs.

County Land Use Policies and Controls. Arizona state law specifies that zoning ordinances enacted by the locality must support the locality's comprehensive plan. The City of Yuma and Yuma County have implemented several land use controls supporting MCAS Yuma missions around the installation and BMGR-W. The City of Yuma has implemented Estate Residential zoning to allow for less dense development in areas previously classified as Rural Density Residential.

The 2005 ARS §28-8481 (Planning and zoning; military airport and ancillary military facility) states that a political entity that has territory in the vicinity of a military airport that includes property in a high noise zone or APZ is required to adopt comprehensive and general plans for property in a high noise or APZs to assure compatible development as outlined in **Table 6-2.**

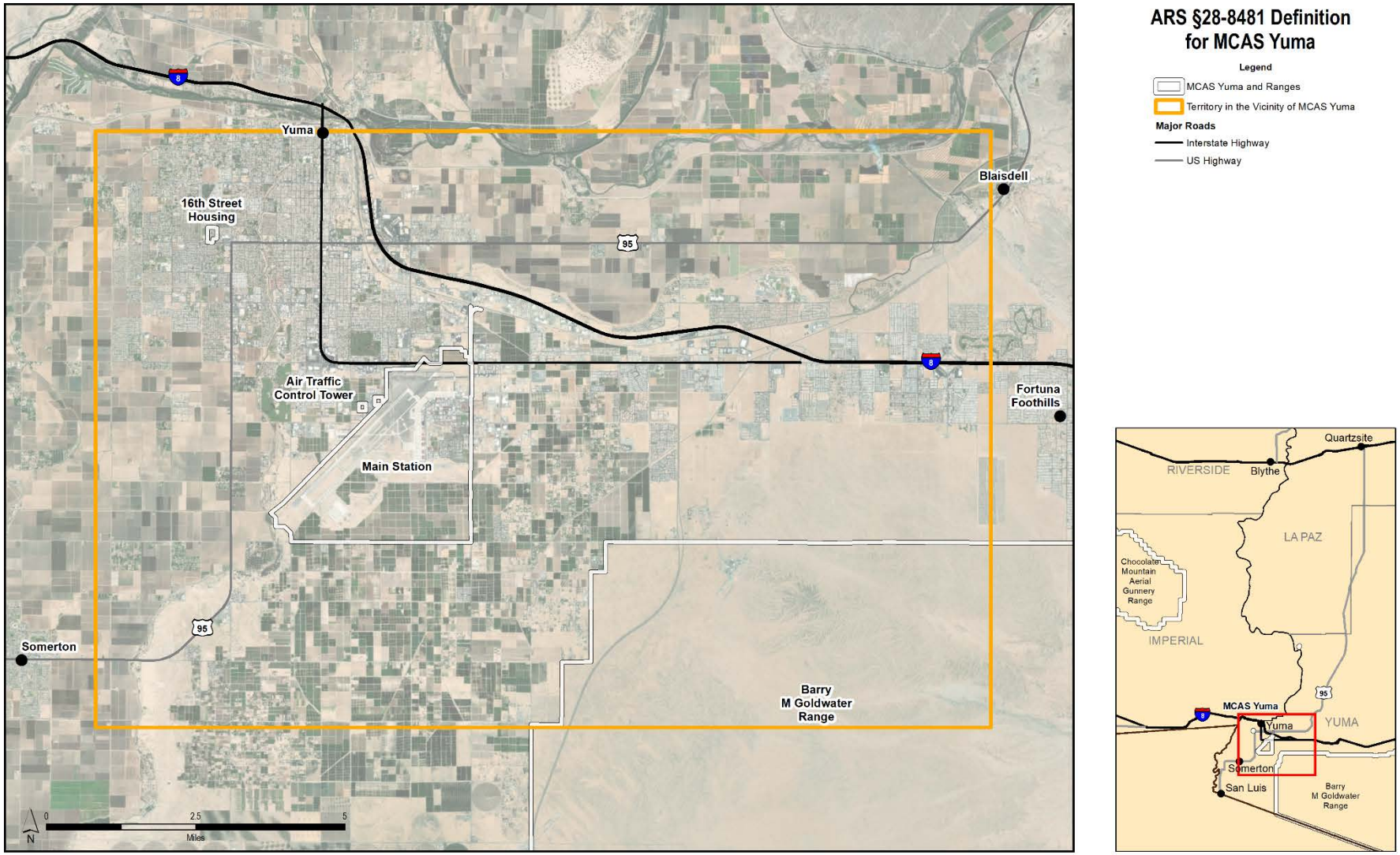

Figure 6-5. AR 28-8481 Definition for MCAS Yuma

Table 6-2. Compatibility of Land Use by Noise Zones and APZ Categories per ARSs 28-8481 (2005)										
Land Use	**Land Use Compatibility Noise Zone (DNL)**							**Land Use Compatibility with APZs**		
	Noise Zone 1		Noise Zone 2		Noise Zone 3					
	<55	55-65	65-70	70-75	75-80	>80	>85	CZ	APZ-I	APZ-II
Agriculture or Ag/Rural Preservation										
Agriculture/Industrial										
Business Park										
Commercial										
Industrial										
High Density Residential										
Low Density Residential										
Medium Density Residential										
Mixed Use Residential										
Public/Quasi-Public										
Open Space/Resort/Recreation										
Suburban Density Residential										

**Adapted from ARS §28-8481*

This use is compatible in these noise and safety zones.

Though this use is generally compatible in these noise zones, Noise Level Reduction (NLR) measures must be implemented in part or all of the structure to achieve a maximum interior noise level of 25-35 dB.

Though this use is generally compatible in these safety zones, land use restrictions including density, use and intensity limitations must be implemented to ensure safety.

This use is not compatible in these noise and safety zones unless a determination of compliance has been made according to ARS 28-8481, Paragraph J.

ARS 28-8481 generally is more restrictive than MCO 11011.16 in identifying compatible land uses under noise and safety zones. The significant differences between the regulations of the ARS (shown in **Table 6-2**) and MCO 11011.16 (shown in **Table 6-3**) include:

- ARS 28-8481 allows for conditionally compatible low/suburban density residential development in 65-70 dB noise zones, whereas the MCO 11011.16 does not recommend any residential development in 65+ dB noise zones.
- Fewer land uses are considered compatible under APZs I and II under ARS 28-8481 than the AICUZ Order.
- Land uses within CZs are not listed within the ARS 28-8481 because they were presumed to not be compatible.
- ARS-28-8481 does not address the compatibility of land uses located in Noise Zone I (<65 dB).
- When a land use is not listed, it is considered to not be compatible.

City of Yuma Airport Overlay District. The City of Yuma established an Airport Overlay District to prevent incompatible land uses within noise zones, CZs, and/or APZs. "Noise zones" are areas within noise contours established by the *Noise Contour Study, MCAS and Yuma International Airport for the City and County of Yuma* (J.J. Van Houten and Associates 1978). The City prohibits the construction of single-family, two-family, multi-family, and manufactured housing within these zones. Recreation vehicles and residential group quarters are expressly considered inconsistent and not compatible with airport operations. This restriction does not apply to land uses or development plans approved on or before December 31, 2000 except that the development must comply with sound attenuation standards. An Airport Overlay District land use matrix identifies land uses that are considered inconsistent and incompatible with noise, APZs, and CZs. The definitions of CZs and APZs for ARS 28-8461 were derived from DoD/DoN regulations. The City of Yuma also includes the Runway Approach Departure Safety Area (RADSA) and Airport Overlay Industrial District (AIOD) for the ends of Runway 8/26. These areas were created to give protection for civilian runways where the CZs and APZs were waived due to pre-existing development. The Arrival and Departure Corridor as specified in the City of Yuma Zoning Ordinance is the same as the High Noise or APZs as defined in ARS 28-8461 (c) and Paragraph (J). These zones are shown in **Figure 6-6.**

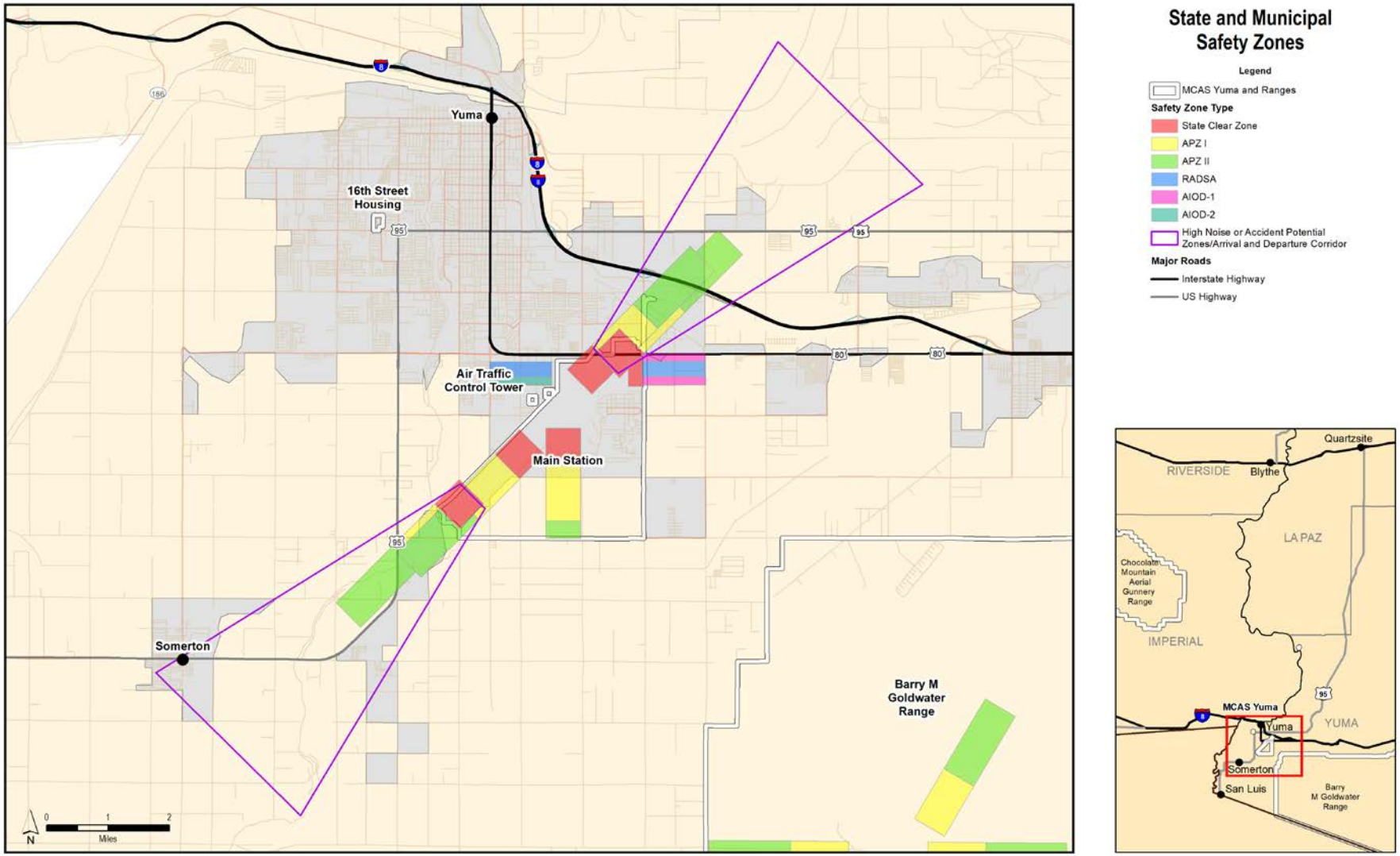

Figure 6-6. State and Municipal Safety Zones

BMGR JLUS. The JLUS for the BMGR presented several recommendations for providing protections along the BMGR boundary. Yuma County adopted several of the recommendations and incorporated them into the Yuma County 2020 Comprehensive Plan (Section Three-15).

Barry M. Goldwater Range Buffer Area Land Use Limitation. The Gila Bend Air Force Auxiliary Field/Barry M. Goldwater Range JLUS, completed in February 2005, is part of the statewide compatibility project. The study was prepared to provide tools to address land use conflicts that might affect the ability of the base to conduct its mission and to ensure land use compatibility around active military reservations as required under Title 28, Chapter 25, Article 7, of the ARS. In order to implement the findings of this study, the following density and intensity guidelines are established:

- The applied use of land within ½ mile of the boundary of the BMGR that is east of the Gila Mountains will have residential density no greater than 5 acres per lot/parcel,
- The applied use of land within ½ mile of the boundary of the BMGR that is south of County 17th Street on the western boundary of the range will have residential density no greater than 5 acres per lot/parcel,
- The applied use of land from within the ½ mile to 1 mile from the BMGR boundary that is east of the Gila Mountains will have residential density no greater than 2 acres per lot/parcel,
- The applied use of land from within ½ to 1 mile from the BMGR boundary that is south of County 17th Street on the western boundary of the range will have residential density no greater than 2 acres per lot/parcel,
- Properties being used for residential purposes up to 3 miles from the BMGR boundary that is east of the Gila Mountains will be required to file a Range/Military Ground Support Disclosure Statement,
- Properties being used for residential purposes up to 3 miles from the BMGR boundary that is south of County 17th Street on the western boundary of the range will be required to file a Range/Military Ground Support Disclosure Statement,
- The applied use of land within 1 mile of the BMGR along its western boundary beginning at County 14th running south to County 17th Street will have a residential density no greater than 2 acres per lot/parcel,
- Amendments to land use classifications up to 3 miles from the BMGR boundary will take into consideration the impacts of increasing density in regard to potential conflicts with the BMGR,
- Property access to roadways bordering the BMGR boundary (particularly County 14th Street in Yuma County) will be limited to reduce the opportunities for unauthorized access to the Range,
- Use of access roads to the BMGR will be restricted in order to discourage access to the BMGR by unauthorized personnel.

6.3 EXISTING LAND USE

6.3.1 Land Use Compatibility Guidelines

MCO 11010.16 establishes land uses and associated compatibility for noise and safety zones. **Table 6-3** provides a synopsis. The existing land uses in the 2019 AICUZ footprint are shown in **Figure 6-7**.

Table 6-3. Land Use Compatibility for Noise Zones and APZs										
Land Use	**Land Use Compatibility Noise Zone (DNL)**							**Land Use Compatibility with APZs**		
	Noise Zone 1		Noise Zone 2		Noise Zone 3					
	<55	55-65	65-70	70-75	75-80	>80	>85	CZ	APZ-I	APZ-II
Agriculture or Ag/Rural Preservation										
Agriculture/Industrial										
Business Park										
Commercial										
Industrial										
High Density Residential										
Low Density Residential										
Medium Density Residential										
Mixed Use Residential										
Public/Quasi-Public										
Open Space/Resort/Recreation										
Suburban Density Residential										

**Adapted from MCO 11010.16*

This use is compatible in these noise and safety zones.

Though this use is generally compatible in these noise zones, Noise Level Reduction (NLR) measures must be implemented in part or all of the structure to achieve a maximum interior noise level of 25-35 dB.

Though this use is generally compatible in these safety zones, land use restrictions including density, use and intensity limitations must be implemented to ensure safety.

This use is not compatible in these noise and safety zones.

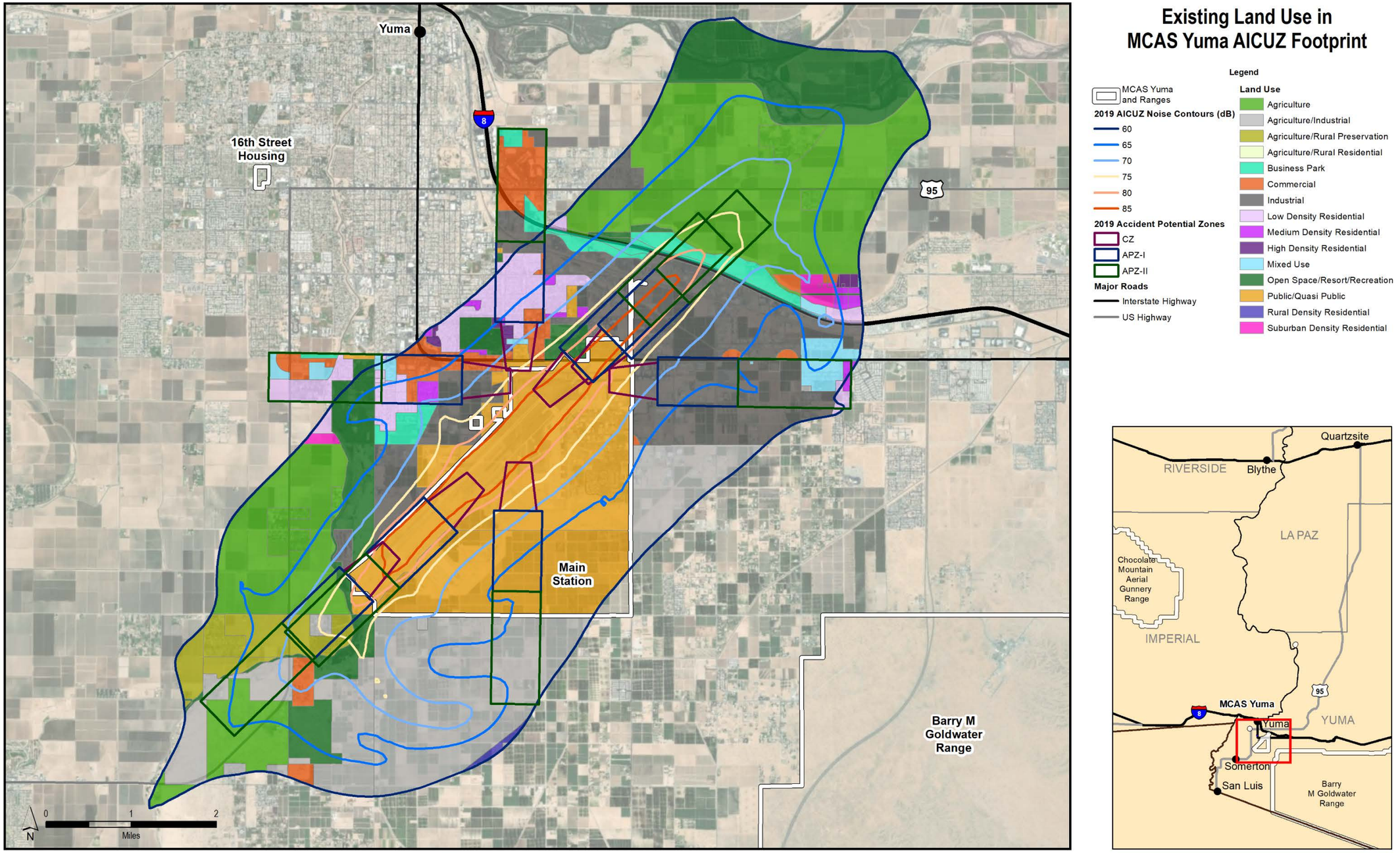

Figure 6-7. Existing Land Use in AICUZ Footprint

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6.4 FUTURE LAND USE

Residential growth constituted the largest changes to land use in the vicinity of MCAS Yuma since the last AICUZ update, and is expected to continue to grow in future years. Particular areas of projected growth are southwest of the core of the City of Yuma, south of Interstate 8 in the Foothills area, and in the Estancia planned development area (a master-planned community of 3,700 acres south of County 15th Street with 20,000 expected residential lots). These areas are mostly outside of the AICUZ footprint, but the installation should remain aware of development in these areas in case it occurs differently than expected. Land uses associated with residential growth, such as educational facilities and local commercial areas, can be expected to grow around these areas as well.

One particular land use change of note is the expansion of Saddles of Joy, Inc., a non-profit therapeutic horse-riding program designed to serve special needs children and their families. It is located on West County 14th Street less than 1 mile from the MCAS Yuma boundary within APZ-I of 3L and APZ-II of 3R, and within the 75+ DNL noise zone. Saddles of Joy would like to expand its operations, but has concerns about noise exposure from MCAS Yuma operations.

ARSs 28-8481 set the guidelines for land uses in the Land Use Matrix. For political subdivisions with properties within the territory in the vicinity of a military airport, compliance with this statute is required. The City of Yuma, City of Somerton, and Yuma County have incorporated these statutes into zoning ordinances. The City of Yuma's Zoning Ordinance Airport Overlay District also includes the RADSA/AIOD. These incorporations will prevent future incompatible land uses within noise zones, CZs, and/or APZs. The City of Somerton and Yuma County have also incorporated ARS into their zoning ordinances. Yuma County recognizes densities established by the JLUS for the BMGR and have included them in the Yuma County 2020 Comprehensive Plan. The Town of Wellton also recognizes these established densities along the BMGR-W.

All these protections help to ensure the continuing mission of MCAS Yuma by limiting incompatible development such as single-family, two-family, multi-family, manufactured housing, recreation vehicles, residential group quarters, nursing homes, hospitals, and schools within noise contours/zones.

6.5 COMPATIBILITY CONCERNS

Several areas in the vicinity of MCAS Yuma contain incompatible or conditionally compatible land uses.

6.5.1 Safety Zones

Figure 6-8 displays the compatibility analysis for the updated safety zones. The areas off the ends of Runways 8 and 17 present the most concern. These are new CZs and APZs for the air station and had not previously been managed with respect to compatible land uses.

Figure 6-9 shows compatibility concerns in the CZs and APZs of Runways 8 and 17. Both CZs have compatibility concerns due to the residential and commercial land uses within them. CZs are the most restrictive safety zones and only agricultural or rural preserve land uses would be compatible.

The APZ-I for both Runways 8 and 17 also contain significant incompatible uses (residential, business and commercial uses) with the few remaining parcels categorized as conditionally compatible. APZ-II for Runway 8 has a couple areas of incompatibility because of mixed use land use. Land uses found in APZ-II for Runway 17 are compatible.

For Runway 21R/L, there is one incompatible area in the CZ for 21L, shown in **Figure 6-10**. This is where the Yuma County Fairgrounds is located and a piece of that property sticks into this CZ. Most of the CZs for these runways are found within base boundaries. The remaining areas in the CZs and all APZs for 21R/L are compatible land uses. Determinations of compliance have been mutually agreed upon by the political subdivision and the military airport stating the use is consistent and compatible with the military airport as required by ARS 28-8481. Height restrictions, no release of substances into the air, noise level reduction standards, avigation easements and avigation disclosures may also be required.

For Runway 26, approximately half of the CZ (farthest eastern half) shows incompatible land use (industrial uses primarily, though what is actually on the ground may differ from that land use designation in the GIS database in locations). The area of APZ-I and some of APZ-II show conditional compatibility (commercial use) while parts of APZ-II show incompatible areas of medium density residential and mixed use. Other areas in APZ-II are conditionally compatible (commercial, low density residential). **Figure 6-10** shows compatibility concerns in the safety zones of Runway 26.

Runway 35 has no land use concerns in the CZs. This zone is on the installation and has been protected through time. The majority of Runway 3L has no land use concerns – however it does have a sliver of land considered conditionally compatible as it is not owned by the DoN. APZ-II for Runway 35 has some conditionally compatible areas as do APZs I and II for Runway 3R/L (agricultural, open space and recreation), all of which are shown in **Figure 6-11**.

6.5.2 Noise Zones

Figure 6-12 shows compatibility analysis for the updated noise zones. The same areas off Runways 8 and 17 on the Northwest side of the base that exhibit safety concerns as discussed above also show noise exposure concerns in the land use compatibility analysis. This area of the City and County of Yuma is higher in residential and commercial density and has been so for some time. It is the intention of the planning staffs in the City and County to minimize any further incompatibilities going forward. Note that the noise contours have decreased in magnitude compared to the Van Houten noise contours and there is no additional burden put on the area with this study update. These incompatibilities existed prior to studies.

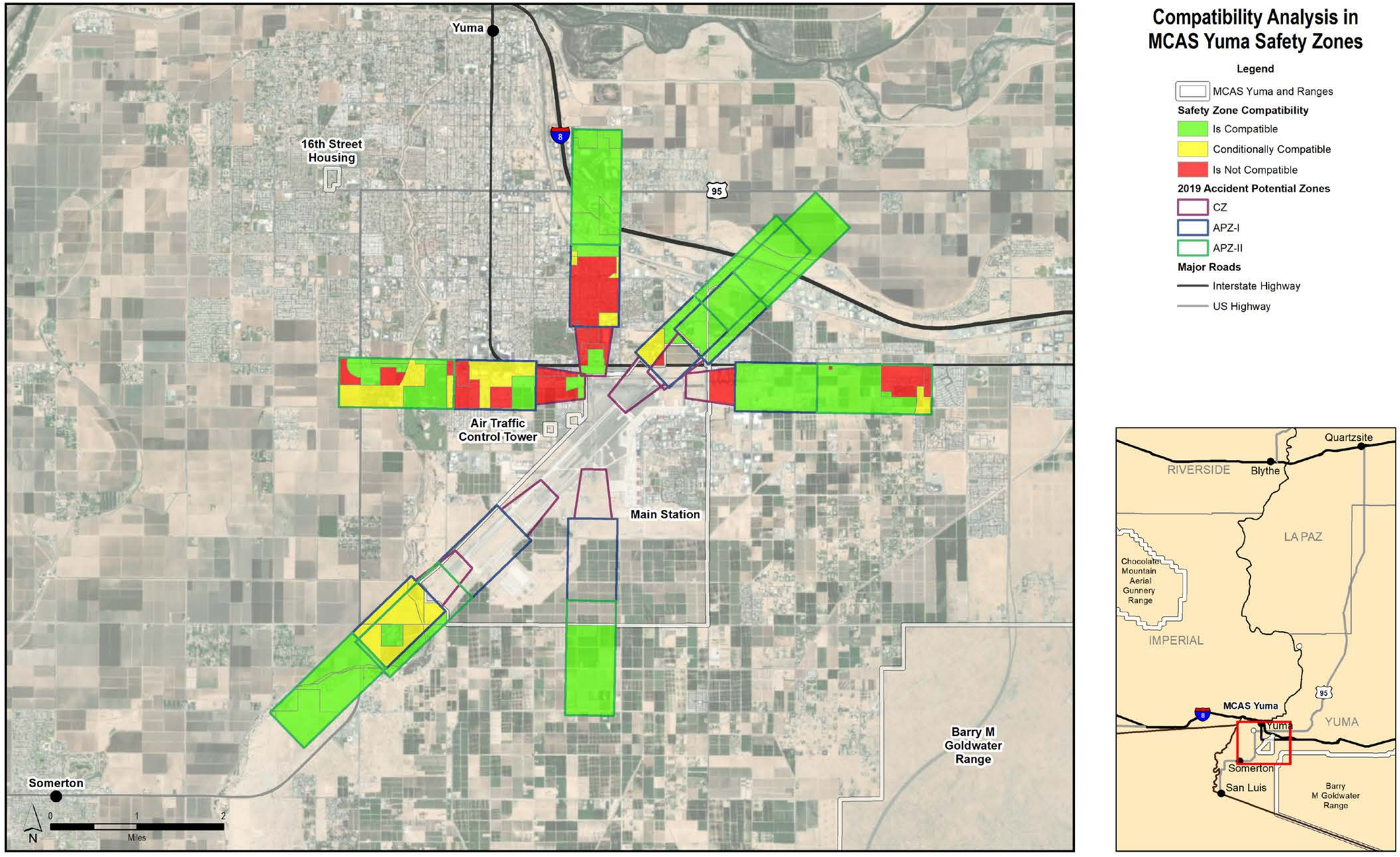

Figure 6-8. Compatibility Analysis in MCAS Safety Zones

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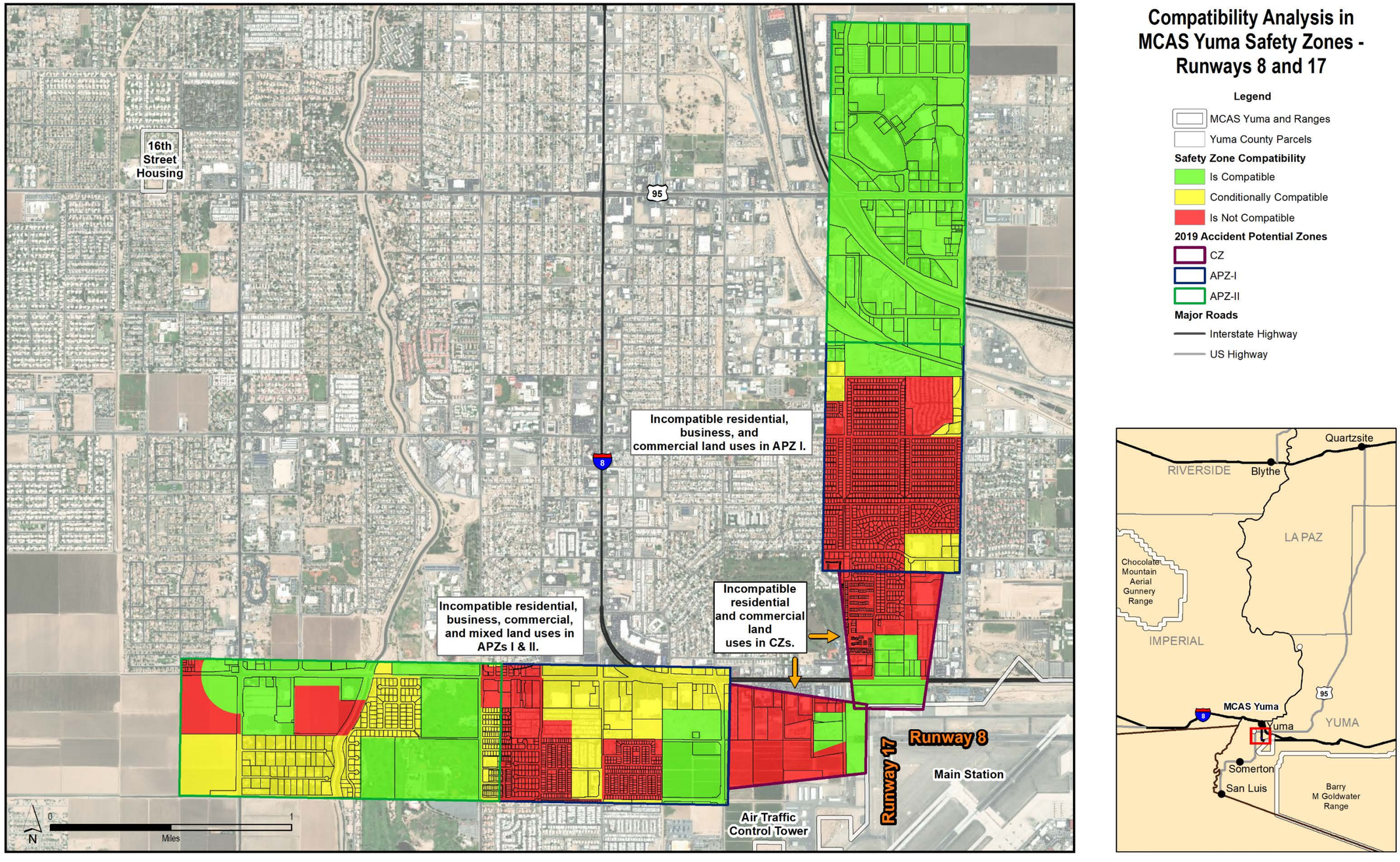

Figure 6-9. Compatibility Analysis in Runways 8 and 17

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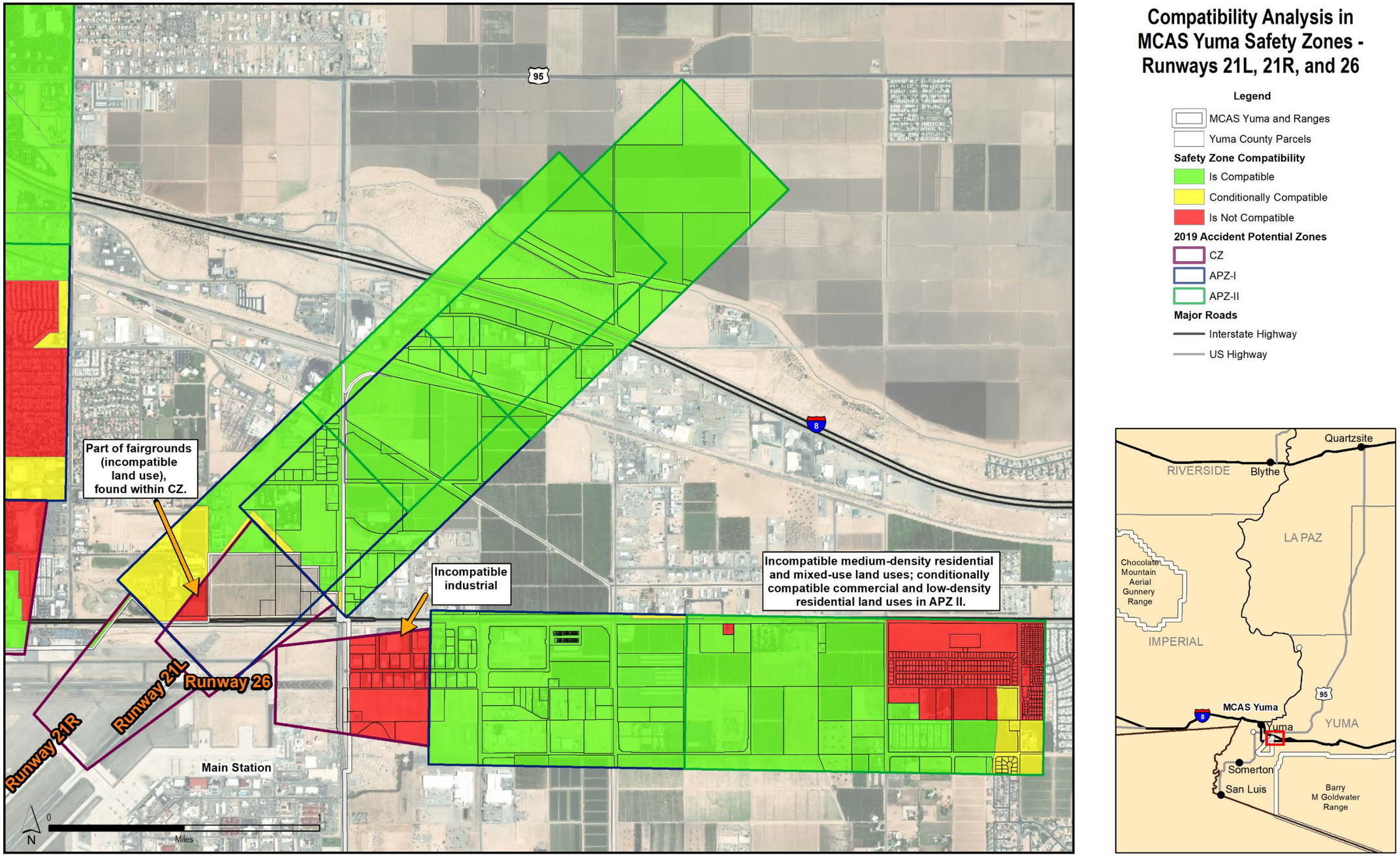

Figure 6-10. Compatibility Analysis in Runways 21R/L and 26

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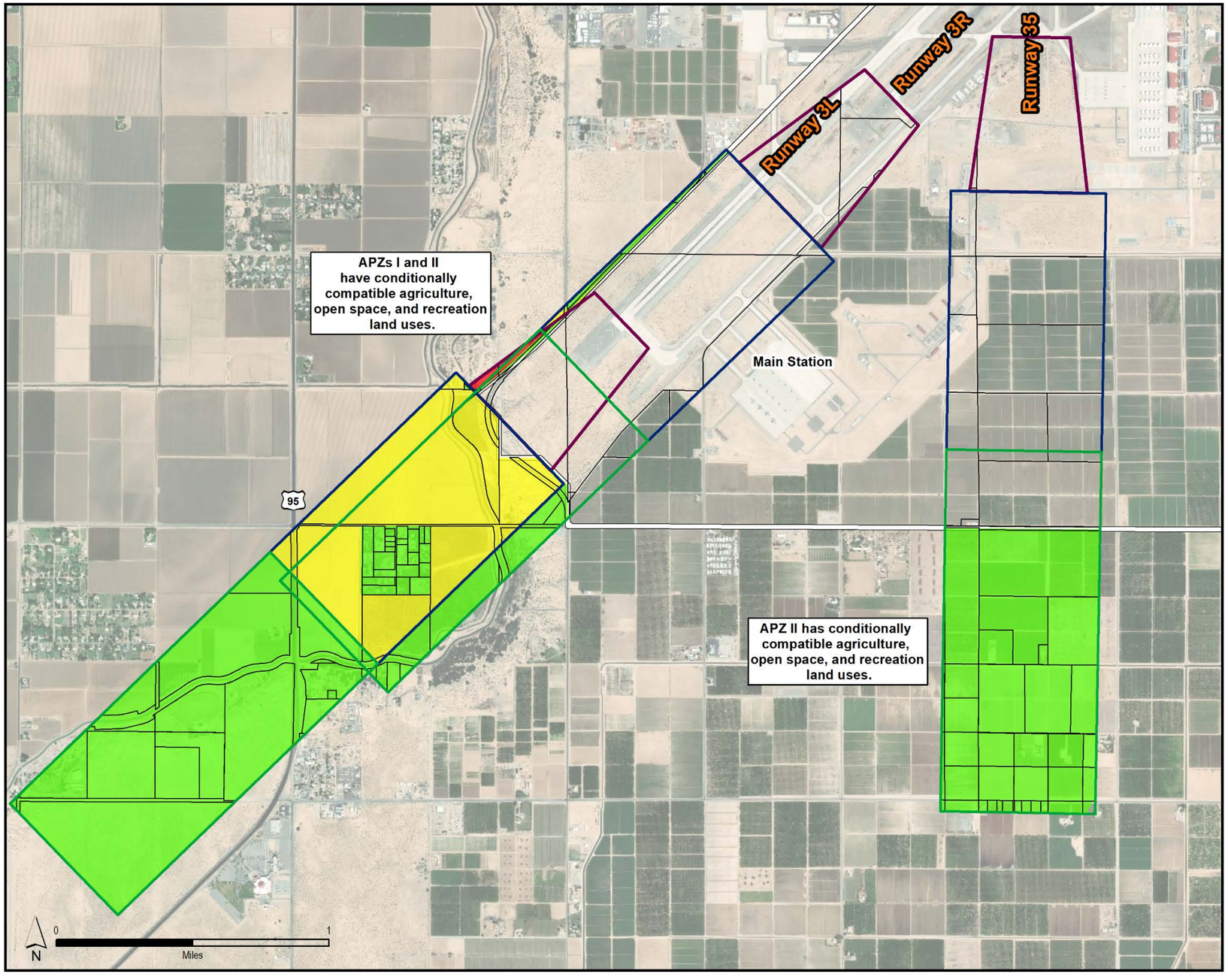

Compatibility Analysis in MCAS Yuma Safety Zones - Runways 3L, 3R, and 35

Legend

- MCAS Yuma and Ranges
- Yuma County Parcels

Safety Zone Compatibility

- Is Compatible
- Conditionally Compatible
- Is Not Compatible

2019 Accident Potential Zones

- CZ
- APZ-I
- APZ-II

Major Roads

- Interstate Highway
- US Highway

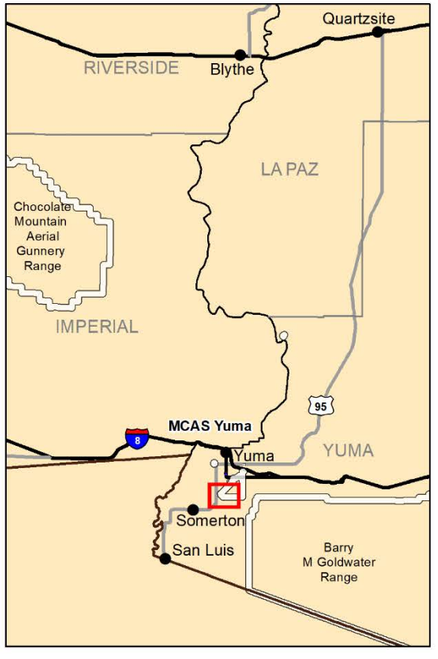

Figure 6-11. Compatibility Analysis in Runways 3R/L and 35

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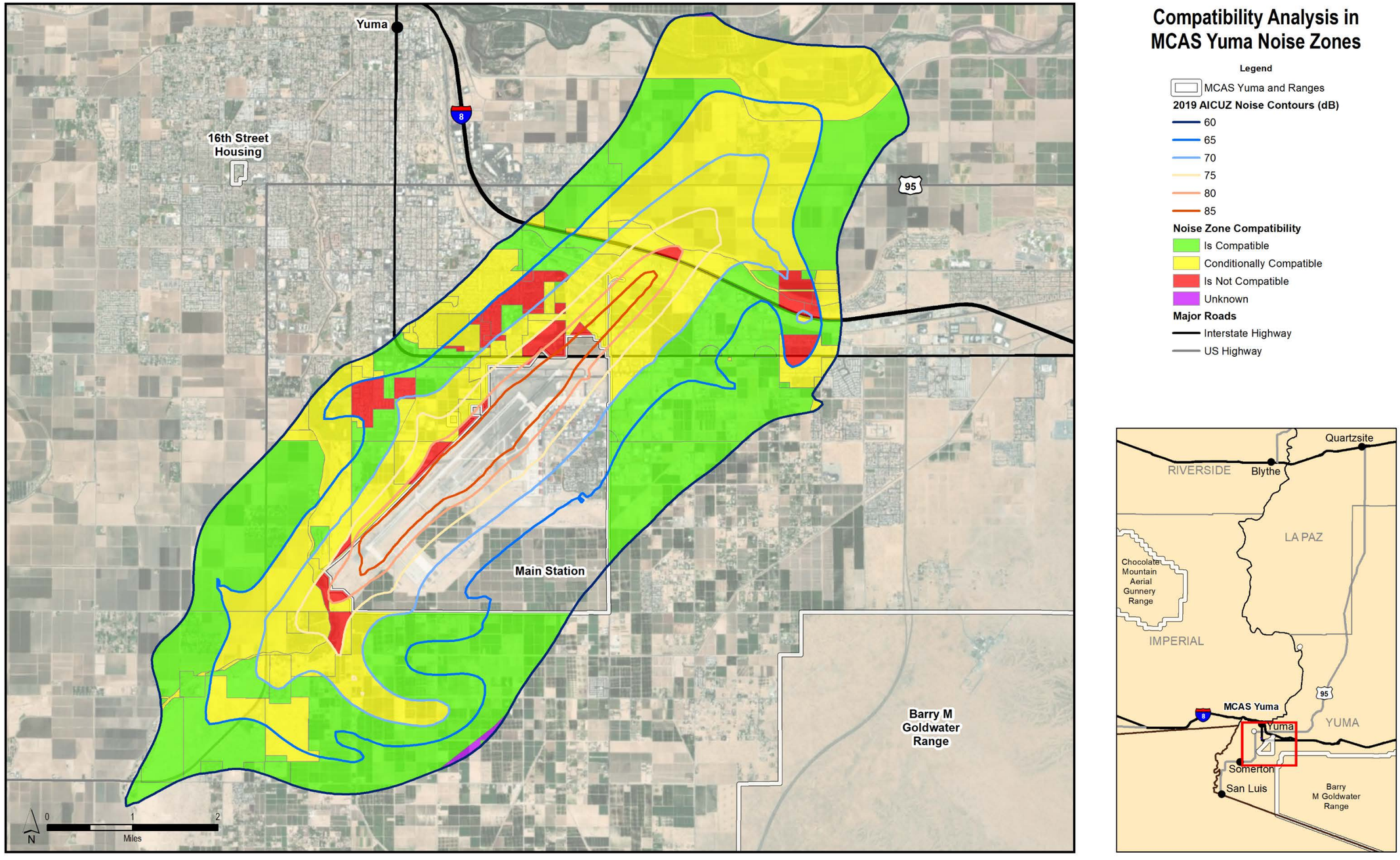

Figure 6-12. Compatibility Analysis in MCAS Noise Zones

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Runways 3/21 now show “bumps” to the northeast and southwest of the airfield that are a result of the F-35C FCLP training that could occur under the projected 2025 scenario. Note that these new noise contours do not extend beyond the existing Van Houten contours except to the northeast where two areas do lay outside the Van Houten contours in areas straight off the runway. These do not add to incompatibility concerns.

There are some areas of incompatibility that are found at the northeast ‘bump’ in the contours. Again, these areas lay within the Van Houten and have not increased the burden on incompatibility concerns that have existed for some time. The same is true for the incompatible area off the end of Runway 3R/L.

6.5.3 Ongoing Compatibility Concerns

There are two areas of continuing concern for the installation. The first is the Yuma County Fairgrounds, which is currently located on parcels within the CZ and APZ-I of the primary military use Runways 21L and 21R. The fairgrounds were established in the 1950s when there were no directives regarding APZs and fair operations were limited to an annual fair and livestock auctions. Today, the fairgrounds are in use 200 days annually and Yuma County Fairgrounds, Inc. is looking to expand facilities and allow for overnight residential parking by fairground guests in Recreational Vehicles/Tents, or other camping structures. Land use compatibility guidelines in MCO 11010.16 are that cultural, entertainment, and recreational uses are incompatible within CZs and outside events should normally be limited to assemblies of not more than 25 people per acre in APZ-I. The increase in use and people in the CZs and APZs increases the consequences of a mishap in terms of risks to the incompatible land use/persons if an accident were to occur. Also of concern is that large congregations of people are exposed to the noise impact of overflight at very low altitudes. (Note that there was a crash of a UH-1 on May 30, 1974 at the Yuma County Fairgrounds. The cause of the crash was undetermined. There was also a crash of a civil aircraft on August 27, 2018 at the Fairgrounds. The cause of the crash was an engine failure that led to an attempted emergency landing).

MCAS Yuma and the community have discussed the relocation of the fairground facilities in order to meet compatible land use requirements. In 2015, the City of Yuma, in cooperation with MCAS Yuma, commissioned a Yuma County Fairgrounds Relocation Feasibility Study. The study objectives included identifying suitable alternative fairground sites; short- and long-term cost projections for relocation, land acquisition, construction and maintenance, and utility access; developing information on constraints and options for repurposing the existing fairgrounds; and identifying environmental conditions and impacts, surrounding densities and zoning, noise levels, and proximity to projected growth for the alternative sites (OSD 2016). The feasibility study identified and assessed ten potential sites for the fairgrounds and ultimately presented three alternatives for consideration (City of Yuma 2016). However, property ownership and funding issues have prevented the fairgrounds from relocating. Many stakeholders believe it is cost-prohibitive to relocate the fairgrounds at this time. MCAS Yuma will continue to work with the community to make the area a compatible land use and assist when possible in future relocation efforts. The Navy entered into a Memorandum of Understanding (MOU) with the Bureau of Reclamation delineating crash zones, runway end zones and glide plane height restrictions. Unfortunately this MOU does not comply with AICUZ clear zone standards.

The Navy also condemned a 5-acre triangular portion of the Yuma County's right to use the land at that location for use as a "park, playground, or fairground". This condemnation applied to the County's limited interest and not the fee title. The Bureau of Reclamation continues to administer withdrawn lands covering

said 5-acre triangular parcel within Yuma County Fairgrounds (See **Figure 6-13**). However, MCAS Yuma's proposed 2019 AICUZ has identified Clear Zones and APZs affecting additional portions of Yuma County Fairgrounds similar to the existing federal and local encumbrances which are not compatible with military air operations per MCO 11010.16 (refer to **Figure 6-14**).

6.5.4 Future Concerns

The second area of concern is a proposed master-planned community, the Estancia development, with over 3,700 acres in the City of Yuma south of County 15th Street (City of Yuma 2012). The developer has proposed approximately 20,000 residential lots. Estancia is currently still in initial stages of development and is noted as one of the City's future growth areas. Based on available plans, it appears that the development would not be within noise zones associated with MCAS Yuma and/or BMGR-W operations (USMC 2010). However, with increased development in this area there is a potential for future infrastructure growth that might impact air station operations. The City of Yuma may desire to change some land development in this area to correspond to the updated noise contours presented by this AICUZ Study.

The change in noise contours may open up areas within Yuma County for residential development that were previously agricultural/industrial. Once development has occurred in an area, it is very hard to go back and protect that area. Careful consideration must be made to all the military operations that occur nearby.

6.5.5 Historical Perspective on Mishaps

Figure 6-15 depicts the locations of reportable incidents and mishaps that have occurred in the vicinity of MCAS Yuma since the last AICUZ (in 1977). Data was obtained from the Naval Safety Center (class "A" aviation mishaps) and from first responders at MCAS Yuma. Incidents recorded at the Naval Safety Center were usually recorded to the nearest minute of latitude and longitude before the proliferation of Global Positioning System devices (no survey-quality locations were recorded). This resulted in many approximate locations being recorded at a location roughly near the center of the airfield. First Responders at MCAS Yuma used their records to refine these positions, resulting in the locations seen in **Figure 6-15**. The figure includes both civil and military aircraft, as well as incidents that resulted from equipment – such as a bolt, ladder, etc. falling off a flying aircraft. The locations are shown relative to the new APZs and CZs resulting from this study. Note that military aviation mishaps below the level of class "A" (including "equipment incidents") and civilian aircraft mishaps are not represented in this depiction.

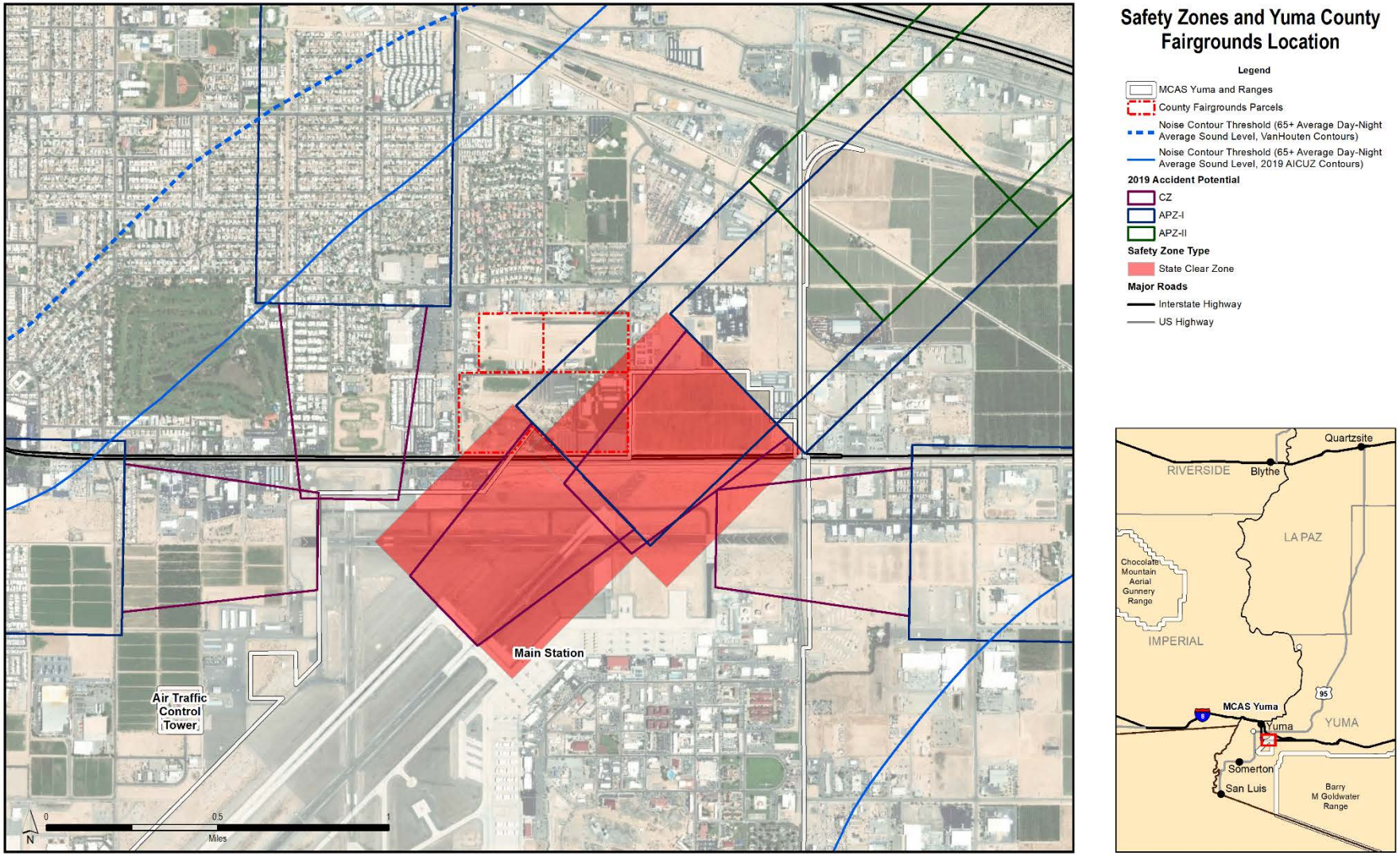


Figure 6-13 Safety Zones and Yuma County Fairgrounds Location

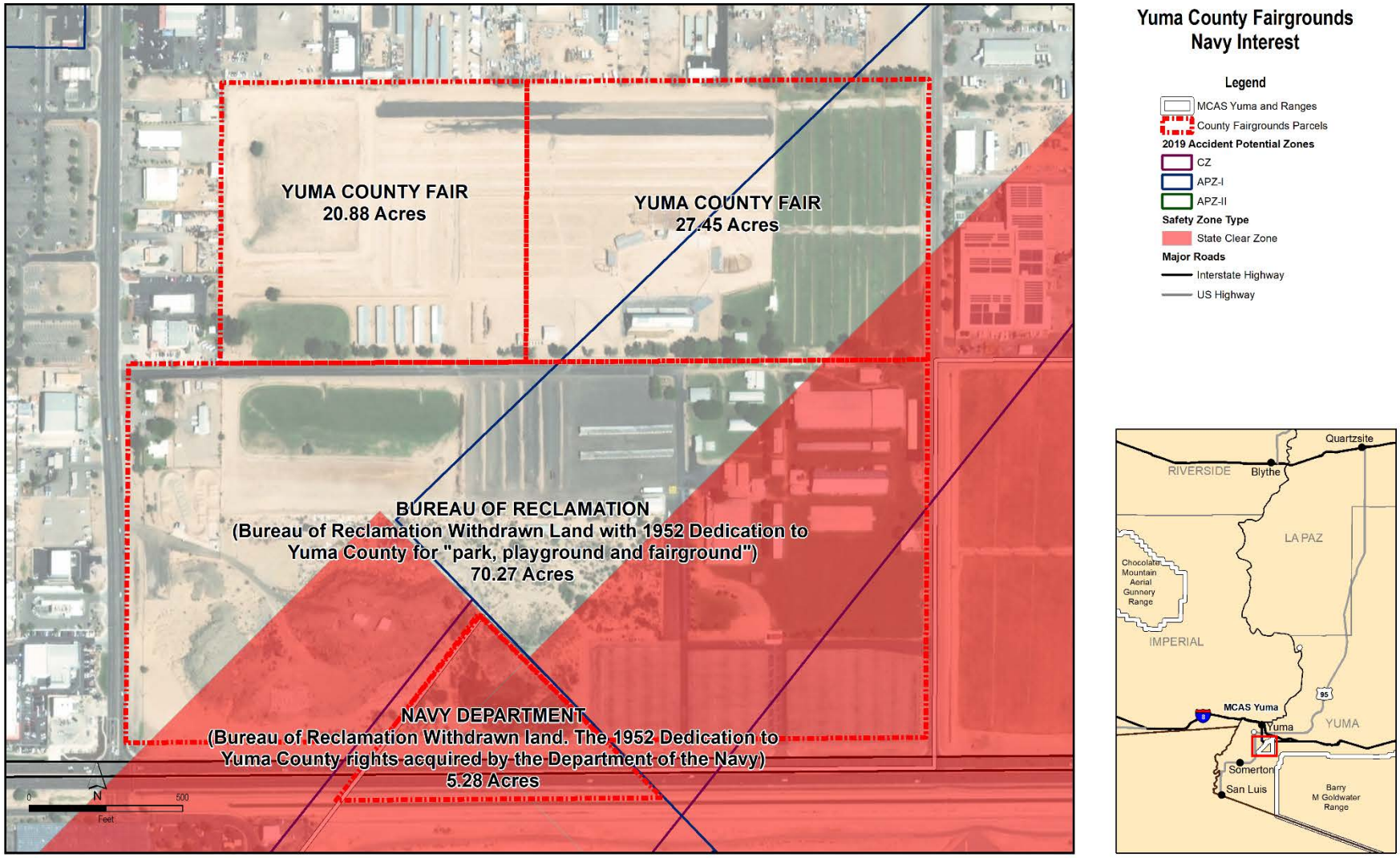
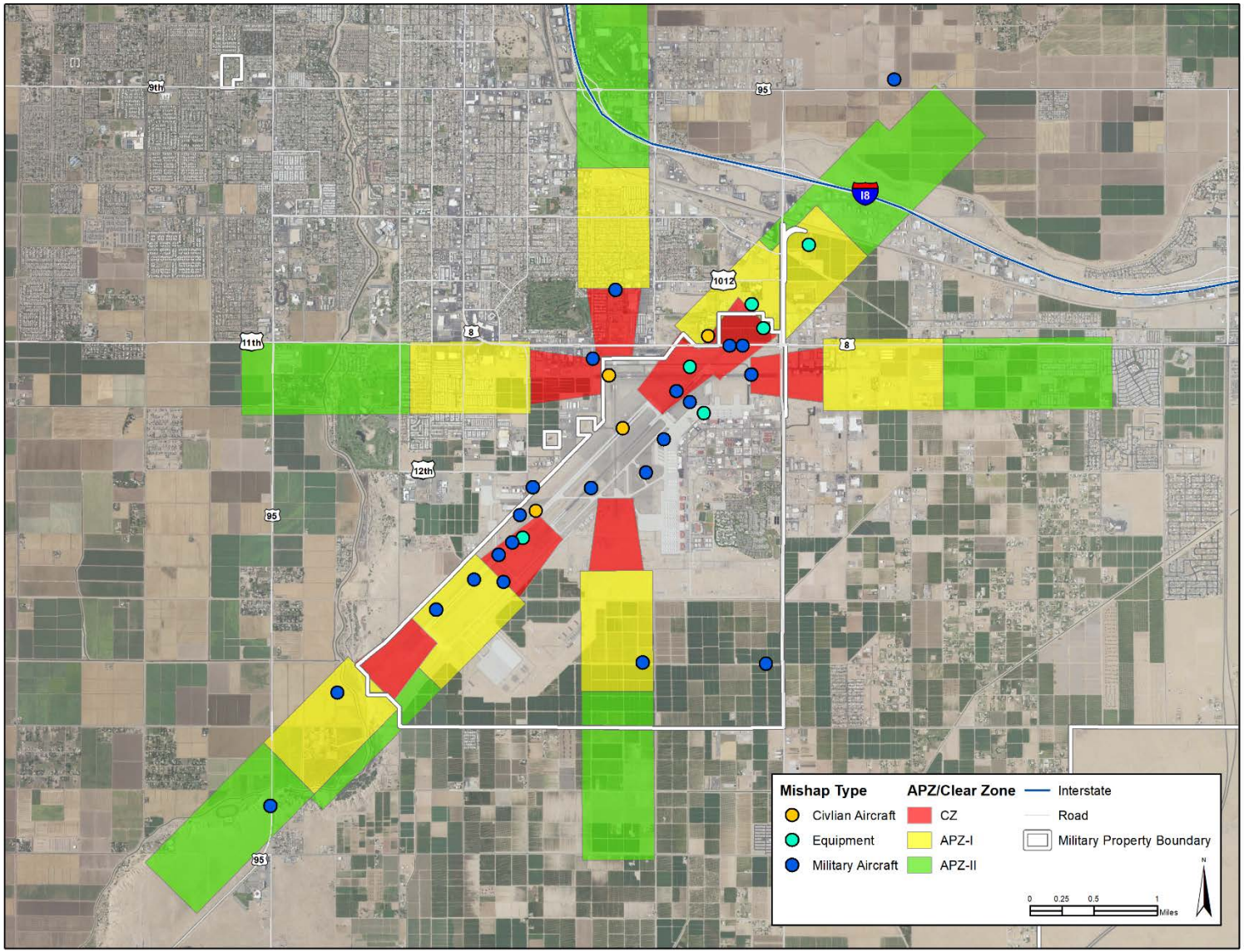


Figure 6-14 Yuma County Fairgrounds Navy Interest



Source: Naval Safety Center and First Responder Data

Figure 6-15 MCAS Yuma Reportable Incidents since 1977

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7

7.1 Recommendations

7.2 Implementation Strategies

7.3 Federal Tools and Programs

CHAPTER 7 AICUZ RECOMMENDATIONS AND STRATEGIES

The goals of the AICUZ Program are to protect the flying mission of the installation through compatible land use development and to protect public health and safety by working with local authorities and installation staffs to implement AICUZ Study recommendations.

This chapter discusses tools, alternative techniques, and recommendations that can be implemented to manage existing and future development within and around the AICUZ footprint. Successfully implementing AICUZ land use compatibility is the collective responsibility of the Marine Corps, federal, state, tribal, and regional governments, citizens, business owners, and real estate professionals.

A wide variety of land use strategies oriented toward the Marine Corps, federal, state, and local levels are available for encouraging compatible land use within the established AICUZ footprints for MCAS Yuma. This chapter identifies stakeholders and their roles and responsibilities as they relate to successful AICUZ implementation. The federal, state, and local land use planning tools are described along with recommendations for implementation.

The purpose of these tools and recommendations is to provide an information base for MCAS Yuma, local governments and agencies, and private citizens to use in exploring, modifying, combining, and implementing polices, plans, and regulations necessary to help ensure the goal of the AICUZ Program.

Although ultimate control over land use and development in the vicinity of MCAS Yuma is the responsibility of local governments, the Marine Corps has the ability and responsibility to conduct actions and implement programs in support of local efforts. At the installation level, the Installation Commander is responsible for ensuring a successful AICUZ Program. Pursuant to MCO 11010.16, the Installation Commander at MCAS Yuma is committed to and shall:

- Maintain an AICUZ Program for the air installation;
- Work with state and local planning officials to implement the objectives of the AICUZ Study;
- Continue to use the CPLO to assist in the execution of the AICUZ Study by the installation and to act as spokesperson for the Command regarding AICUZ matters;

- Promote attendance at AICUZ seminars by commanding officers, executive officers, air operations and traffic control facility officers, and other aviation related staff to increase awareness of current trends and techniques for AICUZ Program development and implementation;
- Provide assistance in developing AICUZ information, including operational data needed to update the AICUZ Study;
- Work with local decision makers in the surrounding communities to evaluate and justify the retention of land or interests in restrictive easements of land required for operational performance; and
- Notify the Chain-of-Command in the AICUZ Program office whenever local conditions merit update or review of the AICUZ Study.

7.1 RECOMMENDATIONS

Since the goals of the AICUZ Program are to protect the flying mission of the installation through compatible land use development and to protect public health and safety by working with local authorities and installation staff to implement AICUZ Study recommendations, an AICUZ report makes recommendations toward those goals. These recommendations include:

7.1.1 Continue Community Outreach and Engagement

The MCAS Yuma CPLO has long-standing experience conducting outreach and educating local and regional stakeholders and should continue these efforts at every opportunity. These stakeholders include state legislators and other state agencies, as well as local governments, realtors, developers, citizen groups and the general public. The MCAS Yuma CPLO should make presentations to local governments including the planning and zoning agencies. Appropriate subject matter includes the following:

- The AICUZ Program,
- The requirements of military aviation,
- Air station operations,
- Efforts underway and planned to reduce noise and ensure compatible development, and
- The local Command's position on specific land use issues.

7.1.2 Initiate Easement and Land Acquisition Where Opportunities Exist

Efforts and programs should focus on the CZs and APZ lands and lands within high noise zones. The acquisition of fee title or restrictive easements over the impacted lands should support the efforts of the updated 2019 AICUZ by addressing problematic areas outlined in Chapter 6, Section 6.5.

MCAS Yuma completed an Encroachment Control Plan (ECP) in 2017 to provide a prioritized action plan for that would protect and maintain mission capabilities. A part of the ECP, the Real Estate Acquisition Strategy (REAS), is an internal document that identifies the extent and scope of land protection required to prevent, mitigate, and repair factors that degrade or have the potential to degrade the installation's mission capabilities. The most recent REAS for MCAS Yuma, which was also completed in 2017, provides a prioritized action plan for achieving that end state that would protect and maintain mission capabilities. Strategies presented in the REAS consider a holistic approach with a combination of various encroachment buffering tools. That study has been coordinated with this AICUZ update to ensure a seamless effort for any easement or land acquisition strategies. As part of MCAS Yuma's overall strategy for minimizing

incompatible land use, the installation should work with Yuma County and the City of Yuma in support of any acquisition or conservation efforts. This includes the ongoing project to relocate the Yuma County Fairgrounds to a compatible location.

Potential solutions that may combine or leverage options that are beyond the more typical real estate acquisition and coordinated pursuits, such as a bond referendum and/or state or federal special legislation to address both the legal and funding authorities for a solution may be required. MCAS Yuma should continue to involve MCIWEST, MCICOM, and NAVFAC Real Estate in this strategy.

7.1.3 Continue to Engage in Local Planning Processes

The MCAS Yuma CPLO should continue to be active and engaged with comprehensive and other local planning efforts to participate in the full discussion and, to the extent possible, recommend and ensure compatible land uses within the AICUZ footprint.

The opportunities for the CPLO to attend planning meetings and similar venues should be taken full advantage of in order that the air station be able to provide input on compatible land uses in the vicinity of the installation. Providing input does not guarantee that it is accepted or agreed to; however, the potential for any mutual collaboration is much improved with participation.

The City of Yuma and Yuma County should continue to incorporate zoning ordinances that mirror state statutes and changes required by ARSs.

The City of Yuma and Yuma County have implemented several land use controls supporting MCAS Yuma missions around the installation and BMGR-W. The County restricted residential development around the BMGR-W to one dwelling unit (DU) per 5 acres and one DU per 2 acres depending on the location along the BMGR-W, and the City of Yuma implemented Estate Residential zoning to allow for less dense development in areas previously classified as Rural Density Residential. Range disclosures are recorded for properties within 3 miles of the BMGR-W. Avigation easements are recorded in a majority of instances for the City of Yuma for property within the area in the vicinity of a military airport. Avigation disclosures are recorded for City of Somerton, Yuma County, Town of Wellton, and City of San Luis when applicable.

The City of Yuma's Airport Overlay District is intended to prevent incompatible land uses within noise zones, CZs, and/or APZs. "Noise zones" are areas within noise contours established by the Van Houten study. The City prohibits the construction of single-family, two-family, multi-family, manufactured housing, and recreation vehicles and residential group quarters are expressly considered inconsistent and not compatible with airport operations. This restriction does not apply to land uses or development plans approved on or before December 31, 2000 except that the development must comply with sound attenuation standards. The Airport Overlay District land use matrix associated with this District (**Figure 6-7**) identifies land uses that are considered inconsistent and incompatible with noise, APZs, and CZs. The definition of safety zones are based on Arizona State law (ARS 28-8461), which are generally similar to Department of Navy definitions for an APZ. They include Approach/Departure Corridor as well as RADSA and AIOD off the ends of Runways 8 and 26.

7.1.4 Actively Participate in Partnerships

Another facet of the AICUZ process is to develop partnerships with the intention of working to mitigate or minimize encroachment impacts to mission. This is in addition to any real estate acquisition strategies. These partnerships include local, state and regional efforts to cooperate and coordinate in managing urban

growth, energy, water, transportation and other cross-jurisdictional and regional issues to ensure impacts to military mission are considered and mitigated to the maximum extent possible.

7.1.5 Continue Noise-Inquiry-Monitoring and Response System

MCAS Yuma maintains a noise complaint hotline and keeps track of the location and other details of the complaints. The installation should continue to record all noise complaints and periodically review them to see whether there are locational trends in the complaints. Responding to complainants allows the installation to continue to inform the complainant about future expected noise events, and to gather information about the noise event, such as whether the installation was responsible for the noise impact and whether it was a one-time or recurring impact.

7.2 IMPLEMENTATION STRATEGIES

7.2.1 General

In general, implementing the AICUZ requires being proactive about the future. This includes using available tools and remaining vigilant about any potential incompatible land uses that could affect the military's mission.

7.2.2 Air Station

7.2.2.1 Overall Strategy

MCAS Yuma is adopting the Van Houten noise contours and identifying DoN clear zones and accident potential zones for each runway. This AICUZ footprint and MCO 11010.16 will be utilized for evaluating land use compatibility in noise and safety zones.

7.2.2.2 Follow-On Actions

MCAS Yuma staff should continue to provide informational briefs on a regular basis to residential and commercial real estate firms, community organizations, business groups, and private citizens. These briefs should explain MCAS Yuma's role in Marine Corps air operations, the nature and the importance of flight operations that occur at MCAS Yuma, and the objectives and achievements of the AICUZ Program. Information should be shared concerning the specific actions the Marine Corps and the local municipalities have already taken to manage encroachment in the area, as well as the requirements for state-mandated residential sale/lease noise disclosures and sound attenuation. The Communication Strategy and Operations Office (Public Affairs Office) should continue to inform the public of upcoming events such as WTI, the MCAS Yuma Airshow and airshow practices, and any other events that may have an impact on the local community.

The staff should coordinate closely on any proposed development within or in the vicinity of the AICUZ footprint. It is also important to brief incoming operational staff on the AICUZ Program, its purpose and goals. It remains imperative to communicate with local officials in matters pertaining to land use and airspace that have the potential to impact mission.

7.2.3 Local and State/Regional Government

MCAS Yuma recommends local municipalities retain the current Van Houten noise contours and adopt within their respective Comprehensive/General Plans and Zoning regulations the DoN CZs and APZs for all runways as identified in this AICUZ Study. Retaining the Van Houten noise contours will avoid the

'accordion effect' of modifying contours with future aircraft platforms and avoids the potential for future incompatible development within the noise contours, CZs and APZs. These recommendations, if adopted by local municipalities, would only affect future approvals on land use and/or modifications on existing development. The intent is to avoid compounding any current land use incompatibilities while recognizing that such incompatibilities currently exist.

The following are local and state or regional opportunities and statutory tools to encourage compatible land uses in the vicinity of a military installation:

- **Military Affairs Commission (MAC) and Military Installation Fund (MIF).** The MAC was created in 2004 by ARS §26-261 to advise the State Executive and Legislative Branches on pertinent issues relating to the military and installations throughout Arizona. They strive to protect the strategic missions of military installations within Arizona. The MIF provides funding to Arizona military installations to acquire private property or real estate, property rights, management rights, and infrastructure that supports the preservation of military missions. Initially, the MIF provided $5 million in funding for cities to fund applicable and necessary studies and allow private citizens to sell lands that were unable to be developed. In 2015, the MIF was reduced to $1.8 million to acquire properties throughout the state. These properties are held by Department of Emergency and Military Affairs (DEMA) or Veterans Affairs (AZ DEMA 2016).
- **The Preservation of Military Airports Act (2001) (ARS §9-461.06)** requires localities within the vicinity of a military facility or airport to consider military airport operations in their comprehensive plans and implement zoning changes that support compatible land uses near military airports. These localities must also provide the military airport with a notice and the opportunity to comment on local land use proposals (National Conference on State Legislature 2013, State of Arizona 2016).
- **ARS §28-8481** expands on the 2001 law by requiring localities within the vicinity of a military airport to mandate sound attenuation standards for new dwellings in high noise zone. The Act requires owners to notify prospective owners or renters about the property's location in a high noise zone or APZ (State of Arizona 2016).
- **ARS §28-8461** defines the military auxiliary airfields and related CZs, high noise zones, and APZs in Arizona. The statute defines the area considered "within the vicinity" of MCAS Yuma as extending 5 miles to the north, south, and west, and 10 miles to the east, from the center of the runway. It also includes AUX-2 on BMGR-W as an "ancillary military facility" (State of Arizona 2016).
- **ARS. §32-2114** requires the state real estate department to map Military Training Routes (MTRs) in the state, and requires localities to disclose the location of properties under MTRs in the public land record (State of Arizona 2016).

It is important to encourage local, state and regional entities to collaborate and coordinate encroachment mitigation efforts to discourage incompatible development around the installation and training areas.

Tribal governments are recognized as sovereign nations by the Federal Government. With several reservations located in the vicinity of both the air station and the BMGR-W, compatible land uses become important for both the various tribes and the military. Cooperation and coordination is appropriate between the air station and reservations regarding land uses.

7.2.4 Private Sector (Developers, Land Managers)

Private sector responsibilities include coordination and collaboration to the best or maximum extent possible with planning and zoning authorities to understand local and regional long-range land use planning goals. Developers and cellular communications companies are to coordinate with planners and CPLO for all tower requests to ensure there is no impact on MCAS Yuma in relation to heights or frequency interference. All development must meet the requirements of 14 CFR Part 77.9 and construction proposals include FAA notification through filing of a Notice of Proposed Construction or Alteration (FAA Form 7460-1), which is the normal process for Government agencies to be informed of, and have a chance to comment on, potential construction that may encroach on navigable airspace in the vicinity of an airport.

7.3 FEDERAL TOOLS AND PROGRAMS

Federal-level regulations and programs that can be used to mitigate development within the AICUZ footprint include:

7.3.1 Public Land Acquisition

In accordance with MCO 11010.16, the Marine Corps is permitted to acquire interest in properties (acquisition) to protect the operational integrity of its air installations. When threats to operational integrity from incompatible development are identified, and when local communities are unwilling or unable to take the initiative to address the threat using their own authority, consideration can be given to land acquisition.

The first priority for acquisition, whether in fee or by restrictive easement, is the CZ. The second priority is other APZs. Noise zones, outside the CZs and APZs, may be considered for acquisition only when all avenues of achieving compatible use zoning or similar protection have been explored and the operational integrity of the installation is clearly threatened. Land can be purchased through negotiation and voluntary agreement of the land, or it can be through condemnation procedures using the power of eminent domain. Other possible actions for acquiring interest in land include easement acquisition, leasehold agreements, development right purchase, and fee title acquisition for full property ownership.

7.3.2 DoD REPI and Encroachment Partnering Program

The Readiness and Environmental Protection Integration (REPI) Program is administered by the OSD. The REPI Program protects the military mission by helping remove or avoid land use conflicts near installations and addressing regulatory restrictions that inhibit military activities.

A key component of the REPI Program is the use of buffer partnerships among the Military services, private conservation groups, and state and local governments, authorized by Congress at 10 United States Code (U.S.C.) § 2684a. These win-win partnerships share the cost of acquisition of easements or other interests in land from willing sellers to preserve compatible land uses and natural habitats near installations and ranges that helps sustain critical, at-risk military mission capabilities.

Title 10 U.S.C. § 2684a authorizes the Secretary of Defense or the Secretary of a military department to enter into agreements with an eligible entity or entities to address the use or development of real property in the vicinity of, or ecologically related to, a military installation or military airspace. Eligible entities include a state, a political subdivision of a state, and a private entity that has, as its principal organizational purpose or goal, the conservation, restoration, or preservation of land and natural resources, or a similar purpose or goal.

Encroachment Partnering (EP) agreements provide for an eligible entity to acquire fee title, or a lesser interest, in land for limiting encroachment. The DoD can share the real estate acquisition costs for projects that support the purchase of fee or conservation or other restrictive easement for such property. The eligible entity negotiates and acquires the real estate interest for partnering projects with a voluntary seller. The eligible entity must transfer the agreed upon restrictive easement interest to the United States of America upon the request of the Secretary.

It is recommended that MCAS Yuma establish an EP program.

7.3.3 Environmental Review

Federal agencies, including the Marine Corps, are required to consider the environmental impacts of any federal project, which could impact the environment by conducting a comprehensive environmental review. The National Environmental Policy Act mandates evaluation of the potential environmental effects resulting from proposed federal actions, approvals, or funding. Impacts of the action are generally documented in a Categorical Exclusion, an Environmental Assessment or an Environmental Impact Statement. The environmental review process represents an excellent means for incorporating the fundamentals of the AICUZ Study in the planning review process of a project.

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APPENDIX A
COMPATIBILITY GUIDANCE

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OPNAVINST 11010.36C
MCO 11010.16
9 Oct 2008

TABLE 1 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES

Land Use		Suggested Land Use Compatibility						
		Noise Zone 1 (DNL or CNEL)		Noise Zone 2 (DNL or CNEL)		Noise Zone 3 (DNL or CNEL)		
SLUCM NO	LAND USE NAME	< 55	55- 64	65 - 69	70 -74	75- 79	80 -84	85+
10	***Residential***							
11	Household Units	Y	Y[1]	N[1]	N[1]	N	N	N
11.11	Single units: detached	Y	Y[1]	N[1]	N[1]	N	N	N
11.12	Single units: semidetached	Y	Y[1]	N[1]	N[1]	N	N	N
11.13	Single units: attached row	Y	Y[1]	N[1]	N[1]	N	N	N
11.21	Two units: side-by-side	Y	Y[1]	N[1]	N[1]	N	N	N
11.22	Two units: one above the other	Y	Y[1]	N[1]	N[1]	N	N	N
11.31	Apartments: walk-up	Y	Y[1]	N[1]	N[1]	N	N	N
11.32	Apartment: elevator	Y	Y[1]	N[1]	N[1]	N	N	N
12	Group quarters	Y	Y[1]	N[1]	N[1]	N	N	N
13	Residential Hotels	Y	Y[1]	N[1]	N[1]	N	N	N
14	Mobile home parks or courts	Y	Y[1]	N	N	N	N	N
15	Transient lodgings	Y	Y[1]	N[1]	N[1]	N[1]	N	N
16	Other residential	Y	Y[1]	N[1]	N[1]	N	N	N
20	***Manufacturing***							
21	Food & kindred products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
22	Textile mill products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
23	Apparel and other finished products; products made from fabrics, leather and similar materials; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
24	Lumber and wood products (except furniture); manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
25	Furniture and fixtures; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
26	Paper and allied products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
28	Chemicals and allied products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
29	Petroleum refining and related industries	Y	Y	Y	Y[2]	Y[3]	Y[4]	N

3-13 Enclosure (1)

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OPNAVINST 11010.36C
MCO 11010.16
9 Oct 2008

TABLE 1 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES (Continued)

Land Use		Suggested Land Use Compatibility						
		Noise Zone 1 (DNL or CNEL)		Noise Zone 2 (DNL or CNEL)		Noise Zone 3 (DNL or CNEL)		
SLUCM NO.	LAND USE NAME	< 55	55- 64	65 - 69	70 -74	75- 79	80 -84	85+
30	***Manufacturing (continued)***							
31	Rubber and misc. plastic products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
32	Stone, clay and glass products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
33	Primary metal products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
34	Fabricated metal products; manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
35	Professional scientific, and controlling instruments; photographic and optical goods; watches and clocks	Y	Y	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
40	***Transportation, communication and utilities***							
41	Railroad, rapid rail transit, and street railway transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
42	Motor vehicle transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
43	Aircraft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
44	Marine craft transportation	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
45	Highway and street right-of-way	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
46	Automobile parking	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
47	Communication	Y	Y	Y	25[5]	30[5]	N	N
48	Utilities	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
49	Other transportation, communication and utilities	Y	Y	Y	25[5]	30[5]	N	N
50	***Trade***							
51	Wholesale trade	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
52	Retail trade - building materials, hardware and farm equipment	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
53	Retail trade - shopping centers	Y	Y	Y	25	30	N	N
54	Retail trade - food	Y	Y	Y	25	30	N	N
55	Retail trade - automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade - apparel and accessories	Y	Y	Y	25	30	N	N

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TABLE 1 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES (Continued)

Land Use		Suggested Land Use Compatibility						
		Noise Zone 1 (DNL or CNEL)		Noise Zone 2 (DNL or CNEL)		Noise Zone 3 (DNL or CNEL)		
SLUCM NO.	LAND USE NAME	< 55	55- 64	65 - 69	70 -74	75- 79	80 -84	85+
57	Retail trade - furniture, home, furnishings and equipment	Y	Y	Y	25	30	N	N
58	Retail trade - eating and drinking establishments	Y	Y	Y	25	30	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N
60	***Services***							
61	Finance, insurance and real estate services	Y	Y	Y	25	30	N	N
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y[2]	Y[3]	Y[4,11]	Y[4,11]
63	Business services	Y	Y	Y	25	30	N	N
63.7	Warehousing and storage	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
64	Repair Services	Y	Y	Y	Y[2]	Y[3]	Y[4]	N
65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, other medical fac.	Y	Y[1]	25	30	N	N	N
65.16	Nursing Homes	Y	Y	N[1]	N[1]	N	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Government Services	Y	Y[1]	Y[1]	25	30	N	N
68	Educational services	Y	Y[1]	25	30	N	N	N
69	Miscellaneous	Y	Y	Y	25	30	N	N
70	***Cultural, entertainment and recreational***							
71	Cultural activities (& churches)	Y	Y[1]	25	30	N	N	N
71.2	Nature exhibits	Y	Y[1]	Y[1]	N	N	N	N
72	Public assembly	Y	Y[1]	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	Y	Y[1]	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y	Y	Y[7]	Y[7]	N	N	N
73	Amusements	Y	Y	Y	Y	N	N	N
74	Recreational activities (include golf courses, riding stables, water rec.)	Y	Y[1]	Y[1]	25	30	N	N
75	Resorts and group camps	Y	Y[1]	Y[1]	Y[1]	N	N	N
76	Parks	Y	Y[1]	Y[1]	Y[1]	N	N	N
79	Other cultural, entertainment and recreation	Y	Y[1]	Y[1]	Y[1]	N	N	N
80	***Resource Production and Extraction***							
81	Agriculture (except live stock)	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]

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TABLE 1 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES (Continued)

Land Use		Suggested Land Use Compatibility						
		Noise Zone 1 (DNL or CNEL)		Noise Zone 2 (DNL or CNEL)		Noise Zone 3 (DNL or CNEL)		
SLUCM NO.	LAND USE NAME	< 55	55- 64	65 - 69	70 -74	75- 79	80 -84	85+
81.5	Livestock farming	Y	Y	Y[8]	Y[9]	N	N	N
81.7	Animal breeding	Y	Y	Y[8]	Y[9]	N	N	N
82	Agriculture related activities	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
83	Forestry Activities	Y	Y	Y[8]	Y[9]	Y[10]	Y[10,11]	Y[10,11]
84	Fishing Activities	Y	Y	Y	Y	Y	Y	Y
85	Mining Activities	Y	Y	Y	Y	Y	Y	Y
89	Other resource production or extraction	Y	Y	Y	Y	Y	Y	Y

KEY TO TABLE 1 - SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES

SLUCM	Standard Land Use Coding Manual, U.S. Department of Transportation
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
Y[x] (Yes with Restrictions)	The land use and related structures are generally compatible. However, see note(s) indicated by the superscript.
N[x] (No with exceptions)	The land use and related structures are generally incompatible. However, see notes indicated by the superscript.
NLR (Noise Level Reduction)	NLR (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35	The numbers refer to NLR levels. Land Use and related structures generally compatible however, measures to achieve NLR of 25, 30 or 35 must be incorporated into design and construction of structures. However, measures to achieve an overall noise reduction do not necessarily solve noise difficulties outside the structure and additional evaluation is warranted. Also, see notes indicated by superscripts where they appear with one of these numbers.
DNL	Day Night Average Sound Level.
CNEL	Community Noise Equivalent Level (normally within a very small decibel difference of DNL)
Ldn	Mathematical symbol for DNL.

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NOTES FOR TABLE 1 - SUGGESTED LAND USE COMPATIBILITY IN NOISE ZONES

1. General

a. Although local conditions regarding the need for housing may require residential use in these zones, residential use is discouraged in DNL 65 to 69 and strongly discouraged in DNL 70 to 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.

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

c. Normal permanent construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation, 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 and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure NLR particularly from ground level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures that only protect interior spaces.

2. Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

3. Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the

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public is received, office areas, noise sensitive areas or where the normal noise level is low.

4. Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.

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

6. No buildings.

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

8. Residential buildings require a NLR of 25

9. Residential buildings require a NLR of 30.

10. Residential buildings not permitted.

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

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TABLE 2 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES [1]

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation	APZ-I Recommendation	APZ-II Recommendation	Density Recommendation
10	Residential				
11	Household Units				
11.11	Single units: detached	N	N	Y[2]	Max density of 1-2 Du/Ac
11.12	Single units: semidetached	N	N	N	
11.13	Single units: attached row	N	N	N	
11.21	Two units: side-by-side	N	N	N	
11.22	Two units: one above the other	N	N	N	
11.31	Apartments: walk-up	N	N	N	
11.32	Apartment: elevator	N	N	N	
12	Group quarters	N	N	N	
13	Residential Hotels	N	N	N	
14	Mobile home parks or courts	N	N	N	
15	Transient lodgings	N	N	N	
16	Other residential	N	N	N	
20	Manufacturing [3]				
21	Food & kindred products; manufacturing	N	N	Y	Max FAR 0.56 in APZ II
22	Textile mill products; manufacturing	N	N	Y	Same as above
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	Max FAR of 0.28 in APZ I & 0.56 in APZ II
25	Furniture and fixtures; manufacturing	N	Y	Y	Same as above
26	Paper and allied products; manufacturing	N	Y	Y	Same as above
27	Printing, publishing, and allied industries	N	Y	Y	Same as above
28	Chemicals and allied products; manufacturing	N	N	N	
29	Petroleum refining and related industries	N	N	N	
30	Manufacturing [3] (continued)				

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TABLE 2 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES [1]

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation	APZ-I Recommendation	APZ-II Recommendation	Density Recommendation
31	Rubber and misc. plastic products; manufacturing	N	N	N	
32	Stone, clay and glass products; manufacturing	N	N	Y	Max FAR 0.56 in APZ II
33	Primary metal products; manufacturing	N	N	Y	Same as above
34	Fabricated metal. products; manufacturing	N	N	Y	Same as above
35	Professional scientific, & controlling instrument; photographic and optical goods; watches & clocks	N	N	N	
39	Miscellaneous manufacturing	N	Y	Y	Max FAR of 0.28 in APZ I & 0.56 in APZ II
40	Transportation, communication & utilities [4]				
41	Railroad, rapid rail transit, and street railway transportation	N	Y[5]	Y	Same as above.
42	Motor vehicle transportation	N	Y[5]	Y	Same as above
43	Aircraft transportation	N	Y[5]	Y	Same as above
44	Marine craft transportation	N	Y[5]	Y	Same as above
45	Highway and street right-of-way	N	Y[5]	Y	Same as above
46	Auto parking	N	Y[5]	Y	Same as above
47	Communication	N	Y[5]	Y	Same as above
48	Utilities	N	Y[5]	Y	Same as above
485	Solid waste disposal (Landfills, incineration, etc.)	N	N	N	
49	Other transport, comm. and utilities	N	Y[5]	Y	See Note 5 below
50	Trade				
51	Wholesale trade	N	Y	Y	Max FAR of 0.28 in APZ I. & .56 in APZ II.
52	Retail trade - building materials, hardware and farm equipment	N	Y	Y	See Note 6 below
53	Retail trade - Shopping centers, Home Improvement Store, Discount Club, Electronics Superstore	N	N	Y	Max FAR of 0.16 in APZ II
54	Retail trade - food	N	N	Y	Max FAR of 0.24 in APZ II

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TABLE 2 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES [1]

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation	APZ-I Recommendation	APZ-II Recommendation	Density Recommendation
55	Retail trade - automotive, marine craft, aircraft and accessories	N	Y	Y	Max FAR of 0.14 in APZ I & 0.28 in APZ II
56	Retail trade - apparel and accessories	N	N	Y	Max FAR 0.28 in APZ II
57	Retail trade - furniture, home, furnishings and equipment	N	N	Y	Same as above
58	Retail trade - eating and drinking establishments	N	N	N	
59	Other retail trade	N	N	Y	Max FAR of 0.16 in APZ II
60	Services				
61	Finance, insurance and real estate services	N	N	Y	Max FAR of 0.22 for "General Office/Office park" in APZ II
62	Personal services	N	N	Y	Office uses only. Max FAR of 0.22 in APZ II.
62.4	Cemeteries	N	Y[9]	Y[9]	
63	Business services (credit reporting; mail, stenographic, reproduction; advertising)	N	N	Y	Max FAR of 0.22 in APZ II
63.7	Warehousing and storage services	N	Y	Y	Max FAR 1.0 APZ I; 2.0 in APZ II
64	Repair Services	N	Y	Y	Max FAR of 0.11 APZ I; 0.22 in APZ II
65	Professional services	N	N	Y	Max FAR of 0.22 in APZ II
65.1	Hospitals, nursing homes	N	N	N	
65.1	Other medical facilities	N	N	N	
66	Contract construction services	N	Y	Y	Max FAR of 0.11 APZ I; 0.22 in APZ II
67	Government Services	N	N	Y	Max FAR of 0.24 in APZ II
68	Educational services	N	N	N	
69	Miscellaneous	N	N	Y	Max FAR of 0.22 in APZ II
70	Cultural, entertainment and recreational				
71	Cultural activities	N	N	N	
71.2	Nature exhibits	N	Y[10]	Y[10]	
72	Public assembly	N	N	N	
72.1	Auditoriums, concert halls	N	N	N	
72.11	Outdoor music shells, amphitheaters	N	N	N	

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TABLE 2 - AIR INSTALLATIONS COMPATIBLE USE ZONES
SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES [1]

SLUCM NO.	LAND USE NAME	CLEAR ZONE Recommendation	APZ-I Recommendation	APZ-II Recommendation	Density Recommendation
72.2	Outdoor sports arenas, spectator sports	N	N	N	
73	Amusements - fairgrounds, miniature golf, driving ranges; amusement parks, etc	N	N	Y	
74	Recreational activities (including golf courses, riding stables, water recreation)	N	Y[10]	Y[10]	Max FAR of 0.11 APZ I; 0.22 in APZ II
75	Resorts and group camps	N	N	N	
76	Parks	N	Y[10]	Y[10]	Same as 74
79	Other cultural, entertainment and recreation	N	Y[9]	Y[9]	Same as 74
80	[illegible]				
81	Agriculture (except live stock)	Y[4]	Y[11]	Y[11]	
81.5, 81.7	Livestock farming and breeding	N	Y[11,12]	Y[11,12]	
82	Agriculture related activities	N	Y[11]	Y[11]	Max FAR of 0.28 APZ I; 0.56 APZ II no activity which produces smoke, glare, or involves explosives
83	Forestry Activities [13]	N	Y	Y	Same as Above
84	Fishing Activities [14]	N[14]	Y	Y	Same as Above
85	Mining Activities	N	Y	Y	Same as Above
89	Other resource production or extraction	N	Y	Y	Same as Above
90	Other				
91	Undeveloped Land	Y	Y	Y	
93	Water Areas	N[15]	N[15]	N[15]	

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KEY TO TABLE 2 - SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES

SLUCM -	Standard Land Use Coding Manual, U.S. Department of Transportation
Y (Yes) -	Land use and related structures are normally compatible without restriction.
N (No) -	Land use and related structures are not normally compatible and should be prohibited.
Yx - (Yes with restrictions)	The land use and related structures are generally compatible. However, see notes indicated by the superscript.
Nx - (No with exceptions)	The land use and related structures are generally incompatible. However, see notes indicated by the superscript.
FAR - Floor Area Ratio	A floor area ratio is the ratio between the square feet of floor area of the building and the site area. It is customarily used to measure non-residential intensities.
Du/Ac - Dwelling Units per Acre	This metric is customarily used to measure residential densities.

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NOTES FOR TABLE 2 - SUGGESTED LAND USE COMPATIBILITY IN ACCIDENT POTENTIAL ZONES

The following notes refer to Table 2.

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 installations and local governments, general suggestions as to FARs are provided as a guide to density in some categories. In general, land use restrictions which limit commercial, services, or industrial buildings or structure occupants to 25 per acre in APZ I, and 50 per acre in APZ II are the range of occupancy levels, including employees, considered to be low density. Outside events should normally be limited to assemblies of not more that 25 people per acre in APZ I, and Maximum (Max) assemblies of 50 people per acre in APZ II.

2. The suggested Max density for detached single-family housing is one to two 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 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), buildings or aboveground utility/communications lines should normally be located in clear zone areas on or off the installation. The clear zone is subject to severe restrictions. See UFC 3-260-01, "Airfield and Heliport Planning and Design" dated 10 November 2001 for specific design details.

5. No passenger terminals and no major above ground transmission lines in APZ I.

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6. Within SLUCM Code 52, Max FARs for lumber yards (SLUCM Code 521) are 0.20 in APZ-I and 0.40 in APZ-II. For hardware/paint and farm equipment stores, SLUCM Code 525, the Max FARs are 0.12 in APZ-I and 0.24 in APZ-II.

7. 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, supermarket or drug store, discount retailer, department store, or several department stores, respectively. Included in this category are such uses as big box discount clubs, home improvement superstores, office supply superstores, and electronics superstores. The Max recommended FAR for SLUCM 53 should be applied to the gross leasable area of the shopping center rather than attempting to use other recommended FARs listed in Table 2 under "Retail" or "Trade."

8. Low intensity office uses only. Accessory uses such as meeting places, auditoriums, etc., are not recommended.

9. No chapels are allowed within APZ I or APZ II.

10. Facilities must be low intensity, and provide no tot lots, etc. Facilities such as clubhouses, meeting places, auditoriums, large classes, etc. are not recommended.

11. Includes livestock grazing, but excludes feedlots and intensive animal husbandry. Activities that attract concentrations of birds creating a hazard to aircraft operations should be excluded.

12. Includes feedlots and intensive animal husbandry.

13. Lumber and timber products removed due to establishment, expansion, or maintenance of clear zones will be disposed of in accordance with appropriate DoD Natural Resources instructions.

14. Controlled hunting and fishing may be permitted for the purpose of wildlife management.

15. Naturally occurring water features (e.g., rivers, lakes, streams, (wetlands) are compatible.

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