Draft
Environmental Assessment
Combat Air Forces Adversary Air
Joint Base San Antonio-Lackland, Kelly Field Annex, Texas

January 2019

Texas Air National Guard
149th Fighter Wing

Kelly Field Annex, Texas

PRIVACY ADVISORY

This EA is provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality (CEQ) NEPA Regulations (40 CFR §§ 1500-1508), and 32 CFR § 989, Environmental Impact Analysis Process (EIAP).

The EIAP provides an opportunity for public input on Air Force decision-making, allows the public to offer inputs on alternative ways for the Air Force to accomplish what it is proposing, and solicits comments on the Air Force's analysis of environmental effects.

Public commenting allows the Air Force to make better, informed decisions. Letters or other written or oral comments provided may be published in the EA. As required by law, comments provided will be addressed in the EA and made available to the public. Providing personal information is voluntary. Any personal information provided will be used only to identify your desire to make a statement during the public comment portion of any public meetings or hearings or to fulfill requests for copies of the EA or associated documents. Private addresses will be compiled to develop a mailing list for those requesting copies of EA; however, only the names of the individuals making comments and specific comments will be disclosed. Personal home addresses and phone numbers will not be published in the EA.

COVER SHEET

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR COMBAT AIR FORCES ADVERSARY AIR, JOINT BASE SAN ANTONIO-LACKLAND, KELLY FIELD ANNEX

a. *Responsible Agency*: United States Air Force (Air Force)

b. *Cooperating Agency*: None

c. *Proposals and Actions:* The environmental assessment (EA) analyzes a Proposed Action to provide dedicated contract adversary air sorties for Combat Air Forces training at Kelly Field Annex. The Proposed Action would include the addition of 46 contract maintenance personnel and an estimated nine contract pilots. Approximately 1,130 additional sorties would be added to perform training activities within the Crystal, Crystal North, Laughlin 2, Laughlin 3 High and Low, Kingsville 3, and Brady High and Low Military Operations Areas. The proposed facilities at Kelly Field Annex would include the required ramp space; maintenance space; operational space; petroleum, oil and lubricant storage; runway access; and associated parking to support the Proposed Action. Three Alternatives in addition to the No Action Alternative were evaluated in the EA.

d. *For Additional Information:* Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott Street, JBSA - Lackland, Texas 78236-5645 or by email at jock.flores@us.af.mil.

e. *Designation:* Draft EA

f. *Abstract:* This environmental assessment has been prepared pursuant to provisions of the National Environmental Policy Act, Title 42 United States Code Sections 4321 to 4347, implemented by Council on Environmental Quality Regulations, Title 40, Code of Federal Regulations (CFR) § 1500-1508, and 32 CFR § 989, *Environmental Impact Analysis Process*. Potentially affected environmental resources were identified in coordination with local, state, and federal agencies. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; safety; air quality; biological resources; water resources; geology and soils; land use and visual resources; socioeconomics; environmental justice and protection of children; cultural resources; hazardous materials and waste, contaminated sites, and toxic substances; and infrastructure, transportation, and utilities.

The purpose of the Proposed Action is to provide dedicated contract adversary air (ADAIR) sorties to improve the quality of training and readiness of pilots of the 149th Fighter Wing located at Joint Base San Antonio-Lackland, Kelly Field Annex, Texas. By providing a dedicated contract ADAIR capability, F-16 trainees and instructor pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated ADAIR would also allow the unit to free up resources used to self-generate ADAIR and more effectively use those available flying hours. Additionally, other Air Force (4th generation) units that are tasked to provide ADAIR training support at Kelly Field Annex could recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

ADAIR training scenarios would include the use of combat tactics and procedures that differ from Combat Air Forces tactics to simulate an opposing force. The elements affecting Kelly Field Annex include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. Elements affecting the airspace include airspace use and defensive countermeasures. The Proposed Action at Kelly Field Annex would include the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven aircraft. Five aircraft types (MiG-21, A-4K, A-4N, L-59, and L-159) have been identified which will meet the needs of the Air Force for contract ADAIR selection at Kelly Field Annex based on performance capabilities of the aircraft and how those capabilities best meet mission training requirements at the installation. Contracted ADAIR service providers may ultimately choose another type of aircraft to support Air Force ADAIR needs at Kelly Field Annex; however, any aircraft selected would need to operate within the parameters and impact levels evaluated within this EA or supplemental National Environmental Policy Act analysis would be required. The proposed facilities at Kelly Field Annex are available for use and include the required ramp space; maintenance space; operational space; petroleum, oil and lubricant storage; runway access; and associated parking to support the Proposed Action.

The analysis of the affected environmental and environmental consequences of implementing the Proposed Action and Alternatives concluded that by implementing standing environmental protection measures and Best Management Practices, there would be no significant adverse impacts from ADAIR operations at Kelly Field Annex or in the special use airspace on the following resources: airspace management and use; noise; safety; air quality; biological resources; water resources; soils; land use and visual resources; socioeconomics; environmental justice and protection of children; cultural resources; hazardous materials and wastes, contaminated sites, and toxic

substances; and infrastructure, transportation, and utilities. Kelly Field Annex is an active installation with demolition and new construction actions currently underway as well as future development currently in the planning phase; however, impacts to air quality, soils, noise, and socioeconomics associated with construction would be minor and short in duration; therefore, significant cumulative impacts are not anticipated from activities associated with the Proposed Action when considered with past, present, or reasonably foreseeable future actions.

DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI)

COMBAT AIR FORCES ADVERSARY AIR
JOINT BASE SAN ANTONIO-LACKLAND, KELLY FIELD ANNEX

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) § 4321 to 4370h; Council on Environmental Quality (CEQ) Regulations, 40 Code of Federal Regulations (CFR) §§ 1500-1508; and 32 CFR § 989, *Environmental Impact Analysis Process,* the United States Air Force (Air Force) prepared the attached Draft Environmental Assessment (EA) to address the potential environmental consequences associated with providing contract adversary air (ADAIR) sorties for improving training and readiness of pilots at Joint Base San Antonio (JBSA)-Lackland, Kelly Field Annex, Texas.

Purpose and Need

The purpose of the Proposed Action is to provide dedicated contract ADAIR sorties to improve the quality of training and readiness of 149th Fighter Wing (149 FW) pilots located at JBSA-Lackland, Kelly Field Annex, Texas. Contract ADAIR support would employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced, simulated, combat training missions. By providing a dedicated contract ADAIR capability, F-16 trainees and instructor pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated ADAIR will also allow the unit to free up resources used to self-generate ADAIR and more effectively use those available flying hours. Additionally, other Air Force (4th generation) units that were tasked to provide ADAIR training support at Kelly Field Annex could recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

The need for action is to provide better and more realistic training for the F-16 flight training program at Kelly Field Annex. Dedicated contract ADAIR is critical to improving pilot readiness as it provides realistic training opportunities to employ Combat Air Forces (CAF) tactics and procedures that optimize the training value of every mission. ADAIR can be used in basic building block syllabus sorties or the very advanced and fluid environment of multiaircraft air combat required by the training syllabus.

Description of Proposed Action and Alternatives

The Proposed Action would provide dedicated contract ADAIR sorties for CAF training at Kelly Field Annex, Texas, to address shortfalls in F-16 pilot training and production capability and to provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced training missions. Training scenarios would include the use of combat tactics and procedures that differ from CAF tactics to simulate an opposing force. The elements affecting Kelly Field Annex include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. The elements affecting the airspace include airspace use and defensive countermeasures.

The Proposed Action at Kelly Field Annex would include the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven aircraft. Five aircraft types (MiG-21, A-4K, A-4N, L-59, and L-159) have been identified for contract ADAIR selection at Kelly Field Annex based on performance capabilities of the aircraft and how those capabilities best meet mission training requirements at the installation. The proposed facilities at Kelly Field Annex are available for use and include the required ramp space; maintenance space; operational space; petroleum, oil and lubricant storage; runway access; and associated parking to support the Proposed Action. Approximately 1,130 sorties annually would support training activities within nearby special use airspace including the Crystal, Crystal North, Laughlin 2, Laughlin 3 High and Low, Kingsville 3, and Brady High and Low Military Operations Areas (MOAs). Contract ADAIR aircraft would employ defensive countermeasures (e.g., chaff and flares) in all the MOAs, except for the Brady High and Low MOAs.

In addition to the No Action Alternative, three alternatives for the proposed contract ADAIR were identified for evaluation in the EA. These alternatives are described below and represent various options for facility use at Kelly Field Annex.

Alternative 1

Contract ADAIR capabilities would be established using an estimated seven aircraft providing 1,200 annual sorties at Kelly Field Annex. Of the 1,200 annual sorties, 1,130 training sorties would occur in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, Laughlin 3 High, Kingsville 3, and Brady High and Low MOAs. The remaining sorties are expected for aircraft leaving for or returning from either maintenance or other deployments. Operations and Maintenance activities would be consolidated in Hangar 1612, and aircrew briefings would take place in Building 917.

Alternative 2

Alternative 2 would be the same as described in Alternative 1 except operations and maintenance activities would be consolidated in Hangar 1610, and aircrew briefings would take place in Building 917.

Alternative 3

Alternative 3 would be the same as described in Alternatives 1 and 2 except operations activities and aircrew briefings would be consolidated in Building 917, and maintenance activities would take place in Hangar 1610.

No Action Alternative

No action means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No action for this EA reflects the status quo, where no contract ADAIR support at Kelly Field Annex would occur.

Summary of Findings

Potentially affected environmental resources were identified through communications with state and federal agencies and review of past environmental documentation. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; safety; air quality; biological resources; water resources; soils; land use and visual resources; socioeconomics; environmental justice and protection of children; cultural resources; hazardous materials and wastes, contaminated sites, and toxic substances; and infrastructure, transportation, and utilities.

Under the Proposed Action, the annual number of sorties would increase by 4 percent and would not impact the operational capacity or necessitate changes to the locations or dimensions of the airspace around Kelly Field Annex. Potential impacts to the airspace around the airfield for Alternatives 1, 2, and 3 would be negligible. Likewise, the MOAs proposed for use have the capacity and the dimensions necessary to support additional sorties; therefore, negligible impacts to airspace are anticipated for Alternatives 1, 2, and 3.

Safety zones around the airfield are not expected to change. Buildings associated with contract ADAIR are located outside of identified Quantity-Distance arcs; therefore, no impacts to explosives safety are anticipated. With an established crash damaged or disabled aircraft recovery program and implementation of all applicable Air Force Office of Safety and Health and Occupational Safety and Health Administration requirements, no significant impacts to ground safety are expected to occur. No significant impacts are expected to flight safety under the implementation of contractor flight safety rules and bird/wildlife-aircraft strike hazard (BASH) procedures.

Increased air emissions resulting from contract ADAIR operations at Kelly Field Annex are not considered significant under Alternatives 1, 2, and 3. The proposed project would not interfere with the region's ability to maintain compliance with National Ambient Air Quality Standards for attainment area pollutants and would not interfere with the ability to achieve compliance for pollutants that contribute to ozone nonattainment. The Brady High and Low MOAs are the only MOAs where contract ADAIR operations would be taking place below 3,000 feet. None of the criteria pollutants emission rates exceeded the 100 tons per year *de minimus* threshold; therefore, no impacts to air quality are expected from contract ADAIR operations in the Brady High and Low MOAs.

Proposed contract ADAIR operations would increase noise impacts; however, that increase would result in negligible to minor impacts for all alternatives. The primary changes in noise contours to the existing conditions resulted in a slight elongation at the runway centerline, increasing the affected area greater than 65 decibels (dB) day-night sound level (DNL) by approximately 1,127 additional acres. The increases in the DNL ranged from 0 to 3 dB above the baseline condition. There would be a slight increase in noise from additional ADAIR subsonic and/or supersonic flight operations in Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs; however, the impact to people would be negligible as these MOAs are not located over highly populated areas.

Noise impacts from increased operations at Kelly Field Annex would have a negligible, short-term and long-term effect on wildlife. Airfield management and risk reduction implementation measures associated with the BASH program would continue to reduce BASH resulting in a minor impact to birds and other wildlife. No federally listed species are present at the Kelly Field Annex; therefore, no impacts are anticipated to any listed species. Sonic booms from supersonic flights are expected during training activities; however, potential impacts in the MOAs associated with sonic booms are expected to be negligible. Likewise, use of chaff and flares would have no impact on wildlife.

Impacts to water resources could occur from the deposition and transport of chaff and flares released during training operations. A 32 percent increase in use of chaff and flares is proposed in the Crystal, Laughlin, and Kingsville 3 MOAs, and chaff and flares would not be used in Brady Low and High MOAs. As such, impacts to water resources are not expected. Additionally, emergency fuel dumps are rare, but if needed, federal law requires a release at an altitude of at least 10,000 feet above ground level to allow for fuel evaporation before reaching the ground or surface water. As such, no impacts to water resources from emergency fuel dumps are expected.

There are no impacts resulting from contract ADAIR operations to geology. The potential for impacts to soils is possible with the release of chaff and flares from training operations. South Texas soils are drier, neutral and alkaline and, therefore, not conducive for fast weathering like in a wet, acidic environment. A significant accumulation of components in the soil would require great quantities of chaff releases in a short period of time. Proposed chaff and flare use would be localized and dispersed over time; therefore, no direct impacts are anticipated, and any adverse indirect effects would be negligible for all three alternatives.

No long-term changes to the existing land use at Kelly Field Annex or land uses beneath the proposed airspace are expected from contract ADAIR operations. No changes to the visual setting at Kelly Field Annex would occur. No ground disturbance would take place as part of the Proposed Action at Kelly Field Annex; therefore, potential archaeological deposits would not be impacted. Under Alternative 1, the proposed Hangar 1612 was determined not eligible for inclusion in the National Register of Historic Places and is located outside of the Kelly Field Historic District; therefore, no impacts to historic resources are anticipated. Hangar 1610 under Alternatives 2 and 3 is considered eligible for inclusion as a contributing element to the Kelly Field Historic District; however, only minor internal renovations are proposed and would not affect the character of the exterior of the building. Contract ADAIR operations in the MOAs would be performed at altitudes that would not affect historic resources; therefore, no impacts are expected.

The required 55 contract personnel and their families supporting the contract ADAIR operations in the San Antonio region would have no impact to the region's population. Even if all personnel were relocated to the region, this increase would be negligible in a county with a population of nearly 2 million people. Since there is no new construction proposed at Kelly Field Annex, the interior upgrades to facilities for contract ADAIR operations would require only a small amount of supplies and labor and therefore, would not impact the existing socioeconomic environment. The 55 contracted ADAIR maintenance personnel and pilots would represent a small increase in the 80,000 military and civilian personnel currently employed at JBSA; therefore, no adverse impact on income and employment, housing, or educational resources would occur.

No disproportionate impacts from increased noise on minority populations or low-income communities surrounding Kelly Field Annex are expected. The increase in noise impacts near education facilities would result in a moderate impact; however, while there would be an adverse noise impact to children in the community, those impacts would not be disproportionate.

Hazardous wastes generated as a result of contract ADAIR operations would be stored and disposed in accordance with the JBSA *Hazardous Waste Management Plan*; therefore, no impacts from managing hazardous waste are expected. No impacts are expected from asbestos-containing materials and lead-based paint from interior renovations of proposed facilities with implementation of requirements described in the JBSA *Asbestos Management Plan*. Lighting fixtures containing polychlorinated biphenyls would be disposed in accordance with federal, state, and local laws, which would result in a long-term, minor, beneficial impact. There is a low potential for radon to pose a health hazard at Kelly Field Annex. As such no impacts from radon is anticipated. There is no environmental contamination know to occur within the project area.

Existing facilities proposed for contract ADAIR operations are currently fully serviced for gas, electric, water/wastewater, and solid waste management. The additional 55 contract personnel and increased use of utilities is expected to have a negligible effect on utilities. Proposed hangars are located on Port San Antonio property and would not require access through JBSA-Lackland or Kelly Field Annex. Traffic at intersections approaching the hangars through Port San Antonio are adequate and no impacts to local traffic or transportation are anticipated. The nine contracted pilots would be required to pass through a JBSA-Lackland/Kelly Field Annex gate; however, no impacts on traffic are expected as the gates have adequate capacity for these additional vehicles.

Cumulative Impacts

The EA considered cumulative impacts that could result from the incremental impact of the proposed project when added to other past, present, or reasonably foreseeable future actions. No potentially significant cumulative impacts were identified for JBSA-Lackland, Kelly Field Annex or MOAs.

The recent ozone nonattainment designation for Bexar County has lowered the threshold for determining significant impacts to air quality; however, given that worst case ADAIR emissions for the pollutants of concern (nitrogen oxides [NO_x] and volatile organic compounds) are more than 64 percent less than the 100 tons per year *de minimis* threshold for conformity and the worst-case emission (i.e., the highest NO_x emission) is only 0.085 percent of the county-wide NO_x emissions, no cumulative air quality impact is anticipated.

The EA included past, present and reasonably foreseeable future projects that could add incrementally to impacts from the Proposed Action. Federal and nonfederal actions with the potential to cause cumulative impacts were described in Tables 5-1 and 5-2. In particular, the proposed Advanced Pilot Trainer T-X Program, which entails the basing of new aircraft at JBSA-Randolph, has the potential to create cumulative airspace, noise, safety, and air quality impacts. Nonfederal actions, such as several ongoing and proposed San Antonio Water System projects, have the potential to create impacts to air quality, infrastructure, and other resources.

Mitigation

The EA analysis concluded that the Proposed Action and Alternatives would not result in significant environmental impacts; therefore, no mitigation measures are required. Best Management Practices are described, and environmental commitments are recommended where applicable.

Conclusion

Finding of No Significant Impact. After review of the EA prepared in accordance with the requirements of NEPA; CEQ regulations; and 32 CFR § 989, *Environmental Impact Analysis Process,* and which is hereby incorporated by reference, I have determined that the proposed activities to provide dedicated contract ADAIR sorties to improve the quality of training and readiness of pilots of the 149 FW located at JBSA-Lackland, Kelly Field Annex, Texas, would not have a significant impact on the quality of the human or natural environment. Accordingly, an Environmental Impact Statement will not be prepared. This decision has been made after considering all submitted information, including a review of public and agency comments submitted during the 30-day public comment period, and considering a full range of practical alternatives that meet project requirements and are within the legal authority of the United States Air Force.

DEE JAY KATZER, Colonel, Air Force **Chief, Civil Engineer Division (ACC/A4C)**	**DATE**

DRAFT
ENVIRONMENTAL ASSESSMENT (EA)
FOR
COMBAT AIR FORCES ADVERSARY AIR
JOINT BASE SAN ANTONIO-LACKLAND, KELLY FIELD ANNEX, TEXAS

PREPARED FOR:

Department of the Air Force

January 2019

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LIST OF ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	microgram(s) per cubic meter
°F	degree(s) Fahrenheit
149 FW	149th Fighter Wing
149 LRS	149th Logistics Readiness Squadron
149 MXS	149th Maintenance Squadron
182 FS	182d Fighter Squadron
ac	acre(s)
ACAM	Air Conformity Applicability Model
ACM	asbestos-containing materials
ADAIR	adversary air
ADF	Automatic Direction Finder
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Office of Safety and Health
AFPD	Air Force Policy Directive
AGE	Aerospace Ground Equipment
AGL	above ground level
AGRS	Aggressor Squadron
AICUZ	Air Installation Compatible Use Zone
Air Force	United States Air Force
AMU	Aircraft Maintenance Unit
ANG	Air National Guard
AOC	area of concern
APE	Area of Potential Effects
APZ	Accident Potential Zone
AQCR	Air Quality Control Region
AST	aboveground storage tank
ATC	Air Traffic Control
BACT	Best Available Control Technologies
BASH	bird/wildlife-aircraft strike hazard
BMP	Best Management Practice
BRAC	Base Realignment and Closure
C	candidate
CAA	Clean Air Act
CAD	cartridge-actuated device
CAF	Combat Air Forces
CDDAR	crash damaged or disabled aircraft recovery
CDNL	C-weighted Day-Night Average Sound Level
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPSC	Consumer Product Safety Commission
CSAF	Chief of Staff Air Force
CSEL	C-Weighted Sound Exposure Level
CWA	Clean Water Act
CZ	Clear Zone
dB	decibel(s)
dBA	A-weighted decibel(s)
DLA	Defense Logistics Agencies
DNL	Day-Night Average Sound Level

LIST OF ACRONYMS AND ABBREVIATIONS

DOD	Department of Defense
DODI	Department of Defense Instruction
E	endangered
EA	Environmental Assessment
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
ESOHC	Environmental Safety and Occupational Health Council
FAA	Federal Aviation Administration
FL	Flight Level
FONSI	Finding of No Significant Impact
FR	Federal Register
FSRM	Facilities Sustainment, Restoration, and Modernization
ft	foot (feet)
ft^2	square foot (feet)
FTU	formal training unit
GHG	greenhouse gas
GWP	global warming potential
HAZMART	hazardous material pharmacy
HAZMAT	hazardous material(s)
IDP	Installation Development Plan
IFR	Instrument Flight Rules
in.	inch(es)
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
JBSA	Joint Base San Antonio
lb	pound(s)
LBP	lead-based paint
L_{dn}	Day-Night Average Sound Level
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
LOS	level of service
LTO	Landing and Takeoff
MBTA	Migratory Bird Treaty Act
mg/m^3	milligram(s) per cubic meter
mi	mile(s)
mi^2	square mile(s)
MOA	Military Operations Area
MOU	Memorandum of Understanding
MSL	mean sea level
MTR	Military Training Route
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NH_3	ammonia
NHPA	National Historic Preservation Act
NM	nautical mile(s)
NO_2	nitrogen dioxide
NOA	Notice of Availability
NO_x	nitrogen oxides

LIST OF ACRONYMS AND ABBREVIATIONS

NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	Operations and Maintenance
O_3	ozone
OSHA	Occupational Safety and Health Administration
PAD	propellant-actuated device
Pb	lead
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter
PM_{10}	particulate matter equal to or less than 10 microns in diameter
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
POI	point of interest
ppb	part(s) per billion
ppm	part(s) per million
PSD	Prevention of Significant Deterioration
psf	pound(s) per square foot
PTE	potential to emit
PWS	*Performance Work Statement for the Combat Air Forces (CAF) Contracted Air Support (CAF CAS)*
Q-D	quantity-distance
R	recovery
RCRA	Resource Conservation and Recovery Act
RONA	Record of Nonapplicability
SAP	satellite accumulation point
SCS	Soil Conservation Service
SEL	Sound Exposure Level
SER	Significant Emission Rate
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
SUA	special use airspace
T	threatened
TAC	Texas Administrative Code
TCEQ	Texas Commission of Environmental Quality
TGO	Touch and Go
TPWD	Texas Parks and Wildlife Department
tpy	ton(s) per year
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
US	United States
US 90	United States Highway 90
USCB	United States Census Bureau
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USSG	United States Surgeon General
UST	underground storage tank
VOC	volatile organic compound
yd^2	square yard(s)

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CHAPTER 1 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The United States Air Force (Air Force) is tasked with the defense of the United States (US) and fulfillment of its Title 10 United States Code (U.S.C.) mission. The Air Force's mission is to fly, fight, and win - in air, space, and cyberspace. In order to accomplish this mission, it is critical that combat pilots, and the Airmen supporting them, adequately train to attain proficiency on tasks they must execute during times of war and further to sustain this proficiency as they serve in the Air Force. Increasingly, fighter pilots of the Combat Air Forces (CAF) have been operating at degraded levels of proficiency and training readiness due to diminishing fiscal resources. For the purpose of this effort, the CAF includes all active duty, Air National Guard (ANG), and Air Force Reserve units in both formal training units (FTUs) and operational units.

Ideally, CAF fighter pilots would be able to maintain their proficiency by flying 200 or more hours per year, practicing training syllabus tasks, tactics, and procedures. Unfortunately, for much of the last decade, pilots of advanced weapons platforms have been falling 25 to 40 percent short of the flying hours recommended to build and sustain their proficiency on required training tasks (Venable, 2016). At the same time, increasingly complex aircraft and technologies require more time to master the full range of skills required to become proficient combat-ready pilots. Along with insufficient budgets to support the flying hours/training requirements needed by CAF pilots, they have also had to support adversary air (ADAIR) flying missions that have minimal training value to the CAF pilots themselves. ADAIR missions simulate an opposing force that provides a necessary and realistic combat environment during CAF training missions. Flying these ADAIR sorties requires the use of potential adversaries' tactics and procedures that may differ significantly from CAF tactics and procedures and therefore provides minimal CAF training while taking up valuable flying hours that could otherwise be spent on core training tasks. In many cases, minimal ADAIR missions, or none at all, have been available to support pilot training and have resulted in degraded readiness for CAF pilots who are expected to operate some of the most sophisticated weapons platforms in the world.

> A SORTIE IS DEFINED AS A SINGLE MILITARY AIRCRAFT FLIGHT FROM INITIAL TAKEOFF THROUGH FINAL LANDING.

During his confirmation hearing, Chief of Staff of the Air Force (CSAF), General David Goldfein, identified a growing crisis in the readiness of CAF pilots (Venable, 2016):

> Less than half of Air Force combat units are ready for "full-spectrum" (high threat, high intensity) combat. This lack of readiness could jeopardize the lives of aircrews and other service members who depend upon them in combat, and put mission-essential tasks at great risk.

1.1.1 Background

Aircrew readiness is currently affected by several issues including training, weapon system sustainment, and facilities. While all are critical, training in particular has become an increasing concern as worldwide commitments, high operations tempo, and fiscal and manpower limitations detract from available training resources. As an example, the Budget Control Act of 2011, as implemented in 2013, reduced flying hours by 18 percent and temporarily stood down 17 of 40 combat-coded squadrons (The Heritage Foundation, 2015). The Air Force prioritized readiness in 2014, but shortfalls in readiness were not eliminated and have persisted through the present day as indicated by the CSAF's acknowledgement of the lack of readiness in more than half of the service's combat units. In the training arena, readiness issues are manifested by multiple issues such as 1) an inability to internally support ADAIR without a corresponding sacrifice in scarce flying hours and normal training objectives; 2) a lack of advanced threat aircraft to provide representative ADAIR for realistic training; 3) a fighter pilot manning crisis, necessitating increased pilot production beyond sustainable levels; and 4) granting excessive syllabus waivers to graduates of the Air Force Weapons School due to inadequate ADAIR support during final training phases.

Lack of available ADAIR is degrading levels of pilot readiness and contributing to the overall decline in availability of proficient CAF pilots. The arrangement in which CAF ADAIR sorties are currently organized is depicted on **Figure 1-1**. At present, the current approach meets less than 50 percent of the total ADAIR requirement across the Air Force.

Self-generated ADAIR can either be “in-house” supporting daily flying schedules or via a dedicated tasking to support an external unit, both referred to as “Red Air.” In both the “in-house” and “dedicated” options, performing self-generated ADAIR is at the expense of the tasked units’ normal Air Force training objectives. These two options still result in an ADAIR capacity less than 50 percent of the Air Force-wide requirement and reduce the availability and proficiency of combat qualified pilots at a time when the Air Force is experiencing a shortfall of more than 750 CAF pilots (Venable, 2016). Furthermore, current dedicated ADAIR units in the Air Force consist of two F-16 aggressor squadrons (AGRSs) and two T-38 fighter training squadrons. The F-16 aircraft used for aggressor missions is an advanced weapons platform, but there are not enough to meet the ADAIR requirements to maintain proficiency of the CAF’s pilots. The T-38 is used for ADAIR but is a basic platform with no advanced electronics (radar and avionics) or weapons capabilities and does not adequately replicate realistic threat capabilities. In both the F-16 AGRS and T-38 ADAIR cases, the number of available aircraft and pilots are insufficient to meet the requirement.

As depicted on **Figure 1-1**, contract ADAIR would provide a fourth avenue to fill ADAIR sorties and improve the quality of training and readiness of CAF pilots and allow the Air Force to recapitalize other valuable assets and training time.

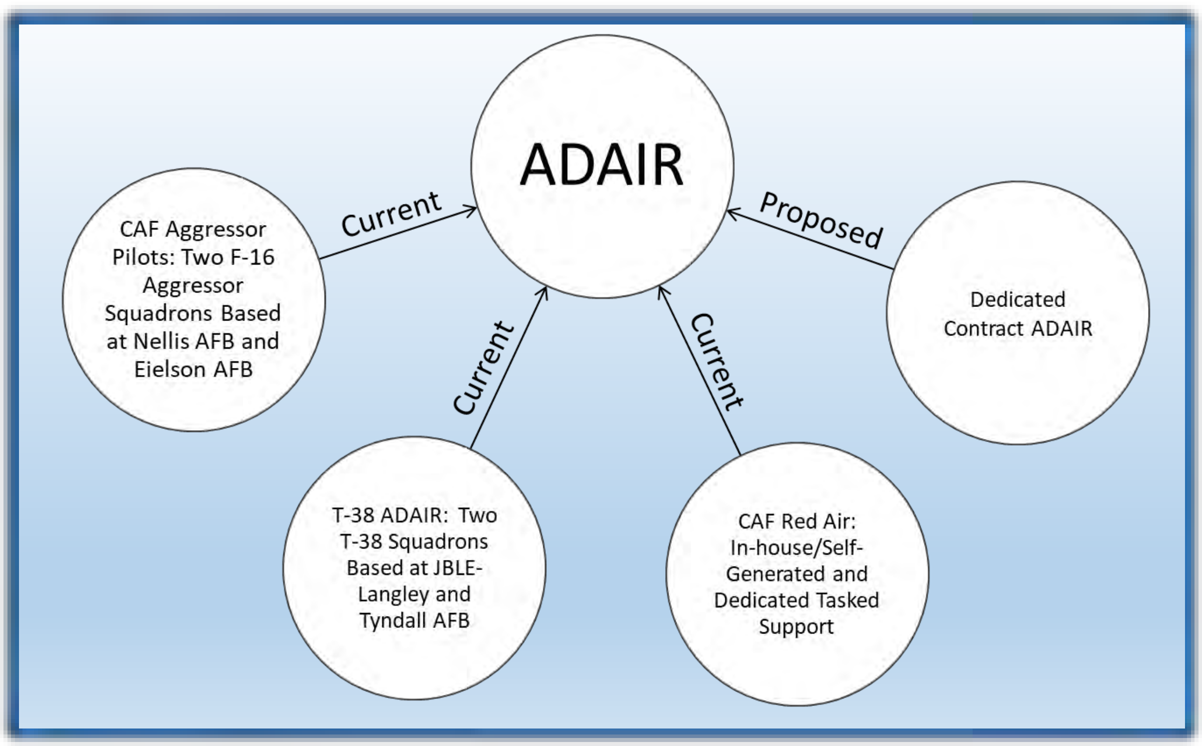

Figure 1-1. Current and Proposed Adversary Air Sortie Generation.

The contract ADAIR requirement is roughly 30,000 annual sorties. The Air Force would implement contract ADAIR in support of installations that host specific critical air-to-air training missions. Installations requiring contract ADAIR support include those bases hosting Air Force 5th generation fighter units (e.g., F-22 or F-35 aircraft), fighter FTUs, or those that support advanced fighter training. Air Force requirements for contract ADAIR exist currently at multiple installations within the continental United States and Joint Base Pearl Harbor-Hickam, Hawaii.

As discussed in **Section 1.3**, the scope of this analysis will evaluate the proposal to implement contract ADAIR at Kelly Field Annex at Joint Base San Antonio (JBSA)-Lackland. National Environmental Policy Act (NEPA) analyses will be completed at all locations identified by the Air Force that require contract ADAIR support and that have sufficient existing facilities.

1.1.2 Location

During the 2005 Base Realignment and Closure (BRAC) Commission, the three major military facilities in San Antonio — the Army's Fort Sam Houston, Lackland Air Force Base (AFB), and Randolph AFB — were consolidated into a single installation, JBSA, to eliminate duplicated support services (**Figure 1-2**). Kelly Field Annex at JBSA-Lackland, formerly Kelly AFB, is in Bexar County, Texas, approximately 7 miles (mi) southwest of downtown San Antonio (**Figure 1-3**). Kelly Field Annex encompasses 4,660 acres (ac) and is bounded on the west by Lackland AFB and to the south by Military Drive and Leon Creek. The northern and eastern boundaries are Growdon Road and the Union-Pacific Railroad Yards, respectively. Kelly Field Annex is the proposed location supporting the Proposed Action; and therefore, the focus of the environmental impact analyses.

JBSA-Lackland, "Gateway to the Air Force," provides basic training for all new service Airmen in the active-duty Air Force, ANG, and Air Force Reserve. Anti-terrorism teams also train at JBSA-Lackland, and its Defense Language Institute English Language Center gives students from 117 countries the opportunity to improve their English-language proficiency. Kelly AFB was home to the San Antonio Air Logistics Center from 1954 until 1995 when, as a result of a BRAC Commission decision, the former Kelly AFB runway and land west of the runway were transferred to neighboring Lackland AFB as Kelly Field Annex in 2001 and the land east of the runway was transferred to Port San Antonio. Kelly Field Annex hosts the 433d Airlift Wing, which operates the C-5 aircraft, and the 149th Fighter Wing (149 FW), which operates the F-16 aircraft. In addition, aircraft such as C-5s, T-38s, B-52s, C-130s, B-58s, and F-100s are or have been maintained and repaired at Kelly Field Annex and former Kelly AFB. Kelly Field Annex supports the training and operations of 4th generation F-16 aircraft.

FOURTH (4TH) GENERATION AIRCRAFT IS A TERM APPLIED TO THE PREVIOUS SUITE OF FIGHTERS SUCH AS F-15, F-16, AND F/A-18. FIFTH (5TH) GENERATION ARE THE NEWEST WEAPONS SYSTEMS SUCH AS THE F-22 AND F-35 FIGHTERS THAT CONTAIN NEW AND ENHANCED LEVELS OF STEALTH PROFILES, SPEED, MANEUVERABILITY, AND ADVANCED AVIONICS AND ATTACK CAPABILITIES.

CAF training activities utilize special use airspaces proximate to Kelly Field Annex. Special use airspace includes Military Operations Areas (MOAs), which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The primary operational airspace that would be used by contract ADAIR aircraft includes the Crystal and Laughlin MOAs located approximately 75 mi southwest of Kelly Field Annex (**Figure 1-4**). Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 mi south-southeast of Kelly Field Annex and the Brady High and Low MOAs located approximately 110 mi north-northwest of Kelly Field Annex. **Section 2.1.6** provides a more detailed description of these MOAs.

Kelly Field Annex and the surrounding military airspace provide a critical venue to train F-16 pilots.

A MILITARY OPERATIONS AREA (MOA) IS DESIGNATED AIRSPACE OUTSIDE OF CLASS A AIRSPACE TO SEPARATE OR SEGREGATE CERTAIN NONHAZARDOUS MILITARY ACTIVITIES FROM INSTRUMENT FLIGHT RULES (IFR) TRAFFIC. ACTIVITIES IN MOAS INCLUDE, BUT ARE NOT LIMITED TO, AIR COMBAT MANEUVERS, AIR INTERCEPTS, AND LOW ALTITUDE TACTICS. THE DEFINED VERTICAL AND LATERAL LIMITS VARY FOR EACH MOA. WHILE MOAS GENERALLY EXTEND FROM 1,200 FEET (FT) ABOVE GROUND LEVEL (AGL) TO 18,000 FT MEAN SEA LEVEL (MSL), THE FLOOR MAY EXTEND BELOW 1,200 FT AGL IF THERE IS A MISSION REQUIREMENT AND THERE IS MINIMAL ADVERSE AERONAUTICAL EFFECT.

CLASS A AIRSPACE IS CONTROLLED AIRSPACE OF DEFINED DIMENSIONS WITHIN WHICH AIR TRAFFIC CONTROL SERVICE IS PROVIDED AND ALL OPERATIONS MUST OCCUR UNDER IFR. CLASS A AIRSPACE IS GENERALLY FROM 18,000 FT MSL UP TO AND INCLUDING 60,000 FT MSL AND INCLUDES AIRSPACE OVERLYING WATERS WITHIN 12 NAUTICAL MILES OF THE COAST OF THE 48 CONTIGUOUS UNITED STATES AND ALASKA.

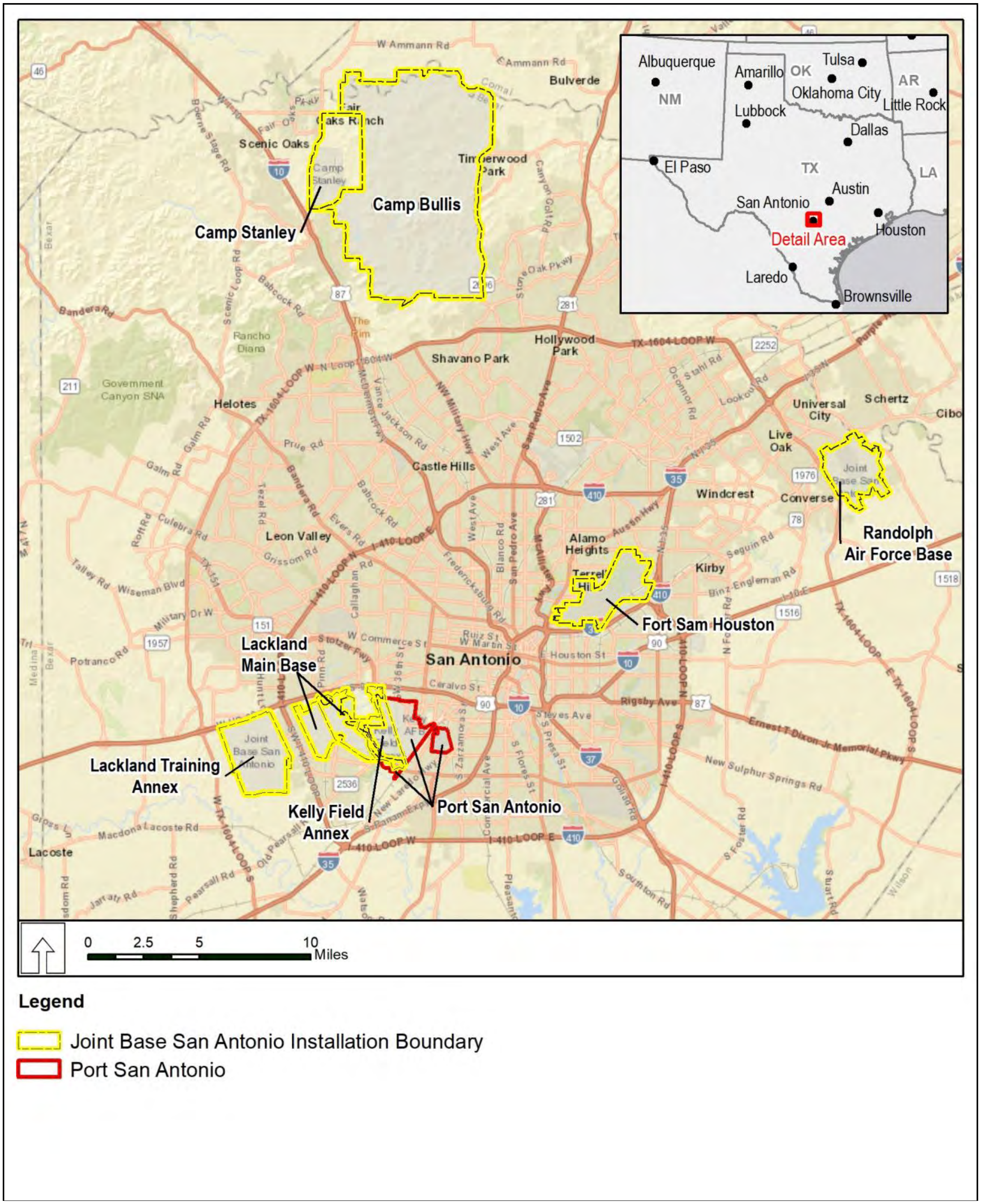

Figure 1-2. Location of Joint Base San Antonio-Kelly Field Annex (Regional View).

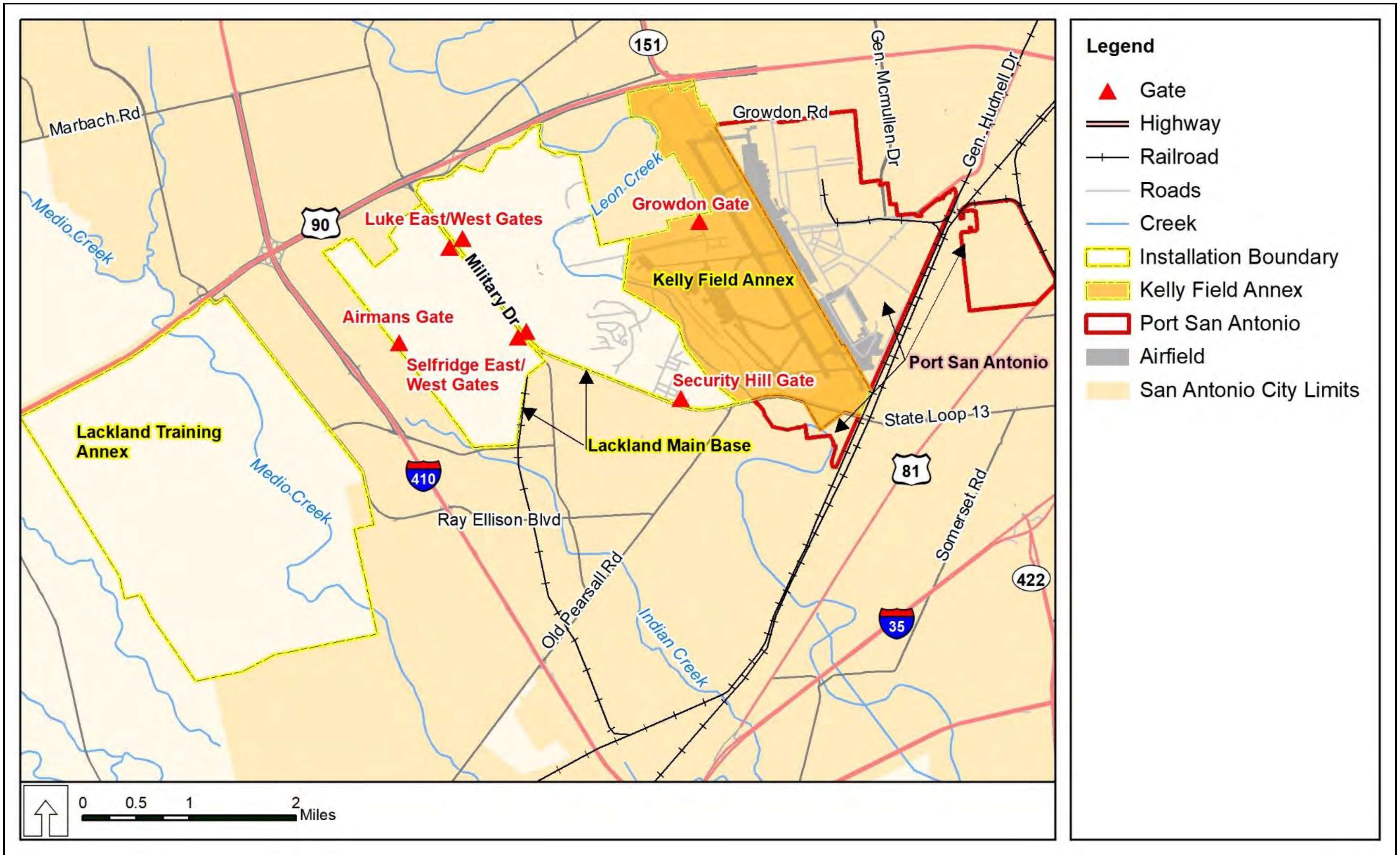

Figure 1-3. Location of Joint Base San Antonio-Kelly Annex Field (Local View).

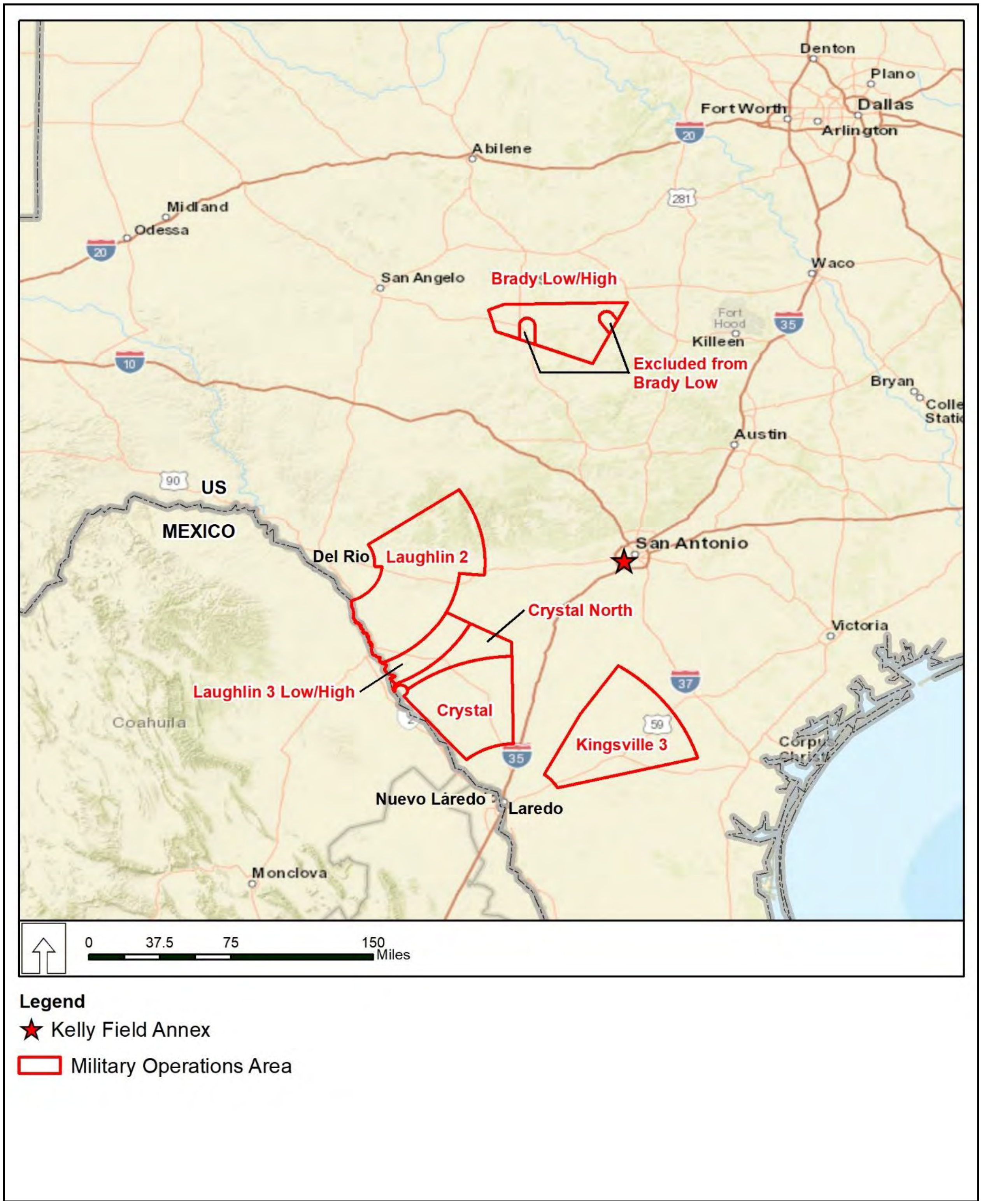

Figure 1-4. Military Operations Areas Proposed for Contract Adversary Air Sorties.

1.2 PURPOSE OF THE ACTION

The purpose of the Proposed Action is to provide dedicated contract ADAIR sorties to improve the quality of training and readiness of pilots of the 149 FW located at JBSA-Lackland, Kelly Field Annex, Texas. Contract ADAIR support would employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced, simulated, combat training missions. The objective of the Proposed Action at Kelly Field Annex is to increase the quality of training for F-16 pilots by providing dedicated, realistic adversary threat aircraft during syllabus training missions. By providing a dedicated contract ADAIR capability, F-16 trainees and instructor pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated ADAIR would also allow the unit to free up resources used to self-generate ADAIR and more effectively use those available flying hours. Additionally, other Air Force (4th generation) units that may have been tasked to provide ADAIR training support at Kelly Field Annex may now recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

1.3 NEED FOR THE ACTION

The need for the action is to provide better and more realistic training for the F-16 flight training program at Kelly Field Annex. Dedicated contract ADAIR is critical to improving pilot readiness as it provides realistic training opportunities to employ CAF tactics and procedures that optimize the training value of every mission. ADAIR can be used in basic building block syllabus sorties or the very advanced and fluid environment of multiaircraft air combat required by the training syllabus.

1.4 SCOPE OF THE ENVIRONMENTAL ANALYSIS

This environmental assessment (EA) analyzes the potential environmental consequences associated with establishing dedicated contract ADAIR support at Kelly Field Annex. Contract ADAIR support would employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced, simulated, combat training missions in order to increase the quality of training for F-16 fighter pilots.

This EA has been prepared in accordance with the NEPA (42 U.S.C. §§ 4321-4347), the Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] §§ 1500-1508), and 32 CFR § 989 et seq., *Environmental Impact Analysis Process (EIAP)*. NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information, including the anticipated environmental consequences of a proposed action, is available to the public, federal and state agencies, and the decision-maker before decisions are made and before actions are taken.

Consistent with the CEQ regulations, the EA is organized into the following sections:

- Chapter 1, Purpose and Need for Action, includes an introduction, background description, location, purpose and need statement, scope of environmental analysis, decision to be made, interagency and intergovernmental coordination and consultations, applicable laws and environmental regulations, and a description of public and agency review of the EA.
- Chapter 2, Description of the Proposed Action and Alternatives, includes a description of the Proposed Action, alternative selection standards, screening of alternatives, alternatives eliminated from further consideration, a description of the selected alternatives, summary of potential environmental consequences, and mitigation and environmental commitments.
- Chapter 3, Affected Environment, includes a description of the natural and man-made environments within and surrounding Kelly Field Annex and the airspace that may be affected by the Proposed Action and Alternatives.
- Chapter 4, Environmental Consequences, includes definitions and discussions of direct and indirect impacts and environmental commitments.
- Chapter 5, Cumulative Effects, considers the potential cumulative impacts on the environment that may result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions.
- Chapter 6, List of Preparers, provides a list of the preparers of this EA.

- Chapter 7, References, contains references for studies, data, and other resources used in the preparation of the EA.
- Appendices, as required, provide relevant correspondence, studies, modeling results, and public review information.

NEPA, which is implemented through the CEQ regulations, requires federal agencies to consider alternatives to the Proposed Action and to analyze potential impacts of alternative actions. Potential impacts of the Proposed Action and its Alternatives described in this document will be assessed in accordance with the Air Force EIAP (32 CFR § 989), which requires that impacts to resources be analyzed in terms of their context, duration, and intensity. To help the public and decision-makers understand the implications of impacts, they will be described in the short and long term, cumulatively, and within context. Environmental resources and the Region of Influence (ROI) analyzed in the EA are summarized in **Table 1-1**. The expected geographic scope of any potential consequences is identified as the ROI. Kelly Field Annex and its environs, as well as the area under the proposed airspace are considered in determining the ROI for each resource. As indicated in **Table 1-1**, Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites and Infrastructure, Transportation, and Utilities are not described in airspace ROI for baseline in **Chapter 3** or considered for detailed analysis in **Chapter 4**. No construction or development is proposed under the airspace, so no impacts to Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites and Infrastructure, Transportation, and Utilities would occur under the airspace. Likewise, because no ground-disturbing activities are associated with the Proposed Action, Water Resources and Geology and Soils are not described in the Kelly Field Annex ROI for baseline in **Chapter 3** or for detailed analysis in **Chapter 4**. Further, Geology is not described under the airspace because no activities that would alter the geology of the area are planned.

Table 1-1
Environmental Resources Analyzed in the Environmental Assessment

Resource	Region of Influence: Kelly Field Annex and Environs	Region of Influence: Crystal, Crystal North, Kingsville 3, Laughlin 2, Laughlin 3 High, Laughlin 3 Low, and Brady High and Low MOAs
Airspace Management and Use	✓	✓
Noise	✓	✓
Safety	✓	✓
Air Quality	✓	✓
Biological Resources (T&E, Wetlands)	✓	✓
Water Resources		✓
Soils		✓
Land Use and Visual Resources	✓	✓
Socioeconomics	✓	✓
Environmental Justice and Protection of Children	✓	✓
Cultural Resources (archaeological, architectural, traditional)	✓	✓
Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites	✓	
Infrastructure, Transportation, and Utilities	✓	

Notes:
MOA = Military Operations Area; T&E = threatened and endangered

1.5 DECISION TO BE MADE

This EA evaluates the potential environmental consequences of implementing the proposed or alternative actions to provide dedicated contract ADAIR sorties at Kelly Field Annex to improve the readiness and proficiency of pilots of the 149 FW, other supported units, and the CAF at large. Based on the analysis in this EA, the Air Force will make one of three decisions regarding the Proposed Action: 1) choose the alternative action that best meets the purpose of and need for this project and sign a Finding of No Significant Impact (FONSI), allowing implementation of the selected alternative; 2) initiate preparation of an Environmental Impact Statement (EIS) if it is determined that significant impacts would occur through implementation of the proposed or alternative actions; or 3) select the No Action Alternative, whereby the Proposed Action would not be implemented. As required by NEPA and its implementing regulations, preparation of an environmental document must precede final decisions regarding the proposed project and be available to inform decision-makers of the potential environmental impacts.

1.6 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

1.6.1 Interagency/Intergovernmental Coordination and Consultation

The environmental analysis process, in compliance with NEPA guidance, includes public and agency review of information pertinent to the proposed and alternative actions. Scoping is an early and open process for developing the breadth of issues to be addressed in an EA and for identifying significant concerns related to an action. Per the requirements of the Intergovernmental Cooperation Act of 1968 (42 U.S.C. § 4231[a]) and Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could potentially be affected by the proposed and alternative actions were notified during the development of this EA. Those Interagency and Intergovernmental Coordination for Environmental Planning letters and responses are included in **Appendix A**.

1.6.2 Agency Consultations

Implementation of the Proposed Action involves coordination with several organizations and agencies. Compliance with Section 7 of the Endangered Species Act (ESA), and implementing regulations (50 CFR § 402), requires communication with the US Fish and Wildlife Service (USFWS) in cases where a federal action could affect listed threatened or endangered species, species proposed for listing, or candidates for listing. The primary focus of this coordination is to request a determination of whether any of these species occur in the proposal area. If any of these species is present, a determination is made of any potential adverse effects on the species. Should no species protected by the ESA be affected by the proposed or alternative actions, no additional consultation is required. Letters were sent to the appropriate USFWS offices as well as relevant state agencies informing them of the proposal, requesting data regarding applicable protected species, and subsequently requesting concurrence with the Air Force's determination of no effect to any federally listed species.

Coordination with appropriate Texas state government agencies and planning districts will occur for review and comment. Compliance with Section 106 of the National Historic Preservation Act (NHPA) and implementing regulations (36 CFR § 800) will be accomplished through the State Historic Preservation Officer. Similarly, the Texas Commission on Environmental Quality would be included for air and water quality and the Texas Parks and Wildlife Department would be included in this coordination on habitat and species of concern.

All agency correspondence is included in **Appendix A**.

1.6.3 Government-to-Government Consultation

The NHPA and its regulations at 36 CFR § 800 direct federal agencies to consult with Indian tribes when a proposed or alternative action may have an effect on tribal lands or on properties of religious and cultural significance to a tribe. Consistent with the NHPA, Department of Defense Instruction (DODI) 4710.02, *Interactions with Federally-Recognized Tribes*, and Air Force Instruction (AFI) 90-2002, *Air Force Interaction with Federally-Recognized Tribes*, federally recognized tribes that are historically affiliated with lands in the vicinity of the proposed and alternative actions have been invited to consult on all proposed undertakings that have a potential to affect properties of cultural, historical, or religious significance to the tribes. The tribal consultation process is distinct from NEPA consultation or the interagency coordination process, and it requires separate notification of all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations. The JBSA point of contact for Native American tribes is the Base Civil Engineer. The point of contact for consultation with the Tribal Historic Preservation Officer and the Advisory Council on Historic Preservation is the JBSA Installation Support Team Cultural Resources Manager. Government-to-government consultation is included in **Appendix A.**

1.7 APPLICABLE LAWS AND ENVIRONMENTAL REGULATIONS

Implementation of the Proposed Action would involve coordination with several organizations and agencies. Adherence to the requirements of specific laws, regulations, Best Management Practices (BMPs), and necessary permits are described in detail in each resource section in **Chapter 3**.

1.7.1 National Environmental Policy Act

NEPA requires that federal agencies consider potential environmental consequences of proposed actions. The law's intent is to protect, restore, or enhance the environment through well-informed federal decisions. The CEQ was established under NEPA for the purpose of implementing and overseeing federal policies as they relate to this process. In 1978, the CEQ issued Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR §§ 1500-1508 [CEQ 1978]). These regulations specify that an EA be prepared to

- briefly provide sufficient analysis and evidence for determining whether to prepare an EIS or a FONSI;
- aid in an agency's compliance with NEPA when no EIS is necessary; and
- facilitate preparation of an EIS when one is necessary.

Further, to comply with other relevant environmental requirements (e.g., the ESA and NHPA) in addition to NEPA and to assess potential environmental impacts, the EIAP and decision-making process for the proposed and alternative actions involves a thorough examination of environmental issues potentially affected by government actions subject to NEPA.

1.7.2 The Environmental Impact Analysis Process

The EIAP is the process by which the Air Force facilitates compliance with environmental regulations (32 CFR § 989), including NEPA, which is primary legislation affecting the agency's decision-making process.

1.8 PUBLIC AND AGENCY REVIEW OF ENVIRONMENTAL ASSESSMENT

A Notice of Availability (NOA) of the Draft EA and FONSI was published in the newspapers of record (listed below) announcing the availability of the EA for review on 27 January 2019. The NOA invited the public to review and comment on the Draft EA. The public and agency review period will end on 26 February 2019. The public and agency comments are provided in **Appendix A**.

The NOA was published in the *San Antonio Express News,* the *Del Rio News Herald*, and the *Corpus Christi Caller Times*. Copies of the Draft EA and FONSI were also made available for review at the following locations:

- San Antonio Central Library, 600 Soledad Street, San Antonio, Texas 78205
- San Antonio Public Library – Bazan, 2200 W. Commerce Street, San Antonio, Texas 78201
- Collins Garden Library, 200 N. Park Boulevard, San Antonio, Texas 78204
- Guerra Library, 7978 W. Military Drive, San Antonio, Texas 78227
- Las Palmas Library, 515 Castroville Road, San Antonio, Texas 78237

- Pan American Library, 1122 W. Pyron Avenue, San Antonio, Texas 78221
- F. M. Richards Memorial Library, 1106 S. Blackburn Street, Brady, Texas 76825
- Val Verde County Library, 300 Spring Street, Del Rio, Texas 78840
- Robert J. Kleberg Public Library, 220 North 4th Street, Kingsville, Texas 78363

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CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Air Force is proposing to provide dedicated contract ADAIR sorties for CAF training at Kelly Field Annex, Texas, to address shortfalls in F-16 pilot training and production capability and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced combat training missions. Training scenarios would include the use of combat tactics and procedures that differ from CAF tactics to simulate an opposing force. The Proposed Action includes elements affecting the Base and military training airspace. The elements affecting Kelly Field Annex include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. The elements affecting the airspace include airspace use and defensive countermeasures.

Numbers of ADAIR aircraft, maintenance personnel, and pilots were estimated and informed through multiple meetings with active duty and civilian Air Force functional area experts and were based on sortie requirements developed by the end user at the Base. Numbers of aircraft and personnel were then used to define facility requirements, which were estimated using planning factors from Air Force Manual (AFMAN) 32-1084, *Facility Requirements*.

2.1.1 Contract Adversary Air Aircraft

Contract ADAIR would have multiple aircraft available with acceptable capabilities to support training requirements. Contract ADAIR proposed aircraft specifications are described in **Table 2-1**; all aircraft listed are capable of providing contract ADAIR support to F-16 CAF aircrews stationed at Kelly Field Annex. One or a combination of these aircraft types would be operated by a contractor at Kelly Field Annex in support of ADAIR training. The Proposed Action at Kelly Field Annex would include the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven aircraft. Five aircraft types (MiG-21, A-4K, A-4N, L-59, and L-159) have been identified for contract ADAIR selection at Kelly Field Annex based on performance capabilities of the aircraft and how those capabilities best meet mission training requirements at the installation.

Table 2-1
Contract Adversary Air Potential Aircraft Specifications

Aircraft	Wingspan (feet)	Length (feet)	Height (feet)	Number of Engines
A-4K/A-4N	28	41	15	1
L-59/L-159	32	40	16	1
MiG-21	24	52	14	1

2.1.2 Facilities

Kelly Field Annex has existing facilities to support the Proposed Action. The proposed facilities are available for use and require minimal modification. They are located around the existing airfield and runway and include the necessary ramp space; maintenance space; operational space; petroleum, oil, and lubricants storage; runway access; and associated parking to support the contract ADAIR mission. In addition, the Munitions Storage Area has sufficient facilities to store the necessary increase in training countermeasure allocations (chaff/flares; discussed further in **Section 2.1.7**). A summary of estimated facilities requirements needed to satisfy the Proposed Action is provided in **Table 2-2**.

Table 2-2
Kelly Field Annex Facilities Requirements

Ramp Required (yd^2)	Number Maintenance Personnel[1]	Number Pilots[1]	Aircraft Maintenance Unit space (ft^2)	Stand-Alone Operations Space (ft^2)	Integrated Operations Space (ft^2)
4,900	46	9	2,300	1,800	1,000

Notes:
[1] The number of personnel is estimated, and the final number may be slightly higher or lower depending on operational needs.
ft^2 = square feet; yd^2 = square yards

> THE AIRCRAFT MAINTENANCE UNIT (AMU) IS THE SUPPORT FUNCTION RESPONSIBLE FOR THE DIRECT SUPPORT AND MAINTENANCE OF AIRCRAFT TO ENSURE THEY ARE MISSION CAPABLE. AMU SPACE INCLUDES DEDICATED FACILITIES FOR CONTRACT MAINTENANCE PERSONNEL AND OFFICE AND ADMINISTRATIVE SPACE, PLUS SPECIAL USE SPACE FOR A TOOL CRIB, PARTS STORAGE, AND SECURE STORAGE. THE ADVERSARY AIR (ADAIR) AMU IS INTENDED, FOR ACCOUNTABILITY PURPOSES, TO REMAIN PHYSICALLY SEPARATED FROM ANY AIR NATIONAL GUARD (ANG) MAINTENANCE ORGANIZATION. CONVERSELY, CONTRACT ADAIR OPERATIONS SPACE MAY, AT THE DISCRETION OF THE HOST UNIT, BE A SEPARATE STAND-ALONE FACILITY OR BE INTEGRATED INTO AN EXISTING ANG OPERATIONS FACILITY. STAND-ALONE OPERATIONS SPACE INCLUDES OFFICE AND ADMINISTRATIVE SPACE, PLUS SPECIAL USE SPACE FOR AIRCREW FLIGHT EQUIPMENT, MISSION PLANNING, AND SECURE STORAGE. INTEGRATED OPERATIONS SPACE INCLUDES REDUCED AMOUNTS OF OFFICE, ADMINISTRATIVE, AND SPECIAL USE SPACE BECAUSE OF ANTICIPATED ECONOMIES OF SCALE REALIZED WHEN FACILITIES ARE SHARED WITH ANOTHER ORGANIZATION.

Kelly Field Annex has three options for providing proposed operations facilities which includes operations and aircraft maintenance functions. Under the Option 1, both Operations and Maintenance (O&M) office and hangar space would be consolidated in Hangar 1612 with aircrew briefings in Building 917 (**Figures 2-1** and **2-2**). Option 2 is similar to the Option 1, but O&M would instead be consolidated in Hangar 1610 with aircrew briefings occurring in Building 917. Under the Option 3, Operations would be integrated with the 182d Fighter Squadron (182 FS) in Building 917, and maintenance space would be located in Hangar 1610. Hangars 1610 and 1612 are owned by Port San Antonio and leased by the Air Force. Hangar 1612 is currently empty and would require Facilities Sustainment, Restoration, and Modernization (FSRM) funding provided by Kelly Field Annex, National Guard Bureau, or the state of Texas for security and modernization and would benefit from adding a fire suppression system. Hangar 1610 would have space for a consolidated O&M space and would require very minor interior renovations (e.g., carpet, paint) but also would benefit from the addition of a fire suppression system using FSRM funds. Integrating contract ADAIR operations into Building 917 would be a turnkey operation but would stress existing space to practical limits. Under all three options, aircraft would be parked on the East Ramp.

Aircraft Maintenance Unit (AMU) activities are proposed to occur out of either Hangars 1612 or 1610, which are located on the east side of the runway (**Figure 2-1**). These hangars would provide office space and covered aircraft maintenance space, if required. The East Ramp provides at least 4,900 square yards of aircraft parking space adjacent to Hangar 1610.

Following training sorties, contract ADAIR pilots would land and park their aircraft at Kelly Field Annex on the ramp area north of Hangars 1612 and 1610 (**Figure 2-1**). Contract pilots would then participate in debriefs with pilots of the 149 FW and other units as required. Debriefs would occur at facilities on Kelly Field Annex.

Contract ADAIR aircraft would use Defense Logistics Agencies (DLA) Jet A aircraft fuel that would be delivered in fuel trucks owned and operated by the 149th Logistics Readiness Squadron (149 LRS). Contract ADAIR personnel would be responsible for all aircraft fuel and defuel operations. An additional one to two personnel may be required in the 149 LRS to meet the increased workload.

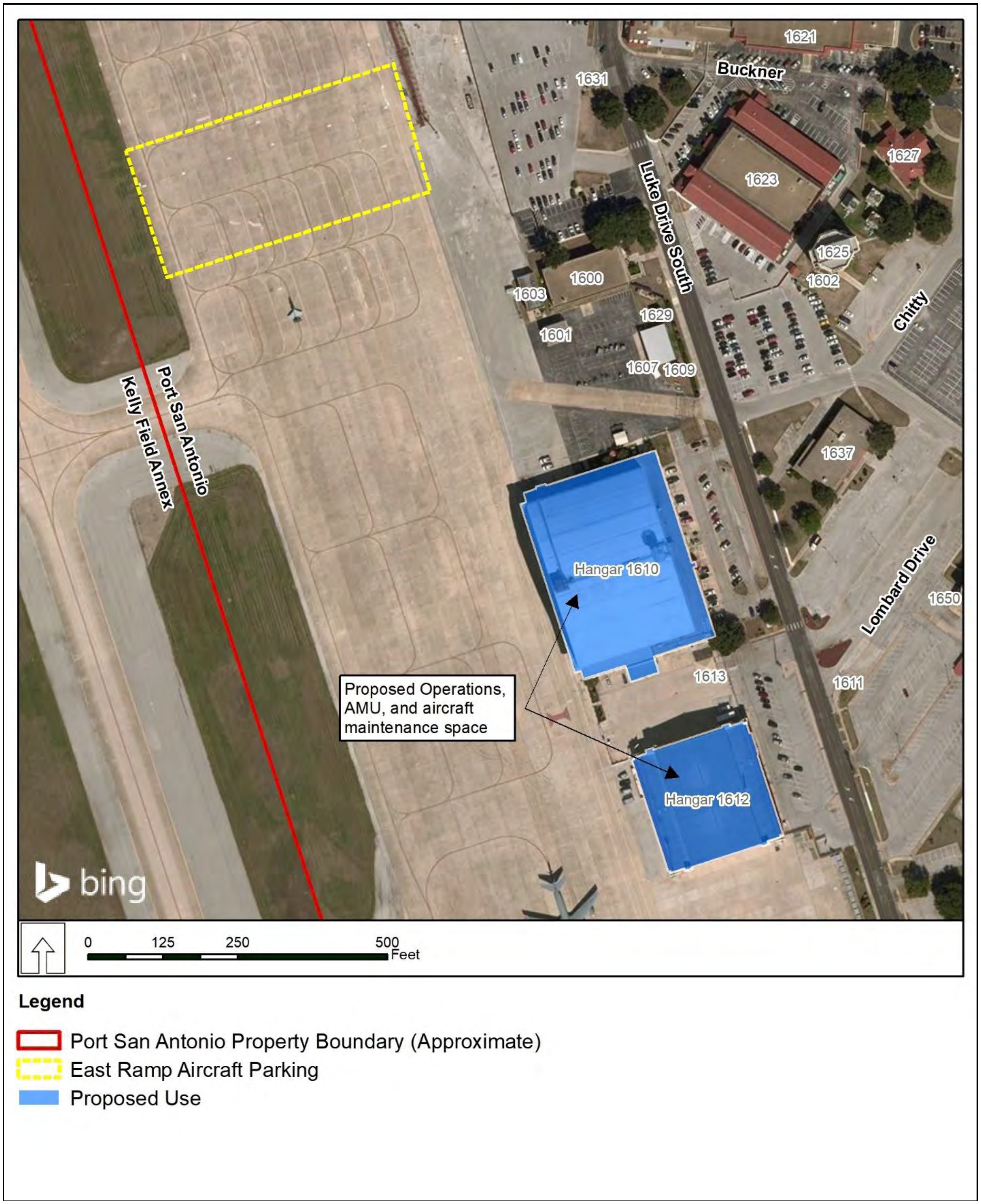

Figure 2-1. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

Figure 2-2. Proposed Location for Operations Space at Building 917.

Contract ADAIR aircraft would also use Air Force chaff and flares (refer to **Section 2.1.7** for additional information on defensive countermeasures). The ADAIR contractor would receive a training munitions allocation through the 149th Maintenance Squadron (149 MXS), Munitions Flight. 149 MXS munitions personnel would store, account for, inspect, maintain, assemble, and deliver chaff and flares to ADAIR aircraft; contract personnel would be responsible for loading and unloading chaff and flares on aircraft. In addition, some minor support for egress system munitions (i.e., cartridge-actuated devices [CADs] and propellant-actuated devices [PADs]) may be necessary; however, the level of support is expected to be minor and infrequent. The additional munitions functions would not require additional munitions personnel. Contractor maintenance personnel would be responsible for the inspection and maintenance of all external stores (e.g., captive air training missiles, electronic countermeasure pods, external fuel tanks). The ejector cartridges required for external stores would be considered as contractor-furnished equipment and would not require support from the base Munitions Maintenance. All required Aerospace Ground Equipment (AGE) would be owned and maintained by the contract ADAIR. Gas and diesel fuel for AGE would be obtained by contract ADAIR personnel from the base DLA fuel station through an account established with 149 LRS.

AEROSPACE GROUND EQUIPMENT (AGE) IS SUPPORT EQUIPMENT REQUIRED FOR AIRCRAFT MAINTENANCE AND SORTIE GENERATION AND IS COMPOSED OF EQUIPMENT SUCH AS GENERATORS, AIR COMPRESSORS, PORTABLE LIGHT SOURCES, TOW BARS, AND MOBILE LIQUID OXYGEN AND NITROGEN SOURCES.

2.1.3 Maintenance

As discussed above, maintenance would use hangar space and AMU facilities in either Hangar 1612 or 1610 to perform limited maintenance operations on contract ADAIR aircraft. Contract ADAIR aircraft maintenance would include routine inspections and minor unscheduled repairs on the flightline. Aircraft requiring major scheduled (depot level maintenance) or unscheduled maintenance would be expected to be flown back to the contractor’s home base for repairs. For the rare occasions when an aircraft is not flyable, the contractor would dispatch a temporary field repair team to Kelly Field Annex to repair the aircraft. Any additional maintenance support requirements (e.g., aircraft fuel cell, defueling, aircraft structural assets, non-destructive inspection Joint Oil Analysis Program tests) would be coordinated with 149 MXS, 149th Aircraft Maintenance Squadron, or 149 LRS, as appropriate on a non-interference basis.

2.1.4 Personnel

Contract ADAIR at Kelly Field Annex would be staffed by an estimated 46 additional contracted maintenance personnel who would primarily operate out of Hangar 1612 or 1610. Implementation of the Proposed Action would also employ an estimated nine contracted pilots to primarily operate out of Hangar 1612, Hangar 1610, or Building 917. It is expected that the initial personnel would arrive about 3 months after a contractor is selected, and the estimated arrival on Kelly Field Annex is between February 2020 and January 2021.

2.1.5 Sorties

The Proposed Action includes contracting for the support of an estimated seven contractor aircraft to fly an estimated 1,200 ADAIR sorties annually in support of the 149 FW at Kelly Field Annex. This number of sorties includes sorties expected for training activities (refer to **Section 2.1.6**) and aircraft leaving for or returning from either maintenance or other deployments.

Air Force convention is to describe daily flying schedules in terms of total sorties and a “flight turn pattern.” A flight turn pattern allows the CAF to fly available aircraft multiple times per day to maximize available flying opportunities for assigned pilots. Flight turn patterns are designed to allow aircraft to fly, land, complete appropriate post flight inspections, get refueled, and fly again. The maximum flight turn pattern to be flown at Kelly Field Annex, by contract ADAIR support, would be a 4 x 4.

A TURN PATTERN OF 4 X 4 DOES NOT REQUIRE EIGHT AIRCRAFT TO EXECUTE BUT RATHER COULD BE FILLED WITH ONLY FOUR AIRCRAFT (NOTWITHSTANDING IMPACTS OF BROKEN AIRCRAFT AND AIRSPACE SCHEDULES). THE TURN PATTERN AND TOTAL DAILY SORTIES ARE THE SAME FOR ENVIRONMENTAL PURPOSES, BECAUSE THEY BOTH INDICATE THE NUMBER OF TAKEOFFS AND LANDINGS FOR ANY GIVEN DAY. A 4 X 4 REPRESENTS EIGHT TOTAL SORTIES FOR THE DAY EVEN THOUGH THOSE SORTIES MAY HAVE BEEN FLOWN WITH ONLY FOUR TOTAL AIRCRAFT.

Contract ADAIR pilots may fly very few additional traffic patterns at Kelly Field Annex to maintain their currency and proficiency as required. Additional traffic patterns would be anticipated on no more than 5 percent of the annual daytime sortie total, about 58 sorties. There would be an estimated three closed patterns performed for each of these sorties.

Implementation of the Proposed Action would result in an increase of approximately 4 percent in the number of operations at Kelly Field Annex. Refer to **Section 2.1.6** for more information on training operations. Contract ADAIR would follow the local squadron's nighttime flying window with 4 percent of departures and 9 percent of arrivals occurring during environmental night (10:00 pm to 7:00 am local time; refer to Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*). This would increase Kelly Field Annex operations at night by approximately 156 operations per year, an increase of 10 percent of existing night operations. Contractor night sorties would be flown during the 149 FW's approved flying window.

2.1.6 Airspace Use

The locations of the airspace that would be used for contract ADAIR are depicted on **Figure 1-4** (**Section 1.1.2**). Current and projected ADAIR training activities in the airspace are estimated to be 1,130 sorties and summarized in **Table 2-3**. Proposed ADAIR sorties would generally consist of the following five steps: depart from Kelly Field Annex runway, transit from the airfield to airspace, perform ADAIR training, transit back to Kelly Field Annex, and land. ADAIR aircraft would spend 10 to 20 minutes to transit each way between the airfield and airspace. Time spent within the airspace within the MOAs projected for use (Crystal, Crystal North, Laughlin 2, Laughlin 3 High and Low, Kingsville 3, and Brady High and Low MOAs) would depend upon the specific training mission performed but would typically last 45 to 60 minutes. Supersonic operations are currently allowed in the MOAs above 30,000 feet (ft) above mean sea level (MSL). Contractor operations would occur in these MOAs concurrent to the 149 FW or other supported Air Force units. No airspace modifications would be required for contract ADAIR as part of the Proposed Action.

> Mean Sea Level (MSL) is altitude in feet above the mean sea level. And Above Ground Level (AGL) is altitude expressed in feet measured above the surface of the ground. When flying over land, both MSL and AGL are used to delineate airspace structure. Flight level (FL) is vertical altitude expressed in hundreds of feet.

Table 2-3
Current and Projected Training Activities by Kelly Field Annex

Airspace	Current Altitude[1]	Baseline Training Sorties	Projected ADAIR Training Sorties	Projected Total Sorties
Crystal and Crystal North	6,000 ft MSL to FL180	2,975	960	3,935
Laughlin 2	7,000 ft MSL to FL180			
Laughlin 3 Low	7,000 ft MSL to 15,000 ft MSL			
Laughlin 3 High	15,000 ft MSL to FL180			
Kingsville 3	8,000 ft AGL to FL180	350	113	463
Brady Low	500 ft AGL to 6,000 ft MSL	175	57	232
Brady High	6,000 ft MSL to FL180			
Total Proposed Airspace Sorties		**3,500**	**1,130**	**4,630**

Notes:
1 No change to current minimum flight altitude is proposed.

ADAIR = adversary air; AGL = above ground level; FL = flight level (vertical altitude expressed in hundreds of feet); ft = feet; MSL= mean sea level

2.1.7 Defensive Countermeasures

While contract ADAIR aircraft would not carry or employ live or inert munitions, aircraft would operate with advanced radar and electronic targeting systems during engagements. Contract ADAIR aircraft would employ chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during 100 percent of their training sortie operations on the Crystal and Crystal North MOAs, the Laughlin 2, Laughlin 3 Low, and Laughlin 3 High MOAs, and Kingsville 3 MOA. Countermeasures would not be used in the Brady High and Low MOAs. Chaff and flares are the principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems.

Chaff is an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Chaff bundles consists of millions of non-hazardous aluminum-coated glass fibers. When ejected from the aircraft, these fibers disperse widely in the air, forming an electromagnetic screen that temporarily hides the aircraft from radar and forms a radar decoy, allowing the aircraft to defensively maneuver or leave the area. Flares are magnesium pellets ejected from military aircraft and provide high-temperature heat sources that act as decoys for heat-seeking weapons targeting the aircraft. These defensive countermeasures are utilized to keep aircraft from being successfully targeted by or escape from weapons such as surface-to-air missiles, air-to-air missiles, anti-aircraft artillery, and in the case of the Proposed Action, other aircraft.

The existing and estimated additional chaff and flare use are presented in **Table 2-4**. Chaff and flares would not be used in the Brady Low and High MOAs. Frequent training in use of chaff and flares by aircrews to master the timing of deployment and the capabilities of the devices is a critical component of ADAIR training. Chaff and flares (similar to RR-188 chaff and M206 flares) are proposed for annual use in ADAIR training. While 100 percent of the requirement may not be allocated or expended, this amount is carried forward to determine potential impact associated with defensive countermeasures. Chaff and flares can be dispensed in the airspace without altitude restrictions.

Table 2-4
Existing and Proposed Defensive Countermeasure Use

Special Use Airspace	Countermeasure Type	Current Baseline Use[1]	Proposed Contract ADAIR Addition[2]	Total Estimated Future Use[3]
Crystal, Crystal North, Laughlin 2, and Laughlin 3 Low and High	Chaff Bundles	4,675	1,690	5,186
	Flares	23,055	8,284	25,575
Kingsville 3	Chaff Bundles	550	198	610
	Flares	2,712	975	3,009

Notes:
1. Baseline countermeasure use is based on the current FY18 use and includes chaff and flares used by CAF self-generated Red Air support.
2. Contract ADAIR estimated countermeasure use.
3. This amount is not additive and reflects a 25 percent savings in the amount of chaff and flares used by the CAF due to no longer being tasked to fly CAF self-generated Red Air support.

ADAIR = adversary air; CAF = Combat Air Forces

2.2 Selection Standards

In order to assess viable alternatives for the ADAIR implementation at Kelly Field Annex, the following selection standards were applied:

1. Mission: In addition to supporting Air Force prioritized missions as described in **Section 1.1.1**, ADAIR alternatives must not displace, interfere with, detract from, or reduce other Air Force missions or combat operations worldwide.
2. Airspace Capacity: Alternatives must have the airspace capacity to support force-on-force training engagements and must be able to safely support the additional ADAIR sorties in the airspace. Airspace must be large enough to effectively support realistic air-to-air training. Viable alternatives should not require establishing new military airspace but should occur within existing surrounding military airspace.
3. Facilities: Alternatives must leverage existing facilities that support the ADAIR requirements with minimal short duration, low-cost renovations, if any are needed. Alternatives must have existing
    a. operations work/office space;
    b. aircraft parking and hangar space;
    c. maintenance work/office space;
    d. munitions storage space;
    e. fuel storage capacity and delivery capability; and
    f. a runway of sufficient length for takeoff and landing of applicable aircraft, with appropriate safety features, infrastructure, and clear zones to ensure safe operations.
4. Cost and Time: ADAIR locations would need to support costs of facilities renovations from within their existing O&M budgets. Viable alternatives must not require major renovations or funding to implement. Furthermore, as CAF pilot readiness is currently an urgent need, viable ADAIR alternatives must be able to support ADAIR activities in the near-term. Solutions that cannot be implemented within the next 2 years, therefore, do not meet the purpose and need for the initiative.

2.3 Screening of Alternatives

The following potential alternatives were considered:

- Alternative 1 – Establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual sorties at Kelly Field Annex with 1,130 of these sorties in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs, with O&M activities consolidated in Hangar 1612 and aircrew briefings in Building 917.
- Alternative 2 – Establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual sorties at Kelly Field Annex with 1,130 of these sorties in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs, with O&M activities consolidated in Hangar 1610 and aircrew briefings in Building 917.
- Alternative 3 – Establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex with 1,130 of these sorties in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs, with operations consolidated completely in Building 917 and maintenance activities in Hangar 1610.
- Alternative 4 – Establish an additional Air Force AGRS of military pilots to fly CAF ADAIR aircraft (an estimated seven aircraft) providing 1,200 annual sorties at Kelly Field Annex with 1,130 of these sorties in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs.
- Alternative 5 – Establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual sorties at Kelly Field Annex with 1,130 of these sorties in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs, constructing new hangars and O&M facilities.
- Alternative 6 – Establish dedicated CAF ADAIR by tasking organic CAF units to provide the capability.

The selection standards described in **Section 2.2** were applied to these alternatives to determine which could support contract ADAIR requirements and fulfill the purpose and need for the Proposed Action. The six alternatives considered above are compared in **Table 2-5**.

Table 2-5
Comparison of Alternatives

Alternative Actions	Selection Standard				Meets Purpose and Need
	1. Mission	2. Airspace	3. Facilities	4. Cost and Time	
Alternative 1	Yes	Yes	Yes	Yes	**YES**
Alternative 2	Yes	Yes	Yes	Yes	**YES**
Alternative 3	Yes	Yes	Yes	Yes	**YES**
Alternative 4	No	Yes	Yes	No	**NO**
Alternative 5	Yes	Yes	No	No	**NO**
Alternative 6	No	Yes	Yes	Yes	**NO**

2.4 ALTERNATIVE ACTIONS ELIMINATED FROM FURTHER CONSIDERATION

Three alternatives were considered and eliminated from further consideration because they would not meet the purpose and need for the action or the selection standards (refer to **Section 2.2**). These alternatives included the following:

- Alternative 4: Establishing a new Air Force AGRS of military pilots would meet many of the selection standards; however, it would take a large amount of time to implement. Establishing a new Air Force AGRS of 4th generation aircraft would meet many of the selection standards; however, it would take a large amount of time to implement. It takes more than a decade to train an Air Force pilot. Establishing another organic AGRS would require intensive planning, budgeting, and training of Air Force pilots before they would be ready to execute their mission. Rapid stand-up and manning of additional AGRS squadrons would be possible but not without reducing both manpower and combat platforms available to support combat operations. Due to the timeframe and/or reductions in combat mission capacity involved, this alternative fails to meet Selection Standards 1 and 4 and does not meet the purpose and need for the Proposed Action.
- Alternative 5: Establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex and constructing new hangars and O&M facilities. Establishing the contract ADAIR mission with new facilities construction was considered but not carried forward as the alternative requires the construction of new facilities and does not provide support in the timely manner needed to address the pilot readiness crisis, and as such does not meet Selection Standards 3 and 4. It would take 4 to 5 years to plan, program, budget, appropriate, design, and construct new facilities. This would not support the purpose and need for the Proposed Action.
- Alternative 6: Establish dedicated CAF ADAIR by tasking organic CAF units to provide the capability. Tasking organic 4th generation assets to provide dedicated ADAIR support to Kelly Field Annex would result in both a reduction of combat power applied worldwide as well as continued degradation of the unit’s own readiness. The units employing 4th generation aircraft, such as the F-16, are heavily engaged in deployments and overseas missions. Under this alternative, these units would continue to struggle with providing for their own proficiency, while maintaining support for both combat operations and CAF ADAIR. Such an alternative does not meet Selection Standard 1 or the overarching purpose and need for the Proposed Action.

2.5 Detailed Description of the Selected Alternative Actions

NEPA and the CEQ regulations mandate the consideration of reasonable alternatives to the Proposed Action. "Reasonable alternatives" are those that also could be utilized to meet the purpose of and need for the Proposed Action. The NEPA process is intended to support flexible, informed decision-making; the analysis provided by this EA and feedback from the public and other agencies will inform decisions made about whether, when, and how to execute the Proposed Action. Three Alternative Actions meet the purpose of and need for the action, satisfy the criteria set forth in the selection standards, and were carried forward for further detailed analysis in this EA. The No Action Alternative provides a benchmark used to compare potential impacts of the Proposed Action. Alternatives carried forward for evaluation are described in **Sections 2.5.1** through **2.5.4**.

2.5.1 Alternative 1: Contract Adversary Air Operating Out of Hangar 1612

Under Alternative 1, CAF would establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex. Operations would be located in a consolidated facility in Hangar 1612 (refer to **Figure 2-1**) and aircrew briefings in Building 917. The contract ADAIR aircraft, maintenance, personnel, sorties, airspace use, and defensive countermeasures would be as described under Proposed Action.

2.5.2 Alternative 2: Contract Adversary Air Operating Out of Hangar 1610

Under Alternative 2, CAF would establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex. Operations would be located in a consolidated facility in Hangar 1610 (refer to **Figure 2-1**) and aircrew briefings in Building 917. The contract ADAIR aircraft, maintenance, personnel, sorties, airspace use, and defensive countermeasures would be as described under Proposed Action.

2.5.3 Alternative 3: Contract Adversary Air Operating Out of Hangar 1610 and Building 917

Under Alternative 3, CAF would establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex. The ADAIR contractor's operational space would be combined with the existing 182 FS in Building 917, while AMU and hangar space would be collocated in Hangar 1610 (refer to **Figures 2-1** and **2-2**). The contract ADAIR aircraft, maintenance, personnel, sorties, airspace use, and defensive countermeasures would be as described under Proposed Action.

2.5.4 No Action Alternative

Analysis of the No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of the potential environmental effects of the Proposed Action. NEPA requires an EA to analyze the No Action Alternative. No action means that an action would not take place at this time, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No action for this EA reflects the status quo, where no additional contract ADAIR assets would be established at Kelly Field Annex. Organic Kelly Field Annex ADAIR support would result in further declines in fielded pilot proficiency or combat operations. Kelly Field Annex self-generated ADAIR support, the status quo following calendar year 2017 pilot increases, is causing declining quality of pilot production which consequently results in unsustainable operations posing an unacceptable threat to national security. Aircraft tasked to support ADAIR missions organically from within CAF would continue to experience their own readiness and proficiency challenges due to the lost training time they are experiencing.

2.6 SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

The potential impacts associated with Alternatives 1, 2, and 3; and the No Action Alternative are summarized in **Table 2-6**. The summary is based on information discussed in detail in **Chapter 4 (Environmental Consequences)** of the EA and includes a concise definition of the issues addressed and the potential environmental impacts associated with each Alternative Action.

2.7 MITIGATION AND ENVIRONMENTAL COMMITMENTS

Agencies are required to identify and include all relevant and reasonable mitigation measures that could reduce potential significant impacts. The CEQ regulations (40 CFR § 1508.20) define mitigation as

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

As summarized in **Section 2.6**, there are no significant impacts as a result of the Proposed or Alternative Actions. Mitigation measures are not included in this EA; however, environmental commitments and BMPs are described, when applicable, in the environmental consequences discussion for each resource in **Chapter 4**. Kelly Field Annex follows applicable Air Force regulations and BMPs as well as federal, state, and local regulations and directives.

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Table 2-6
Comparison of Potential Environmental Consequences of the Proposed Action

Alternative	Resource												
	Airspace Management and Use	**Noise**	**Safety**	**Air Quality**	**Biological Resources**	**Water Resources**	**Soils**	**Land Use and Visual Resources**	**Socioeconomics**	**Environmental Justice -Protection of Children**	**Cultural Resources**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**	**Infrastructure, Transportation, and Utilities**
Alternative 1: **Contract ADAIR operations with 1,130 additional sorties** **O&M activities in Hangar 1612** **Aircrew briefings in Building 917**	**Kelly Field Annex** Negligible impacts **MOAs** Negligible impacts	**Kelly Field Annex** Negligible to minor impacts **MOAs** Negligible impacts Impacts associated with sonic booms would be negligible	**Kelly Field Annex** No impacts to ground, explosive, or flight safety **MOAs** No impacts to ground, explosive, or flight safety	**Kelly Field Annex** Minor increase in criteria pollutant emissions No impact on the region's ability to comply with the NAAQS for regulated pollutants Will not hamper efforts to achieve compliance with ozone NAAQS **MOAs** Minor increase in criteria pollutants in the Brady High and Low MOAs No impact in Crystal, Laughlin, and Kingsville MOAs No impact on the region's ability to meet NAAQS for all regulated pollutants	**Kelly Field Annex** Negligible, short-term and long-term impacts to wildlife Minor impacts to birds from potential aircraft/bird collisions No impacts to federally listed species **MOAs** No impacts to wildlife from use of countermeasures or from noise, including sonic booms	**Kelly Field Annex** N/A **MOAs** No impacts from deposition and transport of chaff and flare release No impacts from emergency fuel dumps	**Kelly Field Annex** N/A **MOAs** No direct impacts to soils from chaff and flare deposition Negligible indirect impacts from chaff and flare deposition	**Kelly Field Annex** No changes to existing land use Negligible impact to visual setting **MOAs** No changes to existing land use beneath the airspace No impacts to visual resources	**Kelly Field Annex** No impacts to population, economic environment, employment, housing, or educational resources **MOAs** No impacts to population, economic environment, employment, housing, or educational resources	**Kelly Field Annex** No disproportionate impact to minority or low-income populations No disproportionate impacts to children **MOAs** No disproportionate impact to minority or low-income populations No disproportionate impacts to children	**Kelly Field Annex** No impact to historic buildings or archaeological deposits No known traditional cultural resources or sacred sites are present **MOAs** No impact to historic buildings or archaeological deposits No known traditional cultural resources or sacred sites are present	**Kelly Field Annex** No impacts to hazardous waste management No impacts to asbestos-containing materials and lead-based paint management Long-term, minor beneficial impact to managing and disposal of PCBs No impacts from radon No environmental contamination **MOAs** N/A	**Kelly Field Annex** No impacts to local traffic Negligible impacts to utilities **MOAs** N/A
Alternative 2: **Contract ADAIR operations with 1,130 additional sorties** **O&M activities in Hangar 1610** **Aircrew briefings in Building 917**	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **Brady High and Low MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** N/A **MOAs** Same as Alternative 1	**Kelly Field Annex** N/A **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Minor alteration to Hangar 1610 interior with neglifible impact No impact to archaeological deposits No known traditional cultural resources or sacred sites present **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** N/A	**Kelly Field Annex** Same as Alternative 1 **MOAs** N/A

Table 2-6
Comparison of Potential Environmental Consequences of the Proposed Action

Alternative	Resource												
	Airspace Management and Use	**Noise**	**Safety**	**Air Quality**	**Biological Resources**	**Water Resources**	**Soils**	**Land Use and Visual Resources**	**Socioeconomics**	**Environmental Justice -Protection of Children**	**Cultural Resources**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**	**Infrastructure, Transportation, and Utilities**
Alternative 3: **Contract ADAIR Operations with 1,130 additional sorties** **Maintenance activities in Hangar 1610** **Operations and aircrew briefings in Building 917**	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **Brady High and Low MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** N/A **MOAs** Same as Alternative 1	**Kelly Field Annex** N/A **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** Same as Alternative 1	**Kelly Field Annex** Same as Alternative 1 **MOAs** No impact to historic buildings or archaeological deposits No known traditional cultural resources or sacred sites are present	**Kelly Field Annex** Same as Alternative 1 **MOAs** N/A	**Kelly Field Annex** Same as Alternative 1 **MOAs** N/A
No Action Alternative	No change to airspace management and use at Kelly Field Annex or inthe MOAs	No change to noise setting at Kelly Field Annex or in the MOAs	No change to ground, flight, or explosive safety at Kelly Field Annex or in the MOAs	No change to air quality at Kelly Field Annex or in the MOAs	No change to biological resources at Kelly Field Annex or in the MOAs	No change to water resources in the MOAs	No change to soil resources in the MOAs	No change to land use or visual resources at Kelly Field Annex or in the MOAs	No change to socioeconomic conditions at Kelly Field Annex or in the MOAs	No change to disproportionate impacts for minority, low-income, or children in the community at Kelly Field Annex or in the MOAs	No change to cultural resources at Kelly Field Annex or in the MOAs	No change to hazardous materials and wastes, contaminated sites, and toxic substances	No change to infrastructure, transportation, or utilities at Kelly Field Annex

No, minor, or negligible impact   Moderate impact but not significant   Major, significant impact

ADAIR = adversary air; MOA = Military Operations Area; N/A = not applicable; NAAQS = National Ambient Air Quality Standards; O&M = Operations and Maintenance; PCB = polychlorinated biphenyl

CHAPTER 3 AFFECTED ENVIRONMENT

Existing environmental conditions could be affected by the Proposed Action and alternatives. The existing conditions for relevant resources are defined to provide a meaningful baseline from which to compare potential future effects. In this chapter, each resource is defined, the geographic scope is identified, followed by a description of the existing conditions for that resource. The expected geographic scope of potential consequences is referred to as the ROI. The ROI boundaries will vary depending on the nature of each resource. For example, the ROI for some resources, such as socioeconomics and air quality, extend over a larger jurisdiction unique to the resource. In addition, some resources discuss the available baseline data, installation (Base) and airspace, in the same section and some discuss these elements separately, depending on the complexity of the ROI and the relationship of the Base to the airspace.

3.1 AIRSPACE MANAGEMENT AND USE

3.1.1 Definition of the Resource

Airspace management involves the direction, control, and handling of flight operations in the airspace that overlies the borders of the United States and its territories. Under Title 49, U.S.C. § 40103, Sovereignty and Use of Airspace and Public Law No. 103-272, the US government has exclusive sovereignty over the nation's airspace. The Federal Aviation Administration (FAA) has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

Aircraft use different kinds of airspace according to the specific rules and procedures defined by the FAA for each type of airspace. For the Proposed Action, the airspaces used are MOAs over land. A MOA is designated airspace outside of Class A airspace used to separate or segregate certain nonhazardous military activities from Instrument Flight Rules (IFR) traffic and to identify for Visual Flight Rules traffic where these activities are conducted (14 CFR § 1.1). Activities in MOAs include, but are not limited to, air combat maneuvers, air intercepts, and low-altitude tactics. The defined vertical and lateral limits vary for each MOA. While MOAs generally extend from 1,200 ft above ground level (AGL) to 18,000 ft MSL, the floor may extend below 1,200 ft AGL if there is a mission requirement and minimal adverse aeronautical effect. MOAs allow military aircraft to practice maneuvers and tactical flight training at airspeeds in excess of 250 knots indicated airspeed (approximately 285 mi per hour). The FAA requires publication of the hours of operation for any MOA so that all pilots, both military and civilian, are aware of when other aircraft could be in the airspace.

Each military organization responsible for a MOA develops a daily use schedule. Although the FAA designates MOAs for military use, other pilots may transit the airspace. To avoid conflicts, MOAs are designed to avoid entirely or have specific avoidance procedures around busy airports; these procedures also apply to small private and municipal airfields. Such avoidance procedures are maintained for each MOA, and military aircrews build them into daily flight plans.

In addition to the lower limits of charted airspace, all aircrews adhere to FAA avoidance rules. Aircraft must avoid congested areas of a city, town, settlement, or any open-air assembly of persons by 1,000 ft above the highest obstacle within a horizontal radius of 2,000 ft of the aircraft. Outside of congested areas, aircraft must avoid any person, vessel, vehicle, or structure by 500 ft. Bases may establish additional avoidance restrictions under MOAs.

The ROI for airspace use and management includes the Kelly Field Annex airfield and environs as well as the MOAs depicted on **Figure 1-4**.

3.1.2 Existing Conditions – Kelly Field Annex

The Kelly Field Annex airfield is operated by the 149 FW supporting military operations conducted by units stationed at the base. Military training has occurred at Kelly Field Annex since the construction of the first runway began in 1917. With a large complement of F-16s and C-5Ms, the 149 FW and 433d Airlift Wing have the ability to train a large number of pilots. Today, Kelly Field Annex airfield is shared with civilian aviation activities, including freight airplanes and private general aviation. The Boeing Corporation uses the airfield for maintenance, repair, and overhaul of several different military aircraft. The majority of operations at Kelly Field are performed by the 149 FW and 433d Airlift Wing.

Air Traffic Control (ATC) for Kelly Field Annex is provided by San Antonio Approach (FAA). Controlled Class D airspace, which is airspace that extends upward from the surface up to and including 3,200 ft MSL within a 4.5-nautical-mile (NM) radius of Kelly Field Annex, has been established around the airfield to support managing air traffic controlled by Kelly Tower.

A variety of factors can influence the annual level of operational activity at an airfield, including economics, national emergencies, and maintenance requirements. Operations consist of arrivals and departures (itinerant) by primarily military aircraft, with a smaller amount of commercial traffic of Amazon Boeing 767 flights. Military aircraft use makes up over 94 percent of the airfield use, with the remaining amount used by Amazon Boeing 767 flights (**Table 3-1**).

Table 3-1
Annual Operations at Kelly Field Annex

Use	Annual Flights/Sorties	Percentage of Use
Military		
149th Fighter Wing	18,200	28.4
433d Airlift Wing	35,360	55.3
Boeing Maintenance, Repair, and Overhaul	576	0.9
Transient	2,500	3.9
Civilian		
General Aviation	3,714	5.8
Commercial		
Amazon	3,650	5.7
Total	**64,000**	**100.0**

3.1.3 Existing Conditions – Airspace

The affected environment for airspace management includes MOAs where aircraft based at Kelly Field Annex perform training operations. F-16 aircraft assigned to Kelly Field Annex primarily train in the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs (see **Figure 1-4**). The Crystal and Crystal North MOAs are controlled by the ANG, the Kingsville MOAs are controlled by the US Navy, and the Laughlin MOAs are controlled by the Air Force Air Education and Training Command. These MOAs are described earlier in **Table 2-3**.

3.2 NOISE

3.2.1 Definition of the Resource

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is generally described as unwanted sound. Unwanted sound can be based on objective effects (such as hearing loss or damage to structures) or subjective judgments (community annoyance). The response of different individuals to similar noise events is diverse and influenced by the type of noise, the perceived importance of the noise, its appropriateness in the setting, the time of day, the type of activity during which the noise occurs, and the sensitivity of the individual. Noise also may affect wildlife through disruption of nesting, foraging, migration, and other life-cycle activities.

Sound is expressed in logarithmic units of decibels (dB). A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB; sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 to 140 dB are felt as pain (Berglund and Lindvall, 1995). The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB.

All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second, or hertz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements usually employ an "A-weighted" scale that filters out very low and very high frequencies to replicate human sensitivity. It is common to add the "A" to the measurement unit to identify that the measurement was made with this filtering process, for instance dBA. In this document, the dB unit refers to A-weighted sound levels unless otherwise noted.

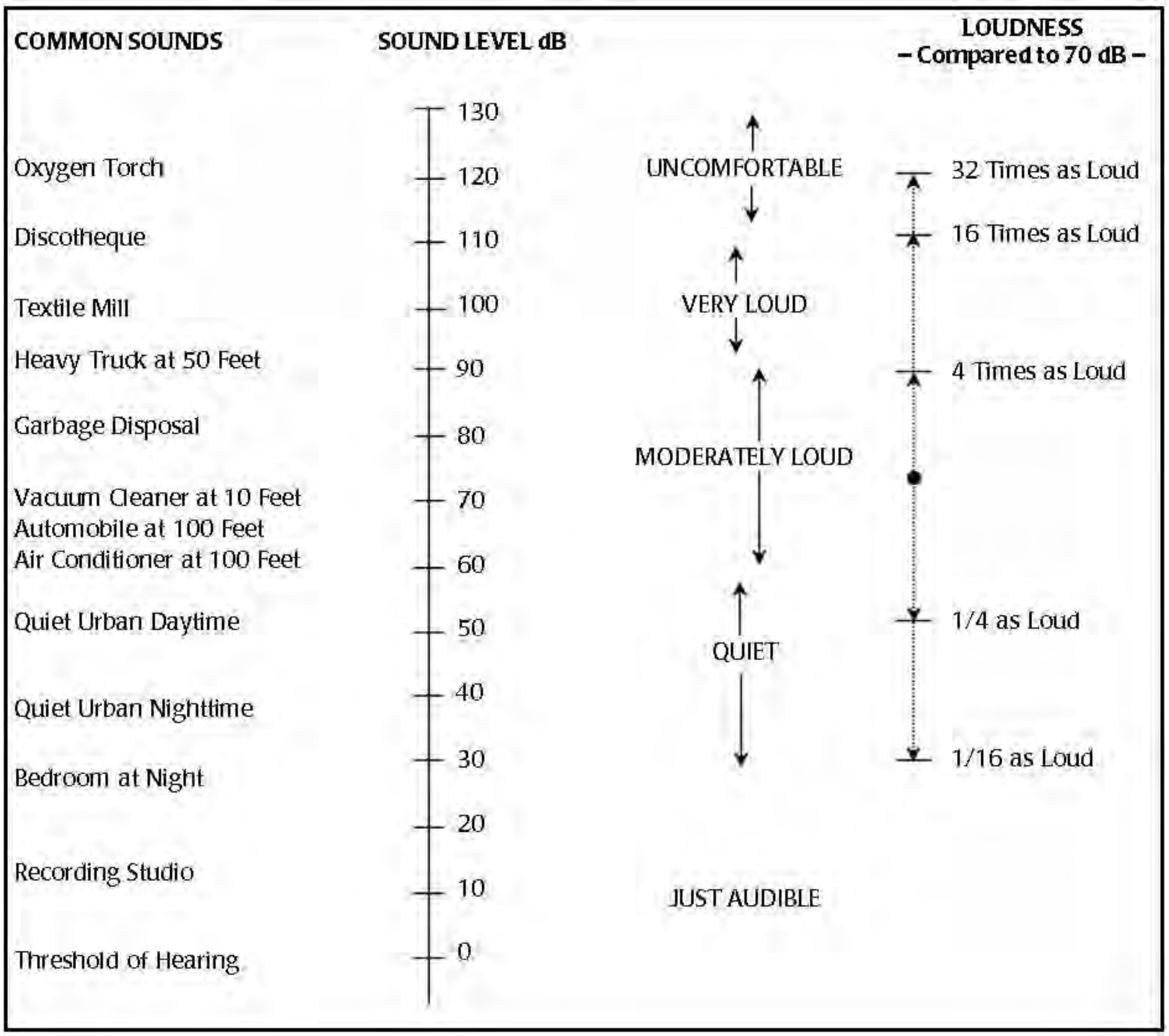
A-weighted sound levels from common sources are given on **Figure 3-1**. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods.

Military aircraft generate two types of sound. One is subsonic noise, which is continuous sound generated by the aircraft's engines and also by air flowing over the aircraft itself. Subsonic noise occurs at the airfields and in the airspace. The other type is supersonic noise consisting of sonic booms. Sonic booms are transient, impulsive sounds generated during supersonic flight. Supersonic flight must occur only within authorized airspace. These two types of noise differ in terms of characteristics.

Aircraft subsonic noise consists of two major types of sound events: flight events (including takeoffs, landings, and flyovers) and stationary events (such as engine maintenance run-ups). Noise from aircraft overflights typically occurs beneath main approach and departure paths and in local air traffic patterns around the airfield. Noise from stationary events typically occurs in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Aircraft in supersonic flight (i.e., exceeding the speed of sound, Mach 1) cause sonic booms. A sonic boom is characterized by a rapid increase in pressure, followed by a decrease before a second rapid return to normal atmospheric levels. This change occurs very quickly, usually within a few tenths of a second. It is usually perceived as a "bang-bang" sound. The amplitude of a sonic boom is measured by its peak overpressure, in pounds per square foot (psf). The amplitude depends on the aircraft's size, weight, geometry, Mach number, and flight altitude. Altitude is usually the biggest single factor. Maneuvers (turns, dives, etc.) also affect the amplitude of particular booms.

Not all supersonic flights cause sonic booms that are heard at ground level. As altitude increases, air temperature and sound speed decrease. These sound speed changes cause booms to be turned upward as they travel toward the ground. Depending on the altitude of the aircraft and the Mach number, many sonic booms can be bent upward such that they never reach the ground. This phenomenon, referred to as "cutoff," also acts to limit the width (area covered) of the sonic booms that do reach the ground. The overpressures of booms that reach the ground are well below those that would begin to cause physical injury to humans or animals (see **Appendix B-1**). They can, however, be annoying and can cause startle reaction in humans and animals. On occasion, sonic booms can cause physical damage (e.g., to a window) if the overpressure is of sufficient magnitude. The condition of the structure is a major factor when damage occurs, the probability of which, tends to be low. For example, the probability of a 1-psf boom (average pressure in airspace) cracking plaster or breaking a window falls in the range of 1 in 10,000 to 1 in 10 million.



Source: Harris, 1979.

Figure 3-1. Typical A-weighted Sound Levels of Common Sounds.

3.2.1.1 Noise Metrics

Noise metrics quantify sounds, so they can be compared with each other, and with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section summarizes the metrics relevant to environmental analysis. Noise metrics and noise models are described in **Appendix B**.

Single Event Metrics

Maximum Sound Level

The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event on **Figure 3-2**.

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). L_{max} is important in judging if a noise event will interfere with conversation, television, or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise, because it does not account for how long the sound is heard.

Sound Exposure Level

Sound Exposure Level (SEL) combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure 3-2** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.

Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time, but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

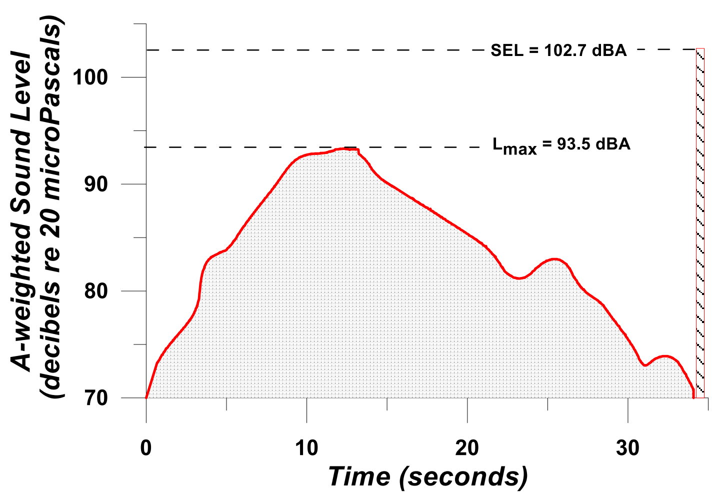


Figure 3-2. Example of Maximum Sound Level (L_{max}) and Sound Exposure Level (SEL) from an Individual Event.

Overpressure

The single event metrics commonly used to assess supersonic noise are overpressure in psf and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint.

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section 3.2.1**) except that C weighting places more emphasis on low frequencies below 1,000 hertz.

Cumulative Metrics

Equivalent Sound Level

Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity and is given along with the value. The time period is often shown in parenthesis (e.g., $L_{eq(24)}$ for 24 hours). The L_{eq} from 7 a.m. to 3 p.m. may give exposure of noise for a school day.

An example of $L_{eq(24)}$ using notional hourly average noise levels ($L_{eq[h]}$) for each hour of the day is given on **Figure 3-3**. The $L_{eq(24)}$ for this example is 61 dB.

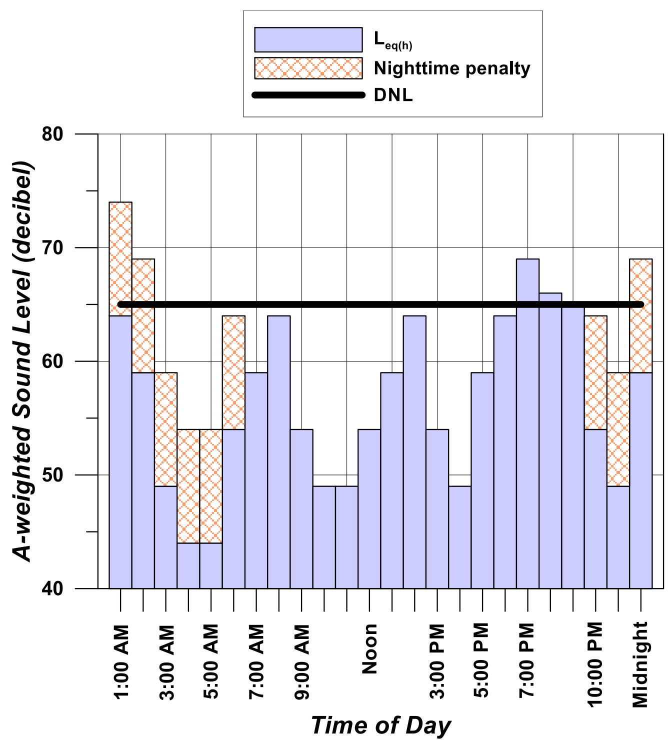


Figure 3-3. Example of Day-Night Average Sound Level (DNL) Computed from Hourly Average Sound Levels ($L_{eq(h)}$).

Day-Night Average Sound Level

Day-Night Average Sound Level (DNL) is a cumulative metric that accounts for all noise events in a 24-hour period; however, unlike $L_{eq(24)}$, DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent. For airports and military airfields, DNL represents the average sound level for annual average daily aircraft events.

An example of DNL using notional hourly average noise levels ($L_{eq[h]}$) for each hour of the day is given on **Figure 3-3**. Note the $L_{eq(h)}$ for the hours between 10 p.m. and 7 a.m. have a 10-dB penalty assigned. DNL for the example noise distribution shown on **Figure 3-3** is 65 dB.

DNL does not represent a noise level heard at any given time but represents long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; US Environmental Protection Agency [USEPA], 1978).

Onset-Rate Adjusted Monthly Day-Night Average Sound Level

Military aircraft utilizing special use airspaces such as Military Training Routes, MOAs, and restricted areas/ranges generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in special use airspaces is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

The cumulative daily noise metric devised to account for the “surprise” effect of the sudden onset of aircraft noise events on humans and the sporadic nature of special use airspace activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event’s SEL, while onset rates below 15 dB per second require no adjustment to the event’s SEL (Stusnick et al., 1992). The term ‘monthly’ in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties, the busiest month.

3.2.1.2 Noise Models

This section summarizes the analysis tools used to calculate the noise levels for the EIAP.

NOISEMAP

Analyses of aircraft noise exposure and compatible land uses around Department of Defense (DOD) airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2006a, 2006b). The core computational program of the NOISEMAP suite is NMAP. In this report, NMAP Version 7.3 was used to analyze aircraft operations and to generate noise contours.

MR_NMAP

When the aircraft flight tracks are not well defined and are distributed over a wide area, such as in Military Training Routes with wide corridors or MOAs, the Air Force uses the DOD-approved MR_NMAP program (Lucas and Calamia, 1996). In this report, MR_NMAP Version 3.0 was used to model subsonic aircraft noise in special use airspaces. For airspace environments where noise levels are calculated to be less than 45 dB, the noise levels are stated as “<45 dB.”

PCBoom

Environmental analysis of supersonic aircraft operations requires calculation of sonic boom amplitudes. For the purposes of this study, the Air Force and DOD-approved PCBoom program was used to assess sonic boom exposure due to military aircraft operations in supersonic airspace. In this report, PCBoom Version 4 was used to calculate sonic boom ground signatures and overpressures from supersonic vehicles performing steady, level flight operations (Plotkin, 2002).

BooMap

For cumulative sonic boom exposure under supersonic air combat training arenas, the Air Force and DOD-approved BooMap program was used. In this report, BooMap96 was used to calculate cumulative C-weighted DNL (CDNL) exposure based on long term measurements in a number of airspaces (Plotkin, 1993).

The ROI for noise includes the Kelly Field Annex airfield and environs as well as the MOAs depicted on **Figure 1-4**. Noise analysis at Kelly Field Annex was conducted to update the airfield noise contours and the MOAs described in **Section 3.1.2**, in order to reflect the most recent and accurate aircraft operations and flying conditions.

3.2.2 Existing Conditions – Kelly Field Annex

As is normal for military installations with a flying mission, the primary driver of noise at Kelly Field Annex is aircraft operations. Standard aircraft operations include take-offs, landings, closed patterns, and static run-ups.

In addition to aviation noise, some additional noise results from the day-to-day activities associated with operations, maintenance, and the industrial functions associated with the operations of the airfield. These noise sources include the operations of ground-support equipment, and other transportation noise from vehicular traffic. Noise resulting from aircraft operations remains the dominant noise source.

Aircraft operations at Kelly Field Annex consist of based military aircraft, civilian aircraft, and a variety of transient aircraft. Existing annual aircraft operations at Kelly Field Annex total 64,000 operations, as summarized in **Table 3-2**. An operation is defined as a single takeoff or landing. Closed patterns consist of two operations, one departure and one arrival (e.g., two closed pattern circuits consist of four total operations). The table pattern numbers are operation counts, not pattern circuit counts. Kelly Field Annex's Runway 15 is used for 80 percent of military aircraft operations while Runway 33 is used for the remaining 20 percent of operations. The majority of aircraft operations at Kelly Field Annex are performed by the based F-16C and C-5M aircraft. A more detailed existing annual aircraft operations table can be found in **Appendix B-2**.

Table 3-2
Existing Annual Aircraft Operations Summary at Kelly Field Annex

Aircraft	Departures		Arrivals		Closed Patterns		Total Operations		
	Day	Night	Day	Night	Day	Night	Day	Night	Total
F-16C	3,360	140	3,184	316	11,200	0	17,744	456	18,200
C-5M	1,014	26	841	199	32,606	674	34,461	899	35,360
Civilian	3,824	26	3,829	21	240	0	7,893	47	7,940
Transients	1,219	31	1,193	57	0	0	2,412	88	2,500
Grand Total	**9,417**	**223**	**9,047**	**593**	**44,046**	**674**	**62,510**	**1,490**	**64,000**

Source: Air Force, 2017

The resultant 65 to 85 dB DNL contours in 5-dB increments for the existing daily flight events at Kelly Field Annex are shown on **Figure 3-4**. In accordance with AFH 32-7084, *AICUZ Program Manager's Guide*, the 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations. It should be emphasized that these noise levels, which are often shown graphically as contours on maps, are not discrete lines that sharply divide louder areas from land largely unaffected by noise. Instead, they are part of a planning tool that depicts the general noise environment around the installation based on typical aviation activities. Areas beyond 65-dBA DNL can also experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL noise contours may vary from year to year due to fluctuations in operational tempo due to unit deployments, funding levels, and other factors. Static run-up operations, such as maintenance and pre/post-flight run-ups, were also modeled. A more detailed discussion of static operations at Kelly Field Annex can be found in **Appendix B-2**.

The prominent features from **Figure 3-4** are the extents of the DNL contours along the extended centerline of Runway 15/33. The 65-dB contour extends beyond the base boundary, approximately 2.0 mi to the north and approximately 2.3 mi to the south from the end of the runway. The 70-dB DNL contour extends approximately 1.4 mi to the north and 1.6 mi to the south from the end of the runway. The 75-dB DNL contour extends approximately 0.3 mi to the north and 0.5 mi to the south from the end of the runway. The area within each DNL noise contour for the existing conditions as shown on **Figure 3-4** are shown in **Table 3-3**.

Table 3-3
Existing Day-Night Average Sound Level Area Affected at Kelly Field Annex

Noise Level (dBA DNL)	Area Within Noise Contour (acres)[1]
>65	4,518
>70	2,390
>75	1,295
>80	701
>85	341

Notes:
[1] Area (on- and off-base) was based off NOISEMAP modeled noise contours and used to calculate the amount of land within each noise contour. The amounts shown are cumulative, i.e., the acreage within the >85 dBA contour is also within all the lower noise level contours.

dBA = A-weighted decibel; DNL = Day-Night Average Sound Level

A number of points of interest (POIs) have been identified in the vicinity of Kelly Field Annex. These POIs are made up of noise-sensitive receptors such as homes, schools, hospitals, and places of worship. **Table 3-4** shows the DNL as a result of aircraft operations at Kelly Field at the 35 POIs for the existing conditions. Nineteen of the 35 POIs are currently exposed to DNL between 60 and 65 dB and three of the POIs are exposed to DNL higher than 65 dB.

3.2.3 Existing Conditions – Airspace

The primary MOAs used by Kelly Field Annex-based aircraft are the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs. Crystal and Crystal North receive approximately 42.5 percent of all airspace operations originating from Kelly Field Annex while Laughlin 2 and Laughlin 3 receive 42.5 percent, Kingsville 3 receives 10 percent, and Brady High and Low receive 5 percent. All MOAs are over land. A summary of Kelly Field Annex's annual airspace operations is presented in **Table 3-5**.

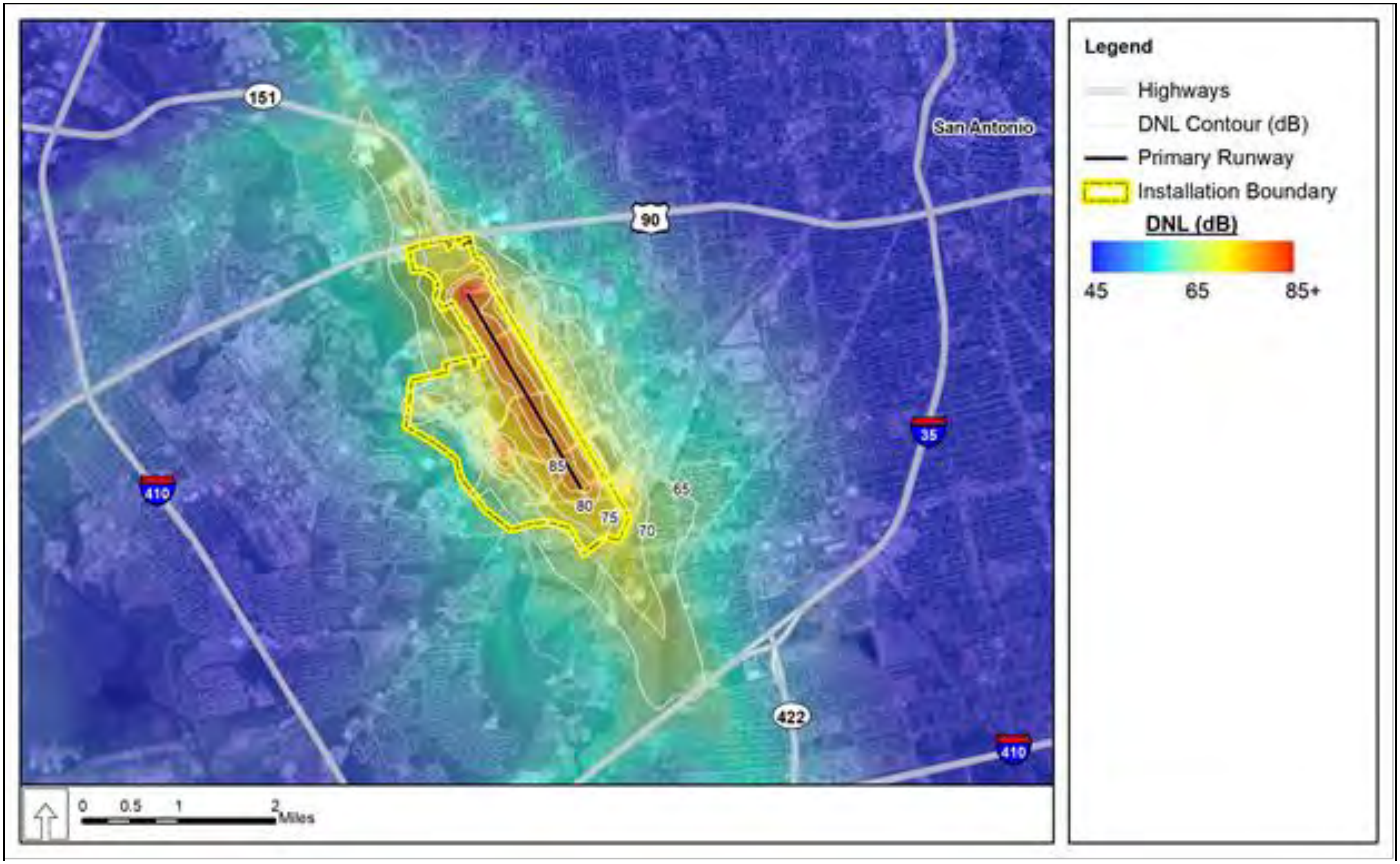


Figure 3-4. Existing Day-Night Average Sound Level Contours at Kelly Field Annex.

Table 3-4
Existing Day-Night Average Sound Level at Points of Interest in the vicinity of Kelly Field Annex

POI		DNL (dBA)
ID	**Description**	
CH1	San Antonio Bynum Seventh Day Advent Church	66
CH2	Browning United Methodist Church	64
CH3	Saint Mark Independent Methodist Church	63
CH4	Centro Cristiano Nueva Vida	63
CH5	First Baptist Church	60
CH6	Iglesia Bautista Monte de la Olivas	64
CH7	Iglesia El Calvario	61
CH8	Kingdom Hall of Jehovahs Witnesses	62
CH9	South San Antonio Baptist Church	62
CH10	Templo Amor y Gracia	63
ELE1	Winston Elementary School	64
ELE2	Athens Elementary School	61
ELE3	Price Elementary School	61
ELE4	H. B. Gonzalez Elementary School	62
ELE5	Miguel Carrillo Jr. Elementary School	64
MID	Dwight Middle School	62
NR11	Kindred School/South San High School	55
NR24	S. Spicewood Park Residential Area	56
NR27	John Glenn School	47
NR37	Lincoln School	54
NR38	Oliver W Holmes High School	53
NR40	John Marshall High School	49
NR42	SE Pearsall Road Residential Area	55
NR49	University of Texas at San Antonio	36
NR50	Stevenson Middle School	39
SD01	Quintana Rd and SW Military Dr Residential Area	73
SD02	Golden Community Park Residential Area	66
SD03	Palo Alto Residential Area	62
SD04	North Spicewwod Park Residential Area	60
SD05	Van de Walle Park Residential Area	65
SD06	Ingram Rd and Callahan Rd Residential Area	61
SD07	South Leon Valley Residential Area	58
SD08	Huebner Rd and Bandera Rd Residential Area	56
SD09	South O P Schnabel Park Residential Area	53
WLFH	Wilford Hall Hospital	54

Notes:
Affected POIs based on NOISEMAP-modeled noise contours and used to calculate the POIs within each noise contour.

dBA = A-weighted decibel; DNL = Day-Night Average Sound Level; POI = point of interest

Table 3-5
Existing Annual Airspace Operations Summary at Kelly Field Annex

Aircraft	Crystal Crystal North		Laughlin 2 Laughlin 3		Kingsville 3		Brady High/Low		Total Operations		
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Total**
F-16C	1,354	134	1,354	134	319	32	159	16	3,186	316	3,502

Based aircraft from Kelly Field Annex contribute the vast majority of airspace flight operations in Crystal and Crystal North MOAs. In each of Laughlin 2 and 3, Kingsville 3, and Brady High and Low MOAs, there can be up to 20,000 sorties annually from other non-Kelly Field Annex-based aircraft. For the subsonic noise levels modeled for Kelly Field Annex aircraft only, the existing conditions do not exceed 45 dB L_{dnmr} under any primary use airspace. Using the methods described in **Section 3.2.1.2** for MR_NMAP, the L_{dnmr} noise levels for the existing conditions were calculated from the subsonic aircraft operations underneath the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs. Kelly Field Annex-based aircraft dominate the noise environment of Crystal and Crystal North MOAs as they are the primary users of these two airspaces. Kelly Field Annex-based aircraft do not dominate the noise environment of the other MOAs due to the large number of operations from aircraft based at other installations and the low number of Kelly Field Annex aircraft operations, and their corresponding low L_{dnmr} noise levels, occurring in these airspaces.

Supersonic operations are allowed in the Crystal, Crystal North, Laughlin 2, Laughlin 3 High, Kingsville 3, and Brady High MOAs above 30,000 ft MSL. Airspace sorties require aircraft to exceed Mach 1.0 (supersonic) for brief periods of time for approximately 10 percent of total flight time. This is equivalent to less than 5 minutes of supersonic flight activity per sortie. These MOAs are all located over land such that supersonic flight operations in these MOAs have the potential to generate noise heard by people on the ground. The cumulative sonic boom levels estimated for the existing conditions do not exceed 45 dB CDNL under any primary use airspace unit.

Single event sonic boom levels estimated for existing supersonic flights in the airspaces are shown in **Tables 3-6** and **3-7**. Overpressure (psf) and CSEL (decibels) were estimated directly under the flight path for the F-16C aircraft at various altitudes and Mach numbers. Overpressure levels estimated for the Crystal, Crystal North, Laughlin 2, and Laughlin 3 High MOAs range from 1.9 to 1.0 psf depending on the flight conditions. Likewise, overpressure levels for the Kingsville 3 and Brady High MOAs range from 1.7 to 0.9 psf.

When sonic booms reach the ground, they impact an area that is referred to as a “carpet.” The size of the carpet depends on the supersonic flight path and on atmospheric conditions. The width of the boom carpet beneath the aircraft is about 1 mi for each 1,000 ft of altitude (NASA, 2017). Sonic booms are loudest near the center of the carpet, having a sharp “bang-bang” sound. Near the edges, they are weak and have a rumbling sounding like distant thunder. The boom levels shown in **Tables 3-6** and **3-7** are the loudest levels computed at the center of the carpet, directly under the flight path, for the constant Mach, level flight conditions indicated. The location of these booms will vary with changing flight paths and weather conditions, so it is unlikely that any given location will experience these undertrack levels more than once over multiple events. Public reaction is expected to occur with overpressures above 1 psf, and in rare instances, damage to structures have occurred at overpressures between 2 and 5 psf (NASA, 2017). People located farther away from the supersonic flight paths, who are still within the primary boom carpet, might also be exposed to levels that may be startling or annoying, but the probability of this decreases the farther away they are from the flight path. People located beyond the edge of the boom carpet are not expected to be exposed to sonic boom although post-boom rumbling sounds may be heard.

Table 3-6
Crystal, Crystal North, Laughlin 2, and Laughlin 3 MOAs: Sonic Boom Levels Undertrack for based Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (Feet)		
	30,000	40,000	50,000
Mach 1.2			
Overpressure (psf)			
F-16C	1.7	1.2	1.0
C-Weighted Sound Exposure Level (dB)			
F-16C	106.2	103.4	101.3
Mach 1.5			
Overpressure (psf)			
F-16C	1.9	1.3	1.0
C-Weighted Sound Exposure Level (dB)			
F-16C	107	104	102

Note:
C-weighted Sound Exposure Level (CSEL) – SEL with frequency weighting that places more emphasis on low frequencies below 1,000 hertz

Table 3-7
Kingsville 3 and Brady High MOAs: Sonic Boom Levels Undertrack for based Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (Feet)		
	30,000	40,000	50,000
Mach 1.2			
Overpressure (psf)			
F-16C	1.5	1.2	0.9
C-Weighted Sound Exposure Level (dB)			
F-16C	105.3	102.8	101.0
Mach 1.5			
Overpressure (psf)			
F-16C	1.7	1.2	1.0
C-Weighted Sound Exposure Level (dB)			
F-16C	106	103	101

Note:
C-weighted Sound Exposure Level (CSEL) – SEL with frequency weighting that places more emphasis on low frequencies below 1,000 hertz

3.3 SAFETY

3.3.1 Definition of the Resource

Safety concerns associated with ground, explosive, and flight activities are considered in this section. Ground safety considers issues associated with ground O&M activities that support unit operations including arresting gear capability, jet blast/maintenance testing, and safety danger. Aircraft maintenance testing occurs in designated safety zones. Ground safety also considers the safety of personnel and facilities on the ground that may be placed at risk from flight operations in the vicinity of the airfield and in the airspace. Clear Zones and Accident Potential Zones around the airfield restrict the public's exposure to areas where there is a higher accident potential. Although ground and flight safety are addressed separately, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns.

Explosives safety relates to the management and safe use of ordnance and munitions. Flight safety considers aircraft flight risks such as midair collision, bird/wildlife-aircraft strike hazard (BASH), and in-flight emergency. Contractor planes will follow Air Force safety procedures and aircraft specific emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to ATC procedures due to an in-flight emergency; these procedures are defined in AFI 11-202 [Volume 3], *General Flight Rules*, AFI 11-2MDS [Volume 3], *Aircrew Flight Equipment (AFE) Operations Procedures*, and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

Existing conditions are organized by ground, explosive, and flight safety. The ROI includes Kelly Field Annex and areas immediately adjacent to the base where ground and explosive safety concerns are described, as well as the airfield and airspaces where flight safety is discussed.

3.3.2 Existing Conditions – Kelly Field Annex and Airspace

3.3.2.1 Ground Safety

Ground safety includes several categories including ground and industrial operations, operational activities, and motor vehicle use. Ground mishaps can occur from the use of equipment or materials and maintenance functions. Day-to-day O&M activities conducted by the 149 FW are performed in accordance with applicable Air Force safety regulations, published Air Force Technical Orders, and standards prescribed by Air Force Occupational Safety and Health requirements.

Emergency Response

For emergency response, the Air Force provides emergency responders (Airport Firefighter) trained on the applicable mission design series. For crash response, the DOD provides on-field aircraft crash damaged or disabled aircraft recovery (CDDAR). For events occurring off base, civilian authorities (city, county, or state) are first on scene; once on scene, the Air Force provides an Incident Commander and command staff for site management, security and safety investigation purposes. Emergency response procedures also apply to civilian aircraft located on the greater Port San Antonio area.

Safety Zones

Safety zones around airfields that restrict incompatible land uses are designated to reduce exposure to aircraft safety hazards. These include the Clear Zones (CZ), which are areas immediately beyond the ends of a runway, and Accident Potential Zones (APZ) I and APZ II, which are areas beyond the CZ. The standards for CZs and APZs are established by DODI 4165.57, *Air Installations Compatible Use Zones*. Within the CZ, which covers a 3,000-by-3,000-ft area at the end of each runway, the overall accident risk is the highest. APZ 1, which extends for 5,000 ft beyond the CZ, is an area of reduced accident potential. In APZ II, which is 7,000 ft long, accident potential is the lowest among the three zones.

Open space (undeveloped) and agricultural uses (excluding raising of livestock) are the only uses deemed compatible in a CZ. Land use within APZs is based on the concept of limiting density of land use, and uses such as residential development, educational facilities, and medical facilities are considered incompatible and are strongly discouraged. Within the CZ at Kelly Field Annex, there is approximately 27 ac of incompatible land use, as well as about 19 ac of incompatible land use in APZ I, and about 81 ac of incompatible land use in APZ II (City of San Antonio, 2018). The safety zones are shown on **Figure 3-5**.

Quantity-distance (Q-D) arcs are an additional safety zone and are described in **Section 3.3.2.2**, **Explosive Safety**.

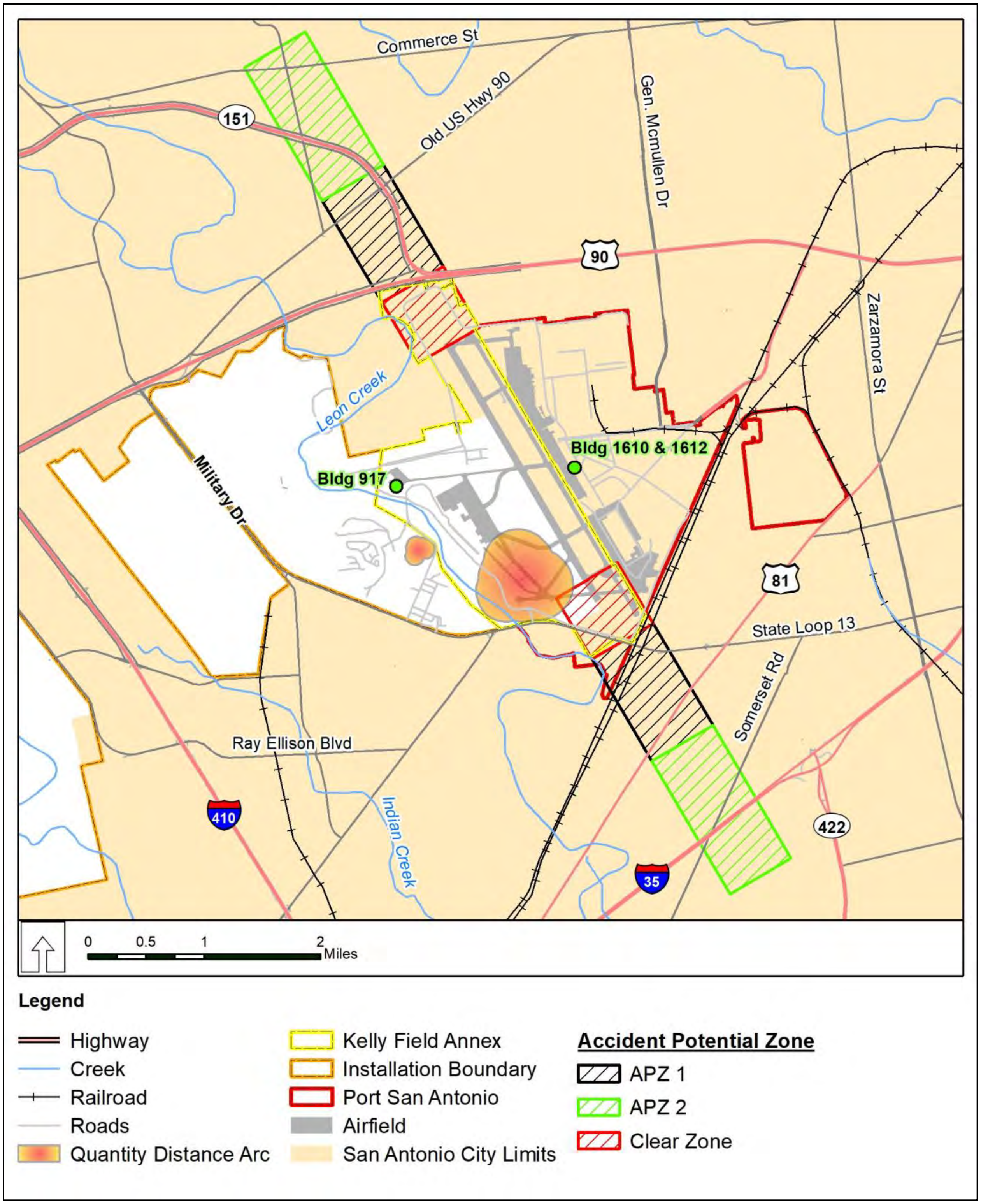


Figure 3-5. Kelly Field Annex Clear Zones and Accident Potential Zones.

Arresting Gear Capability

Per AFI 32-1043, *Managing Aircraft Arresting Systems*, criteria for siting aircraft arresting systems vary according to the type of system and operational requirement. The best location for runways used extensively during instrument meteorological conditions is 2,200 to 2,500 ft from the threshold; however, if aircraft that are not compatible with the arresting system must operate on the same runway, the installation commander may shift the installation site as close to the threshold as possible. The critical factor in this case is assurance that the runout area for an aircraft engaging the system in an aborted takeoff scenario is large enough to safely accommodate other arresting systems or equipment such as light fixtures. Kelly Field Annex has BAK-12/14 cable arresting system on each end of Runway 15/33 and a MB-100 textile brake system on the south overrun.

3.3.2.2 Explosive Safety

The 149 FW has a Munitions Flight assigned to the 149 MXS located at the airfield at Kelly Field Annex. Personnel assigned to the 149 MXS Munitions flight currently support the 149 FW flying mission with munitions support, including storage, inspection, maintenance, accountability, as well as delivery and pick-up of aircraft munitions to the airfield. The 502d Air Base Wing has a Munitions Flight assigned to the 502d Logistics Readiness Squadron located at Medina Training Annex.

Aircraft munitions include ammunition, propellants (solid and liquid), pyrotechnics, warheads, explosive devices, and chemical agent substances and associated components that present real or potential hazards to life, property, or the environment. AFMAN 91-201, *Explosives Safety Standards*, defines the guidance and procedures dealing with munition storage and handling.

During typical training operations, aircraft are not loaded with high-explosive ordnance. Training munitions usually include captive air-to-air training missiles, countermeasure chaff and flares, and cannon ammunition with inert projectiles. All munitions are stored and maintained in the munitions storage area within facilities sited for the allowable types and amounts of explosives. All storage and handling of munitions is carried out by trained and qualified 149 MXS Munitions Flight personnel and in accordance with Air Force-approved technical orders.

Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called Q-D arcs, are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has Q-D arcs extending outward from its sides and corners for a prescribed distance. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure personnel safety and to minimize potential for damage to other facilities in the event of an accident. In accordance with AFMAN 91-201, paragraphs 12.47.2 and 12.47.3, the ramp does not need to be sited for chaff and flares and is not currently sited for Hazard Class 1.3. The Q-D arcs on Kelly Field Annex are shown on **Figure 3-5**.

3.3.2.3 Flight Safety

Located at Building 1160 on Lackland AFB-Kelly Field Annex, Kelly tower supports the training and readiness for the 433d Airlift Wing, 149 FW, and multiple military training transient operations. In addition to military missions/assets, Kelly tower directly supports Port San Antonio and various mission partners ranging from civilian pilot training, parcel services, civilian medical evacuation services, and Boeing maintenance services, which allows a wide variety of aircraft to conduct operations at any given time. The control tower manages aircraft flying within a range of 5 mi of the base. Aircraft flying beyond 5 mi are transferred to San Antonio terminal radar approach.

The potential for aircraft accidents is a primary public concern with regard to flight safety. Such accidents may occur as a result of mid-air collisions, collisions with manmade structures or terrain, mechanical failure, weather-related accidents, pilot error, BASH, or strikes from defensive countermeasures used during training.

Midair Collision

Midair collision accidents involve two or more aircraft coming in contact with each other during flight. Navigation errors, miscommunications, deviations from flight plans, and lack of collision avoidance systems all increase the potential for midair collisions. Aircraft mishaps and their prevention represent a paramount concern for the Air Force. Air Force Policy Directive (AFPD) 91-2, *Safety Programs*, defines four major categories of reportable mishaps based on total cost of property damage or the degree of injury: Class A, B, C, and D mishaps. Mishap types range from loss of life or destruction of an aircraft (Class A) to a minor, reportable injury or property damage less than $50,000 (Class D). Reporting and investigation requirements for aviation mishaps are defined in AFI 91-204, *Safety Investigation and Hazard Reporting*, and AFMAN 91-223, *Safety: Aviation Safety Investigations and Reports*.

In-Flight Emergency

Each aircraft type has different emergency procedures based on the aircraft design which are produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to ATC procedures due to an in-flight emergency; these procedures are defined in AFI 11-202 [Volume 3], AFI 11-2MDS [Volume 3], and established aircraft flight manuals.

Bird/Wildlife-Aircraft Strike Hazards

BASH presents a safety concern for aircraft operations because of the potential for damage to aircraft or injury to aircrews or local populations if a crash should occur. Aircraft can encounter birds at nearly all altitudes up to 30,000 ft MSL; however, most birds fly close to the ground. According to the Air Force Safety Center, BASH statistics, about 52 percent of strikes occur from birds flying below 400 ft, and 88 percent occur at less than 2,000 ft AGL (Air Force Safety Center, 2018).

The Air Force BASH program was established to minimize the risk for collisions of birds/wildlife with aircraft and the subsequent loss of life and property. In accordance with AFI 91-202, *The US Air Force Mishap Prevention Program*, each flying unit in the Air Force is required to develop a BASH plan to reduce hazardous bird/wildlife activity relative to airport flight operations. The intent of each plan is to reduce BASH issues at the airfield by creating an integrated hazard abatement program through monitoring, avoidance, and actively controlling bird and animal population movements. Some of the procedures used at Kelly Field Annex include habitat modification/management, operational avoidance, dispersal harassment, depredation/removal, and reporting incidents.

3.4 Air Quality

3.4.1 Definition of the Resource

Under the authority of the Clean Air Act (CAA) and subsequent regulations, the USEPA has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the National Ambient Air Quality Standards (NAAQS). Kelly Field Annex is located in Bexar County within the city limits of San Antonio Texas. Bexar County is in the Metropolitan San Antonio Intrastate AQCR (40 CFR § 81.40) which also includes the following Texas counties: Atascosa, Bandera, Comal, Dimmit, Edwards, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Kinney, La Salle, Maverick, Medina, Real, Uvalde, Val Verde, Wilson, and Zavala (40 CFR § 81.40).

For air quality there are two ROIs, one in the immediate vicinity of Kelly Field Annex that coincides with the Metropolitan San Antonio Intrastate AQCR and one coinciding with the airspace associated with multiple AQCRs. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft AGL) and coinciding with the spatial distribution of the ROIs that is considered. Pollutants that are released above the mixing height typically will not disperse downward and thus will have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere will undergo mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 ft AGL is an acceptable default value [40 CFR § 93.153(c)(2)]. Although the proposed ADAIR training is projected to occur within multiple MOAs coinciding with five separate AQCR, only the Brady High and Low MOAs, coinciding with the Midland-Odessa-San Angelo AQCR and the Austin-Waco AQCR, is a concern because it is the only airspace where ADAIR sortie altitudes are proposed to extend below 3,000 ft AGL.

3.4.1.1 Criteria Pollutants

In accordance with CAA requirements, the air quality in a given region or area is measured by the concentration of various pollutants in the atmosphere. Measurements of these "criteria pollutants" in ambient air are expressed in units of parts per million (ppm) or in units of micrograms per cubic meter ($\mu g/m^3$). Regional air quality is a result of the types and quantities of atmospheric pollutants and pollutant sources in an area as well as surface topography, the size of the "air basin," and prevailing meteorological conditions.

The CAA directed the USEPA to develop, implement, and enforce strong environmental regulations that would ensure clean and healthy ambient air quality. To protect public health and welfare, the USEPA developed numerical concentration-based standards, NAAQS, for pollutants that have been determined to impact human health and the environment and established both primary and secondary NAAQS under the provisions of the CAA. NAAQS are currently established for six criteria air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), respirable particulate matter (including particulates equal to or less than 10 microns in diameter (PM_{10}) and particulates equal to or less than 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). The primary NAAQS represent maximum levels of background air pollution that are considered safe, with an adequate margin of safety to protect public health. Secondary NAAQS represent the maximum pollutant concentration necessary to protect vegetation, crops, and other public resources in addition to maintaining visibility standards. The primary and secondary NAAQS are presented in **Table 3-8**.

The criteria pollutant O_3 is not usually emitted directly into the air but is formed in the atmosphere by photochemical reactions involving sunlight and previously emitted pollutants, or "O_3 precursors." These O_3 precursors consist primarily of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are directly emitted from a wide range of emissions sources. For this reason, regulatory agencies limit atmospheric O_3 concentrations by controlling VOC pollutants (also identified as reactive organic gases) and NO_x.

The USEPA has recognized that particulate matter emissions can have different health affects depending on particle size and, therefore, developed separate NAAQS for coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$). The pollutant $PM_{2.5}$ can be emitted from emission sources directly as very fine dust and/or liquid mist or formed secondarily in the atmosphere as condensable particulate matter, typically forming nitrate and sulfate compounds. Secondary (indirect) emissions vary by region depending upon the predominant emission sources located there and thus which precursors are considered significant for $PM_{2.5}$ formation and identified for ultimate control.

The CAA and USEPA delegated responsibility for ensuring compliance with NAAQS to the states and local agencies. As such, each state must develop air pollutant control programs and promulgate regulations and rules that focus on meeting NAAQS and maintaining healthy ambient air quality levels. When a region or area fails to meet a NAAQS for a pollutant, that region is classified as "nonattainment" for that pollutant. In such cases the affected State must develop a State Implementation Plan (SIP) that is subject to USEPA review and approval. A SIP is a compilation of regulations, strategies, schedules, and enforcement actions designed to move the state into compliance with all NAAQS. Any changes to the compliance schedule or plan (e.g., new regulations, emissions budgets, controls) must be incorporated into the SIP and approved by USEPA.

Table 3-8
National Ambient Air Quality Standards

Pollutant	Standard Value[6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 μg/m^3)	Primary and Secondary
1-hour average[1]	0.100 ppm	(188 μg/m^3)	Primary
Ozone (O_3)			
8-hour average[2]	0.070 ppm	(137 μg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average[3]		0.15 μg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average[4]		150 μg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean[4]		12 μg/m^3	Primary
Annual arithmetic mean[4]		15 μg/m^3	Secondary
24-hour average[4]		35 μg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average[5]	0.075 ppm	(196 μg/m^3)	Primary
3-hour average[5]	0.5 ppm	(1,300 μg/m^3)	Secondary

Notes:
1 In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.
2 In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas including Virginia. A 1-hour standard no longer exists.
3 In November 2008, USEPA revised the primary lead standard to 0.15 μg/m^3. USEPA revised the averaging time to a rolling 3-month average.
4 In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 μg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 μg/m^3. In 2012, USEPA split standards for primary and secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM10.
5 In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 ppb, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.
6 Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

μg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppb = part(s) per billion; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

The CAA required that USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (attainment areas that were reclassified from a previous nonattainment status and are required to prepare a maintenance plan for air quality). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule and the promulgated regulations found in 40 CFR § 93 exempt certain federal actions from conformity determinations (e.g., contaminated site cleanup and natural disaster response activities). Other federal actions are assumed to conform if total indirect and direct project emissions are below *de minimis* levels presented in 40 CFR § 93.153. The threshold levels (in tons of pollutant per year) depend upon the nonattainment status that USEPA has assigned to a region. Once the net change in nonattainment pollutants is calculated, the federal agency must compare them to the *de minimis* thresholds.

Title V of the CAA Amendments of 1990 requires state and local agencies to implement permitting programs for major stationary sources. A major stationary source is a facility (plant, base, activity, etc.) that has the potential to emit (PTE) more than 100 tons annually of any one criteria air pollutant, 10 tons per year (tpy) of a hazardous air pollutant, or 25 tpy of any combination of hazardous air pollutants; however, lower pollutant-specific “major source” permitting thresholds apply in nonattainment areas. The purpose of the permitting rule is to establish regulatory control over large, industrial-type activities and monitor their impact on air quality.

Federal Prevention of Significant Deterioration (PSD) regulations also define air pollutant emissions from proposed major stationary sources or modifications to be “significant” if a proposed project’s net emission increase meets or exceeds the rate of emissions listed in 40 CFR § 52.21(b)(23)(i); or 1) a proposed project is within 10 kilometers of any Class I area (wilderness area greater than 5,000 ac or national park greater than 6,000 ac), and 2) regulated pollutant emissions would cause an increase in the 24-hour average concentration of any regulated pollutant in the Class I area of 1 $\mu g/m^3$ or more [40 CFR § 52.21(b)(23)(iii)]. PSD regulations also define ambient air increments, limiting the allowable increases to any area’s baseline air contaminant concentrations, based on the area’s designation as Class I, II, or III [40 CFR § 52.21(c)].

Texas Commission of Environmental Quality (TCEQ) air quality rules and standards are codified at Title 30, Part 1 of the Texas Administrative Code (TAC). Numerous parts of the regulations codified into 30 TAC necessary for implementing and enforcing the NAAQS have been adopted into the SIP. The USEPA has delegated enforcement of the PSD and Title V programs to the TCEQ. The TCEQ has adopted the NAAQS, thereby requiring the use of the standards within the State of Texas (30 TAC Chapter 101.21).

3.4.1.2 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. These emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere helps regulate the earth’s temperature and are believed to contribute to global climate change. GHGs include water vapor, carbon dioxide (CO_2), methane, nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the earth’s surface. The GWP of a particular gas provides a relative basis for calculating its carbon dioxide equivalent (CO_2e) or the amount of CO_2 equivalent to the emissions of that gas. CO_2 has a GWP of 1 and is, therefore, the standard by which all other GHGs are measured. Potential impacts associated with GHG emissions are discussed in **Section 4.3**.

On 13 May 2010, the USEPA issued the final GHG Tailoring Rule. This rule established thresholds for GHG emissions that define when permits under the PSD and Title V Operating Permit programs are required for new and existing industrial facilities. The Rule was implemented using a phased-in approach, effective January 2011. The salient features of the Rule are as follows (USEPA, 2011):

- The Tailoring Rule generally defines a major source of GHGs as one that has PTE GHG emissions equal to or greater than 100,000 tpy CO_2e. An installation that is a major source and has not already applied for a Title V permit had to apply for a Title V permit by 1 July 2012, or within 1 year after having a PTE of at least 100,000 tpy or more of GHGs as CO_2e.
- An installation has to obtain a PSD permit and apply Best Available Control Technologies (BACT) for GHGs if the PTE is 100,000 tpy or more of CO_2e for a new source (and for a modification, if the modification also results in a 75,000 tpy increase or more in CO_2e). A PSD permit and BACT for GHGs also applies if an installation is already subject to PSD for non-GHG pollutants and has a PTE of 75,000 tpy or more of CO_2e (new sources) or an increase of 75,000 tpy or more of CO_2e for modifications.
- PSD and BACT requirements apply if a source is an existing minor source for PSD, and the modification alone has actual or PTE GHG emissions equal to or greater than 100,000 tpy CO_2e.
- The USEPA had planned to propose rules for smaller sources of GHG (i.e., with less than 50,000 tpy of GHG on a CO_2e basis) by 30 April 2016. As of February 2018, no such rules have been promulgated or proposed. Until this time, the USEPA cannot take action to make such sources subject to GHG regulation.

On 19 August 2015, the USEPA published regulations that removed several provisions pertaining to Step 2 of the PSD Tailoring Rule. Effectively, GHGs are no longer treated as an air pollutant for the specific purpose of determining whether a source (or modification) is required to obtain a PSD or Title V permit. In other words, a stationary source would not need to obtain a PSD or Title V permit solely because the source emits or has the PTE GHGs above the applicable major source thresholds (80 Federal Register [FR] 50199).

On 26 August 2016, the USEPA proposed regulations that revise provisions to determine whether a source must obtain a permit. In addition, the USEPA proposed a 75,000 tpy CO_2e Significant Emission Rate (SER) for GHGs. The SER establishes a *de minimis* level below which BACT is not required for this pollutant (81 FR 81711). The final rule has not been promulgated.

In addition to the GHG Tailoring Rule in 2009, the USEPA promulgated a rule requiring sources to report their GHG emissions if they emit more than 25,000 metric tons or more of CO_2e per year [40 CFR § 98.2(a)(2)].

3.4.2 Existing Conditions – Kelly Field Annex

3.4.2.1 Regional Climate

The regional climate of South-Central Texas, where Kelly Field Annex is located, is classified as a humid subtropical climate which is characterized by cool to mild winters and hot humid summers (Weatherbase, 2018). The warmest months are July and August, with average high and low temperatures of 95 degrees Fahrenheit (°F) and 74°F, respectively. January is the coldest month with an average high temperature of 62°F and average low temperature of 39°F. The wettest month by average precipitation is May with an average of 4.7 inches (in.) of rain. The driest month is January with an average of 1.65 in. of precipitation. Overall, May, June, and October are the wettest months and December through March are the driest months. Accumulating snow is extremely rare (US Climate Data, 2018). Precipitation in the summer is primarily due to thunderstorms while precipitation in the winter is usually the result of mid-latitude cyclones. Because of San Antonio's relative proximity to the Gulf of Mexico it is infrequently affected by decaying tropical cyclones that can result in heavy rain and flooding (Roth, 2010).

3.4.2.2 Baseline Air Emissions

Kelly Field Annex is located Bexar County which is part of the Metropolitan San Antonio AQCR. Each AQCR has regulatory areas that are designated as an attainment area or nonattainment area for each of the criteria pollutants depending on whether it meets or fails to meet the NAAQS for the pollutant. With the exception of the 2015 ozone standard, the San Antonio AQCR is designated as an unclassifiable/attainment area for all criteria pollutants (USEPA, 2018d).

In November 2017, the USEPA certified some 2,650 areas nationwide as in compliance (or in attainment) with the 2015 ozone standard, but it did not designate any nonattainment areas at that time. The remaining designations (51 area nonattainment designations) were made on 30 April 2018 except for eight counties in the San Antonio Intrastate AQCR (Harvard Environmental Law, 2018). The designations for the eight San Antonio area counties were made on 17 July 2018 and included a designation of marginal nonattainment for Bexar County (83 FR 35136). The remaining seven counties (Atascosa, Bandera, Comal, Guadalupe, Kendall, Medina, and Wilson) were classified as attainment/unclassifiable for the 2015 standard (70 parts per billion of ground level ozone). Unclassifiable areas are those areas that have not had ambient air monitoring and are assumed to be in attainment with NAAQS. Any of the pending attainment designations have no regulatory effect on the analysis described in **Section 4.2.2**. As a result of the nonattainment designation for Bexar County, General Conformity will be applicable in the vicinity of Kelly Field Annex.

JBSA-Lackland is classified as a major source of emissions and as a result has a CAA Title V permit to operate. JBSA-Lackland is not classified as a major source for PSD and is not located within 10 kilometers of any of the 156 USEPA-designated Class I areas protected by the Regional Haze Rule. As shown in **Table 3-9**, JBSA-Lackland accounts for less than 1.5 percent of NO_x emissions in Bexar County and less than 0.5 percent for all other criteria pollutants.

Table 3-9
Joint Base San Antonio-Lackland Emission Summary

	CO	NO_X	PM_{10}	$PM_{2.5}$	SO_2	VOC
Stationary Emissions[1]	35.4	51.1	21.7	14.4	0.43	21.0
Mobile Emissions[1]	155	532	22.9	11.4	21.2	19.5
Total JBSA - Lackland	191	583	44.6	25.8	21.63	40.5
Bexar County[2]	178,527	40,989	25,121	6,221	18,346	58,457
Percent of County Emissions	0.11	1.42	0.18	0.41	0.12	0.07

Notes:
[1] EQM, Inc., 2017
[2] USEPA, 2014

CO = carbon monoxide; JBSA = Joint Base San Antonio; NO_x = nitrogen oxide; PM_{10} = particulate matter with a diameter of less than 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of less than 2.5 micrometers; SO_2 = sulfur dioxide; USEPA = United States Environmental Protection Agency; VOC = volatile organic compound

There are 19 categories of stationary emissions sources listed in the JBSA-Lackland 2016 air emission inventory. External combustion sources (boilers and heaters), and Internal Combustion sources (emergency generators) are the largest source of NO_x and CO emissions. Fuel storage and miscellaneous chemical use are the largest VOC sources. Cooling towers are the largest source of particulate matter emissions. For mobile sources, NO_x had the largest emission rate (532 tpy). Aircraft operations accounted for over 80 percent of the NO_x emissions.

An Air Conformity Applicability Analysis is discussed in **Section 4.3**. An overview of the CAA and the State of Texas air quality regulations as well as assumptions used for the air quality analysis and a Draft Record of Nonapplicability (RONA), General Conformity RONA is provided in **Appendix C**. The RONA documents that an air conformity applicability analysis is not required for this project.

3.4.3 Existing Conditions – Airspace

3.4.3.1 Regional Climate

The Brady High and Low MOAs are located almost due north of San Antonio and have a similar climate classified as a humid subtropical. The summer months are somewhat wetter than the winter months. Much of the summer rainfall is from thunderstorm activity and rare tropical cyclones. Winter precipitation is primarily the result of mid-latitude cyclones (Weatherbase, 2018). The hottest month is August with an average high temperature of 95°F, and December and January are the coldest months with an average high temperature of 60°F. Average annual precipitation is approximately 28 in. per year (US Climate Data, 2018). Ground level air quality impacts in the remaining MOAs (Crystal, Laughlin 2, Laughlin 3, and Kingsville 3) are not expected as ADAIR training exercises in these areas are proposed to occur above 3,000 ft. As a part of JBSA-Lackland, all baseline air emissions data for Kelly Field Annex also include those from JBSA-Lackland.

3.4.3.2 Baseline Emissions

The MOAs are within several AQCRs and counties (**Table 3-10**). Although several MOAs fall within the San Antonio AQCR, they are outside Bexar County and as a result, the General Conformity Rule is not applicable in these areas. The remaining AQCRs listed in **Table 3-10** are in attainment or unclassifiable for all criteria pollutants thus none of the MOAs proposed for contract ADAIR training would be subject to the General Conformity Rule. Note that although the Kingsville 3 and Crystal MOAs fall outside the ROI as discussed in **Section 3.4.1**, they are included in the table below for a complete listing of the MOAs and associated counties and AQCRs.

Table 3-10
Military Operations Areas by County and Air Quality Control Region

MOA	County Name(s)	AQCR
Crystal North	Dimmit, Maverick, Zavala	Metropolitan San Antonio
Laughlin 2	Edwards, Kinney, Maverick, Real, Uvalde, Zavala	Metropolitan San Antonio
Laughlin 3 High/Low	Dimmit, Maverick, Zavala	Metropolitan San Antonio
Brady High/Low	Concho, Llano, McCulloch, Mills, San Saba	Midland-Odessa-San Angelo, Austin-Waco
Kingsville 3	Duval, Jim Wells, La Salle, Live Oak, McMullen, Webb	Corpus Christi-Victoria, Metropolitan San Antonio, Brownsville-Laredo
Crystal	Dimmit, Maverick, Webb, Zavala	Brownsville-Laredo, Metropolitan San Antonio

Notes:
AQCR = Air Quality Control Region; MOA = Military Operations Area

Because of the rural nature of the counties in the vicinity of the Brady High and Low MOAs, air emissions within the region are much lower than those in the San Antonio region. Except for VOC, the combined criteria pollutant emissions for all five counties that comprise the Brady High and Low MOAs are lower than Bexar County alone, as illustrated in **Table 3-11**.

Table 3-11
Brady High and Low Military Operations Areas Emission Comparison
(Tons per Year)

Pollutant	Bexar County (Kelly Field Annex)	Concho, Llano, McCulloch, Mills, San Saba (Brady High and Low MOAs)
NO_2	40,989	3,678
VOC	58,457	113,190
CO	178,527	28,136
$PM_{2.5}$	6,221	1,903
PM_{10}	25,121	10,067
SO_2	18,346	55.5

Notes:
[1] USEPA, 2014

CO = carbon monoxide; MOA = Military Operations Area; NO_2 = nitrogen dioxide; PM_{10} = particulate matter with a diameter of less than 10 micrometers; $PM_{2.5}$ = particulate matter with a diameter of less than 2.5 micrometers; SO_2 = sulfur dioxide; tpy = ton(s) per year; USEPA = United States Environmental Protection Agency; VOC = volatile organic compound

3.5 Biological Resources

3.5.1 Definition of the Resources

Biological resources include native, nonnative, and invasive plants and animals; sensitive and protected floral and faunal species; and the habitats, such as wetlands, forests, and grasslands, in which they exist. Habitat can be defined as the resources and conditions in an area that support a defined suite of organisms. The following is a description of the primary federal statutes that form the regulatory framework for the evaluation of biological resources.

The ROI for biological resources on the installation includes the land surrounding the facilities proposed for use, the land within the airfield noise contours and safety zones (see **Figures 3-4** and **3-5**), and the land beneath the MOAs proposed for ADAIR training (see **Figure 1-4**).

3.5.1.1 Endangered Species Act

The ESA of 1973 (16 U.S.C. § 1531 et seq.) established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. Sensitive and protected biological resources include plant and animal species listed as threatened, endangered, or special status by the USFWS and the National Marine Fisheries Service. Under the ESA (16 U.S.C. § 1536), an “endangered species” is defined as any species in danger of extinction throughout all, or a large portion, of its range. A “threatened species” is defined as any species likely to become an endangered species in the foreseeable future. The USFWS maintains a list of species considered to be candidates for possible listing under the ESA. The ESA also allows the designation of geographic areas as critical habitat for threatened or endangered species. Although candidate species receive no statutory protection under the ESA, the USFWS has attempted to advise government agencies, industry, and the public that these species are at risk and may warrant protection under the ESA.

3.5.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 makes it unlawful for anyone to take migratory birds or their parts, nests, or eggs unless permitted to do so by regulations. Per the MBTA, “take” is defined as “pursue, hunt, shoot, wound, kill, trap, capture, or collect” (50 CFR § 10.12). Migratory birds include nearly all species in the United States, with the exception of some upland game birds and nonnative species.

EO 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, requires all federal agencies undertaking activities that may negatively impact migratory birds to follow a prescribed set of actions to further implement the MBTA. EO 13186 directs federal agencies to develop a Memorandum of Understanding (MOU) with the USFWS that promotes the conservation of migratory birds. On 5 September 2014, the DOD signed a 5-year MOU with the USFWS. In accordance with the MOU, and to the extent possible as per law and budgetary considerations, EO 13186 encourages agencies to implement a series of conservation measures aimed at reinforcing and strengthening the MBTA.

The National Defense Authorization Act for Fiscal Year 2003 (Public Law 107-314, 116 Stat. 2458) provided the Secretary of the Interior the authority to prescribe regulations to exempt the armed forces from the incidental take of migratory birds during authorized military readiness activities. Congress defined military readiness activities as all training and operations of the US armed forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use.

In December 2017, the US Department of the Interior issued M-Opinion 37050 -which concluded that the take of migratory birds from an activity is not prohibited by the MBTA when the underlying purpose of that activity is not the take of a migratory bird. The USFWS interprets the M-Opinion to mean that the MBTA’s prohibition on take does not apply when the take of birds, eggs, or nests occurs as a result of an activity, the purpose of which is not to take birds, eggs or nests.

3.5.1.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (16 U.S.C. § 668-668c) prohibits the “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle [or any golden eagle], alive or dead, or any part, nest, or egg thereof.” “Take” is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb," and “disturb” is defined as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury to an eagle, a decrease in productivity by substantially interfering with the eagle’s normal breeding, feeding or sheltering behavior, or nest abandonment by substantially interfering with the eagle’s normal breeding, feeding or sheltering behavior.” The Bald and Golden Eagle Protection Act also prohibits activities around an active or inactive nest site that could result in an adverse impact on the eagle.

3.5.1.4 Wetlands

The Clean Water Act (CWA) of 1972 (33 U.S.C. § 1251 et seq.) regulates discharges of pollutants in surface waters of the United States. Section 404 of the CWA establishes a program to regulate the discharge of dredged and fill material into waters of the United States, including wetlands. The USACE defines wetlands as “those areas that are inundated or saturated with ground or surface water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated soil conditions” (Environmental Laboratory, 1987). Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR § 328).

3.5.2 Existing Conditions – Kelly Field Annex and Airspace

The information presented in this section was primarily derived from the JBSA Integrated Natural Resources Management Plan (INRMP; JBSA, 2014a) and F-16 Interim Relocation Environmental Assessment (Air Force, 2017c). Data were also gathered from USFWS, USEPA, and Texas Parks and Wildlife Department (TPWD) databases. The existing environment under the airspace currently experiences military overflights, sonic booms, and use of defensive countermeasure.

3.5.2.1 Regional Biological Setting

Ecoregion Description

The ROI for the Proposed Action is located within six Level III Ecoregions (**Table 3-12** and **Figure 3-6**). Ecoregions are used to describe areas of similar type, quality, and quantity of environmental resources (USEPA, 2018a). Ecoregions are assigned hierarchical levels to delineate regions spatially based on different levels of planning and reporting needs. To describe the ecosystems within the ROI, Level III Ecoregions are used. Level III ecoregion descriptions provide a regional perspective and are more specifically oriented for environmental monitoring, assessment and reporting, and decision-making (Commission for Environmental Cooperation, 1997). The vegetation and wildlife common within the ecoregions are described below.

Vegetation and Wildlife

Texas Blackland Prairie. JBSA-Lackland (including Kelly Field Annex) is located on 4,783 ac in the Texas Blackland Prairie ecoregion. Historically, this area was dominated by prairie grasses and forbs (Griffith et al., 2007). This region is now dominated by cropland, pasture and hayland, and urban and suburban development. On JBSA, about 4,420 ac are either developed urban space or improved turf. There are 363 ac of undeveloped woodland at JBSA-Lackland. At Kelly Field Annex, there are small undeveloped areas associated with shrub and woodland habitat predominantly comprised of invasive plant species (JBSA, 2014a). Riparian woodlands are located around creeks and wetlands and are dominated by native trees.

Within the Blackland Prairie ecoregion, the watersheds and riparian zones provide habitat for a variety of wildlife, including small game animals, white-tailed deer (*Odocoileus virginianus*), song birds, waterfowl, and shore birds (TPWD, 2018a). Diversity of wildlife at JBSA-Lackland is relatively limited given that most of the base is developed, and that it is located within highly developed areas of the City of San Antonio. Leon Creek runs through JBSA-Lackland on the west side of the airfield and provides a riparian corridor for wildlife.

Cross Timbers. The Cross Timbers ecoregion is a transition area between the prairie regions to the west and the forested low mountains or hills of eastern Oklahoma and Texas to the east. Little bluestem (*Schizachyrium scoparium*) grassland on sandy soils with scattered blackjack oak (*Quercus marilandica*) and post oak (*Quercus stellata*) trees are the dominant plant species. Big bluestem (*Andropogon gerardi*), Indiangrass (*Sorghastrum nutans*), flameleaf sumac (*Rhus copallina*), and sideoats grama (*Bouteloua curtipendula*) are common herbaceous plant species in the Cross Timbers ecoregion. Rangeland and pastureland are the primary land uses, and along with oil extraction, has altered the native vegetation structure (USEPA, 2010).

Habitat is present for wildlife throughout the Cross Timbers ecoregion. Populations vary considerably, influenced by the diversity and configuration of the plant communities (TPWD, 2018a). Other factors influence wildlife populations in the ecoregion such as loss and fragmentation of habitat, competition with livestock for food and cover, and lack of management for wildlife and habitat. Game species are present such as white-tailed deer, Rio Grande turkey (*Meleagris gallopavo intermedia*), bobwhite quail (*Colinus virginianus*), mourning doves (*Zenaida macroura*), and rabbits. A variety of nongame species is also found in the ecoregion.

Central Great Plains. This ecoregion has a slightly lower elevation, receives more precipitation, and is somewhat more irregular than the High Plains to the west. Once a grassland dominated by little bluestem, Indiangrass, hairy grama (*Bouteloua hirsuta*), buffalograss (*Buchloe dactyloides*), Texas wintergrass (*Nassella leucotricha*), King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), and big bluestem, with some scattered tree cover such as post oak, much of the Central Great Plains is now cropland (USEPA, 2010; Fort Hood, 2013).

The Central Great Plains ecoregion have similar common wildlife communities as the Cross Timbers ecoregion described above, supporting large populations of white-tailed deer and Rio Grande turkeys, bobwhite quail, scaled quail (*Callipepla squamata*), mourning doves, and collared peccary (*Pecari tajacu*) (TPWD, 2018b). There is also a large variety of small mammals, song birds, waterfowl, shorebirds, reptiles, and amphibians found in this ecoregion.

Edwards Plateau. Largely a dissected limestone plateau, the Edwards Plateau ecoregion is hillier in the south and east where it is easily distinguished from bordering ecological regions by a sharp fault line. Historically the vegetation communities that dominated the Edwards Plateau were a composition of juniper-oak savanna and mesquite-oak savanna, but the conversion of the vegetation for animal grazing has changed the vegetation communities. Ashe juniper (*Juniperus ashei*) and redberry juniper (*Juniperus pinchotii*) are now the dominant plant species in much of this ecoregion and it is often referred to locally as a cedar break. Other common plant species that occur in the Edwards Plateau includes live oak (*Quercus virginiana*), scrub oak (*Quercus sinuata Walter* var. *breviloba*), Texas red oak (*Quercus texana*), and honey mesquite (*Prosopis glandulosa*) (USEPA, 2010).

The Edwards Plateau ecoregion contains habitat that supports a wide range of avian and mammalian species and herpetofauna, with many of the more common species the same as those described for the Southern Texas Plains ecoregion below.

Table 3-12
Level III Ecoregions within the Regions of Influence

Level III Ecoregion	Kelly Field Annex	Military Operating Area				Ecoregion Description
		Crystal and Crystal North	Laughlin 2 and Laughlin 3 High/Low	Kingsville 3	Brady High/Low	
Central Great Plains (27)					X	Historically dominated by prairie grasses with scattered trees, much of this region is now cropland.
Cross Timbers (29)					X	A transition area between the prairie regions of the west and the forested low mountains and hills of the east. Characterized by grassland and sandy hills with scattered blackjack oak (*Quercus marilandica*) and post oak (*Quercus stellata*). Current use for pastureland and rangeland has altered the native vegetation structure.
Texas Blackland Prairies (32)	X					Distinguished from surrounding ecoregions, the area is characterized by fine-textured, clayey soils and was historically dominated by prairie vegetation. Currently, most of this region is composed of cropland, pasture, and forage production for livestock. Large areas of this region have been converted to urban and industrial uses.
Edwards Plateau (30)			X		X	Limestone plateau that is hillier in the south and east. Historically dominated by juniper-oak and mesquite-oak savannas. Grazing pressure has changed dominance to Ashe juniper (*Juniperus ashei*) and redberry juniper (*Juniperus pinchotii*).
Southern Texas Plains (31)		X	X	X		Historically native grassland and savanna vegetation that varied during wet and dry cycles. Grazing pressure and fire suppression have changed vegetation makeup to dominantly thorny brush such as honey mesquite (*Prosopis glandulosa*)
Western Gulf Coastal Plain (34)				X		Flat coastal plain historically dominated by grasslands. Much of the land has been converted to cropland and is also impacted by urban development and energy production.

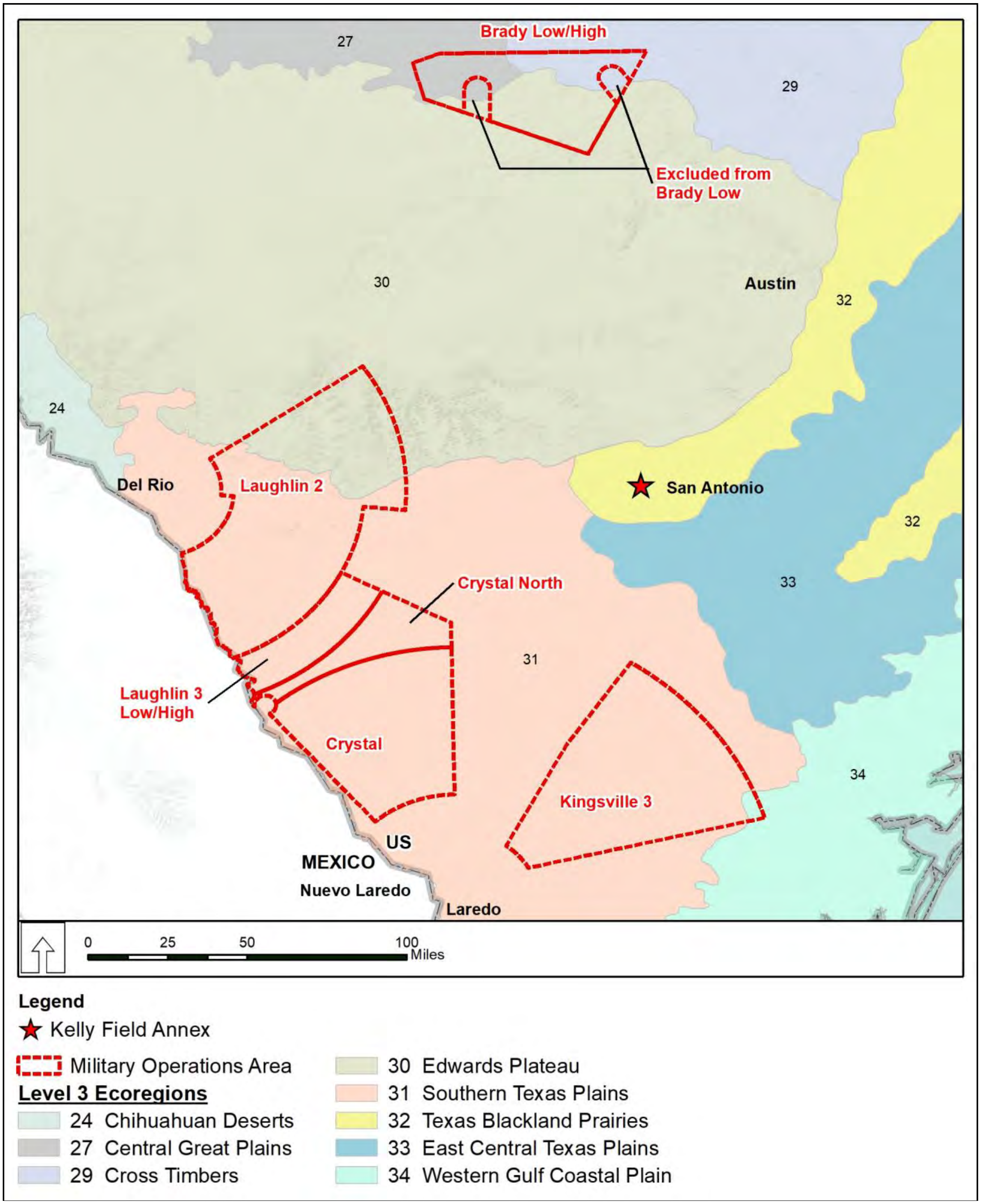


Figure 3-6. Level III Ecoregions within the Regions of Influence.

Southern Texas Plains. This ecoregion was historically native grassland and savanna vegetation that varied during wet and dry cycles; however, following long continued cattle grazing and fire suppression, thorny brush, such as honey mesquite, is now the predominant vegetation type. The region is also known as the Tamualipan Thornscrub, or the "brush country", as it is called locally. This ecoregion extends into Mexico. Although honey mesquite is the dominant tree in the region, vegetation on the flats and ridges also include species such as huisache (*Acacia farnesiana*), blackbrush (*Acacia rigidula*), guajillo (*Acacia berlandieri*), and cenizo (*Leucophyllum frutescens*) (Texas A&M Forest Service, 2018; USEPA, 2010). Texas sugarberry (*Celtis laevigata*), spiny hackberry (*Celtis pallida*), huisache, honey mesquite, and the invasive Carrizo cane (*Arundo donax*) are common plants along the Rio Grande riparian corridor.

Wildlife in the Southern Texas Plains ecoregion contains species of wildlife not found anywhere else in the United States, with an especially diverse number of avian species. Approximately 500 avian species are known to occur in south Texas. Many avian species that are endemic to Mexico have their northernmost distribution in this ecoregion (US Customs and Border Protection, 2017). Other wildlife in this region include ocelots (*Leopardus* [=*Felis*] *pardalis*), the Texas tortoise (*Gopherus berlandieri*), jackrabbits (*Lepus* spp.), collared peccary, horned lizard (*Phrynosoma cornutum*) and green jay (*Cyanocorax yncas*) (TWPD, 2018b). Although much of the ecoregion was historically cleared for agriculture, lands are primarily managed as ranchlands including game hunting ranches. The white-wing dove is the most commonly hunted native species in the region (USEPA, 2010).

Western Gulf Coastal Plain. The Western Gulf Coastal Plain has a relatively flat coastal plain topography with the natural vegetation historically, predominantly grassland. Much of the land has been converted to croplands such as cotton, sorghum, wheat, and corn, or used for cattle grazing. Oil and gas activities and urban development have impacted much of the natural vegetation structure in the ecoregion (USEPA 2010). Although much of the vegetation is dominated by native and nonnative grasses, live oak tends to be a major component of the ecoregion, especially north of the Nueces River and near the Gulf Coast. Other common trees and shrubs include mesquite, huisache, and Texas persimmon (*Diospyros texana*). Sugarberry (C*eltis laevigata*), pecan (*Carya illinoiensis*), and gum bumelia (*Sideroxylon lanuginosum*) are common in and along rivers and creeks (Texas A&M Forest Service, 2018).

Similar to the Southern Texas Plains ecoregion, approximately 500 avian species can occur in the southern portion of the Western Gulf Coastal Plain ecoregion as the Central and Mississippi flyways converge in this area. South Texas is also the northernmost range for many neotropical migrants from Central America.

Invasive Species

As defined in EO 13112, *Invasive Species*, are "an alien species whose introduction does or is likely to cause economic or environmental harm to human health." Invasive species are highly adaptable and oftentimes displace native species. The characteristics that enable them to do so include high reproduction rates, resistance to disturbances, lack of natural predators, efficient dispersal mechanisms, and the ability to out-compete native species.

Common invasive plant species found throughout Texas include privet (*Ligustrum* ssp.), nandina (*Nandina domestica*), Johnson grass (*Sorghum halepense*), King Ranch bluestem, tree of heaven (*Ailanthus altissima*), Chinese pistache (*Pistacia chinensis*), Chinese tallow tree (*Triadica sebifera*), bamboo (*Bambuseae* sp.) and Chinaberry (*Melia azedarach*) (Texasinvasives.org, 2018). Common invasive wildlife include nutria (*Myocastor coypus*), red imported fire ants (*Solenopsis invicta*), Formosan subterranean termites (*Coptotermes formosanus*), feral hogs (*Sus scrofa*), feral cats (*Felis cat*us), feral dogs (*Canis lupus familiaris*), European starlings (*Sturnus vulgaris*), rock pigeons (*Columba livia*), and house sparrows (*Passer domesticus*).

Threatened and Endangered Species and/or Species of Concern

Federally endangered and threatened species are protected under the ESA. In addition, AFPD 32-70, *Environmental Quality,* and AFI 32-7064, *Integrated Natural Resources Management*, require all Air Force installations to protect species classified as federally or state endangered or threatened. There would be no ground-disturbing activities on Kelly Field Annex; moreover, there would no introduction of new, potentially toxic substances from implementation of the Proposed Action. The activities most likely to effect listed species are aircraft overflights in the airspace where noise and visual cues could cause behavioral changes in birds and mammals. As such, there would be no impacts on listed plants, aquatic species (e.g., fish), reptiles and amphibians, invertebrates, or crustaceans, and these listed species are not discussed further. The complete listing of listed species considered that may occur on Kelly Field Annex and within the MOAs is provided in **Appendix D**.

Of the listed species potentially occurring on Kelly Field Annex and in MOAs, 6 federally listed and 13 state listed birds (for a total of 14 unique species) and 4 federally listed and 6 state listed mammals (for a total of 6 unique species) could be impacted by the Proposed Action in the airspace. The whooping crane (*Grus americana*), red knot (*Calidris canutus rufa*), and wood stork (*Mycteria americana*) are coastal species and would be unlikely to occur anywhere within the MOAs except at limited times during migration. Moreover, although historically present in some of these regions, there are no known recent occurrences of the gray wolf (*Canis lupus*) in the ROIs or nearby environs. The nearest known populations occur in the Gila Mountains of New Mexico and Arizona, and in the northern United States and Canada. In addition, while the red wolf (*Canis rufus*) is listed in counties beneath the Kingsville 3 and Brady High and Low MOAs, there have been no recent known occurrences of this species and it is believed to be extirpated from Texas (Texas Tech University, 1997). As such, there are 11 listed birds and 4 listed mammals with the potential to be affected by aircraft operations on Kelly Field Annex and in the MOAs. The species with the potential to be affected by aircraft operations on Kelly Field Annex or the MOAs are listed in **Table 3-13** and discussed below. There is no critical habitat for listed species near Kelly Field Annex or beneath proposed MOAs.

Black-Capped Vireo

The black-capped vireo (*Vireo atricapilla*) was listed as endangered in 1984 and is currently delisted due to recovery but remains state listed in Texas. Adult vireos are approximately 4.5 in. long and have a black cap and white rings around red eyes, making them readily distinguishable from other vireo species. Black-capped vireos nest in scrub-oak habitats and nesting areas are limited to central Texas and three locations in Oklahoma. The black-capped vireo may be present in the Laughlin 2, Laughlin 3, and Brady High and Low MOAs, breeding in scattered clumps of shrubs within open grasslands from late March to late September (Texas Breeding Bird Atlas, 2018).

Piping Plover

The federal and state threatened piping plover (*Charadrius melodus*) is a small, stocky shore bird with a short, stubby bill that breeds along ocean shores in the northeast, and along lakeshores in the northern Great Plains and Great Lakes. Adults nest in shallow depressions, or scrapes, in the sand. Piping plovers winter along the southern portion of the Atlantic Coast and along the Gulf Coast. The Texas Gulf Coast is the wintering range for approximately 35 percent of the known piping plover population where they spend roughly 9 months out of the year (TPWD, 2018c). The piping plover may pass through all of the MOAs in route to wintering grounds in the Texas Gulf Coast; however, birds are unlikely to present.

Golden-Cheeked Warbler

The federal and state endangered golden-cheeked warbler (*Dendroica chrysoparia*) is a small bird approximately 4.5 in. in length. The bird has bright yellow cheeks with a black throat and back and has a distinctive buzzy song. The golden-cheeked warbler breeds in central Texas and is associated with dense forests containing mature stands of ashe juniper (referred to as cedar breaks in Texas). This bird occurs in Texas during the breeding season starting in mid-March and continuing through late August. The loss of habitat from urbanization and land clearing for agricultural use is the greatest threat to this species (Texas Breeding Bird Atlas, 2018). The golden-cheeked warbler may be present in the Laughlin 2, Laughlin 3, and Brady High and Low MOAs.

Table 3-13
Federal and State Listed Species with the Potential to be Affected by Flight Operations

Species	Federal Status[1]	State Status[2]	Kelly Field Annex	Military Operating Area			
				Crystal and Crystal North	Laughlin 2 and Laughlin 3 High/Low	Kingsville 3	Brady High/Low
Birds							
Black-Capped Vireo (*Vireo atricapilla*)	R	E			X		X
Piping Plover (*Charadrius melodus*)	T	T		X	X	X	X
Golden-Cheeked Warbler (=wood) (*Dendroica chrysoparia*)	E	E			X		X
White-Faced Ibis (*Plegadis chihi*)	--	T	X			X	
Zone-Tailed Hawk (*Buteo albonotatus*)	--	T	X		X	X	X
Peregrine Falcon (*Falco peregrinus*)	--	T	X	X	X	X	X
Interior Least Tern (*Sterna antillarum athalassos*)	E	E		X	X[3]	X[3]	X[3]
White-Tailed Hawk (*Buteo albicaudatus*)	--	T				X	
Common Black-Hawk (*Buteogallus anthracinus*)	--	T		X		X	
Texas Botteri's Sparrow (*Peucaea botterii texana*)	--	T				X	
Bald Eagle (*Haliaeetus leucocephalus*)	R	T					X
Mammals							
Black Bear (*Ursus americanus*)	--	T		X	X	X	X
White-Nosed Coati (*Nasua narica*)	--	T		X	X	X	
Gulf Coast Jaguarundi (*Herpailurus* (=*Felis*) *yagouaroundi cacomitli*)	E	E		X	X	X	
Ocelot (*Leopardus* [=*Felis*] *pardalis*)	E	E		X	X	X	

Notes:
[1] Source: USFWS, 2018
[2] Source: TPWD, 2018b
[3] Listed by TPWD as potentially occurring in the counties within the specified MOAs but not listed by USFWS as occurring in these counties.

C = candidate; E = endangered; MOA = Military Operations Area; R = recovery; T = threatened; TPWD = Texas Parks and Wildlife Division; USFWS = United States Fish and Wildlife

White-Faced Ibis

The state threatened white-faced ibis (*Plegadis chihi*) typically occurs in freshwater marshes, swamps, ponds, and rivers. The white-faced ibis is chestnut colored with green or purple plumage on its head and upper body parts. This species has red-colored legs, feet, and skin around the eyes. It has a long, down-curved bill and is similar in appearance to the glossy ibis except during the breeding season when the white-faced ibis has a border of white feathers at the base of its bill. They breed and winter along the Texas Gulf Coast and occur as migrants in the Texas Panhandle and West Texas (TPWD, 2018c). The white-faced ibis could occur as a migrant in the Kingsville 3 MOA and at Kelly Field Annex.

Zone-Tailed Hawk

The state threatened zone-tailed hawk (*Buteo albonotatus*) is rare in occurrence in the Laughlin 2 and Laughlin 3 High and Low MOAs and would only be present in the breeding season from mid-March to late September. They primarily nest in montane areas; however, nesting sites have been observed in the Edwards Plateau. They are sometimes seen soaring with turkey vultures and often hunt with a behavior similar to northern harriers (*Circus cyaneus*), flying low over fields or marshes in search of small mammals, reptiles, and small birds (Texas Breeding Bird Atlas, 2018).

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) was federally listed as endangered in 1970 and delisted in 1999 but remains listed as endangered by the State of Texas. Peregrine falcons are found primarily in mountain ranges, river valleys, and along coasts. They nest on cliff ledges in a scrape or depression in gravel, occasionally in a tree cavity or stick nest, and on manmade structures such as skyscrapers or tall towers (USFWS, 2006). The peregrine falcon may be present in all of the MOAs but are primarily found in the Trans-Pecos region as year-round residents.

Interior Least Tern

The least tern (*Sterna antillarum*) is the smallest of North American terns. The federal and state endangered interior least tern (*Sterna antillarum athalassos*) is one of three subspecies of least tern in the United States and nests on bare or sparsely vegetated sand, shell, and gravel beaches, sandbars, islands, and salt flats associated with rivers and reservoirs. The interior least tern is migratory, breeding along inland river systems and wintering along the Central American and South American coasts. The interior least tern is known to nest on sandbars and islands along the Rio Grande, including observed nesting within the Crystal and Crystal North MOAs during the breeding season (early April to early August) (Texas Breeding Bird Atlas, 2018).

White-Tailed Hawk

The state threatened white-tailed hawk's (*Buteo albicaudatus*) distribution in the United States is limited to South Texas in the Coastal Prairies and Texas Brush Country. It primarily occurs through Mexico, Central America, and South America (east of the Andes). They are residents within their range and breed from late January to late August. They nest in short trees and shrubs in savannas (Texas Breeding Bird Atlas, 2018). The white-tailed hawk could occur in the Kingsville 3 MOA.

Common Black-Hawk

The common black-hawk (*Buteogallus anthracinus*) is state listed as threatened and has been reported breeding in riparian areas containing cottonwood (*Populus* spp.) and willow (*Salix* spp.) trees. In the United States, most breeding sites are in Arizona, with some limited breeding locations in New Mexico and Texas. The common black-hawk is a year-round resident in most of its range from Mexico to northern South America. One breeding site was reported in the lower Rio Grande during surveys conducted for the Texas Breeding Bird Atlas, but most breeding sites in Texas are in, or close to, the Trans-Pecos region (Texas

Breeding Bird Atlas, 2018). In the action area, the common black-hawk could occur in the Crystal, Crystal North, and Kingsville 3 MOAs.

Texas Botteri's Sparrow

The state threatened Texas Botteri’s sparrow (*Peucaea botterii texana*) is a small grassland sparrow which is difficult to identify visually and is typically observed through its song. There are nine subspecies with disjunct ranges across the southwestern United States, Mexico, and Central America. The Texas Botteri’s sparrow occurs in Texas during the breeding season from late March to early October. They breed in low elevation areas in bunch grass habitats with scattered mesquite and huisache, typically within 20 mi of the Gulf Coast (Texas Breeding Bird Atlas, 2018) and would be limited in distribution in the action area to the Kingsville 3 MOA.

American Bald Eagle

The bald eagle (*Haliaeetus leucocephalus*) was delisted in 2008 and is currently in recovery. The bald eagle has a wingspan of approximately 7 ft, with a dark brown body and wings, a white head and tail, and a yellow beak. The species has a broad range across the United States and is often associated with large bodies of water. Only the Brady High/Low MOA contains suitable habitat to support bald eagles. The bald eagle is an opportunistic forager and preys upon fish, birds, mammals and will eat carrion. The bald eagle builds large stick nests in large roost trees that are open and constructs nests at the highest point where large branches join the tree trunk. Breeding in Texas extends from early October to late May (Texas Breeding Bird Atlas, 2018).

Black Bear

The black bear (*Ursus americanus*) is listed as threatened by the State of Texas and is one of the largest mammals in North America, with a length of 5 to 6 ft and weight of 200 to 300 pounds. The black bear is found throughout North American in a broad range of habitats. In Texas, the black bear is primarily restricted to West Texas, predominantly in the Chisos and Guadalupe Mountains; however, there are reported sightings of black bear across Texas and the potential exists for individuals wandering from farther west to occur in the MOAs (TPWD, 2018c).

White-Nosed Coati

The state threatened white-nosed coati (*Nasua narica*), or coatimundi, are the size of a large domestic cat, and have long tails and noses, and masked faces. In the United States, the white-nosed coati ranges from southern Arizona to south Texas, where it reaches the northern limit of its distribution. They inhabit woodland, grassland, and desert scrub habitats and live in matriarchal bands of up to 40 individuals (Biota Information System of New Mexico, 2018). The white-nosed coati could be present in all of the MOAs except the Brady High/Low MOA.

Gulf Coast Jaguarundi

The Gulf Coast jaguarundi (*Herpailurus yagouaroundi cacomitli*), a subspecies of the jaguarundi, is a small cat, slightly larger than a house cat. Except during breeding, jaguarundis are solitary. The Gulf Coast jaguarundi is both federally and state listed as endangered. Their historical range extended from the lower Rio Grande valley in south Texas into eastern Mexico. The last confirmed sighting of the Gulf Coast jaguarundi in the United States was in 1986 as a roadkilled specimen collected 2 mi east of Brownsville, Texas. Although anecdotal sightings have been recorded in south Texas, the nearest confirmed sightings are approximately 95 mi southwest of the US-Mexico border (USFWS, 2013). Although it would be unlikely to occur in any of the MOAs, there is suitable travel and foraging habitat for the jaguarundi in all MOAs except for the Brady High/Low MOA.

Ocelot

The ocelot (*Leopardus pardalis*) is federal and state listed as endangered, as well as being listed throughout its range from south Texas to southern Arizona, south to northern Argentina and Uruguay. The ocelot is a medium-sized spotted cat that has been observed using a wide variety of habitats across its range. In south Texas, habitat is limited to dense thornscrub and grasslands. The ocelot's current distribution includes extreme south Texas with historic records from many of the counties in the Crystal, Crystal North, and Kingsville 3 MOAs (USFWS, 2016).

3.5.2.2 Wetlands

Wetlands are an important natural system and habitat type because of the diverse biologic and hydrologic functions they perform. These functions include water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, wildlife habitat detention, and erosion protection. Wetlands are protected as a subset of the "the waters of the United States" under Section 404 of the CWA. The term "waters of the United States" has a broad meaning under the CWA and besides navigable waters, incorporates deep-water aquatic habitats and wetlands. Section 404(b)(1) of the CWA directs the USEPA to develop guidelines for the placement of dredged or fill material (33 U.S.C. § 1341[b]). These guidelines developed by USEPA are known as the "404(b)(1) Guidelines" and are located at 40 CFR § 230. The stated purpose of the Guidelines is to "restore and maintain the chemical, physical, and biological integrity of waters of the United States through the control of discharges of dredged or fill material." 40 CFR § 230.1(a). In Texas, activities occurring within a wetland are regulated by both the Texas Commission on Environmental Quality and the USACE.

JBSA-Lackland (including the Training Annex and Kelly Field Annex) contains 42 water features comprising approximately 27.75 ac that have been identified as having wetland characteristics. Of these features, 23 (for a total of 18.09 ac) have been delineated as jurisdictional wetlands that are waters of the United States (JBSA, 2014a).

3.6 WATER RESOURCES

3.6.1 Definition of the Resource

Water resources discussed in this section include groundwater, surface waters, and floodplains. Groundwater is found in underground areas, known as aquifers, which consist of permeable and porous rock or unconsolidated substrate where water can be stored within soil or rock pore spaces. Surface water includes all lakes, ponds, rivers, streams, impoundments, and wetlands within a defined area or watershed. Groundwater and surface water are both impacted by stormwater infiltration and runoff generated during rain events. Floodplains are areas that are flooded periodically by the lateral overflow of surface water bodies.

Water resources are vulnerable to contamination and quality degradation. For this reason, the Federal Water Pollution Control Act, as amended by the CWA of 1977, was enacted to protect these valuable, irreplaceable resources. The Water Pollution Prevention and Control Act (33 U.S.C. § 26), also known as the CWA Amendments, set the national policy objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA provides the authority to establish water quality standards, control discharges into surface and subsurface waters (including groundwater), develop waste treatment management plans and practices, and issue permits for discharges. A National Pollutant Discharge Elimination System permit under §402 of the CWA is required for discharges into navigable waters. The USEPA oversees the issuance of National Pollutant Discharge Elimination System permits at federal facilities as well as water quality regulations (§401) for both surface and groundwater within states.

The State of Texas, under delegated authority and oversight by USEPA, defines beneficial uses, and establishes policies and standards relative to managing the quality of Waters of the State. Water quality is managed by the TCEQ, and is responsible for all aspects of planning permitting, and monitoring to protect the state's water resources. The Texas Surface Water Quality Standards (Title 30, Chapter 307 Texas Administrative Code) are written by the TCEQ under the authority of the CWA and the Texas Water Code. The Standards establish quality standards and set goals for the water quality of streams, rivers, lakes, and estuaries.

3.6.1.1 Groundwater

Groundwater is water that occurs in the saturated zone beneath the earth's surface and includes underground streams and aquifers. It is an essential resource that functions to recharge surface water and can be used for drinking, irrigation, and industrial processes. Groundwater typically can be described in terms of depth from the surface, aquifer or well capacity, water quality, recharge rate, and surrounding geologic formations. The susceptibility of aquifers to groundwater contamination relates to geology, depth to groundwater, infiltration rates, and solubility of contaminants. Groundwater resources are regulated on the federal level by the USEPA under the Safe Drinking Water Act, 42 U.S.C. § 300f et seq. The USEPA's Sole Source Aquifer Program, authorized by the Safe Drinking Water Act, further protects aquifers that are designated as critical to water supply and makes any proposed federal or federal financially assisted project that has the potential to contaminate the aquifer subject to USEPA review.

3.6.1.2 Surface Water

Surface waters are defined by USEPA as waters of the United States and are primarily lakes, rivers, estuaries, coastal waters, and wetlands. Jurisdictional waters, including surface water resources as defined in 33 CFR § 328.3, are regulated under §401 and §404 of the CWA and §10 of the Rivers and Harbors Act. Man-made features not directly associated with a natural drainage, such as upland stock ponds and irrigation canals, are generally not considered jurisdictional waters. Federal protection of wetlands is also promulgated under EO 11990, *Protection of Wetlands*, the purpose of which is to reduce adverse impacts associated with the destruction or modification of wetlands. This order directs federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. Wetlands are described in Biological Resources (**Section 3.5**). The USEPA delegated authority to the TCEQ to administer their own National Pollutant Discharge Elimination System permitting program for wastewater and stormwater discharge associated with industrial activity, construction activity, and Municipal Separate Storm Sewer System activity. The Texas Pollutant Discharge Elimination System Permitting Program was developed to meet CWA and federal directives. Permits allowing discharge of stormwater and wastewater into Texas surface waters are obtained through the Texas Pollutant Discharge Elimination System process.

3.6.1.3 Floodplains

Floodplains are areas of low-level ground along rivers, stream channels, or coastal waters that provide a broad area to inundate and temporarily store floodwaters. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body. Floodplains are subject to periodic or infrequent inundation due to rain or melting snow. Risk of flooding typically hinges on local topography, the frequency of precipitation events, and the size of the watershed above the floodplain.

Flood potential is evaluated and mapped by the Federal Emergency Management Agency, which defines the 100-year (regulatory) floodplain. The 100-year floodplain is the area that has a one-percent chance of inundation by a flood event in a given year. Federal, state, and local regulations often limit floodplain development to passive uses, such as recreational and preservation activities, to reduce the risks to human health and safety.

EO 11988, *Floodplain Management*, provides guidelines that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. This EO requires federal agencies avoid, to the extent possible, the long- and short-term, adverse impacts associated with the occupancy and modification of flood plains and avoid direct and indirect support of floodplain development wherever there is a practicable alternative EO 13690, *Establishing a Flood Risk Management Standard and Process for Further Soliciting and Considering Stakeholder Input*, signed in January 2015, established a

Federal Flood Risk Management Standard and a process for further soliciting and considering stakeholder input; however, this EO was revoked by Section 6 of EO 13807, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure (2017)*. EO 13807 did not revoke or otherwise alter EO 11988 (USACE, 2018b). Where possible, federal agencies are directed to use natural systems, ecosystem processes, and nature-based approaches when developing alternatives (USACE, 2015).

The ROI for water resources includes the airspaces identified on **Figure 1-4**. Because no ground-disturbing activities or anticipated changes in surface runoff are associated with the Proposed Action, Kelly Field Annex is not included in the ROI for water resources.

3.6.2 Existing Conditions - Airspace

3.6.2.1 Groundwater

The Crystal, Crystal North, and Laughlin 3 Low and High MOAs and a portion of the Kingsville 3 MOA are located over the Carrizo-Wilcox Aquifer. The Carrizo-Wilcox Aquifer extends from Louisiana to the border of Mexico, northwest and adjacent to the Gulf Coast Aquifer. The aquifer primarily is composed of sand locally imbedded with gravel, silt, clay, and lignite. The freshwater saturated thickness of the sands averages 670 ft, even though the aquifer reaches 3,000 ft in thickness. In the Winter Garden area, parts of the aquifer are slightly to moderately saline. Pumping for municipal supply accounts for 40 percent of the water pumped, while a little more than half is for irrigation purposes. Due to irrigation pumping, water levels have declined in the Winter Garden area (George et al., 2011).

The other portion of Kingsville 3 MOA is located over the Gulf Coast Aquifer. The Gulf Coast Aquifer is a major aquifer which consists of several aquifers, including the Jasper, Evangeline, and Chicot. The Gulf Coast Aquifer parallels the Gulf of Mexico coastline from Louisiana to the border of Mexico and is composed of discontinuous sand, silt, clay, and gravel beds. Freshwater saturated thickness averages approximately 1,000 ft. Water quality varies based on local and depth. The northeastern and central parts of the aquifer have generally good water quality, but further south the productivity of the aquifer diminishes as does the quality of the water. In the south, the water usually contains 1,000 to more than 10,000 milligrams per liter of total dissolved solids. The Gulf Coast Aquifer is used for irrigation, industrial, and municipal purposes (George et al., 2011).

The Laughlin 2 MOA is located in the Edwards and Edwards-Trinity (Plateau) Aquifers and the Brady Low and High MOAs are located over the Edwards-Trinity (Plateau) Aquifer. The Edwards Aquifer is located in the south-central park of the state. The Edwards Aquifer ranges in thickness from 200 to 600 ft. Freshwater thickness averages 560 ft in the southern part of the aquifer. The aquifer is composed of partially dissolved limestone, creating a highly permeable aquifer. The water is primarily utilized for recreation, irrigation, and municipal uses. Almost all of the water supply for San Antonio comes from the Edwards Aquifer. Water levels and spring flow react quickly to rain events due to its highly permeable nature. Even though well levels seasonally decline, they are able to recover quickly with sufficient rainfall (George et al., 2011).

The Edwards-Trinity (Plateau) Aquifer extends across a large portion of southwest Texas. Limestone and dolomite of the Edwards formation and sandstone and limestone of the Trinity formation compose the water-bearing units. Freshwater saturated thickness averages 433 ft although the maximum saturated thickness of the aquifer is more than 800 ft. Water ranges from fresh to slightly saline, increasing in salinity to the west. The largest exposed spring is San Felipe Springs along its southern margin. Over two-thirds of the groundwater is utilized for irrigation, with the rest being used for livestock and municipal supplies. Well levels have remained stable due to low amounts of pumping over the extent of the aquifer (George et al., 2011).

3.6.2.2 Surface Water

This section characterizes the major surface water resources beneath the proposed MOAs. These include the river basins, major rivers, large lakes, and reservoirs. The three major river basins that lay beneath proposed MOAs are the Rio Grande, Nueces, and Colorado (**Figure 3-7**). The Neuces-Rio Grande Coastal Basin is also beneath the Kingsville 3 MOA. The majority of airspace proposed for use is over the Nueces River Basin, followed by the Colorado River Basin. Descriptive information for each of the Texas river basins discussed below was obtained from the Texas Water Development Board (2018), and the information for the Nueces-Rio Grande Coastal Basin was obtained from the Nueces River Authority (2008).

The Nueces River Basin covers 16,700 square miles (mi^2) and includes the Nueces, Leona, Frio, Sabinal and Atacosa Rivers. Of these, portions of the Nueces River flows below the Laughlin 2 and 3 High and Low, Crystal, Crystal North, and the Kingsville 3 MOAs, and the Leona River is beneath the northern corner of the Kingsville 3 MOA. There are three major lakes and reservoirs in the Nueces River Basin: Choke Canyon Reservoir, Lake Corpus Christi, and Upper Nueces Lake. The western portion of Choke Canyon Reservoir is beneath the northern corner Kingsville 3 MOA. The Choke Canyon Reservoir is owned and operated by the City of Corpus Christi and the Nueces River Authority for water supply and recreational purposes. The entirety of the Upper Nueces Lake is below the Crystal High MOA, located about 6 mi north of Crystal City, Texas. This reservoir is primarily owned and operated by Zavala and Dimmit Counties for irrigation, recreation, and water supply.

The Colorado River Basin covers 39,428 mi^2 located in the central part of Texas. Primary rivers include the Colorado, Concho, Llano, Pedernales, and San Saba. Of these, the Colorado and the San Saba Rivers flow beneath the northeast corner Brady High and Low MOAs. There are 31 major lakes and reservoirs identified in the Colorado River Basin, yet only the Brady Creek Reservoir is in the vicinity of an MOA, laying beneath an excluded area of the Brady High and Low MOAs, about 3 mi west of Brady, Texas. The reservoir is owned and operated by the City of Brady for municipal and industrial water supply and recreational purposes.

The Rio Grande basin covers 49,387 mi^2 in the western part of Texas. Portions of the river basin are also located in Colorado and New Mexico. Primary rivers include the Rio Grande, Pecos, Devils, and Arroyo Colorado, yet only the Rio Grande is located near the MOAs, flowing along the western edges of the Laughlin 2 and 3 High and Low and the Crystal and Crystal North MOAs. While there are seven major lakes and reservoirs identified in the Rio Grande basin, none are beneath the MOAs.

The Nueces-Rio Grande Coastal Basin is in South Texas and covers about 10,400 mi^2. Coastal basins are bounded by major river basins and a bay or other outlet to the Gulf of Mexico. The Nueces-Rio-Grand Coastal Basin is bounded in the northeast by the Nueces River and the southwest by the Rio Grande Basins; however, these rivers do not flow beneath the MOAs. There are three major reservoirs within the Nueces-Rio Grande Coastal Basin, but none are located beneath the MOAs.

3.6.2.3 Floodplains

The Special Flood Hazard Areas and 100-year floodplain within each MOA corresponds to low-lying areas along the banks of natural waterways. Overflight activities from the Proposed Action would have no impacts on floodplains; therefore, as there would be no construction, fill activities, or indirect impacts on floodplains from ADAIR training, floodplains are not described further.

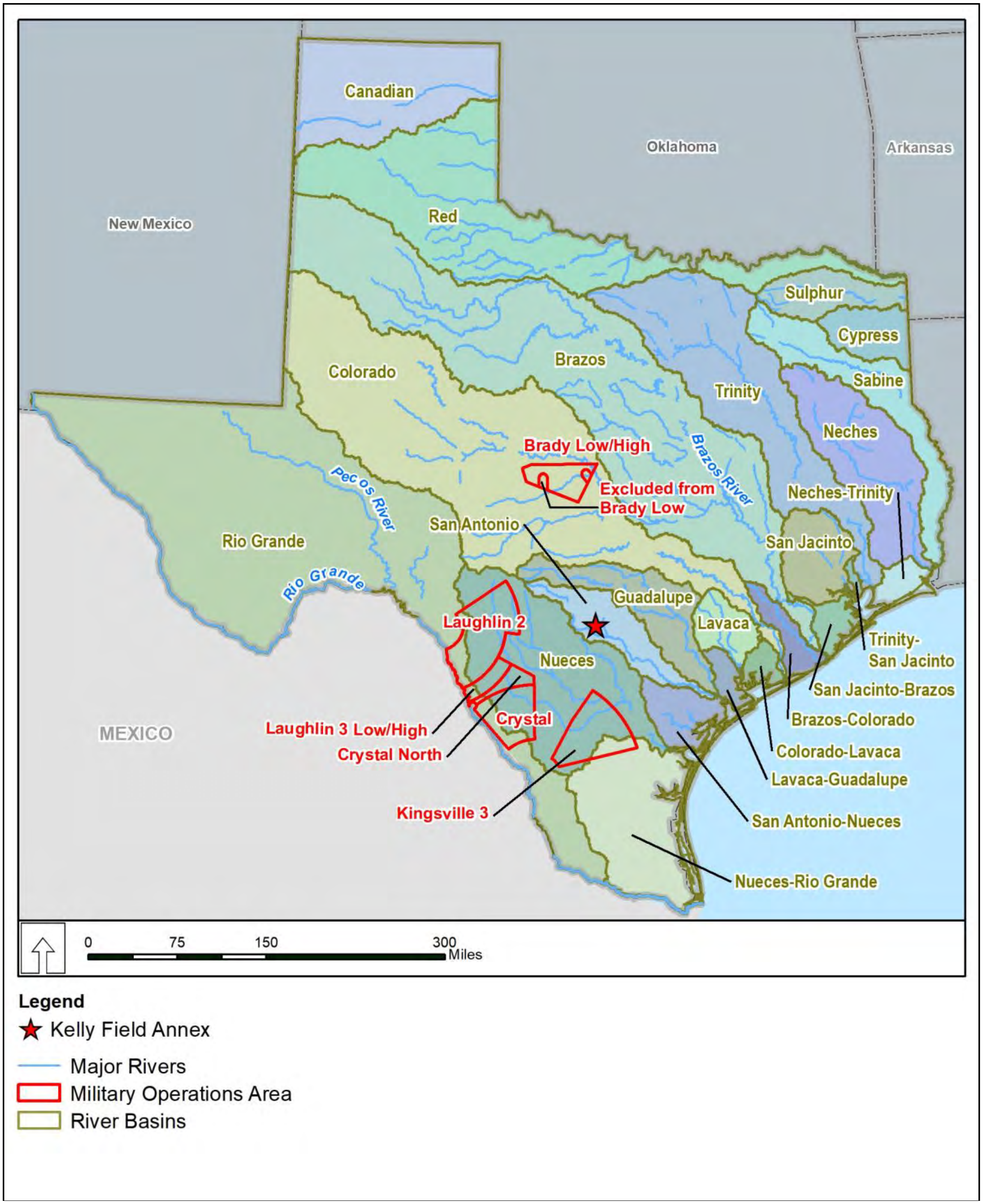


Figure 3-7. Locations of Military Operating Areas Over Major River Basins in Texas.

3.7 Soils

3.7.1 Definition of the Resource

Soils are the unconsolidated materials overlying bedrock or other parent material. Soils typically are described in terms of their complex type, slope, and physical characteristics. Differences among soil types in terms of their structure, elasticity, strength, shrink-swell potential, and erosion potential affect their abilities to support certain applications or uses. In appropriate cases, soil properties must be examined for their compatibility with particular construction activities or types of land use.

The ROI for soils includes the Crystal, Crystal North, Kingsville 3, Laughlin 2, Laughlin 3, and Brady High and Low MOAs. Because no ground disturbing activities or anticipated changes in topography are associated with the Proposed Action or alternatives, soils are not described for Kelly Field Annex. In addition, the Proposed Action does not have the potential to alter physiography, topography, or geology in the ROI which consequently have been eliminated from detailed discussion.

3.7.2 Existing Conditions - Airspace

The dominant soils in the Crystal, Crystal North, and Laughlin 3 MOAs are the Duval-Uvalde-Pryor and Montell-Catarina-Maverick soils of the Rio Grande Plain land resource area (Department of Agriculture [USDA] Natural Resources Conservation Service [NRCS], 2008):

- Duval-Uvalde-Pryor: Soils are deep to very deep, well-drained, moderately slowly or moderately permeable loams. Duval alfisols, Uvalde mollisols, and Pryor aridisols have a moderate to high water capacity and an erosion susceptibility that ranges from slight to severe. These soils are also corrosive to uncoated steel. Soils are well suited for rangeland and wildlife habitat and moderately well suited for cropland (USDA NRCS, n.d.; USDA Soil Conservation Service [SCS], 1985).
- Montell-Catarina-Maverick: Montell and Catarina soils are deep, moderately well-drained, slowly permeable, clayey, smectitic vertisols. Maverick soils are moderately deep, well-drained, clayey, smectitic inceptisols over weathered shale bedrock. This soil series is also affected by excessive sodium levels which decrease water capacity and crop suitability. These soils are best suited for rangeland or wildlife habitat (USDA NRCS, n.d.; USDA SCS, 1985).

The dominant soils in the Kingsville 3 MOA are the Montell-Catarina-Maverick and Delmita-Pernitas-Randado soils of the Rio Grande Plain land resource area (USDA NRCS, 2008):

- Montell-Catarina-Maverick: Described above for the Crystal, Crystal North, and Laughlin 3 MOAs.
- Delmita-Pernitas-Randado: Delmita soils are moderately deep, well-drained, moderately permeable, loamy inceptisols. Pernitas soils are deep, well-drained, moderately permeable, loamy mollisols. Randado soils are shallow, well-drained, moderately permeable, loamy alfisols. Delmita and Randado soils have a root-restrictive layer of cemented caliche over limestone bedrock. These soils are well suited for rangeland, livestock grazing, and wildlife habitat (USDA NRCS, n.d.; USDA SCS, 1985).

The dominant soils in the Laughlin 2 MOA are the Duval-Uvalde-Pryor, Montell-Catarina-Maverick, and Olmos-Langtry-Elindio soils of the Rio Grande Plain land resource area and the Tarrant-Oplin-Rock Outcrop, Ector-Tarrant-Rock Outcrop, and Brackett-Eckrant-Real soils of the Edwards Plateau land resource area (USDA NRCS, 2008):

- Duval-Uvalde-Pryor: Described above for the Crystal, Crystal North, and Laughlin 3 MOAs.
- Montell-Catarina-Maverick: Described above for the Crystal, Crystal North, and Laughlin 3 MOAs.
- Olmos-Langtry-Elindio: Olmos and Langtry soils are shallow, well-drained, moderately permeable, loamy, carbonatic mollisols. Olmos soils have a root-restrictive layer of cemented caliche over limestone bedrock. Elindio soils are very deep, well-drained, moderately permeable, silty mollisols. These soils are well suited to rangeland (USDA NRCS, n.d.; USDA NRCS, 2008).
- Tarrant-Oplin-Rock Outcrop: Tarrant soils are shallow, well-drained, clayey, smectitic mollisols over indurated limestone bedrock. Oplin soils are shallow, well-drained, moderately permeable,

loamy, carbonatic mollisols with a root-restrictive layer of cemented caliche over limestone bedrock. These soils are well suited to rangeland and wildlife habitat (USDA NRCS, n.d.).

- Ector-Tarrant-Rock Outcrop: Soils are shallow to limestone and; Ector soils are shallow, well-drained, moderately permeable, carbonatic, loamy mollisols over limestone bedrock. Tarrant soils are shallow, well-drained, clayey, smectitic mollisols over indurated limestone bedrock. These soils are well suited to livestock, wildlife grazing and habitat, and rangeland (USDA NRCS, n.d.).
- Brackett-Eckrant-Real: Brackett soils are shallow, well-drained, clayey, loamy inceptisols over limestone bedrock. Eckrant soils are shallow, well-drained, moderately slowly permeable clayey, smectitic mollisols over indurated limestone bedrock. Real soils are shallow, well-drained, carbonatic, loamy mollisols over limestone bedrock. These soils are well suited to rangeland and wildlife habitat (USDA NRCS, n.d.).

The dominant soils in the Brady High and Low MOAs are the Keese-Ligon-Rock Outcrop soils of the Texas Central Basin land resource area. Keese soils are shallow, well-drained, loamy inceptisols formed over granite and gneiss on gently sloping to steep hills. Ligon soils are moderately deep, well-drained, loamy alfisols formed over schist and gneiss on gently sloping, broad, rounded ridges. Soils are well suited for rangeland (USDA, n.d.; USDA NRCS, 2008).

3.8 Land Use and Visual Resources

3.8.1 Definition of the Resource

The term “land use” refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws; however, no nationally recognized convention or uniform terminology has been adopted for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions. This section addresses potential land impacts from implementation of the Proposed Action on JBSA-Kelly Field Annex and discusses land use categories identified on the base:

- Administrative – headquarters, security operations, offices;
- Airfield pavements – runways, taxiways, aprons, overruns;
- Aircraft O&M – hangars, aircraft maintenance units, squadron operations;
- Industrial – base engineering, maintenance shops, warehouses;
- Open space – conservation area, buffer space; and
- Outdoor recreation– ballfields, outdoor courts, golf course.

Three development plans provide guidance on future development at Kelly Field Annex. The Installation Development Plan (IDP) for JBSA (JBSA, 2016b) is the master plan for all JBSA installations. The IDP outlines the planning strategies and goals for future development on each installation. The second document, JBSA – Kelly Field Annex Area Development Plan, was prepared as a tool to guide future management and development of assets specifically within the Kelly Field Annex (USACE, 2018a). Finally, the Lackland AFB Joint Land Use Study (Bexar County, 2011) provides guidance for enhancing land use compatibility around Lackland AFB. This study was a cooperative planning effort between the Air Force, Port San Antonio, Bexar County, and the City of San Antonio. These three documents provide direction for future development on the Kelly Field Annex, with the objective of aligning current and programmed mission requirements while maintaining compliance with operational, safety, environmental, energy, and security regulations and requirements; maximizing functional capabilities through the utilization and adaption of existing areas; and to foster awareness of the installation by community stakeholders.

To address land use with respect to noise and safety associated with aircraft operations, military installations, including JBSA-Kelly Field Annex, have established an Air Installation Compatible Use Zone (AICUZ) program. The goal of the AICUZ program is to protect the health, safety, and welfare of those living or working near military air installations and to protect the military operational capabilities of the base (JBSA, 2008). The AICUZ program includes an analysis of the effects of aircraft noise, accident potential, land use compatibility, and development adjacent to the Base. The AICUZ assist governmental entities and communities anticipate, identify, and promote compatible land use and development near military installations. A detailed description of noise is provided in **Section 3.2**, and a description of the safety zones associated with JBSA-Kelly Field Annex is provided in **Section 3.3**.

The location(s) and extent of the Proposed Action is evaluated for potential effects on the proposed sites and land uses adjacent to project areas on Kelly Field Annex and beneath airspace that would be used for ADAIR training. The foremost factor affecting a proposed action in terms of land use is its compliance with any applicable land use or zoning regulations. Other relevant factors include existing land use at the project site, the types of land use on adjacent properties and their proximity to a proposed action, the duration of a proposed activity, and its "permanence." The ROI for land use on the installation includes the land surrounding the facilities proposed for use, and the land within the airfield noise contours and safety zones. The ROI also includes the land beneath the MOAs.

In addition to the land use categories identified above, sensitive lands and visual resources are considered in the evaluation. Sensitive lands include those intended to preserve natural or cultural resources, contain recreational opportunities and public access, or provide for the management of public lands. Visual resources include the natural and human aspects of land use that encompass the aesthetic qualities of an area. Natural areas include uses such as forestry and agriculture, as well as conversation areas, wildlands, and parks. Human aspects include historic properties and architecture (also refer to **Section 3.10, Cultural Resources**).

The ROI for visual resources includes areas adjacent to the facilities and aircraft parking ramp proposed for use at Kelly Field Annex. No sensitive lands were identified within the boundaries of the MOAs; therefore, visual resources for the area under the airspace are not described.

3.8.2 Existing Conditions – Kelly Field Annex

Kelly Field Annex at the JBSA-Lackland AFB is located approximately 7 mi southwest of downtown San Antonio in Bexar County, Texas. The airfield encompasses approximately 1,819 ac and is located east of Lackland AFB and west of Port San Antonio. Following BRAC decisions made in 1995, the former Kelly AFB was closed. The Kelly Field Annex runway and the majority of the property west of the runway was realigned to Lackland AFB; property to the east of the runway was sold to the City of San Antonio (Kelly AFB, 2001). Between 1995 and 2001, the City of San Antonio created a redevelopment authority, now known as Port San Antonio, to own and repurpose the former Air Force facilities for commercial use. In addition to leasing facilities to commercial and industrial firms, Port San Antonio leases back facilities to the Air Force. Proposed Hangars 1612 and 1610 were leased back to the Air Force in 2001 for continued use under Amendment #15 to Lease in Furtherance of Conveyance (Kelly AFB, 2001).

There are six on-base land use categories identified at Kelly Field Annex (**Table 3-14**). Most of the land uses are categorized as open space/buffer zone (**Figure 3-8**). The airfield with aircraft O&M hangars, administrative buildings, and industrial use areas comprise most of the remaining land uses. Approximately 209 ac have been categorized as outdoor recreation land use. Leon Creek traverses the open area west of the airfield. Most of the outdoor recreation area is within the 65-dB noise contour; however, a small portion to the south is within the 65 to 70 dB noise contour. As previously mentioned, Hangars 1612 and 1610, proposed for ADAIR activities, are located on Port San Antonio property east of the runway. The hangars are within an industrial land use area and a 75 to 80 dB noise contour area. Building 917 is located on the western side of the airfield, on-base within an aircraft O&M land use area and a 65 – 70 dB noise contour.

Table 3-14
Land Use Summary of Joint Base San Antonio, Kelly Field Annex

Category	Acreage[1]
Administration	4.4
Aircraft Operations and Maintenance	79.5
Airfield Pavement	349.4
Industrial use area	66.0
Open space/buffer zone	1,110.2
Outdoor Recreation	209.2
Total	**1,818.7**

Source: JBSA-Lackland Geodatabase, 2018

Off-base land within the Kelly Field Annex noise contours account for approximately 2,559 ac. Most of this land is classified as industrial (53 percent) and commercial (20 percent) land use (**Table 3-15**). Industrial and commercial land use dominates the eastern boundary, primarily on Port San Antonio property, and north and south of the airfield within the safety zones.

Approximately 1,959 ac of off-base land comprise the safety zones of the airfield. Of the 1,959 ac, approximately 371 ac represent the safety zone, with primarily commercial and industrial land uses. Approximately 14 ac of residential single-family use and 13 ac of special use – neighborhood preservation are located within the clear zones. APZ 1 comprises 689 off-base ac. Land use within the APZ 1 area falls within the commercial and industrial land use categories, with 0.5 ac designated mixed residential, 15 ac residential single-family use, and almost 3 ac of special use – neighborhood preservation. The APZ 2 area comprises approximately 899 ac of off-base land use. Most of the land use within the APZ 2 is commercial and industrial, with approximately 1 ac of mixed residential and 77 ac of residential single-family use. Almost 2 ac in the APZ 2 area are designated as resource protection and 2.5 ac represent special use – neighborhood preservation. Additional information regarding safety zones can be found in **Section 3.3**.

The visual setting for the Proposed Action on base is generally described as a military installation that includes runways, aircraft parking ramps, maintenance facilities (e.g., hangars), and operations/ administrative buildings. The runway is situated on the eastern boundary of Kelly Field Annex and is oriented in a slight northwestern/southeastern direction (Runway 15/33). Buildings, hangars, and ramps bound the airfield on the eastern and western sides of the runway.

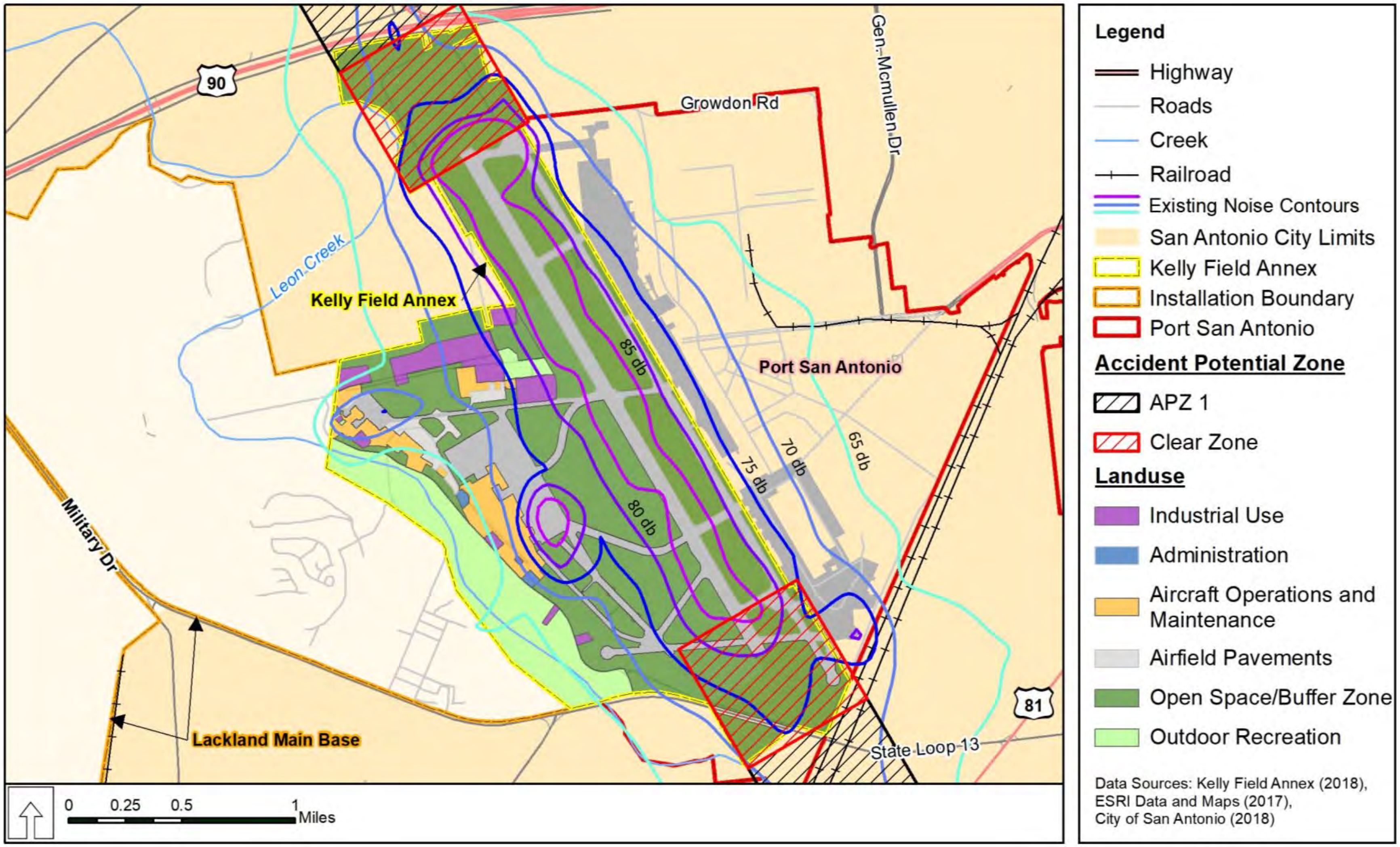


Figure 3-8. Generalized Existing Land Use Categories, Noise Contours, and Safety Zones at Joint Base San Antonio – Kelly Field Annex.

Table 3-15
Off-base Land Use within Kelly Field Annex Noise Contours

Zone Description	Acres Within Noise Contours					Percent of Total
	65 – 70 dB	70 – 75 dB	75 – 80 dB	80 – 85 dB	Total	
Commercial	311.3	172.7	43.9	0.9	528.8	20.6
General Industrial	532.1	200.6	50.8	13.9	797.4	31.1
Heavy Industrial	57.5	41.3	1.7	0.0	100.5	3.9
Mixed Heavy Industrial	205.4	139.5	57.3	0.5	402.7	15.7
Light Industrial	38.0	7.4	1.1	0.0	46.5	1.8
High-rise Office	0.5	0.0	0.0	0.0	0.5	<0.1
Multi-Family District	13.6	0.4	0.0	0.0	14.0	0.5
Residential Single-Family District	169.8	5.6	0.0	0.0	175.4	6.8
Residential Mixed District	30.6	0.1	0.0	0.0	30.7	1.2
Outside City Limits	8.7	0.3	0.4	0.1	9.5	0.3
Un-zoned Right-of-Way	162.6	81.0	6.9	1.5	252.0	9.8
Neighborhood Preservation District	166.2	35.0	0.0	0.0	201.2	7.8
Total	**1,696.3**	**683.9**	**162.1**	**16.9**	**2,559.2**	**100.0**

Source: City of San Antonio, 2018
dB = decibel(s)

3.8.3 Existing Conditions – Airspace

Land use beneath the airspace proposed for contract ADAIR is primarily rural, range, or agriculture. No major metropolitan areas are located beneath the proposed airspace. Population centers beneath the proposed contract ADAIR airspace are listed in **Table 3-16** by county and identified as either incorporated or unincorporated.

Table 3-16
Population Centers Beneath the Airspace Proposed for Contract Adversary Air

Incorporated Cities	Unincorporated Communities
Crystal MOA	
Dimmit County	
Asherton, Big Wells, Carrizo Springs	Brundage, Catarina
Crystal North MOA	
Dimmit County	
Not applicable	Winter Haven
Zavala County	
Crystal City	Not applicable
Kingsville 3 MOA	
Duval County	
Freer	Seven Sisters

Table 3-16
Population Centers Beneath the Airspace Proposed for Contract Adversary Air

Incorporated Cities	Unincorporated Communities
McMullen County	
Not applicable	Tilden
Laughlin 2 MOA	
Edwards County	
Not applicable	Barksdale
Kinney County	
Brackettville, Spofford	Fort Clark Springs
Maverick County	
Eagle Pass	Normandy, Quemado, Seco Mines
Real County	
Vance	Camp Wood, Leakey
Uvalde County	
Not applicable	Blewett, Cline, Concan, Dabney
Laughlin 3 High and Low MOAs	
Maverick County	
Not applicable	El Indio, La Pryor
Brady High MOA	
McCulloch County	
Brady, Melvin	Placid, Rochelle, Salt Gap, Voca, Whiteland
San Saba County	
Richland Springs, San Saba	Algerita, Hall, Harkeyville
Brady Low MOA	
McCulloch County	
Melvin	Placid, Rochelle, Salt Gap, Voca, Whiteland
San Saba County	
Richland Springs	Algerita, Hall, Harkeyville

3.9 SOCIOECONOMICS

3.9.1 Definition of the Resource

Socioeconomics is the relationship between economics and social elements, such as population levels and economic activity. There are several factors that can be used as indicators of economic conditions for a geographic area, such as demographics, median household income, unemployment rates, percentage of families living below the poverty level, employment, and housing data. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on industrial, commercial, and other sectors of the economy provide baseline information about the economic health of a region. The relevant factors related to the Proposed Action include population, income and employment, housing, and schools. Socioeconomic data are typically presented at county, state, and US levels to characterize baseline socioeconomic conditions in the context of regional, state, and national trends.

The ROI includes Bexar County, Texas (which includes the City of San Antonio), for Kelly Field Annex and the following counties for the area under the airspace:

- Crystal and Crystal North MOAs: Dimmit, Maverick, Webb, and Zavala Counties, Texas
- Laughlin 2 MOA: Edwards, Kinney, Maverick, Real, Uvalde, and Zavala Counties, Texas
- Laughlin 3 High and Low MOAs: Dimmit, Maverick, and Zavala Counties, Texas

- Kingsville 3 MOA: Duval, Jim Wells, La Salle, Live Oak, McMullen, and Webb Counties, Texas
- Brady High and Low MOAs: Concho, Llano, McCulloch, Mills, and San Saba Counties, Texas

3.9.2 Existing Conditions – Kelly Field Annex

Population

According to the 2016 US Census, the population of Bexar County was 1.9 million and the population of the City of San Antonio was 1.5 million (US Census Bureau [USCB], 2018). This is a 12.5 percent increase from the 2010 US Census population estimate for Bexar County and a 12.4 percent increase from the 2010 US Census population for the City of San Antonio. Texas's population totaled 27,862,596 in 2016, which was a 10.8 percent increase over the 2010 US Census population for the state. The growth rate for Bexar County, the City of San Antonio, and the State of Texas were all higher than the growth rate for the United States (**Table 3-17**).

Table 3-17
Population in the Kelly Field Annex Region of Influence as Compared to Texas and the United States (2010 – 2016).

Location	2010	2016	Percent Change
Bexar County	1,714,773	1,928,680	12.5
City of San Antonio	1,327,407	1,492,510	12.4
Texas	25,145,561	27,862,596	10.8
United States	308,758,105	323,127,513	4.7

Source: USCB, 2018

Income and Employment

The unemployment rate for Bexar County was 3.5 percent in 2017 (Bureau of Labor Statistics, 2018). This was lower than the 2017 unemployment rate for Texas (4.3 percent) and the United States (3.9 percent) (Bureau of Labor Statistics, 2018). The median household income in 2016 was $52,353 for Bexar County and $48,183 for the City of San Antonio. The median household income for Bexar County and the City of San Antonio was slightly lower in 2016 than that for Texas ($54,727) and the United States ($55,322). The rate of persons in poverty in 2016 was 16.3 percent for Bexar County and 19.5 percent for the City of San Antonio, both of which were higher than the rate of persons in poverty in Texas (15.6 percent) and the United States (12.7 percent) (USCB, 2018).

JBSA is the largest joint base in the DOD and in Fiscal Year 2016, over 80,000 people were employed by JBSA. The annual payroll generated by JBSA in Fiscal Year 2016 was $9.737 billion with a total economic impact (including contract expenditures and value of jobs created) of $14.296 billion (JBSA, 2018).

Housing

There were 693,707 housing units (occupied and unoccupied) in Bexar County, with an owner-occupancy rate of 58.3 percent; the remaining housing units were renter-occupied (USCB, 2018). The median value of owner-occupied homes was $134,000 and the median rental cost for housing was $902 (USCB, 2018). The number of housing units in the City of San Antonio is not provided by the USCB. The owner-occupancy rate for the City of San Antonio was slightly lower than that of Bexar County at 54.1 percent. Also, the median value of owner-occupied homes ($121,100) and median rental cost ($882) in San Antonio in 2016 were slightly lower than those for Bexar County (USCB, 2018). The median cost of owner-occupied housing and rental housing in Bexar County was slightly lower than that of Texas ($142,700 and $911, respectively) and the United States as a whole ($184,700, $949, respectively).

JBSA-Lackland includes 10,983 dormitory rooms in 18 facilities and 885 privatized housing units (JBSA, 2016b).

Schools

In Bexar County, there are 19 independent school districts providing public school education from Prekindergarten through 12th grade. These school districts served 353,184 students in the 2017-2018 school year (Texas Education Agency, 2018). Several institutions of higher education are in the Bexar County. These include University of Texas at San Antonio, Trinity University, University of the Incarnate Word, and the community colleges within the Alamo Colleges District.

3.9.3 Existing Conditions – Airspace

Population

According to the 2016 US Census, of the four Texas counties included in the Crystal and Crystal North MOAs, all but one, Zavala County, had a higher rate of growth between 2010 and 2016 than the US; however, all four counties has a slower population growth rate than the State of Texas (USCB, 2018). Of the four counties, Dimmit and Zavala Counties are rural with ranchlands and small communities; the City of Laredo is located in Webb County and the City of Eagle Pass is located in Maverick County and contribute to the larger population sizes and greater growth rates in these counties than in the remainder of the counties in the Crystal and Crystal North MOAs (**Table 3-18**).

According to the 2016 US Census, the population of the six counties in the Laughlin 2 MOA had lower growth or lost population since 2010 relative to the population changes in the State of Texas and the United States (USCB, 2018). Edwards County experienced a substantial percent decrease in population; however, Edwards County has an extraordinarily small population, and the total change in population was a net loss of 91 persons (**Table 3-18**).

According to the 2016 US Census, the population change between 2010 and 2016 was less within the Laughlin 3 High and Low MOAs than in the State of Texas but a higher percentage increase than in the United States as a whole, except for Zavala County (**Table 3-18**).

Population growth in La Salle, McMullen and Webb Counties within the Kingsville 3 MOA has occurred at a rate similar to the population growth in the State of Texas. Further, Live Oak County has experienced population growths slower than the State of Texas but similar to that of the United States (USCB, 2018); however, Duval County experienced a substantial percent decrease in population, and there was no change in population in Jim Wells County between 2010 and 2016 (**Table 3-18**).

According to the 2016 US Census, all counties in the Brady High and Low MOAs lost population except for Llano County, with Concho County losing approximately a third of their population in the last 6 years (USCB, 2018). Llano County experience a population growth rate similar to that of the State of Texas as a whole (**Table 3-18**).

Income and Employment

In the Crystal and Crystal North MOAs, the 2017 unemployment rate was highest in Zavala County followed by Maverick County (Bureau of Labor Statistics, 2018). Dimmit and Webb Counties had an unemployment rate similar to that of the State of Texas, but still higher than the United States as a whole (**Table 3-19**). The median household income and the rate of persons in poverty in 2016 was substantially different than those for the State of Texas and the United States, with a much lower median household income (half as low in Zavala County) and a much higher percentage of persons in poverty (**Table 3-19**). The percentage of persons in poverty in Webb and Zavala Counties is double that for the State of Texas and nearly three times the rate of the United States as a whole.

In the Laughlin 2 MOA, the unemployment rate was lowest in Edwards County and the percent of persons in poverty was lowest in Real County. (**Table 3-19**). The median household income in 2016 was lower in all six counties within the Laughlin 2 MOA than in Texas and the United States (**Table 3-19**).

The unemployment rate in 2017 was higher in the counties within the Laughlin 3 High and Low MOAs than in the State of Texas and the United States as a whole (**Table 3-19**). The median household income in 2016 was lower in all these counties than in Texas and the United States (**Table 3-19**). The percentage of persons in poverty in these counties was twice as high as the percentage of persons in poverty in the United States (**Table 3-19**) (USCB, 2018).

Duval and Jim Wells Counties had unemployment rates that were substantially higher than the State of Texas or the United States. In the Kingsville 3 MOA, the percent of persons in poverty was highest in Webb, Duval, La Salle, and Jim Wells Counties; except for McMullen County, the percent persons in poverty in all the counties within the Kingsville 3 MOA was higher than the percent of persons in poverty in Texas and the United States (**Table 3-19**). Except for McMullen County, the median household income in 2016 was lower in all counties within the Kingsville 3 MOA than in Texas and the United States (**Table 3-19**).

The unemployment rate throughout the Brady High and Low MOAs was similar to that of the State of Texas and the United States (**Table 3-19**). The median household income in 2016 was lower in all five counties within the Brady High and Low MOAs than in Texas and the United States (**Table 3-19**).

Housing

The median value of owner-occupied housing and the median gross rent for housing in the Crystal and Crystal North MOAs was substantially lower than in the State of Texas and the United States (**Table 3-20**). The percent of owner-occupied housing in the Crystal and Crystal North MOAs was similar to that of the State of Texas and the United States, except for Dimmit County, which had a higher percentage of owner-occupied housing (**Table 3-20**) (USCB, 2018).

All counties in the Laughlin 2 MOA had a lower median value of owner-occupied units and lower monthly gross rents than in Texas and the United States (see **Table 3-20**). The percent of owner-occupied units was higher in all counties under the MOA than the percent of owner-occupied units in Texas (see **Table 3-20**) (USCB, 2018).

The percent of owner-occupied homes in the counties in the Laughlin 3 High and Low MOAs was greater than in the State of Texas and the United States. Both the median value of owner-occupied housing and the median gross rent are lower than in the State of Texas and the United States (see **Table 3-20**) (USCB, 2018).

All counties in the Kingsville 3 MOA had a lower median value of owner-occupied units and lower monthly gross rents than in Texas and the United States (see **Table 3-20**). The percent of owner-occupied units was greater in all counties under the MOA than the percent of owner-occupied units in Texas (see **Table 3-20**) (USCB, 2018).

All counties in the Brady High and Low MOAs had a lower median value of owner-occupied units and lower monthly gross rents than in Texas and the United States (see **Table 3-20**). The percent of owner-occupied units was greater in all counties than the percent of owner-occupied units in Texas and the United States (see **Table 3-20**) (USCB, 2018).

Table 3-18
Population in the Military Operations Areas as Compared to Texas and the United States (2010 – 2016)

Location	2010	2016	Percent Change	Crystal and Crystal North	Laughlin 2	Laughlin 3 High/Low	Kingsville 3	Brady High/Low
Concho County	4,087	2,717	-33.5					X
Dimmit County	9,996	10,794	8.0	X		X		
Duval County	11,782	11,273	-4.3				X	
Edwards County	2,002	1,911	-4.5		X			
Jim Wells County	40,838	40,871	0.1				X	
Kinney County	3,598	3,590	-0.2		X			
La Salle County	6,886	7,584	10.1				X	
Live Oak County	11,531	12,174	5.6				X	
Llano County	19,301	21,210	9.9					X
Maverick County	54,258	57,685	6.3	X	X	X		
McCulloch County	8,283	7,957	-3.9					X
McMullen County	707	778	10.0				X	
Mills County	4,936	4,921	-0.4					X
Real County	3,309	3,389	2.4		X			
San Saba County	6,131	5,959	-2.8					X
Uvalde County	26,405	27,285	3.3		X			
Webb County	250,304	271,193	8.3	X			X	
Zavala County	11,677	12,023	3.0	X	X	X		
Texas	25,145,561	27,862,596	10.8	X	X	X	X	X
United States	308,758,105	323,127,513	4.7	X	X	X	X	X

Source: USCB, 2018 and Bureau of Labor Statistics, 2018

Table 3-19
Unemployment Rate (2017), Income (2016), and Poverty Rate (2016) for the Military Operations Areas

Location	Unemployment Rate	Median Household Income	Percent of Persons in Poverty	Crystal and Crystal North	Laughlin 2	Laughlin 3 High/Low	Kingsville 3	Brady High/Low
Concho County	4.2	$48,516	25.8					X
Dimmit County	5.1	$32,204	27.6	X		X		
Duval County	7.7	$33,115	26.3				X	
Edwards County	3.2	$39,457	23.3		X			
Jim Wells County	7.5	$43,321	23.2				X	
Kinney County	5.5	$34,398	20.0		X			
La Salle County	3.7	$40,094	26.2				X	
Live Oak County	4.7	$50,741	17.2				X	
Llano County	3.7	$48,562	13.4					X
Maverick County	9.3	$37,155	24.3	X	X	X		
McCulloch County	1.9	$57,589	12.0					X
McMullen County	3.6	$40,784	18.4				X	
Mills County	3.5	$44,375	15.8					X
Real County	5.7	$37,059	18.4		X			
San Saba County	3.2	$40,718	20.1					X
Uvalde County	4.7	$39,011	25.3		X			
Webb County	4.2	$38,711	31.8	X			X	
Zavala County	11.1	$26,639	34.4	X	X	X		
Texas	4.3	$54,727	15.6	X	X	X	X	X
United States	3.9	$55,322	12.7	X	X	X	X	X

Source: USCB, 2018

Table 3-20
Housing in the Region of Influence for the Military Operations Areas (2017)

Location	Number of Housing Units	Percent Owner-Occupied	Median Value of Owner-Occupied	Median Gross Rent	Crystal and Crystal North	Laughlin 2	Laughlin 3 High/Low	Kingsville 3	Brady High/Low
Concho County	1,655	73.7	$100,800	$618					X
Dimmit County	4,416	73.0	$61,300	$738	X		X		
Duval County	5,607	67.8	$48,400	$705				X	
Edwards County	1,622	88.6	$73,100	$482		X			
Jim Wells County	16,375	69.8	$73,300	$721				X	
Kinney County	1,961	80.0	$72,700	$515		X			
La Salle County	2,958	69.2	$63,500	$384				X	
Live Oak County	6,228	79.2	$84,900	$700				X	
Llano County	15,304	76.2	$169,200	$741					X
Maverick County	18,477	68.7	$93,100	$602	X	X	X		
McCulloch County	4,342	74.5	$75,800	$685					X
McMullen County	494	74.7	$78,100	$523				X	
Mills County	2,865	84.0	$123,100	$506					X
Real County	2,639	76.5	$110,600	$806		X			
San Saba County	3,187	67.4	$80,500	$632					X
Uvalde County	11,133	71.3	$78,200	$623		X			
Webb County	83,082	63.4	$110,500	$758	X			X	
Zavala County	4,356	68.4	$39,800	$511	X	X	X		
Texas	10,932,870	61.9	$142,700	$911	X	X	X	X	X
United States	137,403,460	63.6	$184,700	$949	X	X	X	X	X

Source: USCB, 2018

Schools

Crystal and Crystal North MOAs. Only one public school district serves the population in each of Dimmit and Maverick Counties. In Dimmit County, the Carrizo Springs Consolidated Independent School District serves 2,450 students. In Maverick County, the Eagle Pass Independent School District provides education services to 14,582 students. Zavala County is served by two public school districts, the Crystal City Independent School District and the La Pryor Independent School District. These two school districts serve a student population of 2,440 students.

In Webb County, five separate independent school districts serve 67,970 students (Texas Education Agency, 2018).

There are various institutions of higher education associated with the Crystal and Crystal North MOAs including Texas A&M International University and Laredo Community College in Laredo, Southwest Texas Junior College in Crystal City, and Sul Ross State University in Eagle Pass.

Laughlin 2 MOA. There are two public school districts in Edwards County supporting 588 students. The Brackett Independent School District is the only district in Kinney County and has an enrollment of 585 students. In Maverick County, the Eagle Pass Independent School District provides education services to 14,582 students. Two school districts in Real County provide educational services to 542 students. Uvalde County has four public school districts serving a total enrollment of 5,644 students. Zavala County is served by two public school districts, with a student population of 2,440 students (Texas Education Agency, 2018).

Southwest Texas Junior College and Sul Ross State University are the primary institutions of higher education in the Laughlin 2 MOA.

Laughlin 3 High and Low MOAs. In Dimmit and Maverick Counties, only one public school district serves the population for each of these counties. In Dimmit County, the Carrizo Springs Consolidated Independent School District serves approximately 2,450 students. In Maverick County, the Eagle Pass Independent School District provides education services to 14,582 students. Zavala County is served by two public school districts, the Crystal City Independent School District and the La Pryor Independent School District. These two school districts serve a student population of 2,440 student (Texas Education Agency, 2018).

Southwest Texas Junior College in Crystal City, and Sul Ross State University in Eagle Pass are the primary institutions of higher education in the Laughlin 3 High and Low MOAs.

Kingsville 3 MOA. There are four public school districts in Duval County with a total enrollment of 2,640 students. In Jim Wells County, a total of 8,223 students are enrolled in five independent school districts. The Cotulla Independent School District is the only public school district in La Salle County, with an enrollment of 1,380 students. There are two school districts in Live Oak County with a total student population of 1,778 students. The McMullen County Independent School District enrolls 257 students and is the only school district in McMullen County. In Webb County, five separate independent school districts serve 67,970 students (Texas Education Agency, 2018).

The Laredo Community College and Texas A&M International University in Laredo, and Coastal Bend College are the institutions of higher education in the Kingsville 3 MOA.

Brady High and Low MOAs. Two public school districts enroll a total of 479 students in Concho County. The Llano Independent School District is the only public school district in Llano County and has an enrollment of 1,793 students. Three school districts each in McCulloch, Mills, and San Saba Counties enroll 1,470, 1,020, and 980 students, respectively (Texas Education Agency, 2018).

There are no institutions of higher education that are located within the boundaries of the Brady High and Low MOAs.

3.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

3.10.1 Definition of the Resource

EOs direct federal agencies to address disproportionate environmental and human health effects in minority and low-income communities and to identify and assess environmental health and safety risks to children. EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, pertains to environmental justice issues and relates to various socioeconomic groups and disproportionate impacts that could be imposed on them. This EO requires that federal agencies' actions substantially affecting human health or the environment do not exclude persons, deny persons benefits, or subject persons to discrimination because of their race, color, or national origin. EO 12898 was enacted to ensure the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Consideration of environmental justice concerns includes race, ethnicity, and the poverty status of populations in the vicinity of a proposed action.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that each federal agency "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

For the purposes of this EA, minority populations are defined as Alaska Natives and American Indians, Asians, Blacks or African-Americans, Native Hawaiians, and Pacific Islanders or persons of Hispanic origin (of any race); low-income population include persons living below the poverty threshold as determined by the USCB; and youth populations are children under the age of 18 years.

The Environmental Justice ROI is identical to that described in **Section 3.9**. Minority, low-income, and youth populations that could be disproportionately impacted by the project are addressed for Bexar County, Texas (which includes the City of San Antonio), for Kelly Field Annex and the counties listed in **Section 3.9.1**. An evaluation of minority and low-income populations in the ROI forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the Proposed Action.

3.10.2 Existing Conditions – Kelly Field Annex

In 2016, the State of Texas, Bexar County, and the City of San Antonio had a similar percentage of minorities as that in the United States as a whole (**Table 3-21**); however, a substantially higher percentage of population was of Hispanic or Latino origin compared to the United States (USCB, 2018). Of the minority population in Bexar County and the City of San Antonio, a smaller percentage is Black or African American (8.5 percent and 7.1 percent, respectively) than in the State of Texas or the United States (12.6 percent and 13.3 percent, respectively).

Table 3-21
Total Population and Populations of Concern for Kelly Field Annex

	Total Population	Percent Minority*	Percent Hispanic or Latino	Percent below Poverty	Percent Youth
Bexar County	1,958,578	71.8	59.9	16.3	26.0
City of San Antonio	1,492,510	74.5	63.6	19.5	25.7
State of Texas	27,862,596	57.4	39.1	15.6	26.2
United States	323,127,513	38.7	17.8	12.7	22.8

Source: USCB, 2018

Note: Hispanic and Latino denote a place of origin and may be of any race and percent youth are all persons under the age of 18.

* Not white or representing more than one race and Hispanic or Latino in origin.

Bexar County and the City of San Antonio had a higher rate of poverty than Texas and the United States (**Table 3-21**). Further, a greater percentage of the population are children in Bexar County and the City of San Antonio than in Texas and the United States as a whole (**Table 3-21**) (USCB, 2018).

3.10.3 Existing Conditions – Airspace

Nearly the entire population of the Crystal and Crystal North MOAs identifies as a minority and most of the population is of Hispanic or Latino origin. The percent of the population that identifies as a minority in the Crystal and Crystal North MOAs is approximately three times that of the United States as a whole (**Table 3-22**). The overall percentage of the population that is below poverty and below the age of 18 is substantially higher than that of the State of Texas and the United States (**Table 3-22**) (USCB, 2018).

Except for Real County, the percentage of the population in the Laughlin 2 MOA that identified as a minority was greater in all counties than that of the State of Texas and in the United States as a whole. Real County had a lower percent of the population that identified as a minority than in Texas or the US; however, a greater percentage of the population was of Hispanic or Latino origin than in the United States but less than in the State of Texas (**Table 3-22**). For most of the counties in the Laughlin 2 MOA, the percent of the population that is below the age of 18 was less than that of Texas and the United States (**Table 3-22**). The percentage of persons below poverty was higher than in the State of Texas and in the United States as a whole (USCB, 2018).

In 2016, nearly the entire population within the Laughlin 3 MOA identified as minorities with most of those minorities consisting of people of Hispanic or Latino origin (**Table 3-22**). The percentage of the population under the age of 18 and the percentage of the population in poverty was higher than in the State of Texas and the United States (**Table 3-22**).

Except for Live Oak and McMullen Counties, the percentage of the population in the Kingsville 3 MOA that identified as a minority was greater than that of the State of Texas and in the United States as a whole. Live Oak and McMullen Counties had a lower percent of the population that identified as a minority than in Texas; however, a greater percentage of the population in these two counties was of Hispanic or Latino origin than in the State of Texas (**Table 3-22**). For most of the counties in the Kingsville 3 MOA, the percentage of youth in the population was less than that of Texas and the United States (**Table 3-22**). The only exceptions are Webb and Jim Wells Counties. The percentage of persons below poverty was higher than in the State of Texas and in the United States as a whole, except for McMullen County which had a percentage of persons in poverty that was lower than Texas and the United States (USCB, 2018).

The percentage of the population that was a minority was lower in all counties in the Brady High and Low MOAs than that of the State of Texas and similar to the percent of the population that identifies as a minority in the United States as a whole. Llano County had a lower percent of the population that identified as a minority than in Texas or the United States. Most of the minorities identify as being of Hispanic or Latino origin (see **Table 3-22**). The percentage of youth in the population was less than that of Texas and the United States (see **Table 3-22**). The percentage of persons below poverty was slightly higher than in the State of Texas and in the United States as a whole (USCB, 2018).

Table 3-22
Total Population and Populations of Concern for the Military Operations Areas (2016)

Location	Total Population	Percent Minority*	Percent Hispanic or Latino	Percent Below Poverty	Percent Youth	Crystal and Crystal North	Laughlin 2	Laughlin 3 High/Low	Kingsville 3	Brady High/Low
Concho County	2,717	40.2	36.6	25.8	20.2					X
Dimmit County	10,794	88.7	86.6	27.6	29.9	X		X		
Duval County	11,273	91.3	89.6	26.3	25.4				X	
Edwards County	1,911	57.0	55.0	23.3	21.4		X			
Jim Wells County	40,871	82.2	80.6	23.2	28.2				X	
Kinney County	3,590	61.7	58.3	20.0	18.5		X			
La Salle County	7,584	88.0	86.4	26.2	20.2				X	
Live Oak County	12,174	46.2	40.0	17.2	20.2				X	
Llano County	21,210	13.9	10.7	13.4	15.5					X
Maverick County	57,685	97.2	95.3	24.3	31.9	X	X	X		
McCulloch County	7,957	36.5	32.4	18.4	22.3					X
McMullen County	778	46.5	42.4	12.0	19.8				X	
Mills County	4,921	21.0	18.6	15.8	21.1					X
Real County	3,389	21.3	27.5	18.4	17.2		X			
San Saba County	5,959	35.6	30.3	20.1	20.5					X
Uvalde County	27,285	73.0	71.0	25.3	27.6		X			
Webb County	271,193	96.4	95.5	31.8	33.8	X			X	
Zavala County	12,023	94.4	93.6	34.4	30.1	X	X	X		
Texas	27,862,596	57.4	39.1	15.6	26.2	X	X	X	X	X
United States	323,127,513	38.7	17.8	12.7	22.8	X	X	X	X	X

Source: USCB, 2018

Note: Hispanic and Latino denote a place of origin and may be of any race and percent youth are all persons under the age of 18.

* Not white or representing more than one race and Hispanic or Latino in origin.

3.11 Cultural Resources

3.11.1 Definition of the Resource

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture or community for scientific, traditional, religious, or other purposes. These resources are protected and identified under several federal laws and EOs.

Cultural Resources include the following subcategories:

- Archaeological (i.e., prehistoric or historic sites where human activity has left physical evidence of that activity, but no structures remain standing);
- Architectural (i.e., buildings or other structures or groups of structures, or designed landscapes that are of historic or aesthetic significance); and
- Traditional Cultural Properties (resources of traditional, religious, or cultural significance to Native American tribes).

Significant cultural resources are those that have been listed on the National Register of Historic Places (NRHP) or determined to be eligible for listing. To be eligible for the NRHP, properties must be 50 years old and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. They must possess sufficient integrity of location, design, setting, materials, workmanship, feeling, and association to convey their historical significance, and meet at least one of four criteria (National Park Service [NPS], 2002):

- Associated with events that have made a significant contribution to the broad patterns of our history (Criterion A);
- Associated with the lives of persons significant in our past (Criterion B);
- Embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic values, or represent a significant and distinguishable entity whose components may lack individual distinction (Criterion C); and/or
- Have yielded or be likely to yield information important in prehistory or history (Criterion D)

Properties that are less than 50 years old can be considered eligible for the NRHP under Criterion Consideration G if they possess exceptional historical importance. Those properties must also retain historic integrity and meet at least one of the four NRHP Criteria for Evaluation (Criterion A, B, C, or D). The term “Historic Property” refers to National Historic Landmarks, NRHP-listed, and NRHP-eligible cultural resources.

Federal laws protecting cultural resources include the Archaeological and Historic Preservation Act of 1960 as amended, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA), and the NHPA, as amended through 2016, and associated regulations (36 CFR § 800). The NHPA requires federal agencies to consider effects of federal undertakings on historic properties prior to making a decision or taking an action and integrate historic preservation values into their decision-making process. Federal agencies fulfill this requirement by completing the Section 106 consultation process, as set forth in 36 CFR § 800. Section 106 of the NHPA also requires agencies to consult with federally recognized Indian tribes with a vested interest in the undertaking.

Section 106 of the NHPA requires all federal agencies to seek to avoid, minimize, or mitigate adverse effects to historic properties (36 CFR § 800.1[a]). For cultural resource analysis, the Area of Potential Effects (APE) is used as the ROI. APE is defined as the “geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist,” (36 CFR § 800.16[d]) and thereby diminish their historic integrity. There are two APEs encompassing direct and indirect effects for ADAIR including 1) the area of proposed use at Kelly Field Annex and 2) the airspace described in **Section 2.1.6** (see **Figure 1-4**).

3.11.2 Existing Conditions – Kelly Field Annex

3.11.2.1 Environmental Setting

The APE for Kelly Field Annex includes the Kelly Field Historic District and the adjacent runway complex to the west within the JBSA-Lackland Kelly Field Annex including Building 917. The area is on level terrain, land which had been farmland before the establishment of the former Kelly AFB in 1917 (KOMATSU/ Rangel, Inc. et al., 1997; Geo-Marine, Inc., 2000).

3.11.2.2 Archaeological and Traditional Cultural Properties

JBSA has been extensively surveyed for cultural resources. Overall, it is believed the survey coverage has been adequate to identify the majority of the prehistoric, historic, military era, and burial sites. More than 14 archaeological studies have been conducted at JBSA-Lackland since 1993 (JBSA, 2014b [Volume I]) and three archaeological investigations have specifically focused on Kelly AFB (Espey, Huston, and Associates, Inc., 1989; Geo-Marine, Inc., 2011; Peter and Shanabrook, 1997; JBSA, 2014b [Volume I]). No archaeological sites are documented within the APE or its immediate vicinity (Texas Historical Commission, 2018).

Traditional cultural properties and sacred sites are a special class of cultural resources that require specialized expertise in their identification and assessment. The base is not in possession of prehistoric human remains, funerary objects, sacred objects, or objects of cultural patrimony and no known traditional cultural resources or sacred sites have been identified at Kelly Field Annex or JBSA-Lackland. Collections recovered from sites at JBSA-Lackland, and curated at the Center for Archaeological Research, University of Texas at San Antonio, have been reported in the Federal Register as required by NAGPRA (JBSA, 2014b [Volume I]).

Based on a context study conducted in 2000, four federally recognized tribes—the Mescalero Apache, the Wichita and Affiliated Tribes, the Tonkawa, and the Comanche Nation—have been identified as potentially having an interest in JBSA's activities and historic properties. A fifth tribe, the Tap Pilam Coahuiltecan Nation, is not federally recognized but conducts consultation through the Wichita in cases where federal recognition is required by regulations (JBSA, 2014b [Volume I]).

3.11.2.3 Architectural Properties

The three buildings proposed to support the ADAIR mission are located within two discontinuous areas. Hangars 1610 and 1612, adjacent to each other on the flight line east of the runway, are part of Port San Antonio industrial complex. These hangars are currently leased by the Air Force (Texas Air National Guard, 2018). Building 917 is located just northwest of the intersection of Chappie James Way and Hangar Way within the JBSA-Lackland Kelly Field Annex, west of the runway.

The Kelly Field Historic District (NR# 03000626) was listed on the NRHP in July 2003 (KOMATSU/Rangel, Inc. et al., 1997; Geo-Marine, Inc., 2000) (**Figure 3-9**). The district represents the core of development associated with pre-World War II mobilization, and includes a mix of housing, office, instructional, recreational, hangar, maintenance, service and support, utility and warehouse buildings, infrastructure, and landscaping elements (Geo-Marine, Inc., 2000). Of the 58 buildings and structures located within the district, 39 have been determined to be contributing elements.

Hangars 1610 and 1612 were built in 1940 and 1942, respectively, at Kelly Field during the massive buildup of US Army Air Corps airfields prior to American entry into World War II. Kelly Field, which dates to 1917, underwent several phases of new construction between 1938 and 1942 in support of its pilot training program (Pemberton and Krapf, 1998). Hangar 1610 is located within the boundaries of the Kelly Field Historic District, which encompasses the 1600 and 1700 Areas on the east side of the runway.

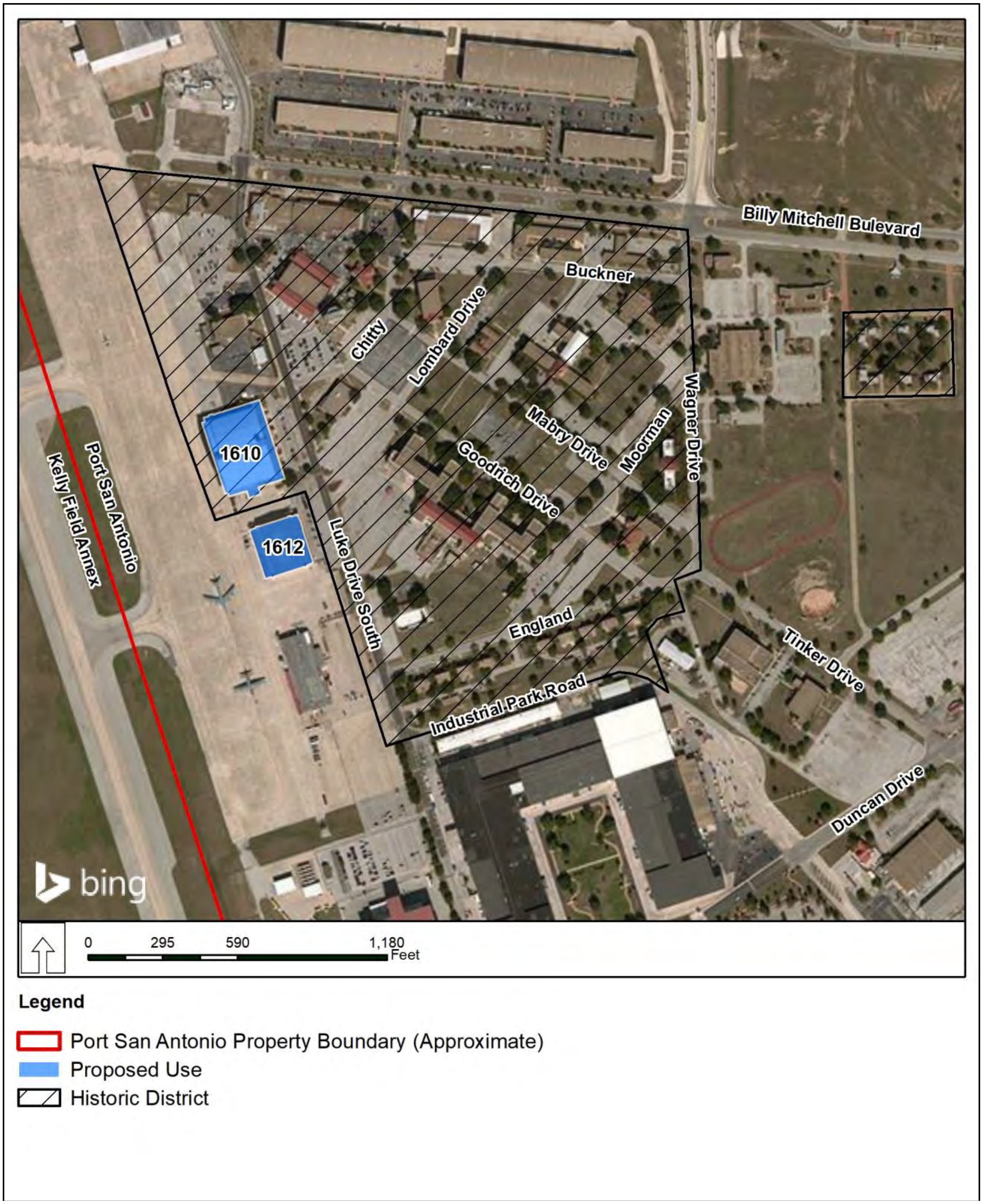


Figure 3-9. Kelly Field Historic District.

Hangar 1610 originally served as an Army Air Corps operations hangar for Kelly Field (Clow, 1998: Section F, p. 9). The utilitarian structure is of multilevel, vaulted construction featuring a two-way box truss system incorporating eight aircraft bays. The hangar has a steel framework with corrugated metal siding. A two-story office block runs the length of the east façade. The hangar's character-defining features include elements of the Art Moderne (molded stucco banding) and International (industrial metal windows) architectural styles. Alterations to the hangar over time include the replacement of some original doors and windows with aluminum storefront components (KOMATSU/Rangel, Inc., et al. 1997; Kane and Freeman 1995). Hangar 1610 was determined eligible for inclusion in the NRHP in 2003 under Criteria A and C as a contributing element of the Kelly Field Historic District (Geo-Marine, Inc., 2000: Section 7, p. 11; Tables Section, p. 57; JBSA, 2014b:C54).

Hangar 1612 was constructed in 1942 as an Operations Hangar and Fire and Crash Truck Station. It is a multilevel, utilitarian structure with a gabled steel truss framework and stucco siding. Two-story office blocks are located along the east and west facades. In 1986, the hangar was severely damaged in a fire, resulting in extensive renovations and alterations to the structure. As a result, the hangar suffered a loss of integrity (KOMATSU/Rangel, Inc. et al., 1997; Kane and Freeman, 1995: 28); therefore, Hangar 1612 has been determined not eligible for inclusion in the NRHP because of the fire and significant alteration during reconstruction (Peter et al., 1992: Table IV-4; KOMATSU/Rangel, Inc. et al., 1997). See **Appendix A** for the SHPO concurrence letter.

Building 917 was constructed in 2002; therefore, it is not considered a historic building.

3.11.3 Existing Conditions – Airspace

3.11.3.1 Environmental Setting

The airspace APE for ADAIR includes the airspace as described in **Section 2.1.6**. Based on the nature of the Proposed Action, archaeological and architectural resources under the airspace are not described in this EA. No known traditional cultural properties have been identified in the APE. Significant cultural resources under the airspace are described below.

3.11.3.2 National Register of Historic Places Eligible Resources

There are nine historic resources associated with the airspace APE listed in the NRHP, including one structure (a bridge), one district (a ranch and headquarters), and seven buildings (one home, one jail, and five courthouses) (**Table 3-23**) (NPS, n.d.).

Table 3-23
National Register of Historic Places Listed Resources Under the Airspace*

Military Operating Area	Resource	Type	Reference Number
Brady High	McCulloch County Courthouse	Building	77001515
Brady High	Old McCulloch County Jail	Building	75002073
Brady High	San Saba County Courthouse	Building	03000328
Crystal	Dimmit County Courthouse	Building	84001652
Crystal	Richardson, Asher and Mary Isabelle, House	Building	88002539
Crystal	Valenzuela Ranch Headquarters	District	85001562
Laughlin 2	1911 Kinney County Courthouse	Building	04000230
Laughlin 2	Maverick County Courthouse	Building	80004141
Laughlin 2	State Highway 3 Bridge at the Nueces River	Structure	96001108

Note:

* The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

3.12 Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances

3.12.1 Definition of the Resource

The Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act (SARA) and the Toxic Substances Control Act (TSCA), defines hazardous materials (HAZMAT). HAZMAT is defined as any substance with physical properties of ignitability, corrosivity, reactivity, or toxicity that might cause an increase in mortality, serious irreversible illness, and incapacitating reversible illness, or that might pose a substantial threat to human health or the environment. The Occupational Safety and Health Administration (OSHA) is responsible for enforcement and implementation of federal laws and regulations pertaining to worker health and safety under 29 CFR § 1910. OSHA also includes the regulation of HAZMAT in the workplace and ensures appropriate training in their handling.

The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA), which was further amended by the Hazardous and Solid Waste Amendments, defines hazardous wastes. Hazardous waste is defined as any solid, liquid, contained gaseous, or semi-solid waste, or any combination of wastes, that pose a substantial present or potential hazard to human health or the environment. In general, both HAZMAT and hazardous wastes include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, might present substantial danger to public health and welfare or the environment when released or otherwise improperly managed.

AFPD 32-70 establishes the policy that the Air Force is committed to

- cleaning up environmental damage resulting from its past activities;
- meeting all environmental standards applicable to its present operations;
- planning its future activities to minimize environmental impacts;
- responsibly managing the irreplaceable natural and cultural resources it holds in public trust; and
- eliminating pollution from its activities wherever possible.

AFI 32-7044, *Storage Tank Compliance*, implements AFPD 32-70 and identifies compliance requirements for underground storage tanks (USTs), aboveground storage tanks (ASTs), and associated piping that store petroleum products and hazardous substances. Evaluation of HAZMAT and hazardous wastes focuses on USTs and ASTs as well as the storage, transport, and use of pesticides, fuels, oils, and lubricants. Evaluation might also extend to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project site of a Proposed Action. In addition to being a threat to humans, the improper release of HAZMAT and hazardous wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of HAZMAT or hazardous wastes, the extent of contamination varies based on type of soil, topography, weather conditions, and water resources.

AFI 32-7086, *Hazardous Materials Management*, establishes procedures and standards that govern management of HAZMAT throughout the Air Force. It applies to all Air Force personnel who authorize, procure, issue, use, or dispose of HAZMAT, and to those who manage, monitor, or track any of those activities.

Through the Environmental Restoration Program (ERP) initiated in 1980, a subcomponent of the Defense ERP that became law under SARA (formerly the Installation Restoration Program [IRP]), each DOD installation is required to identify, investigate, and clean up hazardous waste disposal or release sites. Remedial activities for ERP sites follow the Hazardous and Solid Waste Amendment of 1984 under the RCRA Corrective Action Program. The ERP provides a uniform, thorough methodology to evaluate past disposal sites, control the migration of contaminants, minimize potential hazards to human health and the environment, and clean up contamination through a series of stages until it is decided that no further remedial action is warranted.

Description of ERP activities provides a useful gauge of the condition of soils, water resources, and other resources that might be affected by contaminants. It also aids in identification of properties and their usefulness for given purposes (e.g., activities dependent on groundwater usage might be foreclosed where a groundwater contaminant plume remains to complete remediation).

Toxic substances might pose a risk to human health but are not regulated as contaminants under the hazardous waste statutes. Included in this category are asbestos-containing materials (ACM), lead-based paint (LBP), radon, and polychlorinated biphenyls (PCBs). The presence of special hazards or controls over them might affect, or be affected by, a Proposed Action. Information on special hazards describing their locations, quantities, and condition assists in determining the significance of a Proposed Action.

Asbestos. AFI 32-1052, *Facility Asbestos Management*, provides the direction for asbestos management at Air Force installations. This instruction incorporates by reference applicable requirements of 29 CFR § 669 et seq., 29 CFR § 1910.1025, 29 CFR § 1926.58, 40 CFR § 61.3.80, Section 112 of the CAA, and other applicable AFIs and DOD Directives. AFI 32-1052 requires bases to develop an Asbestos Management Plan to maintain a permanent record of the status and condition of ACM in installation facilities, as well as documenting asbestos management efforts. In addition, the instruction requires installations to develop an asbestos operating plan detailing how the installation accomplishes asbestos-related projects. Asbestos is regulated by the USEPA with the authority promulgated under OSHA, 29 U.S.C. § 669 et seq. Section 112 of the CAA regulates emissions of asbestos fibers to ambient air. USEPA policy is to leave asbestos in place if disturbance or removal could pose a health threat.

Lead-based Paint. Human exposure to lead has been determined an adverse health risk by agencies such as OSHA and the USEPA. Sources of exposure to lead are dust, soils, and paint. In 1973, the Consumer Product Safety Commission (CPSC) established a maximum lead content in paint of 0.5 percent by weight in a dry film of newly applied paint. In 1978, under the Consumer Product Safety Act (Public Law 101-608, as implemented by 16 CFR § 1303), the CPSC lowered the allowable lead level in paint to 0.06 percent (600 ppm). The Act also restricted the use of LBP in nonindustrial facilities. DOD implemented a ban of LBP use in 1978; therefore, it is possible that facilities constructed prior to or during 1978 may contain LBP.

Radon. The United States Surgeon General (USSG) defines radon as an invisible, odorless, and tasteless gas, with no immediate health symptoms, that comes from the breakdown of naturally occurring uranium inside the earth (USSG, 2005). Radon that is present in soil can enter a building through small spaces and openings, accumulating in enclosed areas such as basements. No federal or state standards are in place to regulate residential radon exposure at the present time, but guidelines were developed. Although 4.0 picocuries per liter (pCi/L) is considered an "action" limit, any reading over 2 pCi/L qualifies as a "consider action" limit. The USEPA and the USSG have evaluated the radon potential around the country to organize and assist building code officials in deciding whether radon-resistant features are applicable in new construction. Radon zones can range from 1 (high) to 3 (low).

Polychlorinated Biphenyls. PCBs are a group of chemical mixtures used as insulators in electrical equipment, such as transformers and fluorescent light ballasts. Chemicals classified as PCBs were widely manufactured and used in the United States until they were banned in 1979. The disposal of PCBs is regulated under the federal TSCA (15 U.S.C. § 2601, et seq., as implemented by 40 CFR § 761), which banned the manufacture and distribution of PCBs, with the exception of PCBs used in enclosed systems. Per Air Force policy, all installations should have been PCB-free as of 21 December 1998. In accordance with 40 CFR § 761 and Air Force policy, both of which regulate all PCB articles, which are regulated as follows:

- Less than 50 ppm—non-PCB (or PCB-free)
- 50 ppm to 499 ppm—PCB-contaminated
- 500 ppm and greater—PCB equipment (USEPA, 2008)

The TSCA regulates and the USEPA enforces the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

The ROI for hazardous materials and wastes, the installation ERP, and toxic materials includes Hangars 1610 and 1612, Building 917, and ramp space at Kelly Field Annex.

3.12.2 Existing Conditions – Kelly Field Annex

The information below was summarized from several documents, including management plans, material surveys, TCEQ, the Texas Department of Health, and other State of Texas records, and related documentation.

3.12.2.1 Hazardous Materials and Wastes

Hazardous and toxic material procurements at Kelly Field Annex are approved and tracked by the JBSA Environmental Section (502 CES/CEIE), which has overall management responsibility of the installation environmental program. The Bioenvironmental Engineering Flight/Preventative Medicine supports and monitors environmental permits, hazardous materials, and hazardous waste storage, spill prevention and response, and participation on the Environmental Safety and Occupational Health Council (ESOHC) (JBSA, 2016a).

The ESOHC is a network of safety, environmental, and logistics experts who work with hazardous materials Managers, Unit Environmental Coordinators, and other hazardous materials users to ensure safe and compliant hazardous materials management throughout the Base. A privately contracted hazardous material pharmacy (HAZMART) ensures that only the smallest quantities of hazardous materials necessary to accomplish the mission are purchased and used.

The 502 CES/CEIE maintains the *Hazardous Waste Management Plan* (JBSA, 2016a) as directed by AFI 32-7042, *Waste Management*, and complies with 40 CFR §§ 260 to 272. This plan prescribes the roles and responsibilities of all members of the ESOHC with respect to the waste stream inventory, waste analysis plan, hazardous waste management procedures, training, emergency response, and pollution prevention. The *Hazardous Waste Management Plan* establishes the procedures to comply with applicable federal, state, and local standards for solid waste and hazardous waste management. The plan outlines procedures for transport, storage, and disposal of hazardous wastes.

Hazardous materials at JBSA are managed by the HAZMART. The Enterprise Environmental, Safety, and Occupational Health Management Information System tracks acquisition and inventory control of hazardous materials. Hazardous materials and petroleum products such as fuels, flammable solvents, paints, corrosives, pesticides, deicing fluid, refrigerants, and cleaners are used throughout JBSA for various functions including aircraft maintenance; aircraft ground equipment maintenance; and ground vehicles, communications infrastructure, and facilities maintenance.

Hazardous wastes generated at Kelly Field Annex include waste flammable solvents, contaminated fuels and lubricants, paint/coating, stripping chemicals, waste oils, waste paint-related materials, mixed-solid waste, and other miscellaneous wastes. Certain types of hazardous wastes are subject to special management provisions intended to ease the management burden and facilitate the recycling of such materials. These are called “Universal Wastes,” and their associated regulatory requirements are specified in 40 CFR § 273. Types of waste currently covered under the universal waste regulations include fluorescent light tubes, hazardous waste batteries, hazardous waste thermostats, and hazardous waste lamps.

Noncontiguous properties at JBSA generate varying amounts of hazardous waste under all three generator sizes as defined by the USEPA (40 CFR § 260.10): large-quantity generator, small-quantity generator, and conditionally exempt small-quantity generator. JBSA-Lackland Main Base and Kelly Field Annex are categorized as a large-quantity generator. JBSA-Lackland (including Kelly Field Annex) operates 119 satellite accumulation points (SAPs), where up to 55 gallons of “total regulated hazardous wastes” or up to 1 quart of “acutely hazardous wastes” are accumulated. The installation operates three 90-day accumulation sites, where hazardous waste accumulates before being transported off-installation for ultimate disposal (JBSA, 2016a). None of the facilities in the ROI contain SAPs.

An inventory of ASTs and USTs is maintained at JBSA and includes the location, contents, capacity, containment measures, status, and installation dates (JBSA, 2016a). Storage tanks at Kelly Field Annex contain jet fuel, diesel fuel, used cooking oil, used oil, and unleaded gasoline. There are 187 ASTs with capacities ranging from 60 gallons to 1.05 million gallons (JBSA, 2016a). No USTs are located at Hangars 1610 and 1612 and Building 917. Hangar 1610, which is owned by Port San Antonio and leased by the Air Force, contains one 120-gallon diesel fuel AST. No other ASTs are reported within the project area (JBSA-Lackland, 2013).

3.12.2.2 Environmental Restoration Program Sites

JBSA began its IRP in 1985 with the investigation of possible locations of hazardous waste contamination. A total of 70 ERP sites have been identified at JBSA. Of those sites, 59 are closed with no further action planned and 11 are under remediation. Additionally, 27 areas of concern (AOCs) have been identified, of which two are being investigated for further action (JBSA-Lackland, 2013). None of the facilities within the ROI are proximate to an active ERP site nor have any been identified as AOCs. Hangars 1610 and 1612 are owned and operated by Port San Antonio and leased by the Air Force[1]. Building 917 does not pose any risks. Compliance with federal, state, and local hazardous waste laws and regulations is the responsibility of the Installation Commander through the ESOHC.

3.12.2.3 Asbestos and Lead-Based Paint

The 502 CES/CEIE developed the *Asbestos Management Plan* for JBSA, including Kelly Field Annex, which includes program administration, organizational roles and responsibilities, standard work practices, and documentation (JBSA, 2017). Asbestos surveys for Hangars 1610 and 1612 and Building 917 have not been completed.

Comprehensive information or records on the presence or absence of LBP in Hangars 1610 and 1612 and Building 917 is not available. Kelly Field Annex was an active Air Force Base from 1954 until 1995 and based on these dates was likely constructed prior to 1978.

3.12.2.4 Radon

The USEPA and the USSG have evaluated the radon potential around the country to organize and assist building code officials in deciding whether radon-resistant features are applicable in new construction. Radon zones can range from 1.0 (high) to 3.0 (low). The USEPA radon zone for Bexar County, Texas, is Zone 3 (Low Potential, predicted indoor average level less than 2.0 pCi/L); however, radon potential throughout the county can vary (USEPA, 2016, 2018c). The Texas Department of State Health Services (2018) indicates that radon levels in Bexar County vary from under 2.0 pCi/L (87 percent [*sic*] of reported results in Zone 3), to 8 percent [*sic*] of results between 2.0 and 3.9 pCi/L (Zone 2), and 6 percent [*sic*] greater than 4.0 pCi/L (Zone 1). Each zone designation reflects the average short-term radon measurement that can be expected in a building without the implementation of radon control methods.

3.12.2.5 Polychlorinated Biphenyls

Known high-voltage equipment containing 50 ppm or more of PCBs have been removed from JBSA/KFA (JBSA 2016; JBSA-Lackland, 2013). The facility's *Hazardous Waste Management Plan* indicates that there are no known PCB materials at the installation but notes that ballasts and starters from light fixtures could contain PCB-containing material. The disposal of these materials is regulated. If the ballasts are not plainly marked as "Non-PCB", the material must be treated as PCB-containing (or be tested and proven to be non-

[1] Travis Tucker, AFMC AFCEC/CZOW, Joint Base San Antonio, Texas, e-mail to Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 20 June 2018.

PCB containing). As facility repairs and demolition occur, the suspected ballasts are removed and disposed. No PCB spills have been identified within the installation.

3.13 Infrastructure, Transportation, and Utilities

3.13.1 Definition of the Resource

Infrastructure consists of the systems and structures that enable a population in a specified area to function. Infrastructure is wholly man-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as developed. The availability of infrastructure and its capacity to support more users, including residential and commercial expansion, are generally regarded as essential to the economic growth of an area. The infrastructure information was primarily obtained from the JBLE Installation Development Plan (JBLE, 2017), which provides a brief overview of each infrastructure component and comments on its existing general condition.

The infrastructure components include solid waste management, sanitary and storm sewers, transportation, and utilities. Solid waste management primarily relates to the availability of landfills to support a population's residential, commercial, and industrial needs. Sanitary and storm sewers (also considered utilities) includes those systems that collect, move, treat, and discharge liquid waste and stormwater. Transportation is defined as the system of roadways, highways, and transit services that are in the vicinity of the installation, which could be potentially affected by the Proposed Action. Utilities include electrical, natural gas, liquid fuel, water supply, sanitary sewage/wastewater, and communications systems.

The ROI for this resource is JBSA-Lackland as data is not specified for Kelly Field Annex.

3.13.2 Existing Conditions – Kelly Field Annex

JBSA-Lackland operates one runway located at Kelly Field Annex. Runway 15/33 is 11,500 ft long, 300 ft wide, with overruns of 1,000 ft at each end of the runway (JBSA, 2016). Kelly Field Annex is located in the City of San Antonio, Texas, which is a major US metropolitan area.

3.13.2.1 Solid Waste Management

JBSA-Lackland does not operate a landfill. Nonhazardous municipal solid waste generated at JBSA Lackland and Kelly Field Annex that cannot be diverted for recycling is collected by a private contractor and disposed of at the Covel Gardens Landfill located on Covel Road in San Antonio. The Covel Gardens Landfill, managed by Waste Management, is a Type I Municipal Solid Waste Landfill that opened in 1992, and is 783 ac, with a disposal footprint of 480 ac. Permitted capacity of the landfill is 124.1 million cubic yards with a remaining capacity is 110.5 million cubic yards, it processes approximately 1.3 million tons annually, and operates under TCEQ Permit No. 2093B (Waste Management, 2018). Assuming there is approximately 3.3 cubic yards of mixed municipal solid waste per ton, the Covel Gardens Landfill has approximately 26 years before reaching capacity at the current rate of waste processing.

3.13.2.2 Sanitary and Storm Sewer Systems

The San Antonio Water System provides wastewater collection and treatment services for Kelly Field Annex. The Kelly Field Annex stormwater system is a combination of underground collection pipes and open drainage ditches. The majority of the surface runoff drains into Leon Creek, which flows to the Medina River and then to the San Antonio River (JBSA-Lackland, 2013). JBSA-Lackland operates under two types of stormwater discharge regulation programs. JBSA-Lackland operates under Texas Pollutant Discharge Elimination System Multi-Sector Permit for Storm Water Discharges Associated with Industrial Activities (Permit Number TXR050000), issued by the TCEQ, effective from 14 August 2016 through 14 August 2021 (TCEQ, 2016). The TCEQ has determined that JBSA-Lackland should be regulated as a small municipal separate storm sewer system (MS4). The MS4 permit requires implementation of BMPs, development of schedules and measurable goals, establishment of a Storm Water Management Program, and submission of annual reports. JBSA-Lackland currently operates under MS4 Permit TXR040000, general permit for small MS4s (JBSA-Lackland, 2013).

3.13.2.3 Transportation

JBSA-Lackland and Kelly Field Annex are located 7 mi southwest of downtown San Antonio. The nearest major highway interchange is US Highway 90 (US 90) and Interstate 410, northwest of the installation (**Figure 3-10**). Interstate 410 is a beltway around San Antonio that connects major interstates, US highways, state highway arteries, and provides access to San Antonio International Airport located north of downtown at the intersection of US Highway 281 and Interstate 410. There are approximately 18 mi of roadway on Kelly Field Annex.

Access to Kelly Field Annex from the north is via US 90 and Growdon Drive, and from the south via SW Military Drive. The primary roads servicing Kelly Field Annex are Growdon Drive, Billy Mitchell Boulevard, Luke Drive, and Hall Street. JBSA-Lackland Main Base connects to Kelly Field Annex via Luke Boulevard/Kelly Drive and Hall Street/Westover Road/Berman Road.

JBSA-Lackland has nine access gates and the majority of these gates connect from Military Drive. Kelly Field Annex can be accessed by commercial vehicles via the Growdon Gate as well as through JBSA-Lackland gates located on the east side of Military Drive (**Figure 3-10**). No traffic studies have been conducted specifically for Kelly Field Annex. A traffic study was conducted at JBSA-Lackland in October 2012 and traffic volumes were determined at six gates (Bergquist Gate, Luke East Gate, Luke West Gate, Selfridge East Gate, Selfridge West Gate, and Valley Hi Gate) as well as for roads providing access to access gates and for some internal roadways. Military Drive bisects the JBSA-Lackland and carried 37,800 vehicles per day at a point immediately north of Bergquist Drive and 18,500 vehicles per day at a point immediately south of Selfridge Boulevard. The total inbound and outbound traffic volume at the six access gates was 46,555 vehicles, with daily users accessing JBSA-Lackland through the Valley Hi Gate.

The study also evaluated the level of service for various intersections associated with the base entrance control facilities. The study assigned levels of service for these key intersections. Levels of service range from A to F, with A indicating a free-flow of traffic and Level F indicating stop-and-go waves with traffic exceeding the amount that can be served. All intersections had a level of service (LOS) between A and C, except for eastbound US 90 and Military Drive (LOS: AM = F, Midday = D, PM = E) and westbound US 90 and Military Drive (LOS: AM = F, Midday = C, and PM = E). JBSA-Lackland also maintains a comprehensive shuttle bus system, which provides access to most areas of the installation (Surface Deployment & Distribution Command Transportation Engineering Agency, 2013 and JBSA-Lackland, 2013).

3.13.2.4 Utilities

Electricity is provided to JBSA-Lackland, including Kelly Field Annex, by the CPS Energy. JBSA-Lackland operates the Valley Hi Substation on the western side of Lackland Main Base, off of Valley Hi Drive. Three incoming feeders from the on-installation substation provide power to the Lackland Main Base Switching Station. Seven 13.2-kilovolt distribution circuits serve different areas of the installation including Kelly Field Annex (JBSA-Lackland, 2013).

Natural gas is provided to JBSA-Lackland, including Kelly Field Annex, by Kinder-Morgan. Natural gas is provided through an 8-in. pipeline entering the southern end of JBSA-Lackland. The distribution system is comprised of 41 mi of pipeline in a combination loop and radial distribution system, of which much of the system at Kelly Field Annex is steel gas lines that are approximately 50 years old (JBSA, 2016a; JBSA-Lackland, 2013).

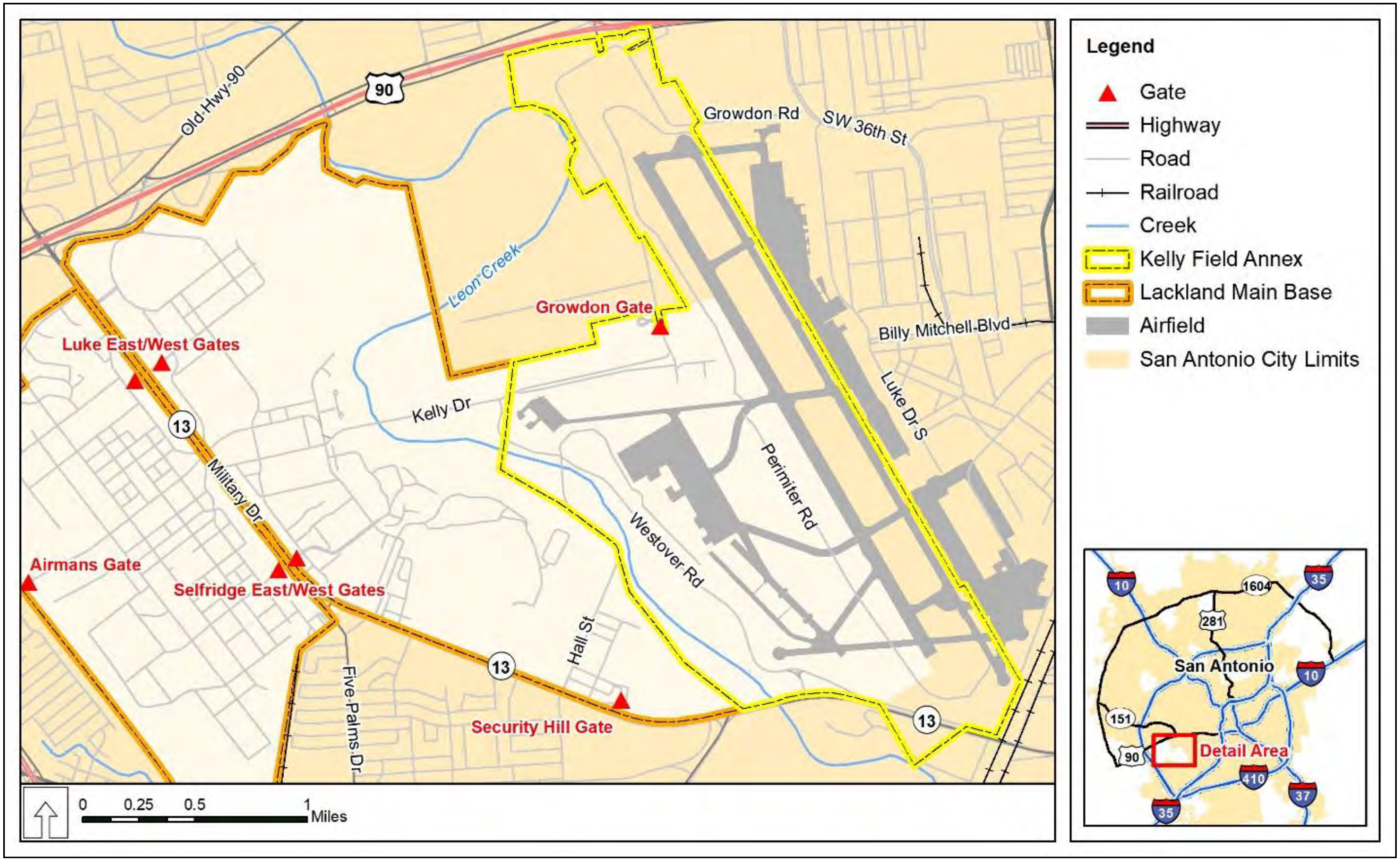


Figure 3-10. Transportation Network for Kelly Field Annex.

Potable water is provided through a privatized water system that is owned and operated by the San Antonio Water System. Water is received from two water mains located on the east and west sides of Kelly Field Annex. There are two elevated water towers with a storage capacity of 500,000 gallons each. The Kelly Field Annex water distribution system is connected to JBSA-Lackland Main Base via a 12-in. pipe and can be used as an emergency source of potable water for JBSA-Lackland Main Base (JBSA-Lackland, 2013).

Communication at JBSA-Lackland is supported through a multimode fiber optic cable system. Most of the cable is underground in vaults or directly buried, with the primary communication infrastructure located in Building 1674 and the Dial Central Office located in Building 1050. Building 1050 houses the information transfer nodes. JBSA has expanded communications for voice, video, and data over fiber to meet the Air Force's Unified Communications objective. Where feasible, JBSA has been migrating voice communications to Voice over Internet Protocol from the traditional analog phone lines, especially in new buildings (JBSA, 2016a; JBSA-Lackland, 2013).

Jet fuel is stored in 19 storage tanks at JBSA-Lackland and Kelly Field Annex with a combined capacity of 2.1 million gallons. JBSA-Lackland and Kelly Field Annex also have storage tank capacity for 1 million gallons of diesel fuel in eight storage tanks, and 100,000 gallons of unleaded gasoline in five storage tanks (JBSA, 2016a; and JBSA-Lackland, 2013).

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CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter presents a detailed analysis of the potential environmental impacts associated with the Proposed Action, Alternatives, and No Action Alternative as described in **Chapter 2**. Impacts are described for each ROI previously described in **Chapter 3**. The specific criteria for evaluating impacts and assumptions for the analyses are presented under each resource area. Evaluation criteria for most potential impacts were obtained from standard criteria; federal, state, or local agency guidelines and requirements; and/or legislative criteria. Proposed environmental commitments and BMPs to reduce potential impacts are included for each resource area, as appropriate.

Impacts are defined in general terms and are qualified as adverse or beneficial, and as short-term or long-term. For the purposes of this EA, short-term impacts are generally considered those impacts that would have temporary effects. Long-term impacts are generally considered those impacts that would result in permanent effects.

Impacts may be direct or indirect and are described in terms of type, context, duration, and intensity, which is consistent with the CEQ regulations. “Direct effects” are caused by an action and occur at the same time and place as the action. “Indirect effects” are caused by the action and occur later in time or are farther removed from the place of impact but are reasonably foreseeable.

Impacts are defined as
- negligible, the impact is localized and not measurable or at the lowest level of detection;
- minor, the impact is localized and slight but detectable;
- moderate, the impact is readily apparent and appreciable; or
- major, the impact is severely adverse or highly noticeable and considered to be significant.

Major impacts are considered significant and receive the greatest attention in the decision-making process. The significance of an impact is accessed based on the relationship between context and intensity. Major impacts require application of a mitigation measure to achieve a less than significant impact. Moderate impacts may not meet the criteria to be classified as significant, but the degree of change is noticeable and has the potential to become significant if not effectively mitigated. Minor impacts have little to no effect on the environment and are not easily detected; impacts defined as negligible are the lowest level of detection and generally not measurable. Beneficial impacts provide desirable situations or outcomes.

CEQ regulations (at 40 CFR § 1508.20) define mitigation in the following five ways, in order of preference:
1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments.

Direct and indirect effects and their significance, as well as the means (e.g., BMPs or environmental commitments) for reducing adverse environmental impacts are also discussed for each resource.

4.1 AIRSPACE MANAGEMENT AND USE

4.1.1 Evaluation Criteria

Adverse impacts to airspace might include modifications to MOAs or significantly increasing flight operations within airspaces as a result of the Proposed Action and alternatives. For the purposes of this EA, an impact is considered significant if it modifies airspace location, dimensions, or aircraft operational capacity.

4.1.2 Proposed Action

Under the Proposed Action, an estimated seven contract ADAIR aircraft would provide training sorties at Kelly Field Annex and airspaces as described in **Chapter 2**. An estimated additional 1,200 sorties would be added to the current number of sorties flown at Kelly Field Annex. This number includes training sorties and a smaller number of sorties for aircraft leaving and returning from either maintenance or other deployments. The number of sorties within MOAs would increase by an estimated 1,130 sorties. Sorties in MOAs would include both subsonic and supersonic flight operation (with the exception of Brady Low MOA where supersonic flight would not occur).

4.1.2.1 Alternatives 1, 2, and 3

Implementation of alternatives differs only in the facilities chosen for operations, maintenance, and aircrew briefings. Because the number and type of aircraft, using the same flight profiles and airspace are the same under all alternatives, potential impacts to airspace management and use are the same for all action alternatives.

The addition of an estimated 1,200 sorties in the Kelly Field Annex airspace is negligible, increasing the annual number of sorties by 4 percent. This change is not expected to impact the operational capacity or necessitate changes to airspace locations or dimensions around Kelly Field Annex. Potential impacts to the airspace around the airfield are expected to be negligible and long-term.

There would be a 32 percent increase in aircraft operations in the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs. Additionally, Air Force training flights at night would increase by approximately 156 airspace operations per year, an increase of 10 percent of existing nighttime airspace sorties. Contractor night sorties would be flown during the 149 FW's approved flying window and concurrent to the 149 FW's operations in the airspace.

The MOAs proposed for use have the capacity and are in locations with the dimensions necessary to support the additional sorties proposed; therefore, negligible impacts to airspace are expected from the implementation of Alternatives 1, 2, and 3.

4.1.2.2 No Action Alternative

Under the No Action Alternative, contract ADAIR would not perform sorties at Kelly Field Annex and nearby airspaces. Under the No Action Alternative, there would be no change to airspace use and management.

4.2 NOISE

4.2.1 Evaluation Criteria

Noise impact analysis typically evaluates potential changes to existing noise environments that would result from implementation of the Proposed Action and alternatives. At the installation, the 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations. Areas beyond 65-dBA DNL can also experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL noise contours may vary from year to year due to fluctuations in operational tempo due to unit deployments, funding levels, and other factors. In the airspace, supersonic flight operations in the overland MOAs have the potential to generate loud sonic booms.

Potential changes in the noise environment can be beneficial (i.e., if they reduce the number of sensitive receptors exposed to unacceptable noise levels), negligible (i.e., if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (i.e., if they result in increased noise exposure to unacceptable noise levels). Projected noise impacts were evaluated qualitatively for the Proposed Action and alternatives.

4.2.2 Proposed Action

The Proposed Action includes contracting for the support of an estimated seven contractor aircraft to fly an estimated 1,200 annual sorties in support of the 149 FW at Kelly Field Annex. This number of sorties includes sorties expected for training activities and aircraft leaving for or returning from either maintenance or other deployments. Of the estimated 1,200 sorties, about 1,130 of those are the training sorties that would occur within MOAs.

Because it is not known at this time what type of aircraft type would be used by contract ADAIR, three aircraft scenarious were evaluated - High, Medium, Low – to represent the range of aircraft types that could be selected. These scenarios are discussed further below. Depending on the specific type of ADAIR aircraft, impacts to the noise environment are expected to range from negligible to minor and would be long-term.

No significant impacts to the noise environment are expected from the High Noise, Medium Noise, or Low Noise Scenarios. Impacts from each alternative are summarized in **Table 4-1,** with details regarding impacts specific to the alternatives described in **Sections 4.2.2.1** through **4.2.2.3**.

Table 4-1
Summary of Potential Noise Impacts

Alternative	Change in Noise
Alternatives 1, 2, and 3	High Noise Scenario – Long-term negligible to minor increases in noise from addition of ADAIR flight operations in the vicinity of the Kelly Field Annex airfield. Impacts are primarily localized north and south of Kelly Field Annex. Negligible increase in noise from additional ADAIR subsonic and/or supersonic flight operation in Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs.
	Medium Noise Scenario – Long-term negligible to minor increases in noise from addition of ADAIR flight operations in the vicinity of the Kelly Field Annex airfield. Impacts are primarily localized north and south of Kelly Field Annex. Negligible increase in noise from additional ADAIR subsonic and/or supersonic flight operation in Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs.
	Low Noise Scenario – Long-term negligible to minor increases in noise from addition of ADAIR flight operations in the vicinity of the Kelly Field Annex airfield. Impacts are primarily localized north and south of Kelly Field Annex. Negligible increase in noise from additional ADAIR subsonic and/or supersonic flight operation in Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs.
No Action Alternative	None

Notes:
ADAIR = adversary air; MOA = Military Operations Area

4.2.2.1 Alternatives 1, 2, and 3

Implementation of the Proposed Action would establish contract ADAIR capabilities (an estimated seven aircraft) providing 1,200 annual training sorties at Kelly Field Annex in Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs.

Since the exact fleet of contract ADAIR aircraft operating at Kelly Field Annex is unknown, three scenarios were designed to provide a bounded analysis of potential impacts to the noise environment. The aircraft proposed for use by contract ADAIR and the surrogate aircraft modeled for the high, medium, and low noise scenarios are summarized in **Table 4-2**.

Table 4-2
Adversary Air Noise Scenarios

Scenario	Adversary Air Aircraft	Surrogate Aircraft
High Noise Scenario	A-4N	A-4C
Medium Noise Scenario	MiG-21	F-104D&G
Low Noise Scenario	L-59	T-45

To model changes in noise relative to the baseline conditions, all modeled contract ADAIR flight and engine run-up operations are set to the ADAIR aircraft listed in **Table 4-2** for the appropriate scenario. For example, when looking at the high noise scenario, all contract ADAIR operations are modeled as A-4N operations; however, the NOISEMAP database does not contain noise data for the A-4N, so an appropriate noise modeling surrogate was selected, the A-4C in this case. The noise modeling surrogates for various aircraft presented in **Table 4-2** have been approved for use by the Air Force Civil Engineer Center (AFCEC) CZN (NEPA division) and CPPR (Noise and AICUZ division). Flight profiles for contract ADAIR (i.e., schedules of altitude, power setting, and airspeed along each flight track) were reviewed and approved by the Air Force. The representative flight profiles for the various contract ADAIR scenarios are provided in **Appendix B**. All contract ADAIR departure profiles were modeled using afterburner or the maximum possible power on all take-offs.

High Noise Scenario

Under the High Noise Scenario, all contract ADAIR operations are assumed to be performed by A-4N aircraft. Since noise data for the A-4N is not available in NOISEMAP, the A-4C was used as a modeling surrogate. Proposed contract ADAIR flight operations at Kelly Field Annex and associated airspaces would be identical to existing conditions except for the additional contract ADAIR sorties. Noise analysis of the High Noise Scenario was conducted to analyze changes to the airfield noise contours and the proposed airspaces.

Kelly Field Annex Noise Environment

Implementation of the Proposed Action would result in a 4 percent increase in the number of operations at Kelly Field Annex. Contract ADAIR would fly up to a projected 5 percent of the estimated total 1,200 additional sorties during environmental night hours when the effects of aircraft noise are accentuated (10:00 pm to 7:00 am local time). This equates to an increase of approximately 156 sorties per year, a 10 percent increase above existing night sorties. Runway utilization, flight tracks, and flight track utilization for contract ADAIR aircraft would be similar to the existing F-16 operations. Proposed annual departure, arrival, and closed pattern aircraft operations at Kelly Field Annex with the addition of contract ADAIR are summarized in **Table 4-3**. Contract ADAIR would also perform static run-up operations, such as pre- and post-flight run-ups.

Table 4-3
Proposed Annual Aircraft Operations Summary at Kelly Field Annex

Aircraft	Departures		Arrivals		Closed Patterns		Total Operations		
	Day	Night	Day	Night	Day	Night	Day	Night	Total
F-16C	3,360	140	3,184	316	11,200	0	17,744	456	18,200
C-5M	1,014	26	841	199	32,606	674	34,461	899	35,360
ADAIR	1,152	48	1,092	108	324	0	2,568	156	2,724
Civilian	3,824	26	3,829	21	240	0	7,893	47	7,940
Transients	1,219	31	1,193	57	0	0	2,412	88	2,500
Grand Total	**10,569**	**271**	**10,139**	**701**	**44,370**	**674**	**65,078**	**1,646**	**66,724**

As described in **Section 3.2.1.2**, NOISEMAP was used to model military aircraft noise. The resultant 65- to 85-dB DNL contours in 5-dB increments for the daily flight events at Kelly Field Annex under the proposed High Noise Scenario are summarized on **Figure 4-1**. The 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations.

The primary changes in noise contour features between the High Noise Scenario and the existing conditions is the slight elongation of the DNL contours along the extended centerline of Runway 15/33 and the slight expansion perpendicular to the runway. This overall increase in noise level is a result of contract ADAIR departures, pitch arrivals, and closed pattern flight operations. A comparison of the DNL noise contours of the High Noise Scenario and the existing conditions is shown on **Figure 4-2**.

Under the High Noise Scenario of the Proposed Action, the amount of area within noise contours increases (**Table 4-4**). These increases are unlikely to lead to significant impacts in these areas.

As a result of the implementation of the High Noise Scenario, noise levels at representative POIs identified in **Section 3.2.2** would increase (**Table 4-5**).

At the representative noise-sensitive locations modeled, the DNL would increase by an amount ranging from 0 to 3 dBA under the High Noise Scenario. The DNL at Wilford Hall Hospital would increase by approximately 3 dBA under the High Noise Scenario, which would be a perceptible, yet minor impact that is not considered significant. All other POIs examined would experience negligible to minor DNL increases of 0 to 2 dBA. The increased DNL at these POIs and the surrounding areas would be long term, barely noticeable, and not significant under Alternatives 1, 2, and 3.

Airspace Noise Environment

Under the High Noise Scenario, contract ADAIR would perform an estimated 1,130 annual airspace operations in the various MOAs. Contract ADAIR would only operate in the same MOAs already used by based Kelly Field Annex aircraft. Crystal and Crystal North would receive approximately 42.5 percent of sorties originating from Kelly Field Annex, while Laughlin 2 and Laughlin 3 would receive approximately 42.5 percent, Kingsville 3 about 10 percent, and Brady High and Low about 5 percent. A summary of estimated annual airspace operations is presented in **Table 4-6**.

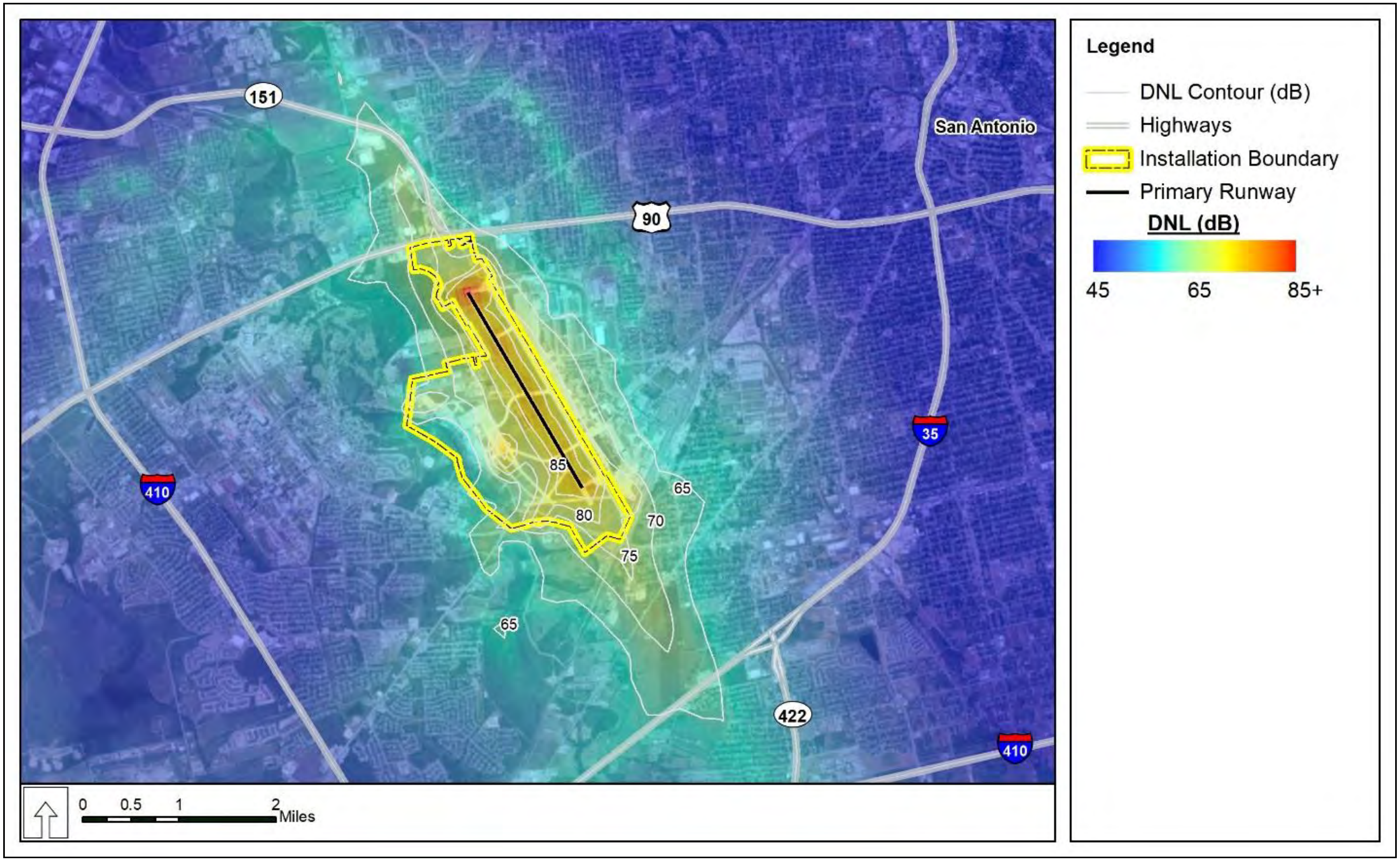

Figure 4-1. High Noise Scenario Day-Night Average Sound Level Contours at Kelly Field Annex.

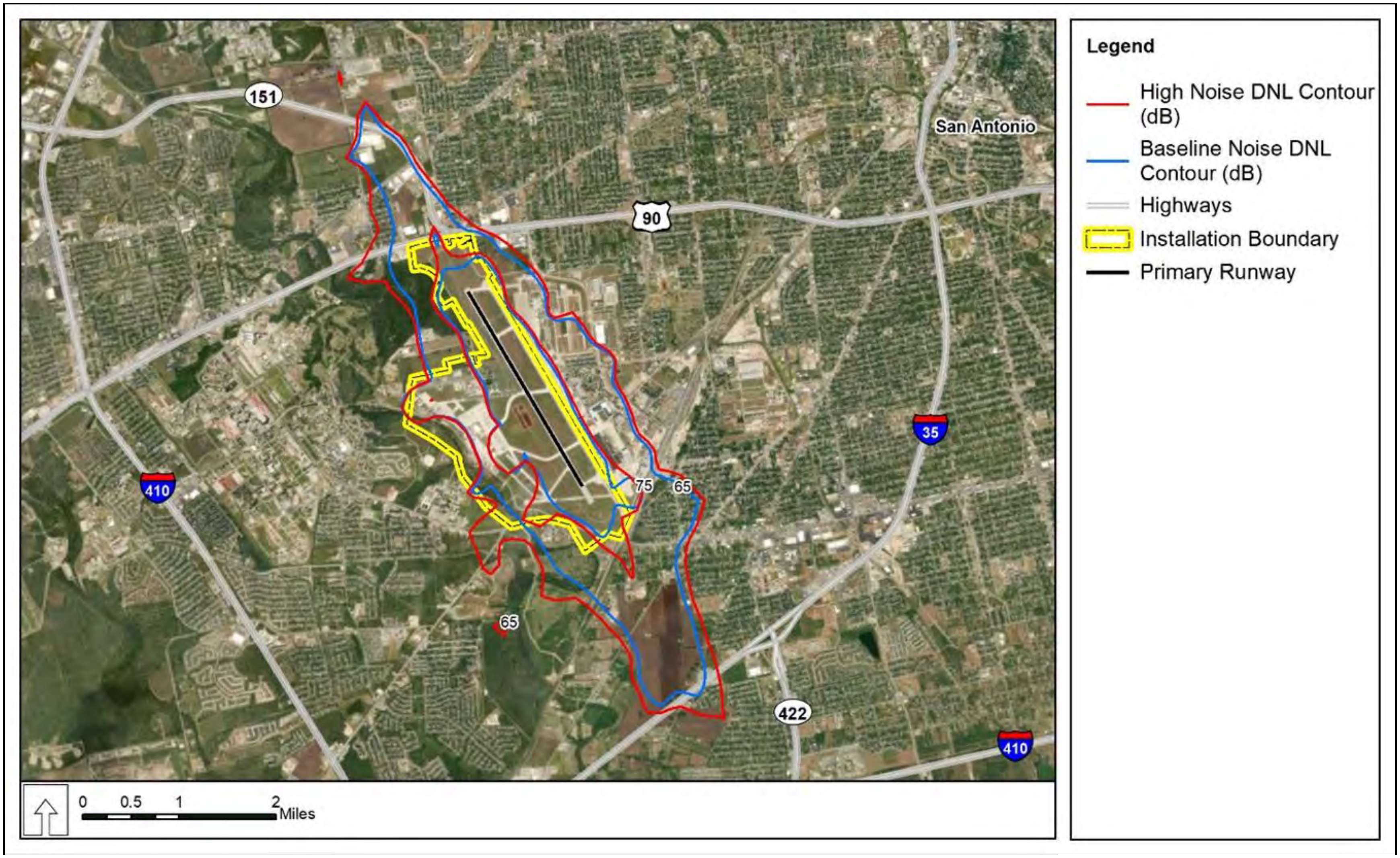

Figure 4-2. Comparison of High Noise Scenario and Existing Day-Night Average Sound Level Contours at Kelly Field Annex.

Table 4-4
Proposed High Noise Scenario Day-Night Average Sound Level Area Affected on and Surrounding Kelly Field Annex

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	High Noise Scenario	Increase
>65	4,518	5,046	528
>70	2,390	2,629	239
>75	1,295	1,474	179
>80	701	796	95
>85	341	427	86

Notes:
dBA = A-weighted decibel(s); DNL = day-night average sound level

Table 4-5
Proposed High Noise Scenario Day-Night Average Sound Level at Representative Points of Interest on and near Kelly Field Annex

POI		DNL (dBA)		
ID	Description	Existing	High Noise Scenario	Increase in DNL
CH1	San Antonio Bynum Seventh Day Advent Church	66	67	1
CH2	Browning United Methodist Church	64	64	1
CH3	Saint Mark Independent Methodist Church	63	65	2
CH4	Centro Cristiano Nueva Vida	63	63	1
CH5	First Baptist Church	60	61	1
CH6	Iglesia Bautista Monte de la Olivas	64	65	1
CH7	Iglesia El Calvario	61	62	1
CH8	Kingdom Hall of Jehovahs Witnesses	62	62	1
CH9	South San Antonio Baptist Church	62	63	1
CH10	Templo Amor y Gracia	63	64	1
ELE1	Winston Elementary School	64	64	0
ELE2	Athens Elementary School	61	61	1
ELE3	Price Elementary School	61	61	1
ELE4	H. B. Gonzalez Elementary School	62	64	1
ELE5	Miguel Carrillo Jr. Elementary School	64	64	1
MID	Dwight Middle School	62	63	1
NR11	Kindred School/South San High School	55	56	1
NR24	S. Spicewood Park Residential Area	56	58	2
NR27	John Glenn School	47	48	1
NR37	Lincoln School	54	56	2
NR38	Oliver W Holmes High School	53	54	1
NR40	John Marshall High School	49	49	0
NR42	SE Pearsall Road Residential Area	55	56	0
NR49	University of Texas at San Antonio	36	36	0
NR50	Stevenson Middle School	39	39	0
SD01	Quintana Rd and SW Military Dr Residential Area	73	75	1
SD02	Golden Community Park Residential Area	66	68	1
SD03	Palo Alto Residential Area	62	64	2
SD04	North Spicewwod Park Residential Area	60	61	1
SD05	Van de Walle Park Residential Area	65	66	1
SD06	Ingram Rd and Callahan Rd Residential Area	61	61	0
SD07	South Leon Valley Residential Area	58	58	0
SD08	Huebner Rd and Bandera Rd Residential Area	56	56	0

Table 4-5
Proposed High Noise Scenario Day-Night Average Sound Level at Representative Points of Interest on and near Kelly Field Annex

POI		DNL (dBA)		
ID	**Description**	**Existing**	**High Noise Scenario**	**Increase in DNL**
SD09	South O P Schnabel Park Residential Area	53	53	0
WLFH	Wilford Hall Hospital	54	57	3

Notes:
Affected POIs based off NOISEMAP modeled noise contours and used to calculate the POIs within each noise contour.
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

Table 4-6
Proposed Annual Airspace Operations Summary from Kelly Field Annex

Aircraft	Crystal Crystal North		Laughlin 2 Laughlin 3		Kingsville 3		Brady Low / High		Total Operations		
	Day	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Day**	**Night**	**Total**
F-16C	1,354	134	1,354	134	319	32	159	16	3,186	316	3,502
ADAIR	437	43	437	43	103	10	51	5	1,028	101	1,129
Grand Total	**1,791**	**177**	**1,791**	**177**	**422**	**42**	**210**	**21**	**4,214**	**417**	**4,631**

Using the methods described in **Section 3.2.1.2** for MR_NMAP, the L_{dnmr} noise levels from the proposed High Noise Scenario were calculated from the subsonic aircraft operations underneath the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, and Brady High and Low MOAs. The subsonic noise levels modeled for Kelly Field Annex-based aircraft and contract ADAIR aircraft under the High Noise Scenario do not exceed 45 dB L_{dnmr} under any primary use airspace. As noted in **Section 3.2.1.2**, Kelly Field Annex-based aircraft dominate the noise environment of Crystal and Crystal North MOAs as they are the primary users of these two airspaces. Kelly Field Annex-based aircraft do not dominate the noise environment of the other MOAs due to the large number of operations from aircraft based at other installations and the low number of Kelly Field Annex aircraft operations, and their corresponding low L_{dnmr} noise levels, occurring in these airspaces. Due to the low L_{dnmr} noise levels from the proposed High Noise Scenario, there are no significant impacts expected to the noise environments of any of the listed airspaces.

Supersonic flight operations in the overland MOAs have the potential to generate loud sonic booms. The sonic boom noise levels modeled for the High Noise Scenario do not exceed 45 dB CDNL under any primary use airspace unit. Airspace sorties require aircraft to exceed Mach 1.0 (supersonic) for brief periods of time for approximately ten percent of total flight time. This is equivalent to less than 5 minutes of supersonic flight activity per sortie. That percentage of supersonic flight is in not expected to change with the addition of ADAIR aircraft.

For cumulative sonic boom exposure under supersonic air combat training arenas, the BooMap program as described in **Section 3.2.1.2** was used to model the cumulative CDNL exposure in the MOAs proposed for use under the Proposed Action. Sonic boom levels were estimated directly undertrack for the F-16C, and the surrogates modelled for the Mig-21, and L-59 aircraft at various altitudes and Mach numbers. The levels include Overpressure (psf) and CSEL in decibels. Note that the A-4N does not have supersonic capability and thus is not included in any supersonic analysis. Sonic boom levels estimated for ADAIR supersonic flights in the airspace above the Crystal and Laughlin MOAs and the Kingsville 3 and Brady High MOAs are shown on **Tables 4-7** and **4-8**, respectively. For ease of comparison sonic boom levels for the high, medium, and low noise scenarios are included.

The sonic boom levels shown on **Tables 4-7** and **4-8** are the loudest levels computed at the center of the footprint for the constant Mach, level flight conditions indicated. Supersonic flights above the Crystal, Laughlin, Kingsville, and Brady High MOAs occur at high altitudes but would still generate booms that are certain to be noticed. The location of these booms would vary with changing flight paths and weather conditions, so it is unlikely that any given location would experience these undertrack levels more than once over multiple events. Overpressure levels, directly under the flight path, estimated for the Crystal, Crystal North, Laughlin 2, and Laughlin 3 High MOAs would range from 1.9 to 0.8 psf depending on the flight conditions. Likewise, overpressure levels, directly under the flight path, for the Kingsville 3, and Brady High MOAs would range from 1.7 to 0.8 psf. Public reaction is expected to occur with overpressures above 1 psf, and in rare instances, damage to structures have occurred at overpressures between 2 and 5 psf (NASA, 2017). People located farther away from the supersonic flight paths, who are still within the primary boom carpet, might also be exposed to levels that may be startling or annoying, but the probability of this decreases the farther away they are from the flight path. People located beyond the edge of the boom carpet are not expected to be exposed to sonic boom although post-boom rumbling sounds may be heard. The addition of contractor aircraft operating at supersonic speeds means that the number of sonic booms heard will likely increase and as a result public reaction may increase; however, potential impacts associated with sonic booms are still expected to be negligible under Alternatives 1, 2, and 3.

Table 4-7
Above Crystal and Laughlin Military Operations Areas: Sonic Boom Levels Undertrack for Adversary Air Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (Feet)		
	30,000	40,000	50,000
Mach 1.2			
Overpressure (psf)			
F-16C	1.7	1.2	1.0
Mig-21[1]	1.5	1.1	0.9
L-59[2]	1.4	1.0	0.8
CSEL (dB)[1]			
F-16C	106	103	101
Mig-21[1]	105	102	100
L-59[2]	104	101	99
Mach 1.5			
Overpressure (psf)			
F-16C	1.9	1.3	1.0
Mig-21[1]	1.7	1.2	0.9
L-59[2]	1.5	1.0	0.8
CSEL (dB)[1]			
F-16C	107	103	101
Mig-21[1]	106	103	100
L-59[2]	105	101	99

Notes:
[1] As modelled with the surrogate F-104 D&G
[2] As modelled with the surrogate T-45
C-weighted Sound Exposure Level (CSEL) – Sound Exposure Level with frequency weighting that places more emphasis on low frequencies below 1,000 hertz

dB = decibel(s); psf = pound(s) per square foot

Table 4-8
Above Kingsville 3 and Brady High Military Operations Areas: Sonic Boom Levels Undertrack for Adversary Air Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (Feet)		
	30,000	40,000	50,000
Mach 1.2			
Overpressure (psf)			
F-16C	1.5	1.2	0.9
Mig-21[1]	1.4	1.0	0.9
L-59[2]	1.2	0.9	0.8
CSEL (dB)[1]			
F-16C	105	103	101
Mig-21[1]	104	102	100
L-59[2]	103	101	99
Mach 1.5			
Overpressure (psf)			
F-16C	1.7	1.2	1.0
Mig-21[1]	1.5	1.1	0.9
L-59[2]	1.3	1.0	0.8
CSEL (dB)[1]			
F-16C	106	103	101
Mig-21[1]	105	102	101
L-59[2]	104	101	99

Notes:
[1] As modelled with the surrogate F-104 D&G
[2] As modelled with the surrogate T-45
C-weighted Sound Exposure Level (CSEL) – Sound Exposure Level with frequency weighting that places more emphasis on low frequencies below 1,000 hertz
dB = decibel(s); psf = pounds per square foot

Medium Noise Scenario

Under the Medium Noise Scenario, all contract ADAIR operations are assumed to be performed by MiG-21 aircraft. Since noise data for the MiG-21 are not available in NOISEMAP, the F-104D&G was used as a modeling surrogate. Proposed flight operations at Kelly Field Annex and associated MOAs would be identical to existing conditions except for the additional contract ADAIR sorties. Noise analysis of the Medium Noise Scenario was conducted to analyze changes to the airfield noise contours and assess noise changes in the proposed airspaces.

Kelly Field Annex Noise Environment

Under the Medium Noise Scenario, contract ADAIR would perform the same operations as outlined under the High Noise Scenario in **Section 4.2.3.1** (see **Table 4-4**). As such, the increase in the total number of operations and increase in night sorties, runway utilization, flight tracks, and flight track utilization would also be the same as described in the High Noise Scenario.

NOISEMAP was used to model military aircraft noise. The resultant 65- to 85-dB DNL contours in 5-dB increments for the existing daily flight events at Kelly Field Annex are shown on **Figure 4-3**. The primary changes in noise contour features between the Medium Noise Scenario and the existing conditions would be a slight elongation of the DNL contours along the extended centerline of Runway 15/33 and a slight expansion perpendicular to the runway. This overall increase in noise level would be a result of contract ADAIR departures, pitch arrivals, and closed pattern flight operations. A comparison of the DNL noise contours of the Medium Noise Scenario and the existing conditions is shown on **Figure 4-4**.

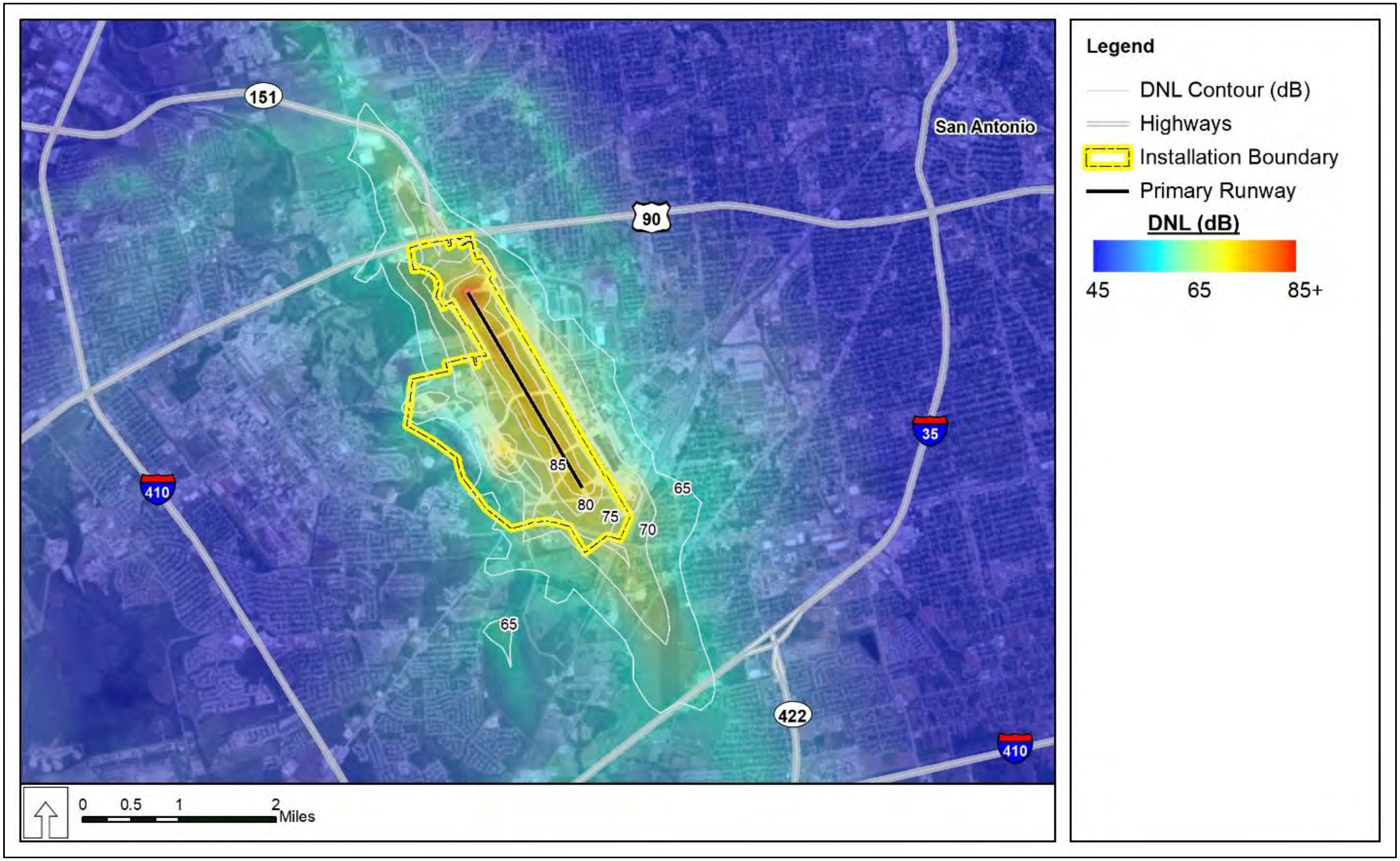

Figure 4-3. Medium Noise Scenario Day-Night Average Sound Level Contours at Kelly Field Annex.

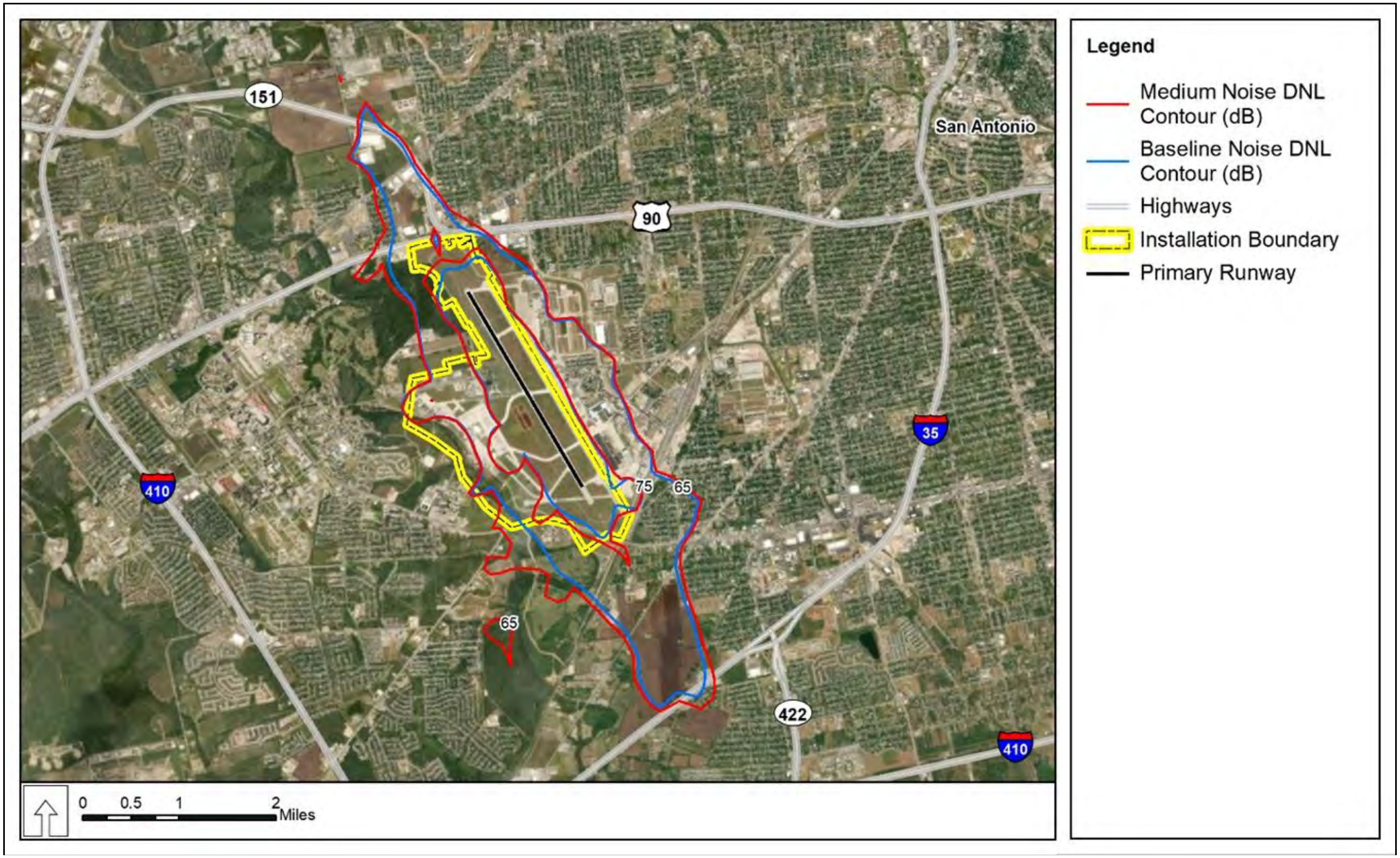

Figure 4-4. Comparison of Medium Noise Scenario and Existing Day-Night Average Sound Level Contours at Kelly Field Annex.

Under the Medium Noise Scenario, the amount of area within noise contours would increase (**Table 4-9**). These increases would not lead to significant impacts in these areas.

As a result of the implementation of the Medium Noise Scenario, noise levels at representative POIs identified in **Section 3.2.3** would increase (**Table 4-10**). At the representative noise-sensitive locations modeled, the DNL would increase by an amount ranging from 0 to 2 dBA under the Medium Noise Scenario. As such, all representative POIs examined would experience negligible to minor impacts from DNL increases of 0 to 2 dBA. The negligible to minor impacts on these POIs and the surrounding areas, would be long term, barely noticeable, and not significant under Alternatives 1, 2, and 3.

Table 4-9
Proposed Medium Noise Scenario Day-Night Average Sound Level Area affected on and surrounding Kelly Field Annex

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Medium Noise Scenario	Increase
>65	4,518	4,784	266
>70	2,390	2,487	97
>75	1,295	1,374	78
>80	701	704	3
>85	341	363	22

Notes:
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level

Table 4-10
Proposed Medium Noise Scenario Day-Night Average Sound Level at Representative Points of Interest on and near Kelly Field Annex

POI		DNL (dBA)		
ID	Description	Existing	Medium Noise Scenario	Increase in DNL
CH1	San Antonio Bynum Seventh Day Advent Church	66	66	0
CH2	Browning United Methodist Church	64	64	0
CH3	Saint Mark Independent Methodist Church	63	64	1
CH4	Centro Cristiano Nueva Vida	63	63	0
CH5	First Baptist Church	60	61	0
CH6	Iglesia Bautista Monte de la Olivas	64	64	1
CH7	Iglesia El Calvario	61	61	0
CH8	Kingdom Hall of Jehovahs Witnesses	62	62	0
CH9	South San Antonio Baptist Church	62	63	0
CH10	Templo Amor y Gracia	63	64	0
ELE1	Winston Elementary School	64	64	0
ELE2	Athens Elementary School	61	61	0
ELE3	Price Elementary School	61	61	0
ELE4	H. B. Gonzalez Elementary School	62	63	1
ELE5	Miguel Carrillo Jr. Elementary School	64	64	0
MID	Dwight Middle School	62	62	0
NR11	Kindred School/South San High School	55	55	0
NR24	S. Spicewood Park Residential Area	56	57	1
NR27	John Glenn School	47	48	1
NR37	Lincoln School	54	56	2
NR38	Oliver W Holmes High School	53	54	1

Table 4-10
Proposed Medium Noise Scenario Day-Night Average Sound Level at Representative Points of Interest on and near Kelly Field Annex

POI		DNL (dBA)		
ID	Description	Existing	Medium Noise Scenario	Increase in DNL
NR40	John Marshall High School	49	50	0
NR42	SE Pearsall Road Residential Area	55	56	0
NR49	University of Texas at San Antonio	36	38	1
NR50	Stevenson Middle School	39	39	1
SD01	Quintana Rd and SW Military Dr Residential Area	73	74	1
SD02	Golden Community Park Residential Area	66	67	1
SD03	Palo Alto Residential Area	62	63	1
SD04	North Spicewwod Park Residential Area	60	61	1
SD05	Van de Walle Park Residential Area	65	66	1
SD06	Ingram Rd and Callahan Rd Residential Area	61	61	0
SD07	South Leon Valley Residential Area	58	58	0
SD08	Huebner Rd and Bandera Rd Residential Area	56	56	0
SD09	South O P Schnabel Park Residential Area	53	53	0
WLFH	Wilford Hall Hospital	54	56	2

Notes:

Affected POIs based off NOISEMAP modeled noise contours and used to calculate the POIs within each noise contour.

dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

Airspace Noise Environment

Under the Medium Noise Scenario, the subsonic and/or supersonic airspace noise environment would be practically identical to the subsonic and/or supersonic airspace noise environment under the High Noise Scenario described in **Section 4.2.3.1**. The aircraft proposed in the Medium Noise Scenario are slightly quieter than those used in the High Noise Scenario, which was determined to have no significant impacts; as such, there would be no significant impacts under the quieter Medium Noise Scenario (**Tables 4-7** and **4-8**) under Alternatives 1, 2, and 3.

Low Noise Scenario

Under the Low Noise Scenario, all contract ADAIR operations would be performed by L-59 aircraft. Since noise data for the L-59 are not available in NOISEMAP, the T-45 was used as a modeling surrogate. Proposed contract ADAIR flight operations at Kelly Field Annex and associated airspaces would be identical to existing conditions except for the additional contract ADAIR sorties. Noise analysis of the Low Noise Scenario was conducted to analyze changes to the airfield noise contours and the proposed airspaces.

Kelly Field Annex Noise Environment

Under the Low Noise Scenario, contract ADAIR would perform the same operations as outlined under the High Noise Scenario in **Section 4.2.3.1** (see **Table 4-4**). As such, the increase in the total number of operations and increase in night sorties, runway utilization, flight tracks, and flight track utilization would also be the same as described in the High Noise Scenario.

NOISEMAP was used to model military aircraft noise. The resultant 65- to 85-dB DNL contours in 5-dB increments for the existing daily flight events at Kelly Field Annex are shown on **Figure 4-5**. The primary changes in noise contour features between the Low Noise Scenario and the existing conditions would be the slight elongation of the DNL contours along the extended centerline of Runway 15/33 and the slight expansion perpendicular to the runway. This overall increase in noise level would be a result of contract ADAIR departures, pitch arrivals, and closed pattern flight operations. A comparison of the DNL noise contours of the Low Noise Scenario and the existing conditions is shown on **Figure 4-6**.

The area within each DNL noise contour band for both the existing conditions and the Low Noise Scenario is shown in **Table 4-11**. These increases would be unlikely to lead to significant impacts in these areas. Further, there would be beneficial effects to the 80+ dBA DNL noise contour as a result of the Low Noise Scenario.

As a result of the implementation of the Low Noise Scenario, noise levels at representative POIs identified in **Section 3.2.2** would increase (**Table 4-12**). At the representative noise-sensitive locations studied, the DNL would increase by an amount ranging from 0 to 1 dBA under the Low Noise Scenario. All POIs examined would experience negligible to minor impacts due to DNL increases of 0 to 1 dBA. The negligible to minor impacts on these POIs, and the areas surrounding them, would be long-term, barely noticeable, and less than significant under Alternatives 1, 2, and 3.

Airspace Noise Environment

Under the Low Noise Scenario, the subsonic and/or supersonic airspace noise environment is practically identical to the subsonic and/or supersonic airspace noise environment under the High Noise Scenario described in **Section 4.2.3.1**. The aircraft used in the Low Noise Scenario are slightly quieter than those used in the High Noise Scenario. Since there was a determination of no significant impacts under the High Noise Scenario, there would be no significant impacts under the quieter Low Noise Scenario (**Tables 4-7** and **4-8**) under Alternatives 1, 2, and 3.

4.2.2.2 No Action Alternative

Under the No Action Alternative, contract ADAIR would not perform sorties at Kelly Field and nearby airspaces. Under the No Action Alternative, there would be no change to the noise environment.

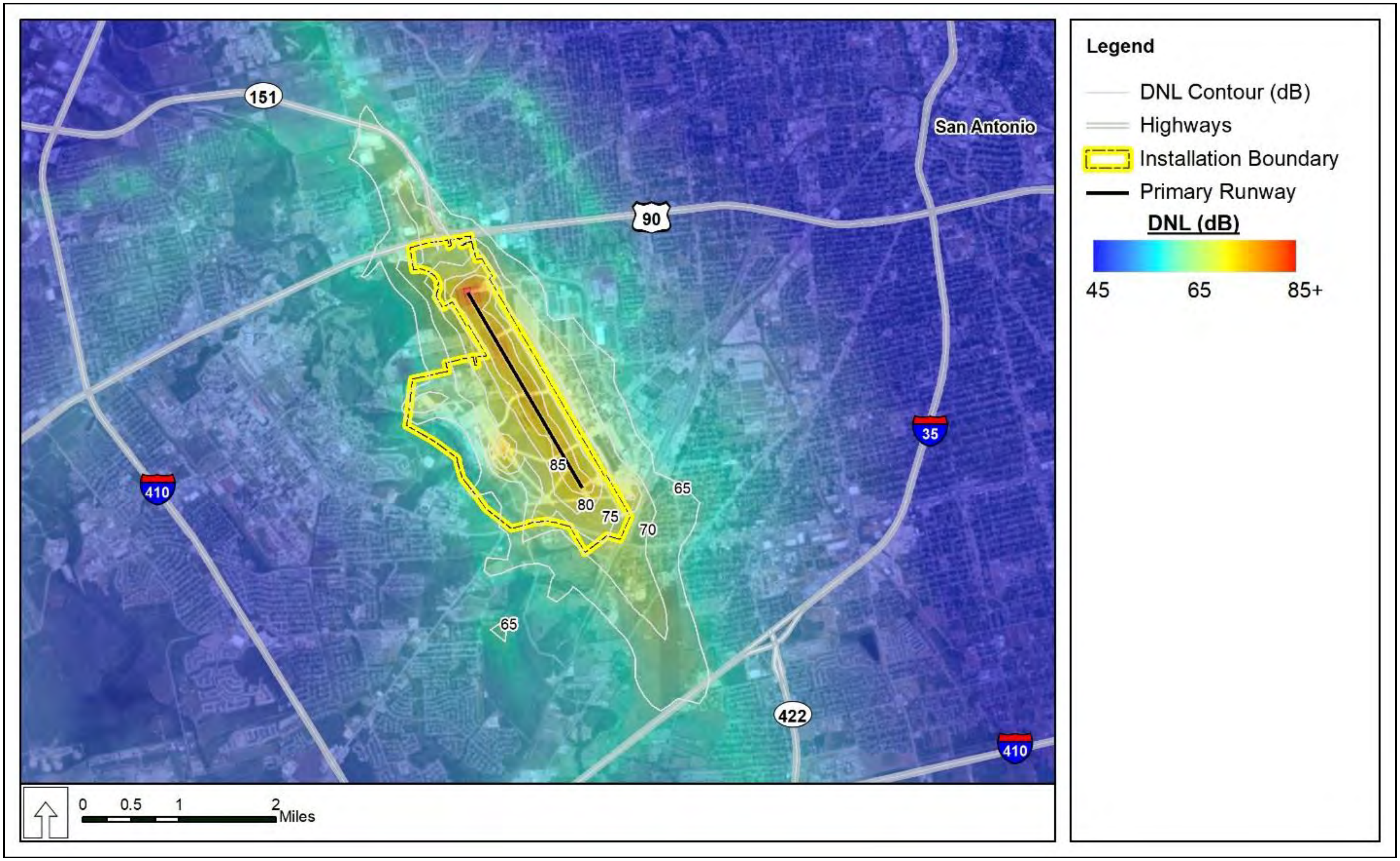

Figure 4-5. Low Noise Scenario Day-Night Average Sound Level Contours at Kelly Field Annex.

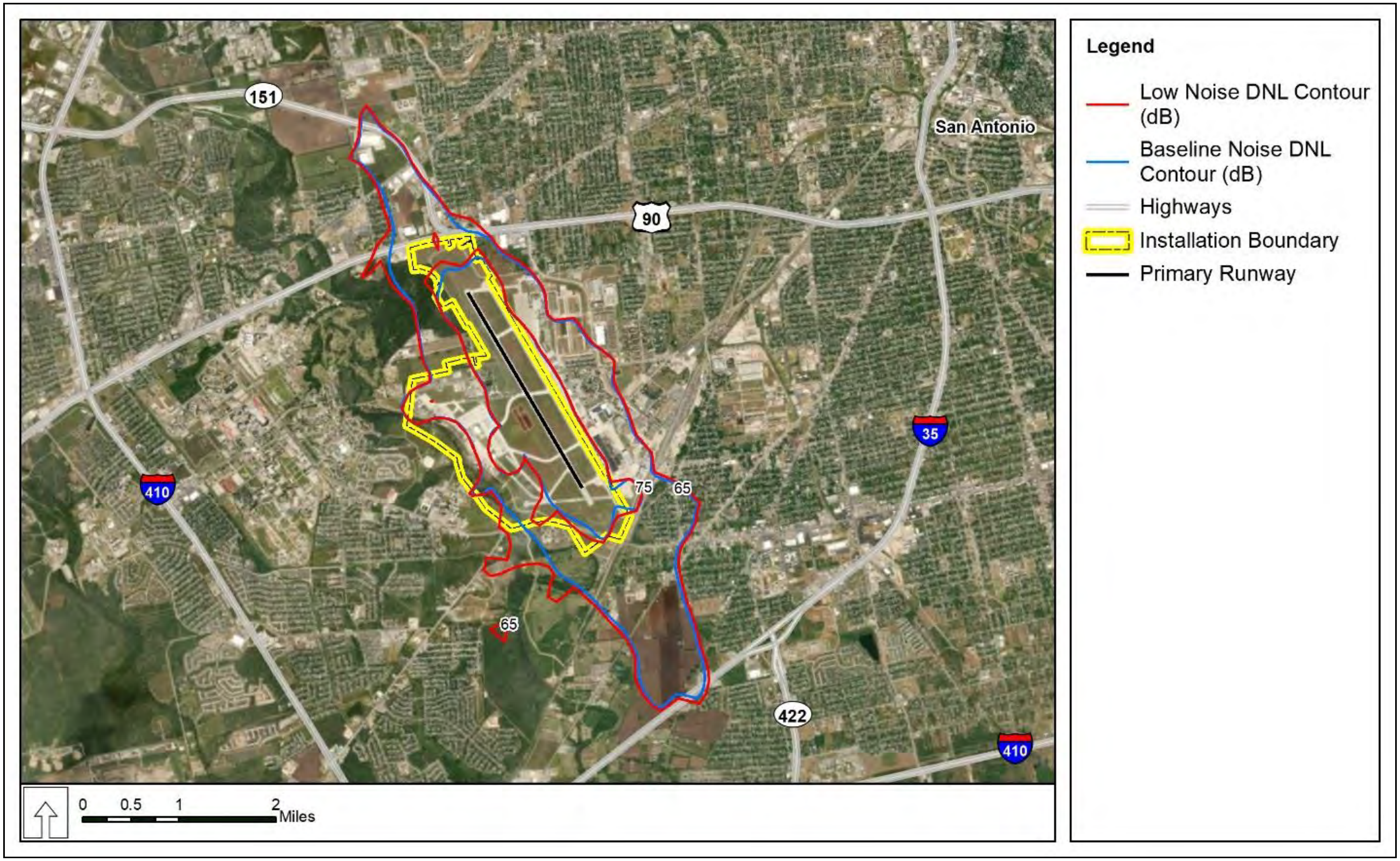

Figure 4-6. Comparison of Low Noise Scenario and Existing Day-Night Average Sound Level Contours at Kelly Field Annex.

Table 4-11
Proposed Low Noise Scenario Day-Night Average Sound Level area affected on and surrounding Kelly Field Annex

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Low Noise Scenario	Increase
>65	4,518	4,593	75
>70	2,390	2,415	25
>75	1,295	1,320	25
>80	701	713	12
>85	341	344	2

Notes:
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level

Table 4-12
Proposed Low Noise Scenario Day-Night Average Sound Level at Points of Interest at Kelly Field Annex

POI		DNL (dBA)		
ID	Description	Existing	Low Noise Scenario	Increase in DNL
CH1	San Antonio Bynum Seventh Day Advent Church	66	66	0
CH2	Browning United Methodist Church	64	64	0
CH3	Saint Mark Independent Methodist Church	63	64	1
CH4	Centro Cristiano Nueva Vida	63	63	0
CH5	First Baptist Church	60	61	0
CH6	Iglesia Bautista Monte de la Olivas	64	64	0
CH7	Iglesia El Calvario	61	61	0
CH8	Kingdom Hall of Jehovahs Witnesses	62	62	0
CH9	South San Antonio Baptist Church	62	62	0
CH10	Templo Amor y Gracia	63	63	0
ELE1	Winston Elementary School	64	64	0
ELE2	Athens Elementary School	61	61	0
ELE3	Price Elementary School	61	61	0
ELE4	H. B. Gonzalez Elementary School	62	63	1
ELE5	Miguel Carrillo Jr. Elementary School	64	64	0
MID	Dwight Middle School	62	62	0
NR11	Kindred School/South San High School	55	55	0
NR24	S. Spicewood Park Residential Area	56	57	1
NR27	John Glenn School	47	47	1
NR37	Lincoln School	54	55	1
NR38	Oliver W Holmes High School	53	54	1
NR40	John Marshall High School	49	49	0
NR42	SE Pearsall Road Residential Area	55	55	0
NR49	University of Texas at San Antonio	36	36	0
NR50	Stevenson Middle School	39	39	0
SD01	Quintana Rd and SW Military Dr Residential Area	73	74	0
SD02	Golden Community Park Residential Area	66	67	0
SD03	Palo Alto Residential Area	62	63	1
SD04	North Spicewwod Park Residential Area	60	60	1
SD05	Van de Walle Park Residential Area	65	65	0
SD06	Ingram Rd and Callahan Rd Residential Area	61	61	0

Table 4-12
Proposed Low Noise Scenario Day-Night Average Sound Level at Points of Interest at Kelly Field Annex

POI		DNL (dBA)		
ID	Description	Existing	Low Noise Scenario	Increase in DNL
SD07	South Leon Valley Residential Area	58	58	0
SD08	Huebner Rd and Bandera Rd Residential Area	56	56	0
SD09	South O P Schnabel Park Residential Area	53	53	0
WLFH	Wilford Hall Hospital	54	55	1

Notes:
Affected POIs based off NOISEMAP modeled noise contours and used to calculate the POIs within each noise contour.
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

4.3 Safety

4.3.1 Evaluation Criteria

Impacts from implementation of the Proposed Action are assessed according to the potential to increase or decrease in safety risks to personnel, the public, property, or the environment. Adverse impacts to safety might include implementing contractor flight procedures that result in greater safety risk or constructing new buildings within established Q-D safety arcs. For the purposes of this EA, an impact is considered significant if Air Force Office of Safety and Health (AFOSH) or OSHA criteria are exceeded or if established or proposed safety measures are not properly implemented resulting in unacceptable safety risk to personnel.

Safety concerns associated with ground, explosive, and flight activities are considered in this section. Ground safety considers issues associated with ground O&M activities that support operations including arresting gear capability, jet blast/maintenance testing, and safety danger zones. Ground safety also considers the safety of personnel and facilities on the ground that may be placed at risk from flight operations in the vicinity of the airfield and in the airspace.

CZs and APZs around the airfield restrict the public's exposure to areas where there is a higher accident potential. Although ground and flight safety are addressed separately, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns. Explosives safety relates to the management and safe use of ordnance and munitions. Flight safety considers aircraft flight risks such as midair collision, BASH, and in-flight emergency requirements. Contractor planes will follow Air Force safety procedures and aircraft specific emergency procedures based on the aircraft design. Basic airmanship procedures also exist for handling any deviations to ATC procedures due to an in-flight emergency; these procedures are defined in AFI 11-202 [Volume 3], AFI 11-2MDS [Volume 3], and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations which is composed of air and ground operation rules and procedures.

4.3.2 Proposed Action

Ground, explosive, and flight safety associated with implementation of the Proposed Action are described in the following sections. ADAIR safety procedures described in this section are mandated by the *Performance Work Statement for the Combat Air Forces (CAF) Contracted Air Support (CAF CAS)* (PWS) (Air Force 2018).

4.3.2.1 Alternatives 1, 2, and 3

Ground Safety

Under the Proposed Action, limited contractor aircraft maintenance and testing would occur on the aircraft parking ramp or in the hangar and would be consistent with current aircraft maintenance activities on Kelly Field Annex. No unique maintenance activities would be associated with the contract ADAIR aircraft. All scheduled depot-level or other heavy maintenance requirements would occur at off base contractor facilities.

Emergency Response

For initial emergency response involving a contract ADAIR aircraft, the Air Force would provide emergency responders (Airport Firefighter) trained on the applicable mission design series they are providing. For crash response, the DOD would provide on-field aircraft CDDAR. For events occurring off-base, civilian authorities (city, county, or state) would be first on scene. After the initial response, the Contractor would be required to facilitate crash site security and clean-up. The Contractor is responsible to cooperate with the Air Force or the National Transportation Safety Board investigation, depending upon circumstances of the incident.

The contractor emergency response would include the following:

- Establish a CDDAR program that is fully integrated into the host operating location's CDDAR program. The Contractor would provide technical expertise and facilitate the host operating location's response and recovery capability of Contractor-owned aircraft, consistent with the following considerations: (1) urgency to open the runway for operational use; (2) prevention of secondary damage to the aircraft; and (3) preservation of evidence for mishap or accident investigations in accordance with AFI 91-202 and AFI 91-204; National Transportation Safety Board guidelines; and any local operating location guidance, as applicable. The Contractor would ensure the host operating location's CDDAR personnel receive familiarization training on Contractor aircraft and procedures prior to commencing local flying operations, at permanent and temporary duty operating locations.
- The Contractor would develop an egress/cockpit familiarization training program to ensure all host operating location's nonegress personnel (e.g.,emergency response personnel, fire department, CDDAR) who may access Contractor aircraft cockpits, equipped with egress systems, receive initial and annual refresher training.

Safety Zones

Under the Proposed Action, safety zones around the airfield would not change.

Arresting Gear Capability

Contract ADAIR aircraft would be compatible with the arresting systems on the airfield; or able to operate on the airfield without interference to the existing arresting system. There would be no need to change or modify the existing arresting gear. There would be no impacts to arresting gear capability for the implementation of the Proposed Action under Alternative 1, 2, or 3.

No significant impacts to ground safety are anticipated to occur under Alternative 1, 2, or 3 provided the contractor establishes a CDDAR program and all applicable AFOSH and OSHA requirements are implemented.

Explosives Safety

Under the Proposed Action, the 149 MXS Munitions Flight would support contract ADAIR daily training operations with the maintenance and delivery of countermeasure chaff and flares. This support would be provided by trained and certified personnel following Air Force safety guidance and technical orders.

Trained and certified contract ADAIR personnel would be responsible for the loading and unloading of countermeasures on contract ADAIR aircraft and would follow approved safety measures outlined in the PWS. Contract ADAIR personnel would also be responsible for the maintenance of captive air training missiles and any ejector cartridges as contractor-provided equipment.

There may be rare occasions in which egress CADs and PADs may need to be removed from the aircraft for maintenance. In accordance with AFMAN 91-201, 11.15, when necessary, units may license a limited quantity of in-use egress explosive components of any Hazard Division explosive in the egress shop after removal from aircraft undergoing maintenance. This limit would not exceed the total number of complete sets for the number of aircraft in maintenance and the net explosive weight is limited. Contract ADAIR would work with the Wing Safety Office to obtain a license, if needed, to store egress CADs and PADs. Short-term storage could be provided at either the 149 MXS Munitions Storage Area or the 502 MXS Munitions Storage Area, provided a courtesy storage agreement is created and space is available. Short-term storage would be limited, short-term, and only in the event of an emergency or unforeseen occurrence such as the issuance of a suspension or restriction egress equipment or munitions. All scheduled maintenance would occur at the Contractor's off-base Central Repair Facility. CAD/PAD items are typically replaced just prior to expiration of the service life, which is typically part of aircraft scheduled maintenance. If temporary storage of contract ADAIR CAD/PAD items within the Wing munitions storage area is needed, they would be stored in facilities sited in the Explosive Safety plan for the type and amount of explosives to be stored.

The loading and unloading of countermeasure chaff and flares would occur on the aircraft parking ramp. The proposed ramp area for contract ADAIR aircraft is not currently sited for Hazard Class 1.3 and does not need to be sited for chaff or flares in accordance with AFMAN 91-201 para 12.47.2 and 12.47.3.

No significant impacts to explosive safety are anticipated to occur under Alternative 1, 2, or 3 provided contract ADAIR personnel are trained and all applicable safety guidelines are implemented. Q-D arcs would not change.

Flight Safety

The potential for aircraft accidents is a primary public concern with regard to flight safety. Such accidents may occur as a result of mid-air collisions, collisions with manmade structures or terrain, mechanical failure, weather-related accidents, pilot error, BASH, or strikes from defensive countermeasures used during training. Under the Proposed Action, contract ADAIR would be required to strictly conform to the flight safety rules directed by the Operations Group Commander. In addition, the PWS stipulates the following requirements for contract ADAIR:

- Contractor Flight Operations would respond to and follow ATC vectors from approved facilities per FAA and AFI guidelines.
- Contract ADAIR would be conducted under positive tactical control. Pilots would be responsible to respond to tactical vectors and instructions by the applicable controlling authority (Ground Controller Intercept, Baron Controllers, Range Control Officer, Joint Terminal Attack Controller, etc.). If positive control is unavailable, mission flights would remain autonomous and adhere to the briefed presentations and Special Instructions.
- Contract ADAIR aircraft would
  - be equipped with applicable communication and navigation capability to operate in the National Airspace Structure under FAA IFR and aircraft operating limitations (if applicable) and International Civil Aviation Organization equipment prerequisites;
  - have at least one type of FAA-approved Navigation System such as a Tactical Air Navigation, Automatic Direction Finder (ADF) Receiver System, with ADF indicator; Very High Frequency Omni Directional Range; Global Positioning System/Long Range Navigation;
  - have sufficient precision approach instrumentation (compatible with standard Air Force instrument landing systems) to permit operations down to 300-ft ceilings and 1-statute-mile visibility; and
  - have at least two functional voice radios operating in either the very high frequency/ ultra-high frequency bands, and one must be ultra-high frequency.

Bird/Wildlife-Aircraft Strike Hazards

Contractor operations would not follow government BASH procedures; they follow the PWS-directed Flight Operations Procedures and Quality Management System per the references above. In this case, the contractor's BASH plan would be part of the Quality Management System and be integrated with the host Wing's plan. It is expected the contract ADAIR BASH plan would very closely mirror and, in fact, may be an exact copy of the Wing's BASH plan. While, it is not required to be so, the contract ADAIR BASH plan would comply with the FAA Wildlife Hazard Mitigation Program.

No significant impacts to airspace/flight safety are anticipated to occur under Alternative 1, 2, or 3 provided that contractor flight safety rules are followed and all applicable AFOSH and OSHA requirements are implemented.

4.3.2.2 No Action Alternative

Under the No Action Alternative, contract ADAIR would not perform sorties at Kelly Field and nearby airspaces. Under the No Action Alternative, there would be no change to safety.

4.4 Air Quality

4.4.1 Evaluation Criteria

The CAA Section 176(c), *General Conformity*, requires federal agencies to demonstrate that their proposed activities would conform to the applicable SIPs for attainment of the NAAQS. General conformity applies to nonattainment and maintenance areas. If the emissions from a federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases.

This section discusses the potential effects of the Proposed Action and alternatives on air quality within the ROI. Part of the San Antonio AQCR, Bexar County, has recently been designated as a marginal nonattainment area with respect to the 2015 8-hour ozone standard and thus the general conformity rule will apply if applicability *de minimis* thresholds are exceeded. The ROI comprising Kelly Field Annex is located within the ozone nonattainment area and as a result, expected emissions from contract ADAIR activities in the immediate vicinity of the airfield were evaluated against conformity *de minimis* thresholds.

All MOAs to be associated with contract ADAIR training are within attainment or unclassifiable areas for all regulated pollutants. Although in such areas the conformity does not apply, the 100 tpy *de minimis* threshold was relied upon as a significance indicator. If project emissions exceed the *de minimis* threshold further analysis of projected emissions is conducted to determine their significance. In such cases the PSD threshold for new major sources (i.e., 250 tpy of a criteria pollutant and 100,000 tpy CO_2e) is used as the primary indicator of potential significant impact as a result of implementing the Proposed Action.

As described in **Section 3.4.1**, for the airspace only, emissions from the Brady Low MOA were estimated as this airspace was the only MOA that would support Contractor ADAIR sorties within the mixed layer (surface to 3,000 AGL). These emissions were compared against the *de minimis* thresholds. In addition, an earlier version of the General Conformity Rule used a 10 percent indicator for regional significance. Under the rule, "regionally significant action means a Federal action for which the direct and indirect emissions of any pollutant represent 10 percent or more of a nonattainment or maintenance area's emission inventory for that pollutant". The regional significance indicator was removed in the March 2010 revision to the rule (40 CFR §§ 51 and 93); however, it still provides one metric against which projected ADAIR emissions can be evaluated.

The Air Conformity Applicability Model (ACAM) (version 5.0.12) was used to provide emissions estimates for contract ADAIR airfield operations, maintenance activities, worker commutes, and flight operations in the airspaces. ACAM was developed by the Air Force (Air Force, 2017a) and provides estimated air emissions from proposed federal actions for each specific criteria and precursor pollutant as defined in the NAAQS. Assumptions of the model are discussed in **Appendix C**. ACAM uses the procedures established by the Air Force as provided in *Air Emissions Guide for Air Force Mobile Sources* (Air Force, 2017a) and the *Air Emissions Guide for Air Force Stationary Sources* (Air Force, 2017b). Emission calculations in the stationary guide often reflect the use of emission factors published in USEPA's AP-42. For aircraft, operational modes (including taxi/idle [in and out], take off, climb out, approach, and pattern flight that includes touch and go operations) are used as the basis of the emission estimates. Furthermore, only emissions in the lower atmosphere's mixing level have the potential to cause a significant impact on ground-level pollutant concentrations. The mixing layer extends from ground level up to the point at which the vertical mixing of pollutants decreases significantly. The USEPA recommends that a default mixing layer of 3,000 ft be used in aircraft emission calculations (40 CFR § 93.153[c][2]); therefore, aircraft emissions released above 3,000 ft were not included in analysis for the ROI. The basis for the air emissions performed is summarized in **Table 4-13**. Emissions were calculated separately for Air Field Opertions (Kelly Field Annex) and the Brady Low MOA.

Table 4-13
Basis of Air Emission Calculations

Location	Type of Operation	Number of Sorties per Year	Ground Operation Emission Sources
Kelly Field Annex	LTO Cycles	1,200	Auxiliary power unit equipment, AGE, personal vehicle use, aircraft maintenance (solvent use), fuel handling and storage, emergency generator, aircraft trim tests (24 per aircraft)
	TGO Cycles	162[1]	
Brady (High and Low)	Sorties @ ≤3,000 feet	60[2]	Not Applicable
Crystal and Laughlin	Sorties @ ≤3,000 feet	None[3]	Not Applicable
Kingsville 3	Sorties @ ≤3,000 feet	None[4]	Not Applicable

Notes:
1 5 percent of on-airfield daytime sorties (1,080) are expected to include multiple patterns for contractor proficiency. Each of those 5 percent sorties is assumed to include three TGO/low approaches.
2 5 percent of all sorties (1,200).
3 1,020 total sorties (85 percent of all sorties) occur above the mixing height. No emissions calculated.
4 120 total sorties (10 percent of all sorties) occur above the mixing height. No emissions calculated.

AGE = Aerospace Ground Equipment; LTO = Landing and Takeoff; TGO = Touch and Go

In nonattainment and maintenance areas, emissions at or above 100 tpy are considered significant, particularly as this threshold triggers full conformity analysis. Emissions below 100 tpy are considered moderate or, if very low, minor. The air quality analysis focused on emissions associated with the airfield operations and with sorties in the MOAs. As such, emissions from ACAM were determined separately for the airfield ROI and the Brady Low MOA.

Details regarding impacts specific to each alternative are described in **Sections 4.4.2.1** through **4.4.2.3**.

4.4.2 Proposed Action

Under the Proposed Action all three alternatives are nearly identical in terms of potential air emissions. As described in **Chapter 2** the only substantive difference between the three alternatives is the location of the contract ADAIR facilities on Kelly Field Annex and whether the operations are consolidated in one building versus two. Further, no construction emissions are associated with any of the alternatives. There may be some minor, small scale interior renovations which would have negligible effects on outdoor air quality. For these reasons, the emissions are the same for all alternatives. Note that Building 1612 associated with Alternative 1 is currently not supported by an emergency generator. Thus, the ACAM analysis included a separate emission estimate to account for the possibility that an emergency generator may be installed under Alternative 1, but it did not result in a measureable change in emissions for that alternative. Only those emissions associated with the addition of contract ADAIR operations were evaluated as no substantive changes to current operations of the 149 FW, 182 FS, and other tenants using Kelly Field Annex are expected to change as a result of the action.

Similar to the analysis for potential noise impacts, analyses were performed for three different emission scenarios to evaluate the different adversarial aircraft that may be utilized by the ADAIR contractor. The three different emission scenarios (identified as high, medium, and low) are listed below with the engine type used for the basis for the emission calculations:

- High: MiG-21, Engine: F110-GE-100*
- Medium: A-4N, Engine: J52-P408
- Low: L-59/L-159, Engine: TF34-GE-100 (2 Engines) *

  * Surrogate engine type, reliable criteria emission factors not available for foreign engine types.

4.4.2.1 Alternatives 1, 2, and 3

While ADAIR targeted performance is estimated to start in February 2020 with a 10-year contract, the emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. For air quality modeling purposes, these are representative years; the modeling generates air emissions estimates for the life of a representative 10-year contract. Total increases in annual operational emissions in the vicinity of the airfield are presented in **Table 4-14**. The methodologies, emission factors, and assumptions used for the emission estimates for each of the scenarios and related activities are outlined in **Appendix C**.

Table 4-14
Contractor Adversary Air Emissions – Airfield Operations

Scenario	Contract Year(s)[1]	Emissions (tpy)[2,3]								
		VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
High	2019 (July – Dec)	1.71	10.7	13.6	0.93	1.33	0.90	2,394	0	0.004
	2020 through 2028	3.41	21.4	27.1	1.86	2.67	1.80	4,787	0	0.008
	2029 (January - June)	1.71	10.7	13.6	0.93	1.33	0.90	2,394	0	0.004
Medium	2019 (July - Dec)	2.30	5.69	17.2	0.74	0.40	0.38	1,814	0	0.004
	2020 through 2028	4.61	11.4	34.4	1.47	0.80	0.76	3,629	0	0.008
	2029 (January - June)	2.30	5.69	17.2	0.74	0.40	0.38	1,814	0	0.004
Low	2019 (July - Dec)	13.3	17.9	26.7	1.08	3.78	2.80	1,476	0	0.004
	2020 through 2028	26.7	35.7	53.5	2.17	7.56	5.59	2,951	0	0.008
	2029 (January - June)	13.3	17.9	26.7	1.08	3.78	2.80	1,476	0	0.004

Source: Air Conformity Applicability Model output

Notes:
1 While ADAIR targeted performance is estimated to start in February 2020 with a 10-year contract, the emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. For air quality modeling purposes, these are representative years; the modeling generates air emissions estimates for the life of a representative 10-year contract.
2 Represents total per year emissions for: 1) flight operations (includes trim tests and auxiliary power unit use), 2) Aerospace Ground Equipment, 3) aircraft maintenance (parts cleaning), and 5) Jet-A storage (fuel for Contractor ADAIR operations only - includes Contractor ADAIR fuel for LTOs, TGOs, trim tests, airspace use, and travel to the airspace).
3 Based on 1,200 LTOs and 162 TGOs per year.

ADAIR = adversary air; NO_x = nitrogen oxides; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; LTO = Landing and Takeoff; NH_3 = ammonia; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; TGO = Touch and Go; VOC = volatile organic compound

Because Bexar County was designated as nonattainment for ozone, the primary pollutants of concern are NO_x and VOC. VOC and NO_x in all three emission scenarios are well below (less than half) the 100 tpy *de minimis* threshold (**Table 4-14**). Looking at all criteria pollutants, CO had the highest annual emission rate (53.5) tons/yr) under the low scenario. This is well below the *de minimis* threshold for conformity and less than 25 percent of the PSD threshold for pollutants in attainment. For all pollutants the project emissions are only a very small fraction (<0.015 percent) of the emissions for Bexar County shown in **Chapter 3** (**Table 3-9**). Inclusion of an emergency generator emissions to Alternative 1 does not change the outcome in a meaningful way; the addition of the generator emissions would result in a negligible increase in emissions (**Table 4-15**).

The analysis results discussed above demonstrate the following for the airfield operations in Bexar County:

1. The project should not interfere with region's ability to maintain compliance with the NAAQS for attainment area pollutants (CO, NO_x, PM, SO_x).
2. The project should not hamper efforts to achieve NAAQS compliance for the pollutants that contribute to ozone nonattainment (VOC and NO_x). No conformity analysis required.

Thus, the predicted contract ADAIR annual emission increases are not considered significant in the vicinity of the airfield.

Table 4-15
Additional Alternative 1 Criteria Pollutant Emissions Associated with a New Emergency Generator

	VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e
lb/yr	11.3	46.6	31.10	9.52	10.17	10.17	5,380
ton/yr	0.006	0.023	0.016	0.005	0.005	0.005	2.69

Notes:

Based on the installation of a single 135-horsepower, diesel-fired emergency generator operating 30 hours per year (Air Conformity Applicability Model defaults). Generator eligible for permit by rule.

ADAIR = adversary air; NO_x = nitrogen oxides; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; lb = pound(s); $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; VOC = volatile organic compound; yr = year

For the MOAs, only Brady Low would include contract ADAIR sorties at or below 3,000 ft and thus this is the only MOA included in the air quality analysis. Consistent with the USEPA recommendation regarding mixing height, only those emissions that would occur with the mixing layer (lowest 3,000 ft) were analyzed. Out of the of the proposed sorties, 60 are expected to include some time between 500 ft to 3,000 ft ASL in the Brady Low MOA. The analysis did not include the impact of defensive countereasures (chaff and flares) as they would not be used in the MOA. For the remaining MOAs, chaff was not considered to have an air quality impact as it has been determined that chaff material maintains its integrity after ejection and that the use of explosive charge in impulse cartridges results in minimal PM_{10} emissions (Air Force, 1997). Flare emissions were not determined for any MOA because at no time would they occur within the mixed layer (surface to 3,000 ft AGL).

The emissions associated with contract ADAIR sorties proposed for the Brady High and Low MOAs were evaluated using ACAM for the high, medium and low scenarios described previously. The flight time in the mixing layer was estimated to be approximately 11.9 minutes per sortie. In addition, it was assumed the time it would take to fly from Kelly Field Annex to and from the MOA would occur at an altitude above 3,000 ft and thus this portion of the sortie is not included in the analysis. The methodologies, emission factors, and assumptions used for the emission estimates for each of the scenarios are outlined in **Appendix C**.

The emissions estimated for the Brady Low MOA that are the result of contract ADAIR sorties are shown in **Table 4-16**. Emissions cover the proposed 10-year period beginning in July 2019 and ending in June 2029. Since the airspace operations would be identical for all three alternatives, the results are applicable to all alternatives.

The Brady Low MOA is located in an area that is an attainment or unclassifiable for all criteria pollutants. As such, the general conformity rule does not apply; however, the rule's 100 tpy *de minimis* threshold was applied as a significance indicator. Low emission scenarios are not necessarily lower for all pollutants. Because of its role in ozone formation NO_x is the primary pollutant of concern in many areas and thus the low emission scenarios reflect lower emission rates for NO_x; however, the lower NO_x emissions are often at the expense of other pollutants such as higher CO. Other factors such as the number of engines, fuel flow rates, and power mode can cause variations that may result in a lower emission scenario having higher emissions for some pollutants when compared to an engine with higher emission factors (pounds pollutant/1,000 pounds fuel burned).

As shown in **Table 4-16**, none of the criteria pollutants emission rates exceed 1 tpy. This demonstrates that the proposed contract ADAIR sorties would have no impact on air quality (NAAQS compliance) in the ROI associated with the Brady Low MOA under Alternative 1, 2, or 3.

Table 4-16
Contractor Adversary Air Emissions – Brady Low Military Operations Area

Scenario	Contract (Years)[1]	Emissions (tpy)[2,3]								
		VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
High	2019 (July - December)	0.001	0.37	0.08	0.02	0.01	0.01	70.5	0	0
	2020 through 2028	0.002	0.74	0.15	0.05	0.03	0.02	141	0	0
	2029 (January - June)	0.001	0.37	0.08	0.02	0.01	0.01	70.5	0	0
Med	2019 (July - December)	0.001	0.15	0.15	0.02	0.003	0.002	62.6	0	0
	2020 through 2028	0.001	0.29	0.30	0.04	0.005	0.005	125	0	0
	2029 (January - June)	0.001	0.15	0.15	0.02	0.003	0.002	62.6	0	0
Low	2019 (July - December)	0.06	0.01	0.21	0.003	0.02	0.02	8.9	0	0
	2020 through 2028	0.13	0.01	0.43	0.01	0.05	0.04	17.7	0	0
	2029 (January - June)	0.06	0.01	0.21	0.003	0.02	0.02	8.9	0	0

Source: Air Conformity Applicability Model output

Notes:
1 While ADAIR targeted performance is estimated to start in February 2020 with a 10-year contract, the emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. For air quality modeling purposes, these are representative years; the modeling generates air emissions estimates for the life of a representative 10-year contract.
2 Represents total per year emissions.
3 Emission based on 60 sorties (5 percent of 1,200 on airfield sorties).

NO_x = nitrogen oxides; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NH_3 = ammonia; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; VOC = volatile organic compound

4.4.2.2 No Action Alternative

The No Action Alternative would not generate any new emissions and would not change emissions from current baseline levels presented in **Section 3.4**. As a result, there would be no change to regional air quality.

4.4.3 Climate Change Considerations

Like many locations, climate trends in South Central Texas appear to be reflecting the influence of global warming. In Texas, annual average temperature has increased by about 0.9˚F since 1900 and although this is slightly below the national average there has been pronounced location to location and season to season variability. For example, in the San Antonio area there has been pronounced, statistically significant increases in winter average temperature accompanied by a significant decrease in the number of days below freezing. Looking forward, based on observed trends and the future projections provided by the Third National Climate Assessment, there is high confidence that in San Antonio average temperatures will continue to warm, and that the number of hot days and warm nights occurring on average each year will continue to increase. There is moderate confidence that average winter and spring precipitation will decrease over the long term increasing the risk for longer periods of consecutive dry days (SA Tomorrow, 2016).

To serve as a reference point, project GHG emissions were compared against San Antonio area GHG emissions, and to the Title V and PSD major source thresholds for CO_2e applicable to stationary sources (**Table 4-17**). Based on the relative magnitude of the project's GHG emissions, a general inference can be drawn regarding whether the Proposed Action is any way meaningful with respect to the discussion regarding climate change.

Table 4-17
Metrics for Greenhouse Gas Emission Impacts

Emission Scenario	ADAIR Projected CO_2e Emissions (tpy)[1, 2]	CO_2e Regulatory Thresholds (tpy)			San Antonio 2014 GHG Inventory (tons CO_2e/yr)[3]		
		Title V Permit	PSD New/ Modified Source	GHG Mandatory Reporting Rule[4]	Government Operations[5]	Electrical Generation	Community[6]
High	4,931	100,000	100,000/ 75,000	25,000	583,326	16,351,643	16,498,864
Medium	3,757						
Low	2,971						

Notes:
1 CO_2e = carbon dioxide equivalent from Air Conformity Applicability Model
2 Sum of emissions from air field operations (including Alternative 1 emergency generator) and Military Operations Area sorties
3 Source: SA Tomorrow, 2016
4 40 Code of Federal Regulations Part 98
5 Includes closed landfills, buildings & facilities, water supply, wastewater treatment, vehicle fleet, streetlights & traffic signals.
6 Includes buildings, transportation, solid waste management, water supply & waste water treatment
ADAIR = adversary air; GHG = greenhouse gas; PSD = Prevention of Significant Deterioration; tpy = ton(s) per year

As shown in the table, GHG emissions (expressed as CO_2e) for all three emission scenarios are negligible when compared against the metrics. The projected GHG emissions would account for about 0.015 percent of San Antonio area emissions, are more than 15 times lower than permitting thresholds, and 5 times lower than the GHG mandatory reporting rule threshold. This demonstrates that in isolation, additional CO_2e emissions expected as a result of contract ADAIR would have a negligible impact under Alternatives 1, 2 and 3.

4.5 Biological Resources

4.5.1 Evaluation Criteria

The level of impact on biological resources is based on the

- importance (i.e., legal, commercial, recreational, ecological, or scientific) of the resource;
- proportion of the resource that would be affected relative to its occurrence in the region;
- sensitivity of the resource to the proposed activities; and
- duration of potential ecological ramifications.

The impacts on biological resources are adverse if species or habitats of high concern are negatively affected over relatively large areas. Impacts are also considered adverse if disturbances cause reductions in population size or distribution of a species of high concern.

As a requirement under the ESA, federal agencies must provide documentation that ensures that agency actions do not adversely affect the existence of any threatened or endangered species. The ESA requires that all federal agencies avoid "taking" federally threatened or endangered species (which includes jeopardizing threatened or endangered species habitat). Section 7 of the ESA establishes a consultation process with USFWS that ends with USFWS concurrence or a determination of the risk of jeopardy from a federal agency project.

4.5.2 Proposed Action

Under the Proposed Action, there would be no ground disturbing activities and all potential impacts on biological resources would be associated with aircraft operations at Kelly Field Annex and in the MOAs. The aircraft operations associated with the Proposed Action could have impacts on biological resources from aircraft movement, noise impacts, or BASH. Because the number and type of aircraft, using the same flight profiles and airspace are the same under all alternatives, potential impacts to biological resources are the same for all action alternatives.

Chaff and flares (types similar to RR-188 chaff and M206 flares) are proposed for annual use during the training sortie operations. Potential direct impacts to resources from training activities include the deposition of residual materials, such as plastic, from chaff and flare use, its accumulation in sensitive and protected areas, and the ultimate breakdown of these materials into substrate mediums. Indirect impacts include fire risk, transportation of these materials to other areas by environmental elements, and the potential for ingestion by sensitive species within the ROI and beyond. Depending on the altitude of release and wind speed and direction, the chaff from a single bundle can be spread over distances ranging from less than a 0.25 mi to over 100 mi (Air Force, 1997). The most confined distribution would be from a low-altitude release in calm conditions (Air Force, 1997).

Chaff chemical composition, composition, rate of decomposition, and tendency to leach toxic chemicals under various situations paired with baseline substrate chemistry and conditions are factors that could potentially alter substrate chemistry. A change in chemistry could potentially affect fauna, flora, vegetative cover, substrate stability, the type and quality of habitat, and leaching and runoff potential. Silica (silicon dioxide), aluminum, and stearic acid are major components of chaff with minor quantities of copper, manganese, titanium, vanadium, and zinc in the aluminum chaff coating. All are generally prevalent in the environment, and all but titanium are either found in plants and animals and/or necessary essentials for their growth. Silica does not present a concern to chemistry as it is found in silicate minerals, the most common mineral group on Earth. Silica is more stable in acidic environments than alkaline. Aluminum is also very abundant in the earth's crust, forming common minerals like feldspars, micas, and clays. While acidic and extremely alkaline substrates increase the solubility of aluminum, what is left eventually oxidizes to aluminum oxide which is insoluble. Stearic acid is used in conjunction with palmitic acid to produce an anti-clumping compound for chaff fibers and both degrade when exposed to light and air (Air Force, 1997).

The primary material in flares is magnesium, which is not highly toxic, and it is highly unlikely organisms would ingest flare materials; however, plastic caps are released with the deployment of both chaff and flares. Some flares utilize impulse cartridges and initiates which contain chromium and sometimes lead. Even though these are hazardous air pollutants under the CAA, a screening health risk assessment concluded that they do not present a significant health risk. More significantly, flares have a potential to start fires that can spread, adversely and indirectly affecting many resources. Flare-induced fires depend on the probabilities of flare materials reaching the ground, igniting vegetation, and causing significant damage if fire spreads (Air Force, 1997); however, all use of flares in the MOAs would occur above 6,000 ft greatly reducing the risk of wildland fires as a result of flare use.

The following BMPs would be implemented as appropriate:

- Comply with Air Force and local procedures.
- Establish a capability to analyze fire risks on a site-specific basis. The methodologies presented in this report provide a mechanism for accomplishing this.
- Replace impulse cartridges and initiators in future procurements of flares with models that do not contain toxic air pollutants such as chromium and lead.
- Consider a public information program in areas where flares are used over non-DOD land to educate the public about the hazards of dud flares and proper procedures to follow if a dud flare is found.

4.5.2.1 Alternatives 1, 2, and 3

Vegetation

Under the Proposed Action, there are no ground disturbing activities and as such no potential to disturb vegetation or habitats on Kelly Field Annex; therefore, there would be no impacts to vegetation under Alternative 1, 2, or 3.

Flights within MOAs under would not have impacts on vegetation communities or habitat under Alternative 1, 2, or 3. Potential impacts to vegetation from countermeasure chaff and flare constituents may include toxicity or accumulation of chemical compounds. Studies have determined that chaff deposition onto soils does not lead to significant increase of concentrations of chaff or flare chemical constituents in soil and have not been found to be toxic to plants or soil fauna (Air Force, 1997).

Wildlife

There is limited suitable habitat for wildlife on Kelly Field Annex and in developed areas adjacent to the Base; however, undeveloped areas near Kelly Field Annex support relatively common wildlife species. Wildlife, and especially avian species, utilizing these undeveloped areas for foraging and breeding would normally be sensitive to increased noise impacts from military aircraft. Although there is variability in responses across species, many birds and wildlife have the ability to habituate to noise and movement from military aircraft (Grubb et al., 2010) and military aircraft operations have been ongoing at Kelly Field Annex for decades. As such, the noise and movement from increased aircraft operations is anticipated to have negligible short-term and long-term impacts on wildlife, including birds breeding and foraging in nearby relatively undisturbed habitats, under Alternative 1, 2, or 3.

Aircraft operations always have the potential for bird and other wildlife strikes. This can occur during takeoff and landing on and near active runways, as well as during flight at altitude. With an increase in air operations associated with contract ADAIR aircraft at Kelly Field Annex, there is an increased risk of BASH; however, JBSA and Kelly Field Annex maintain a BASH prevention program specifically to manage BASH risk and implement measures to greatly reduce the likelihood for BASH incidents. The outcome of the BASH program is both increased safety for pilots and military aircraft as well as less incidents of injury or death to birds and other wildlife. As such, with the continued airfield management and risk reduction implementation measures associated with the BASH program, the impacts on birds and other wildlife from contract ADAIR aircraft strikes during air operations at Kelly Field Annex is minor as discussed in **Section 4.3.2.1**.

Contract ADAIR aircraft training operations would occur at altitudes above where most bird species would be migrating or foraging. As such, it is highly unlikely that aircraft movement would adversely impact foraging birds or have a risk of BASH under Alternative 1, 2, or 3. Migrating birds could have a greater potential of encountering contract ADAIR aircraft during training operations, especially those that migrate at altitudes above 2,000 ft; however, given the large area and high altitude where training would occur, that most ADAIR training would during daytime hours while most songbirds migrate at night, and that most migratory birds migrate at altitudes less than 2,000 ft, the likelihood for birds to encounter aircraft during training operations is low; therefore, adverse impacts on birds from aircraft movement is negligible under

Alternative 1, 2, or 3. Further, given the altitudes that training occurs, aircraft movement in MOAs would have no impacts on mammals under Alternative 1, 2, or 3.

Noise modeling for the contract ADAIR aircraft training operations indicates that there would be no substantial increase in noise impacts within the MOAs and that subsonic and/or supersonic noise levels in the airspace would be less than 45 dB. The noise impacts from ADAIR training over the ambient noise levels would have no impact on breeding, foraging, or nesting birds or mammals in MOAs under Alternative 1, 2, or 3.

Sonic booms from supersonic flights within MOAs could cause startle effects to avian and mammal species on or near the ground level; however, the sonic boom and post-boom rumbling sounds that would be experienced by wildlife do not differ substantially from thunder, which is commonly experienced by wildlife during relatively frequent thunderstorms in the region. Further, the sonic boom events would be highly isolated and rare occurrences in the MOAs and occur in areas where supersonic flights currently occur with military training activities. As such, sonic booms from supersonic flights would have no impact on wildlife, including birds breeding and foraging in MOAs under Alternative 1, 2, or 3.

Under the Proposed Action, the use of chaff and flares would increase by 11 percent within MOAs. Impacts on wildlife from the use of chaff and flares would be limited to a startle effect from chaff and flare deployment and inhalation of chaff fibers or flare combustion products. The potential of being struck by debris, given the small amount, or a dud flare is remote. Startle effects from the release of chaff and flares would be minimal relative to the noise of the aircraft. The potential for wildlife to be startled from flare deployment at night when flares would be most visible would be minimal due to the short burn time of the flare. It is highly unlikely that during active military training with contract ADAIR aircraft that birds would remain in the area where training is occurring to be adversely impacted by chaff and flares deployment. Further, chaff and flares are so small in size, that it is highly unlikely that small amount of light-weight material ejected during their deployment would have an adverse impact on birds or that the material would reach the ground level and have an impact on mammals. Lastly, an evaluation of the potential for chaff to be inhaled by humans and large wildlife found that the fibers are too large to be inhaled into the lungs and that chaff material is made of silicon and aluminum that has been shown to have low toxicity (Air Force, 1997); therefore, the use of chaff and flares during contract ADAIR training would have no impact on wildlife under Alternative 1, 2, or 3.

Invasive Species

There are no activities associated with the Proposed Action that have the potential to affect invasive species. There would be no ground disturbing activities that have the potential to spread or remove invasive plants. Similarly, aircraft operations on the airfield or in the MOAs would have no impact on invasive plants or wildlife under Alternative 1, 2, or 3.

Threatened and Endangered Species

There are no federally listed species on Kelly Field Annex. As such, there would be no effect to listed species from implementation of the Proposed Action.

Because the contract ADAIR operations are entirely limited to aircraft training flights, and no ground disturbing activities are proposed, no state listed species would be impacted by the Proposed Action under Alternative 1, 2, or 3. Further, the state listed white-faced ibis could be present in areas near Kelly Field Annex as a migrant foraging in ponds or rivers; however, the white-faced ibis would not be present in areas proximate to the airfield and would not be impacted by the ADAIR aircraft training at Kelly Field Annex.

Federally and state listed species are known to occur beneath and within the airspace of the MOAs proposed for use. The potential exists for species discussed in **Section 3.5.2.1** to be affected by aircraft operation, noise, and the use of defensive countermeasures.

As previously described for impacts on birds, there would be no effect on the federally and state listed birds from contract ADAIR aircraft operations during training under Alternative 1, 2, or 3. Bird species within the ROI would primarily be foraging or nesting. As such, these species would likely not be startled or at risk from aircraft strikes from aircraft flying at higher altitudes. Aircraft noise in the MOAs would have no effect on bird species as the noise levels would not exceed 45 dB from ADAIR training. Biological impacts from the use of countermeasure chaff and flares are not likely to be significant. Reasons include: the components of chaff and flares have been found to have low or low toxicity and do not accumulate or magnify in food webs; chaff fibers are too large to be inhaled; and human health assessments have found the products from flare combustion have been found to not have significant adverse effects, which is likely applicable to other species (Air Force, 1997). While birds and bats may experience disorientation if they fly through a cloud of chaff, the effect would be short and the potential for injury is low due to the low mass and diffuse nature of the chaff, the low resistance times chaff is in the air, and the localized nature of the chaff release (Air Force, 1997). The use of chaff and flares during contract ADAIR training would have no effect on federally and state listed birds.

The listed mammals would potentially only be affected by aircraft overflights if the training activities elicited negative behavioral responses. It is highly unlikely that either aircraft movement or noise, especially at higher altitudes, would elicit a response from mammals. Noise from contract ADAIR aircraft would not exceed 45 dB and would therefore have no effect on the listed mammal species. Aircraft movement would not be visible to mammals unless an individual was at the exact location at the moment in which an aircraft traveling at high speed at a relatively low altitude passed directly overhead. These occurrences with contract ADAIR aircraft would be so rare as to be negligible and may not even generate a startle response if an interaction occurred. Lastly, extensive studies have shown that the use of chaff and flares has no adverse impact on wildlife, their components have been shown to have no or low toxicity and not known to accumulate or magnify in food webs (Air Force, 1997). As such, the contract ADAIR training in the Crystal and Crystal North MOAs would have no effect on listed mammals.

Sonic booms from supersonic aircraft movement could cause a startle response by the listed species; however, sonic booms would be relatively rare events during ADAIR training in the MOAs, and the sonic boom and post-boom rumbling would be similar to what wildlife experience during a thunderstorm, and thunderstorms do occur with relative frequency in the region; therefore, sonic booms from supersonic aircraft movement would have no effect on listed species.

The Air Force has made a no effect determination on federally listed species in the action area and a letter requesting concurrence with this determination has been sent to the USFWS (**Appendix A**).

Wetlands

The locations proposed for use on the installation are not located near wetlands. There would be no need to fill or alter wetlands on Kelly Field Annex; therefore, there are no impacts associated with wetlands on the installation under Alternative 1, 2, or 3.

Contract ADAIR operations would not impact wetlands located beneath the proposed MOAs under Alternative 1, 2, or 3. As discussed in vegetation, impacts from increased chaff and flare use would not have significant impacts to wetlands as the deposition of countermeasure chaff and flare compounds onto soils does not lead to significant increase of soil concentrations of their chemical constituents and have not been found to be toxic to plants or soil fauna (Air Force, 1997).

4.5.2.2 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex and there would be no training operations in the MOAs. As such, there would be no change to biological resources.

4.6 WATER RESOURCES

4.6.1 Evaluation Criteria

Evaluation criteria for potential impacts on water resources are based on water availability, quality, and use; existence of floodplains; and associated regulations. Adverse impacts to water resources would occur if the Proposed Action or alternatives

- reduce water availability or supply to existing users;
- overdraft groundwater basins;
- exceed safe annual yield of water supply sources;
- affect water quality adversely;
- endanger public health by creating or worsening health hazard conditions; or
- violate established laws or regulations adopted to protect sensitive water resources.

4.6.2 Proposed Action

Impacts on water resources from aircraft operations are the same under all alternatives. As described in **Section 2.1.7**, defensive countermeasures are a component of the Proposed Action. Impacts associated with chaff and flares are summarized in **Section 4.5.2**.

4.6.2.1 Alternatives 1, 2, and 3

Activities associated with potential impacts to Water Resources include fire suppression, the use of chaff and flares and emergency fuel dumps. Impacts analysis associated with these topics are discussed below.

The Crystal and Laughlin MOAs have the highest number of projected training sorties, increasing by an estimated 960 sorties. Kingsville 3 has the second highest projected training sorties, increasing by an estimated 113 training sorties. Brady Low and High MOAs would add an estimated 57 additional training sorties. Across the MOAs, these additional sorties represent an approximate 33 percent increase in sorties. Chaff and flare use would increase approximately by 11 percent in the Crystal and Laughlin MOAs and the Kingsville 3 MOA. Chaff and flares would not be used in the Brady Low and High MOAs.

Depending on the altitude of release and wind speed and direction, the chaff from a single bundle can be spread over distances ranging from less than a 0.25 mi to over 100 mi (Air Force, 1997). The most confined distribution would be from a low-altitude release in calm conditions. Freshwater environments are potentially more sensitive to chemicals released from chaff than terrestrial environments for the reasons: 1) dissolution of materials occurs faster in water than on land; 2) chemicals are more mobile and more available to organisms; and 3) the thresholds of toxicity tend to be lower for sensitive aquatic species. Chaff material is made of silicon and aluminum that are common in nature and degrade naturally in the environment following deployment (Air Force, 1997). A study for the US Navy was conducted in the Chesapeake Bay to evaluate the potential for chaff concentrations to be harmful to aquatic organisms. The study found that there was no evidence that chaff was acutely toxic to six species of aquatic organisms. Concentrations of chaff at one to two orders of magnitude greater than expected chaff concentrations had no significance in mortality (Air Force, 2014). The primary material in flares is magnesium, which in not highly toxic, and it is highly unlikely the animals would ingest flare materials; however, plastic caps are released with the deployment of the chaff and flares. Plastic accumulation is a problem in aquatic environments. Microplastic pollution (small particles of plastic <5 mm in size) impacts have been well documented in oceans, and more recently as lakes and rivers, but more research is needed on the fate and effects of microplastics in these diverse freshwater ecosystems themselves (Rochman, 2018). Refer to **Section 4.5.2** for an overview of chaff and flare chemistry and properties.

Additionally, emergency fuel dumps could potentially occur during rare in-flight emergency circumstances involving increased loss of life potential for the pilot; however, such actions are not included on any established training syllabus and would only occur under extreme circumstances where human or aircraft survival is a concern (FAA Order JO 7110.65U Section 4, *Fuel Dumping*). Air Force regulations require that fuel be dumped at an altitude of at least 10,000 ft AGL (see AFI 11-2F-15V3, *F-15--Operations Procedures*). This allows the fuel to evaporate and atomize before it reaches the ground or surface water (American Petroleum Institute, 2010). Due to the infrequent nature of fuel dumps as well as in-place safety precautions, these emergency procedures are not likely to adversely affect water resources.

For these reasons, the activities associated with the implementation of the Proposed Action under Alternative 1, 2, or 3 would have no impact on water resources.

4.6.2.2 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex and there would be no training operations in the MOA; therefore, there would be no change to water resources.

4.7 SOILS

4.7.1 Evaluation Criteria

Protection of geology and soils are considered when evaluating potential impacts of the Proposed Action. Effects on geology and soils would be adverse if they altered the lithology, stratigraphy, and geological structure that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability, change the soil composition, structure, or function within the environment, or accumulate in the soil. The degree of adverse effects depends on the quantity of material deposited locally, stability of the chaff components, the soil chemical conditions, and the sensitive of the environment to chemicals of concern.

4.7.2 Proposed Action

Implementation of alternatives differs only in the facilities chosen for operations, maintenance, and aircrew briefings, and no ground disturbing activities would occur; therefore, potential impacts associated with soils also are the same for all alternatives. Activities under the Proposed Action that could affect soils are the use of chaff and flares, fire risk due to flares, and emergency fuel dumps. Refer to **Section 4.5.2** for an overview of chaff and flare chemistry and properties.

4.7.2.1 Alternatives 1, 2, and 3

Potential impacts to soils from countermeasure chaff and flare constituents may include toxicity or accumulation of chemical compounds and fire risk. Dissolution of chaff components would be the greatest where the water content is high meaning weathering will be faster in the wet, acidic environment; however, the climate southern Texas is typically drier with more neutral and alkaline soils in all the MOAs. The availability and mobility of the components in the soil would be reduced by attenuation factors such as solid phase precipitation, ion exchange, coprecipitation, and iron and aluminum oxyhydroxides and organic matter complexation (Air Force, 1997). This retention would reduce their availability to organisms and groundwater. A significant accumulation of components in the soil would demand massive chaff releases in a short period of time (Air Force, 1997); the projected total countermeasure use proposed (refer to **Table 2-4**) would be localized, dispersed over time, and never equal the one-time release required for this type of accumulation. Studies have determined that chaff deposition onto soils does not lead to significant increase of concentrations of chaff or flare chemical constituents in soil. The fire risk from potential flare landing could reduce soil productivity, but with the low probability of occurrence and BMPs in place (see **Section 4.5.2**), indirect, adverse impacts would be negligible under Alternative 1, 2, or 3.

As discussed in **Section 4.6.2.1**, federal regulations require that fuel be dumped at an altitude of at least 10,000 ft AGL (see AFI 11-2F-15V3). This allows the fuel to evaporate and atomize before it reaches the ground or surface water (American Petroleum Institute, 2010). Due to the infrequent nature of fuel dumps as well as in-place safety precautions, these emergency procedures are not likely to adversely affect soils.

For these reasons, under Alternatives 1, 2, or 3, no direct effects are anticipated to soils, and any adverse indirect effects would be negligible for all MOAs.

4.7.2.2 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex and there would be no training operations in the MOA. As such, there would be no change to soils.

4.8 Land Use and Visual Resources

4.8.1 Evaluation Criteria

Potential impacts on land use are based on the level of land use sensitivity in areas potentially affected by the Proposed Action and alternatives as well as compatibility of those actions with existing conditions. In general, a land use impact would be adverse if it met one of the following criteria:

- inconsistency or noncompliance with existing land use plans or policies
- precluded the viability of existing land use
- precluded continued use or occupation of an area
- incompatibility with adjacent land use to the extent that public health or safety is threatened
- conflict with planning criteria established to ensure the safety and protection of human life and property

Potential impacts to visual resources are based on the level of change to the surrounding visual setting and the degree of concern for visual change from sensitive receptors or POIs.

4.8.2 Proposed Action

Under the Proposed Action, contract ADAIR would augment current ADAIR sorties flown by the 149 FW at Kelly Field Annex. Contract ADAIR personnel would use existing facilities at Kelly Field Annex for operations, maintenance, and administrative activities, as well as for equipment and tool storage. In addition, existing ramp and hangar space would be used for parking and maintenance of aircraft. Contract ADAIR proposes to use existing airspace (Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, Laughlin 3 High, Kingsville 3, and Brady Low and High MOAs) for training. The Proposed Action is compatible with the IDP for JBSA (JBSA, 2016b), JBSA – Kelly Field Annex Area Development Plan (USACE, 2018a), and the Lackland AFB Joint Land Use Study (Bexar County, 2011). The Proposed Action also would use existing facilities that are available for use at the Kelly Field Annex. Three options for O&M facilities are proposed; all facilities would require some internal modifications. Under all three options, aircraft would be parked on the East Ramp, which is located in a Commercial land use area on Port San Antonio property. Land use under the airspace would not be impacted by the Proposed Action.

Implementation of alternatives differs only in the facilities chosen for operations, maintenance, and aircrew briefings. Because the number and type of aircraft, using the same flight profiles and airspace are the same under all alternatives, potential impacts associated with land use and visual resources are the same for all alternatives.

4.8.2.1 Alternatives 1, 2, and 3

Changes in the noise setting can affect land use compatibility as a result of increased noise exposure to existing POIs. As indicated in **Section 4.2**, during a High Noise Scenario, the DNL would increase slightly, but while considered long-term, this increase would be minor and less than significant; therefore, this minor change in the noise setting would be compatible with surrounding land uses. Changes to the current noise contours are minor and APZ designations are not expected to change; therefore, land use would not change under Alternative 1, 2, or 3.

No new structures are proposed, and minor building modifications would be to the interior only (e.g, carpet, paint); therefore, no changes to the existing visual setting are expected. Additional aircraft parked on the ramps would be visible as compared to a previously empty ramp space; however, this change to the visual setting would not affect POIs or create contrast to the surrounding environment. The impact to the visual setting would be negligible under Alternative 1, 2, or 3.

4.8.2.2 No Action Alternative

Under the No Action Alternative, there would be no addition of contract ADAIR personnel or aircraft stationed at JBSA-Kelly Field Annex. ADAIR O&M facilities would not change from their current use; therefore, no changes would occur to the existing land use. The visual setting would remain as it currently exists; no impacts to visual resources are expected under the No Action Alternative.

4.9 SOCIOECONOMICS

4.9.1 Evaluation Criteria

Consequences to socioeconomic resources were assessed in terms of the potential impacts on the local economy from proposed contract ADAIR. The level of impacts associated with the contract ADAIR expenditure is assessed in terms of direct effects on the local economy and related effects on other socioeconomic resources (e.g., housing, employment). The magnitude of potential impacts can vary greatly, depending on the location of an action. For example, implementation of an action that creates 10 employment positions might be unnoticed in an urban area but might have significant impacts in a rural region. In addition, if potential socioeconomic changes resulting from other factors were to result in substantial shifts in population trends or in adverse effects on regional spending and earning patterns, they may be considered adverse.

4.9.2 Proposed Action

Under the Proposed Action, the Air Force would contract an estimated 1,200 sorties annually at Kelly Field Annex, which requires an estimated seven aircraft and 55 contract personnel for this requirement. As such, there is no substantive difference in where the aircraft and personnel are located at Kelly Field Annex as it pertains to impacts on socioeconomics. There are no socioeconomic impacts in the MOAs as contract ADAIR training in the Crystal, Crystal North, Laughlin 2, Laughlin 3 High and Low, Kingsville 3, and Brady High and Low MOAs would not alter the population, income and employment, housing, or educational opportunities in these ROIs.

Implementation of alternatives differs only in the facilities chosen for operations, maintenance, and aircrew briefings. Because the number and type of aircraft, using the same flight profiles and airspace are the same under all alternatives, potential impacts associated socioeconomics resources are the same for all alternatives.

4.9.2.1 Alternatives 1, 2, and 3

The requirement for an estimated 55 contract personnel and their families supporting the contract ADAIR sorties in the San Antonio region would have no impact on the region's population. Even assuming all 55 contract personnel relocated with family members to Bexar County, this would be a negligible increase in the County's population of nearly 2 million people; therefore, there would be no impacts of the Proposed Action on the local or regional population under Alternative 1, 2, or 3.

Minor interior renovations to buildings and hangars and associated communication infrastructure needed for aircrew flight equipment or secured storage space would be a minor requirement for materials and labor and would have no impacts on the socioeconomic condition on the region under Alternative 1. The 55 contracted ADAIR maintenance personnel and pilots would represent a small increase in the total persons permanently assigned to and working at JBSA, where currently over 80,000 military and civilian personnel are employed. Adequate housing and educational resources are available in the ROI for the small increase in personnel associated with contract ADAIR action; therefore, no adverse impacts on income and employment, housing, or educational resources would occur under Alternative 1, 2, or 3.

It is estimated that the maximum contracted value for ADAIR training would be $30,000 per flight hour (Headquarters Air Combat Command Acquisition Management and Integration Center, 2018), though most likely between $8,500 and $15,000 based on technical solution sought; therefore, there would be increased annual expenditures in the region of up to approximately $18 million to support the seven contracted fighter aircraft flying 1,200 annual sorties from Kelly Field Annex. These expenditures would be in the form of purchasing fuel, equipment, and materials to support the contract ADAIR sorties as well as the employment of 55 highly skilled contracted personnel (maintainers and pilots). These increased expenditures would provide a long-term, major, beneficial impact on the ROI through increased payroll tax revenue and the purchase of additional equipment, materials, and fuel needed for aircraft O&M under Alternative 1, 2, or 3.

4.9.2.2 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex and no expenditures would occur locally or regionally to support contracted aircraft or sorties. As a result, there would be no change in socioeconomics.

4.10 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

4.10.1 Evaluation Criteria

Environmental justice analysis applies to potential disproportionate effects on minority, low-income, and youth populations. Environmental justice issues could occur if an adverse environmental or socioeconomic consequence to the human population fell disproportionately upon minority, low-income, or youth populations. Ethnicity and poverty status were examined and compared to state and national data to determine if these populations could be disproportionately affected by the Proposed Action.

4.10.2 Proposed Action

Under the Proposed Action, the Air Force would contract an estimated 1,200 ADAIR sorties annually at Kelly Field Annex. The addition of an estimated seven aircraft and 55 contract personnel and their families to JBSA and Kelly Field Annex, and the associated noise from those aircraft have the potential to cause disproportionate impacts on minorities and children in the community, regardless of the alternative location at Kelly Field Annex for contract ADAIR O&M.

Implementation of alternatives differs only in the facilities chosen for operations, maintenance, and aircrew briefings; therefore, potential impacts to environmental justice populations and children are the same for all alternatives.

4.10.2.1 Alternatives 1, 2, and 3

Under the Proposed Action, the increase in the number of personnel at Kelly Field Annex supporting the contracted ADAIR sorties would not result in a disproportionate impact on minorities, low-income populations, and protection of children, because there is adequate housing, community resources, and community services in the region to support the increase in personnel. The 55 additional personnel and their families supporting the contract ADAIR requirement would not disproportionately affect the availability of these resources to minorities, low-income populations, or children under Alternative 1, 2, or 3.

The DNL increase under the high noise scenario was modeled to be up to 2 dBA at residences and schools and would impact neighborhoods proximate to Kelly Field Annex, which are part of 17 census tracts defined by the USCB. Of those 17 census tracts, 15 have populations with a percentage of minorities and persons living below the poverty level similar to the overall populations in the City of San Antonio and Bexar County.

The other two census tracts have substantially lower percentages of the population that identify as minorities; therefore, there would be no disproportionate impacts from minor increase in noise impacts on minority populations or low-income communities under Alternative 1, 2, or 3.

Although aircraft noise in the community from contract ADAIR aircraft operations would adversely impact schools and daycare centers in the ROI, posing a special risk to children, the percentage of the population that is under the age of 18 in communities near Kelly Field Annex is similar to the City of San Antonio, Bexar County, and the State of Texas. Further, changes in the DNL at nearby schools under the high noise scenario range from 0 to 2 DBA. This is not a significant noise increase and would only have moderate impacts on educational facilities where the DNL increases; therefore, although adverse noise impacts would affect children in the community, those impacts would not be disproportionate under Alternative 1, 2, or 3.

As noise levels in the MOAs proposed for ADAIR training would not exceed 45 dB, there would be no impacts on minority or low-income communities or children as a result of Alternative 1, 2, or 3.

4.10.2.2 No Action Alternative

Contract ADAIR operations would not occur at Kelly Field Annex under the No Action Alternative; therefore, there would be no disproportionate impacts on minority or low-income communities or children from regional expenditures to support contracted aircraft or from the increased training sorties.

4.11 Cultural Resources

4.11.1 Evaluation Criteria

Adverse impacts on cultural resources might include: physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; neglecting the resource to the extent that it deteriorates or is destroyed; or the sale, transfer, or lease of the property out of agency ownership (or control) without adequate enforceable restrictions or conditions to ensure preservation of the property's historic significance. For the purposes of this EA, an impact is considered major if it alters the integrity of the Kelly Field Historic District or results in the loss of contributing resources in the historic district or potentially impacts Traditional Cultural Properties.

4.11.2 Proposed Action

The Proposed Action includes elements affecting the base and military training airspace. As described in **Chapter 2**, the elements affecting the Base include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. The elements affecting the airspace include airspace use and defensive countermeasures. Impacts resulting from each alternative related to cultural resources are described below.

4.11.2.1 Alternative 1

Under this alternative, contract ADAIR O&M would be consolidated in Hangar 1612. Hangar 1612 is currently empty and would require interior modernization updates. Aircrew briefings would take place in Building 917. The use of Building 917 would be a turnkey operation with no changes to the building.

Hangar 1612 is located outside the boundaries of the Kelly Field Historic District and has been determined not eligible for inclusion in the NRHP due to a loss of integrity following a damaging fire in 1986. Building 917, constructed in 2003, is not a historic building; therefore, there would be no effect on any NRHP-eligible resources.

Four federally recognized tribes—the Mescalero Apache, the Wichita and Affiliated Tribes, the Tonkawa, and the Comanche Nation—have been identified as potentially having an interest in JBSA's activities and historic properties (a fifth tribe, the Tap Pilam Coahuiltecan Nation, is not federally recognized but conducts consultation through the Wichita in cases where federal recognition is required by regulations); however, no known traditional cultural resources or sacred sites have been identified at Kelly Field Annex or JBSA-Lackland (JBSA, 2014b [Volume I]).

No ground disturbance would take place as part of the Proposed Action; therefore, potential archaeological deposits would not be impacted. Sorties within the MOAs would be performed at an altitude that would not affect historic resources; therefore, Alternative 1 would have no impact on historic properties.

4.11.2.2 Alternatives 2 and 3

Hangar 1610 is presently considered eligible for inclusion in the NRHP as a contributing element of the Kelly Field Historic District. Considering that the character-defining features of Hangar 1610 are located on the exterior, the impact of this alternative is considered negligible. The minor interior modifications proposed to Hangar 1610 are not expected to affect any characteristics that contribute to the hangar's historic significance or its overall contribution to the historic district. Building 917, constructed in 2003, is not historic.

No traditional cultural resources or sacred sites have been identified at Kelly Field Annex or JBSA-Lackland. No ground disturbance would take place as part of the Proposed Action; therefore, potential archaeological deposits would not be impacted. Sorties within the MOAs would be performed at an altitude that would not affect historic resources; therefore, Alternatives 2 and 3 would have no impact on historic properties.

4.11.2.3 No Action Alternative

Under this alternative, no contract ADAIR assets would be established at JBSA-Lackland, Kelly Field Annex. As a result, there would be no change to cultural resources.

4.12 HAZARDOUS MATERIALS AND WASTES, CONTAMINATED SITES, AND TOXIC SUBSTANCES

4.12.1 Evaluation Criteria

Impacts on HAZMAT management would be considered adverse if the federal action resulted in noncompliance with applicable federal and state regulations or increased the amounts of hazardous waste generated or procured beyond Kelly Field Annex's current waste management procedures and capacities. Impacts on the ERP would be considered adverse if the federal action disturbed or created contaminated sites resulting in negative effects on human health or the environment.

4.12.2 Proposed Action

Under the Proposed Action, maintenance and operations of seven contracted ADAIR aircraft could contribute to the volume of HAZMAT stored and used at Kelly Field Annex and the amount of hazardous wastes generated. Impacts associated with hazardous materials and wastes, contaminated sites, toxic substances, are limited to Kelly Field Annex. As discussed previously, and emergency fuel dump could occur in the MOAs; however, due to the infrequent nature of fuel dumps as well as in-place safety precautions, these emergency procedures are not likely to have adverse effects.

4.12.2.1 Alternative 1

Hazardous Materials and Wastes

The quantity of HAZMAT such as oil, Jet-A fuel, hydrazine, hydraulic fluid, solvents, sealants, and antifreeze would increase with the O&M of contract ADAIR aircraft at Kelly Field Annex. HAZMAT required for the contract ADAIR aircraft and used by contract personnel would be contractor-provided and managed in accordance with approved ground operations procedures outlined in the PWS but tracked through the JBSA

Environmental Section (502 CES/CEIE) following established Kelly Field Annex procedures. This would ensure that only HAZMAT needed for O&M at the smallest quantities would be used and that all HAZMAT used for contract ADAIR at Kelly Field Annex would be properly tracked and remain compliant at the Base; therefore, there would be a minor impact from the requirement to track and handle the increased HAZMAT use to support the contract ADAIR sorties at Kelly Field Annex under Alternative 1.

The quantity of hazardous wastes generated (e.g., used petroleum products) would increase as a result of the contract ADAIR operations at Kelly Field Annex; however, all hazardous waste generated as a result of contract ADAIR aircraft O&M would be properly handled, stored, and disposed of following the JBSA *Hazardous Waste Management Plan* (JBSA, 2016a). These procedures ensure that hazardous waste is managed according to all federal, state, and local laws and regulations. As such, there would be no impact from the storage and disposal of hazardous waste in support of the contract ADAIR sorties at Kelly Field Annex under Alternative 1.

Environmental Restoration Program

No environmental contamination is known to occur within the project area, and no impact on contaminated sites would occur from the use of Building 917 and Hangar and 1612 for contracted ADAIR O&M under Alternative 1.

Asbestos-Containing Materials and Lead-Based Paint

As no asbestos surveys have been conducted in Building 917 and Hangar and 1612, ACM could be present in building materials within these three facilities. Before any interior renovations or modifications occur to these buildings to support contract ADAIR, materials to be disturbed during renovations must be sampled for ACM including any construction materials, including pipe insulation and HDUCT insulation that will be disturbed regardless of construction date must be sampled for ACM[2]. If ACM is discovered in building materials that would be modified as a result of Alternative 1, the ACM would be remediated following all federal, state, and local laws and regulations.

LBP could be present in Building 917 and Hangar 1612. Interior renovations would require that materials to be altered would be tested for LBP, and any LBP found would be properly handled by a certified contractor, and disposed of in accordance with federal, state, and local laws. LBP sampling must be analyzed by a certified TCEQ laboratory. Any LBP areas that are disturbed require a lead inspection. All lead sample analysis must be conducted by a Texas Department of State Health Service-approved laboratory. X-ray fluorescence is authorized for lead sampling if the instrument is cleared through Bio Environmental[1].

With the implementation of the requirements described by the JBSA *Asbestos Management Plan*, appropriate testing and handling of any possible LBP, and implementation of the requirements of the *JBSA Lead-Based Paint Management Plan* (JBSA, 2018), there would be no impact from potential ACM or LBP disturbed by any potential interior renovations of Building 917 and Hangar 1612 under Alternative 1.

Radon

There is a low potential for radon to pose a health hazard at Kelly Field Annex. Building 917 and Hangar 1612 have adequate ventilation systems. Further, no new construction is proposed. As such, no impact from radon is anticipated under Alternative 1.

Polychlorinated Biphenyls

Removal of any light fixtures has the potential to disturb PCBs. If renovations of the interior of Building 917 and Hangar 1612 require the removal of fluorescent lighting fixtures where the ballasts and starters could

[2] Edward Vogel, 502 CES/CEIE Toxics Team Lead, Joint Base San Antonio - JBSA Randolph, Texas, e-mail to Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 13 June 2018.

contain PCBs, the lighting fixtures will be disposed of according to federal, state, and local laws. The removal and proper disposal of light fixtures containing PCBs is a long-term, minor, beneficial impact under Alternative 1.

4.12.2.2 Alternatives 2 and 3

Under Alternatives 2 and 3, impacts to hazardous materials and wastes, contaminated sites, and toxic substances would be the same as those described under Alternative 1 for their respective buildings. ACM could be present in materials within Hangar 1610. Any renovations to the interior of Hangar 1610 would require further inspection by a qualified contractor. If ACM are determined to be present in areas where interior renovation is needed to support contract ADAIR personnel, ACM would be properly removed and disposed of according to the JBSA *Asbestos Management Plan* following all federal, state, and local regulations.

4.12.2.3 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex. As such, no increased quantity of HAZMAT would be used, and no increased quantity of hazardous wastes would be generated. No interior renovations of buildings to support contract ADAIR personnel would be required; therefore, there would be no potential disturbance of ACM, LBP, or PCBs in Kelly Field Annex buildings. As a result, there would be no change on any HAZMAT or hazardous or special wastes.

4.13 Infrastructure, Transportation, and Utilities

4.13.1 Evaluation Criteria

Impacts on infrastructure from the Proposed Action are evaluated for their potential to disrupt or improve existing levels of service in the ROI as well as generate additional requirements for energy or water consumption and impacts to resources such as sanitary sewer systems and waste management.

The Proposed Action would result in transportation impacts if it resulted in a substantial increase in traffic generation that would cause a decrease in the level of service, a substantial increase in the use of the connecting street systems or mass transit, or if on-site parking demand would not be met by projected supply.

The Proposed Action would result in an adverse impact on utilities or services if the project required more than the existing infrastructure could provide or required services in conflict with adopted plans and policies for the area.

4.13.2 Proposed Action

Under the Proposed Action, 55 contract personnel (maintainers and pilots) would utilize existing facilities and the transportation network in and around the Kelly Field Annex to support an estimated 1,200 contracted sorties annually. No new construction or infrastructure changes would occur under the Proposed Action. The level of service for transportation and utilities needed to support the contract personnel is assumed to be the same under all alternatives and would be adequate to support the Proposed Action.

4.13.2.1 Alternatives 1, 2, and 3

During site selection, the support for the contract ADAIR operations was determined to be very good for facilities, transportation, and communication infrastructure at Building 917 and Hangars 1610 and 1612. These facilities are fully serviced by utilities such as gas, electric, water/wastewater, and solid waste management. Building 917 is directly connected to the Kelly Field's and JBSA-Lackland's transportation network while vehicular access to Hangars 1610 and 1612 is via City of San Antonio surface streets, outside of the Kelly Field Annex perimeter security.

The additional 55 contracted personnel would utilize the local San Antonio road network to travel to Hangars 1610 or 1612 as they are located on Port San Antonio property and not on JBSA-Lackland or Kelly Field Annex. It is anticipated that under typical contract ADAIR mission-support situations, the 55 contracted personnel could be working at Hangar 1610 or 1612 at the same time. To reach Hangar 1610 or 1612, access through a Kelly Field/JBSA gate is not required and vehicular access by contract ADAIR personnel would not impact traffic at installation gates. Further, the LOS at intersections approaching Hangars 1610 and 1612, including SW 36th Street and US 90 and General Hudnell Drive and US 90, are adequate and no impacts on local traffic or transportation are anticipated from the additional contract personnel under Alternatives 1, 2, and 3.

Travel between Building 917 and Hangars 1610 and 1612 for the nine contracted pilots would require passing through a JBSA-Lackland/Kelly Field Annex Gate, such as the Growdon Gate. The addition of up to nine privately owned vehicles entering and exiting the Growdon Gate, or another JBSA-Lackland/Kelly Field Annex Gate, would have no impacts on traffic as the gates have adequate capacity for these additional vehicles.

Contract ADAIR personnel would utilize the installation's electric, natural gas, water/wastewater, solid waste management, and communications distributions systems. All systems have adequate capacity to support an additional 55 contract personnel operating from Building 917 and Hangars 1610 and 1612. As such, the direct, long-term, adverse impacts on infrastructure from the increased use of utilities, including electric, gas, potable water, wastewater, and solid waste disposal to support the additional contract personnel associated with the ADAIR requirement would be negligible under Alternative 1, 2, or 3.

4.13.2.2 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at Kelly Field Annex and no facilities would be used to support contracted aircraft or sorties. As a result, there would be no measurable change to infrastructure, transportation, or utilities.

CHAPTER 5 CUMULATIVE IMPACTS AND OTHER ENVIRONMENTAL CONSIDERATIONS

This section includes an analysis of the potential cumulative impacts by considering past, present, and reasonably foreseeable future actions; potential unavoidable adverse impacts; the relationship between short-term uses of resources and long-term productivity; and irreversible and irretrievable commitment of resources.

5.1 CUMULATIVE EFFECTS

The CEQ regulations stipulate that the cumulative effects analysis considers the potential environmental consequences resulting from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions" (40 CFR § 1508.7). In addition, CEQ published guidance for addressing and analyzing cumulative impacts under NEPA. CEQ's publication, *Considering Cumulative Effects Under the National Environmental Policy Act*, January 1997, provides additional guidance for conducting an effective and informative cumulative impacts analysis.

The baseline conditions at Kelly Field Annex and in the MOAs were discussed in **Chapter 3**. The potential for environmental consequences related to the Proposed Action and alternatives were addressed in **Chapter 4**. This section identifies and evaluates past, present, and reasonably foreseeable other projects, which could cumulatively affect environmental resources in conjunction with the Proposed Action. The ROI for cumulative analysis is the same as defined for each resource in **Chapter 4**. Actions identified in **Tables 5-1** and **5-2** would not interact with all resources; therefore, resources that could potentially result in a cumulative effect with the addition of the Proposed Action and alternatives are noted in **Tables 5-1** through **5-3**.

Assessing cumulative effects begins with defining the scope of other actions and their potential interrelationship with the Proposed Action or alternatives. Other activities or projects that coincide with the location and timetable of the Proposed Action and other actions are evaluated. Actions not identified in **Chapter 2** as part of the Proposed Action or alternatives but that could be considered as actions connected in time or space (40 CFR § 1508.25) may include projects that affect areas on or near the Kelly Field Annex or the MOAs.

An effort has been made to identify actions that are being considered or are in the planning phase at this time. To the extent that details regarding such actions exist and the actions have a potential to interact with the ADAIR proposal, these actions are included in this cumulative analysis. This approach enables decision-makers to have the most current information available in order that they can evaluate the potential environmental consequences of the Proposed Action.

5.2 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

Past, present, and reasonably foreseeable actions by the Air Force on JBSA-Lackland, Kelly Field Annex as well as in the region and MOAs were considered.

5.2.1 Air Force Actions

Recent past and ongoing military actions at Kelly Field Annex were considered as part of the baseline or existing condition in the ROI. Each project summarized in this section was reviewed to consider the implication of each action with the Proposed Action and alternatives. Potential overlap in the affected area and project timing were considered.

Kelly Field Annex is an active military installation that experiences continuous evolution of mission and operational requirements. All construction projects must comply with land use controls, which include safety and environmental constraints, which are outlined in the Draft Area Development Plan (JBSA, 2018). Kelly Field Annex, like other major military installations, requires new construction, infrastructure improvements, and general maintenance. Routine projects are environmentally cleared using the Air Force's Categorical Exclusion process (32 CFR § 989, Appendix B) and would continue to occur during operation of the Proposed Action. In addition to these routine projects, the past, present, and reasonably foreseeable future major Air Force projects anticipated to occur on the Base are listed in **Table 5-1**. Anticipated future off-base projects that may overlap in the potentially affected area or project timing with the Proposed Action were also considered and are discussed in **Sections 5.2.2** and **5.2.3** below.

Table 5-1
Past, Present, Reasonably Foreseeable Future Projects at Kelly Field Annex

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Past Actions				
Environmental Assessment of Installation Development at JBSA – Lackland, Texas	Installation development projects including demolition, construction, infrastructure improvement, and natural infrastructure management. Potential minor impacts to wetlands and 100-year floodplains, potential safety impacts from demolition of buildings previously used for storage or assembly of nuclear components for atomic weapons.	March 2013	Demolition and construction in the area where proposed ADAIR buildings are located.	Air Quality, Biological Resources, Water Resources, Land Use
Growdon Gate/Road Relocation and Property Acquisition EA	Relocate the Growdon Gate/Road to reduce conflicts between commercial traffic and the 433d Airlift Wing's mission and the acquisition of land to accommodate expansion planning needs.	2012	Improves potential access and reduces transportation conflicts to Kelly Field Annex.	Air Quality, Soils, Infrastructure, Transportation
Present Actions				
Chaff and Flares in Crystal North MOA Categorical Exclusion	Evaluation of the ability to expand chaff and flares in the Crystal North MOA for F-16 training.	2018	Use of chaff and flares is necessary for effective ADAIR training.	Airspace Management and Use, Air Quality

Table 5-1
Past, Present, Reasonably Foreseeable Future Projects at Kelly Field Annex

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Construction of Firefighter Training Facility	Construction of a single-story, 4,200-square-foot firefighter classroom training and storage facility across the street from the existing fire station (Building 1207). The facility would include space for training, briefing, testing, administration, equipment storage, and personnel lockers.	2018	Construction could potentially overlap with ADAIR implementation	Noise, Safety, Air Quality, Land Use
Modification of Crystal Operating Airspace	Proposed action would modify the existing Crystal MOA by updating the low-altitude airspace to 500 feet above ground level to allow for low-level flight training at high air speeds.	2021	The Crystal MOA is proposed for use by contract ADAIR.	Airspace Management and Use, Noise, Safety, Air Quality, Biological Resources, Water Resources, Soils, Land Use and Visual Resources, Socioeconomics, Environmental Justice and Protection of Children, Cultural Resources, Hazardous Materials/Wastes, Infrastructure, Transportation
Future Actions				
Construct new Air Traffic Control Tower Categorical Exclusion	Construction of a new 6,313-square-foot Air Traffic Control Tower and demolish Building 1160 existing control tower); new tower would meet Air Force siting requirements and structural, mechanical, and electrical components would be made to standard. A 10,000-square-foot lay down area for construction would be required.	2019	The air traffic control tower is central to the ADAIR mission, and construction would overlap with ADAIR implementation.	Airspace Management and Use, Noise, Safety, Air Quality, Water Resources, Soils, Land Use, Socioeconomics, Infrastructure

Table 5-1
Past, Present, Reasonably Foreseeable Future Projects at Kelly Field Annex

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Construct Nondestructive Inspection Shop	Renovation of building 932 or constructing a new 4,000-square-foot nondestructive inspection lab for inspection aircraft components.	2019	Renovation/ construction could potentially overlap with ADAIR implementation	Noise, Air Quality, Water Resources, Soils, Land Use, Socioeconomics
Addition and Alteration of Medical and Security Forces Facility	Construction of a 2,000-square-foot addition to the medical and security forces facility (Building 930) to support existing mission requirements.	2021	Construction could overlap with ADAIR implementation.	Noise, Safety, Air Quality, Water Resources, Soils, Socioeconomics, Hazardous Materials/Waste
Advanced Pilot Trainer T-X Program	Beddown of the Advanced Pilot Trainer System at JBSA – Randolph. The beddown would include 81 aircraft, 10 flight simulators, 200 permanent personnel, 60 temporary personnel over a 2-year period, demolition of some existing buildings, and new construction of additional buildings. Currently proposed RAN-1A MOA but has limited capacity, and use of RAN-2A, and Brady High and Low MOAs.	Currently under NEPA review. Delivery of first aircraft – November 2022; Initial Operational Capability of system July 2024.	Potential airspace conflicts with ADAIR	Airspace Management and Use, Noise, Safety, Air Quality
Repair Airfield Aprons	Replace approximately 45,175 square yards of deteriorated apron pavements; repair approximately 3,777 square yard of asphalt shoulder.	2023	Construction during ADAIR operations	Noise, Safety, Air Quality, Water Resources, Soils, Socioeconomics, Infrastructure and Transportation

Table 5-1
Past, Present, Reasonably Foreseeable Future Projects at Kelly Field Annex

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Airfield Support Unit Relocation from Port San Antonio to Kelly Field Annex	Relocate fire training pit and tower and demolition of buildings to provide infill opportunities for construction of new hangars and facilities to allow relocation of airfield support units from Port San Antonio to Kelly Field Annex.	2034 - 2038	ADAIR proposed Hangars 1610 and 1612 are leased from Port San Antonio; these facilities could be relocated.	Safety, Air Quality, Soils, Land Use, Infrastructure, Transportation
Construct Corrosion Control Facility	Convert the aircraft wash rack (Building 936) into a corrosion control facility. Facility would include space for paint preparation and drying, abrasive blasting room, booths for mixing and applying paint, tool storage, lockers, and administrative areas.	2024	Construction during ADAIR operations	Noise, Safety, Air Quality, Socioeconomics, Hazardous Materials/Waste

Notes:
ADAIR = adversary air; EA = environmental assessment; JBSA = Joint Base San Antonio; MOA = Military Operations Area; NEPA = National Environmental Policy Act

5.2.2 Nonfederal Actions

Nonfederal actions such as new development or construction projects occurring in the area surrounding Kelly Field Annex were considered for potential cumulative impacts. The Kelly Field Annex is located adjacent to and west of Port San Antonio. Port San Antonio is an approximately 1,900-ac complex of existing facilities for lease to private manufacturing and commercial/industrial firms. Some buildings have been leased back to the Air Force for their continued use. Major renovation and maintenance, primarily internal to existing buildings, is ongoing and expected to continue throughout ADAIR operations. A listing of past, present, and reasonably foreseeable future capital projects at Port San Antonio is provided in **Table 5-2**. No projects in Bexar County that would interact with the ADAIR Proposed Action or alternatives were identified.

Table 5-2
Nonfederal Past, Present, Reasonably Foreseeable Future Project

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Past/Present Actions				
Port San Antonio - Airfield Site Preparation	Demolition of obsolete building/roads north of Kelly Air Field for future hangar and workshop construction.	2016	New construction following demolition could interact with ADAIR implementation	Air Quality, Soils, Land Use, Socioeconomics
Port San Antonio - 36th Street Phase III-B	Construction of a 0.5-mile extension connecting Billy Mitchell Boulevard and General Hudnell Drive.	2017	Potential access for contract ADAIR personnel to proposed hangar facilities.	Infrastructure, Transportation
Texas Department of Transportation – US 90 Improvements	Improvements along US 90 from I-410 to Loop 13 (Military Drive) involving the design and construction of an elevated pedestrian walkway over US 90.	2016	Project adjacent to Lackland AFB and improved pedestrian mobility from the installation over US 90.	Air Quality, Infrastructure, Transportation
San Antonio Water System – Swiss Oaks By-Pass Project – Leon Creek North of US 90	Installation of 1.23 miles of sewer pipe and related infrastructure. The project is located along Leon Creek north of US 90.	2018	Project adjacent (north of US 90) to Lackland AFB and construction could overlap with ADAIR implementation	Air Quality, Infrastructure
San Antonio Water System – Western Watershed Sewer Relief Line – Projects 3 and 4: SW Military Drive to Quintana	Sewer project to relieve sewer capacity constraints. Involves replacement of 0.6 miles of sewer pipe and infrastructure. Parallels Leon Creek Greenway South between SW Military Drive and Quintana Road.	2018	Project adjacent to and south of Lackland AFB/Kelly Field Annex and construction could overlap with ADAIR implementation.	Air Quality, Infrastructure
San Antonio Water System – Multiple Sewershed Projects – Package 5	Part of a package of project at various locations, prioritized under a USEPA Consent Decree. Involves the rehabilitation of 1.3 miles of sewer pipe and related infrastructure located north of US 90 and Highway 151.	2018	Project near Kelly Field Annex and construction phase could overlap with ADAIR implementation.	Air Quality, Infrastructure

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Interaction with Resources
Future Actions				
Port San Antonio - Drainage Infrastructure	Construction of a 100-year storm capacity drainage channel connecting existing storm water detention infrastructure.	2018 – 2020	Construction during ADAIR implementation	Air Quality, Water Resources, Soils, Infrastructure
Texas Department of Transportation – Loop 1604 Widening	Project proposed to widen Loop 1604 to a four-lane divided highway west of Lackland Training Annex.	Currently under environmental review	Potential construction conflicts and traffic delays into and out of the Lackland AFB	Air Quality, Soils, Transportation

Notes:
ADAIR = adversary air; AFB = Air Force Base

5.3 CUMULATIVE EFFECTS ANALYSIS

The following analysis considers how projects identified in **Tables 5-1** and **5-2** could cumulatively result in potential environmental consequences with the Proposed Action.

5.3.1 Airspace Management and Use

Cumulative impacts to airspace from ADAIR operations, in addition to past, present, and reasonably foreseeable future actions is expected to be negligible. The construction of a new control tower would improve airspace management and result in a beneficial cumulative effect. There is the potential for T-X training operations to take place in the Brady High and Low MOAs. The addition of T-X training operations would initially increase the number of sorties and therefore, an increase in airspace use from JBSA-Randolph; however, the number of sorties would reduce over time as the T-38C aircraft are phased out and replaced with T-X aircraft. Training airspace capacity is sufficient and with schedule coordination, airspace would accommodate support for multiple Air Force training units. The Navy is planning an increase in pilot training in Kingsville 3 MOA with no foreseen end date. Cumulative impacts to airspace management are expected to be neglibible as a result of these increases in conjuction with the proposed ADAIR operations; implementation of the Proposed Action with additional proposed actions would require deconfliction through the scheduling process.

5.3.2 Noise

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off Kelly Field Annex would result in negligible to minor cumulative impacts to noise for the high-, medium-, and low noise scenarios. Several construction and demolition projects are proposed during the same period as the Proposed Action at Kelly Field Annex. Port San Antonio is proposing the construction of additional drainage infrastructure projects, and the San Antonio Water System is proposing several sewer line projects. In addition, the T-X project is proposing approximately 5 new construction and 14 renovation projects to support T-X training operations at JBSA-Randolph; however, since construction noise is localized to the construction sites and would be short-term, no long-term cumulative noise impacts are anticipated. The addition of ADAIR aircraft and future proposed actions could increase the number of sonic booms; however, this increase is not expected to be significant in the airspace compared to what currently exists; therefore, no cumulative effect to noise is expected in the airspace.

5.3.3 Safety

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off Kelly Field Annex would follow existing safety procedures and policies for ground and flight operations. Safety zones would not change under contract ADAIR. Contract personnel would be trained and required to follow safety procedures in accordance with the Flight Crew Information File and established aircraft flight manuals as implemented by the contract. Training sorties would increase by approximately 20 percent during the transition and implementation of the T-X project. This would pose a cumulative increased risk to flight safety when added to the Proposed Action; however, through compliance with the BASH plan and flight safety rules, the cumulative impact would be minimized. As such, no cumulative impact to ground and flight safety is expected with implementation of the Proposed Action. The construction of a new ATC tower would improve safety conditions and result in a beneficial cumulative impact to ground and flight safety.

5.3.4 Air Quality

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex would result in negligible cumulative impacts to air quality. For all pollutants, the Proposed Action emissions at the installation represent a small fraction of emissions for Bexar County and the annual emission increase was considered less than significant. With the addition of ongoing demolition and construction projects in the area, including the San Antonio Water System projects off installation, PM_{10} emissions could increase, but those increases would be short in duration and the incremental impact to air quality would be negligible.

Training in the Brady Low MOA, the only MOA that supports ADAIR sorties below the mixing height (3,000 ft AGL) (see **Section 4.2.1**), would result in no impact to air quality. With the addition of future T-X operations at the Brady High and Low MOAs, there could be an increase in cumulative air quality impacts. The increase in air emissions would be most noticeable during the T-38C aircraft training transition to T-X aircraft training; however, this increase in air emissions, primarily during 2023 through 2025, is expected to be negligible as the T-38C aircraft are retired and replaced by T-X aircraft. Overall, no incremental change to air quality is expected when adding the Proposed Action to past, present, and reasonably foreseeable future actions; therefore, cumulative impacts to air quality is expected to be negligible.

5.3.5 Biological Resources

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex would result in negligible cumulative impacts to biological resources. While construction and demolition activities at Lackland AFB and Kelly Field Annex would be occurring during ADAIR operations, some wildlife species may be displaced, but it is anticipated those species would return once construction is completed. There are no projected impacts to threatened and endangered species. When added to past, present, and foreseeable future action, the Proposed Action would result in an increased risk of aircraft bird and other wildlife strikes. Compliance with the Kelly Field Annex BASH prevention program would reduce the potential cumulative risk of additional sortie operations associated with aircraft bird and other wildlife conflicts. No significant cumulative effects on biological resources is expected.

5.3.6 Water Resources

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex would result in no cumulative impacts to water resources since use of existing facilities is proposed and no new construction would take place. Cumulative impacts to water resources from contract ADAIR activities in the airspace would be dependent on the MOA be used. For instance, the Proposed Action would increase the effects of chaff and flare use by 32 percent in the Crystal and Laughlin MOAs. This increase could incrementally increase the deposition of chaff or flare material into water bodies. Water resources would not be affected by chaff and flares in the Brady Low and High MOAs. Cumulative impacts to water resources from proposed ADAIR activities would not be significant.

5.3.7 Soils

The Proposed Action, in addition to the past, present, and reasonably foreseeable future actions would have negligible cumulative effects to soils during new construction and demolition activities. BMPs and compliance with permits would minimize the cumulative effect on soils. The Proposed Action would result in the release of additional chaff from current conditions; however, no direct effects to soils are expected; therefore, no cumulative effects to soils from the Proposed Action when added to the past, present, and reasonably foreseeable future projects are anticipated.

5.3.8 Land Use and Visual Resources

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex are consistent with existing land uses; therefore, no cumulative impacts to land use are anticipated. There are several maintenance and building modification projects currently occurring on the base; however, the modifications associated with Building 917 and Hangars 1610 and 1612 under all three alternatives include interior modifications and would not create a cumulative change to the surrounding land use or the existing visual landscape.

5.3.9 Socioeconomics

The Proposed Action, as well as past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex would not result in an adverse cumulative impact to the region’s population, employment, housing, or educational opportunities. Construction and demolition projects would result in a cumulative beneficial impact as local sales and payroll taxes would increase. The Proposed Action would increase annual expenditures in the local economy up to approximately $18 million at the installation (Headquarters Air Combat Command Acquisition Management and Integration Center, 2018). This economic boost to the region represents a beneficial impact to the local economy. The ADAIR program contracts are expected to be awarded at 11 additional Air Force Bases nationwide over the next few years. With each additional installation implementing the ADAIR program, expenditures associated with the purchase of additional fighter aircraft, annual maintenance costs, and additional expenditures to support the program, would result in a major beneficial cumulative socioeconomic impact for the nation’s economy.

5.3.10 Environmental Justice and Protection of Children

The Proposed Action, as well as past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex are not expected to have a disproportionate cumulative impact to minority and low-income populations or children from increased noise.

5.3.11 Cultural Resources

The Proposed Action, as well as past, present, and reasonably foreseeable future actions on and off the Kelly Field Annex are not anticipated to result in incremental cumulative impacts to cultural resources, archaeological resources, historic resources, or Native American Traditional Cultural Properties.

5.3.12 Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances

The Proposed Action, as well as past, present, and reasonably foreseeable future actions on and off Kelly Field Annex are not anticipated to result in significant cumulative impacts to the management of hazardous materials and wastes, contaminated sites, and toxic substances. Storage and quantity of jet fuels, solvents, oil, and other hazardous materials supporting ADAIR operations would increase in addition to past, present, and foreseeable future projects; however, this increase would result in a minor cumulative effect. The proposed ADAIR project in addition to other proposed projects would require compliance with the 149 FW *Hazardous Waste Management Plan*. The plan ensures that procedures for managing hazardous waste are in accordance with federal, state, and local regulations; therefore, no cumulative impacts to the storage and disposal of hazardous waste is expected. No environmental contamination is known to occur within the project area, and no impact on contaminated sites would occur. The addition of the proposed ADAIR project and foreseeable future projects would be required to adhere to the *Asbestos Management and Operations Plan* for any modifications to existing structures. No significant adverse cumulative impacts to hazardous materials and wastes, contaminated sites, and toxic substances are expected.

5.3.13 Infrastructure, Transportation, and Utilities

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off Kelly Field Annex, is not anticipated to result in significant cumulative impacts to infrastructure, transportation, and utilities. No additional burden on infrastructure is expected that would result in a cumulative impact to what is already being provided or would be provided for future actions. San Antonio water projects currently being constructed in and around the Kelly Field Annex would result in a beneficial cumulative impact to the existing infrastructure through enhancement of sewer capacity in an area where there is new development in Bexar County. While the Proposed Action would add 55 contracted personnel, the increase of privately owned vehicles travelling to and from the installation would not result in a significant cumulative impact. The existing transportation networks are adequate to handle additional peak hour traffic. The proposed facilities for ADAIR operations under the Proposed Action and alternatives are currently being serviced for gas, electric, water/wastewater, and solid waste management.

5.4 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

CEQ regulations (Section 1502.16) specify that analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Attention should be given to impacts that narrow the range of beneficial uses of the environment in the long term or pose a long-term risk to human health or safety. This section evaluates the short-term benefits of the proposed project compared to the long-term productivity derived from not pursuing the Proposed Action and alternatives.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. For example, short-term effects could include localized disruptions from construction. Environmental commitments and BMPs in place for each project should reduce potential impacts or disruptions. Under the Proposed Action, these short-term uses would have a negligible cumulative effect.

The Proposed Action involves providing dedicated contract ADAIR sorties to employ adversary tactics within existing Kelly Field Annex airspace. There would be no short-term effects to the airspace used by ADAIR activities and, therefore, would not adversely affect the long-term productivity and future us of the MOAs proposed for ADAIR use. The Proposed Action also includes elements affecting the Base such as ADAIR aircraft, facilities, maintenance, and personnel. Under the Proposed Action, there would be no new construction. Existing Kelly Field Annex facilities would be used with some interior modifications. While other maintenance activities would be occurring in the vicinity of the Proposed Action facilities, construction associated with these modifications represent a negligible effect to the short-term use of construction labor, goods, and services. No negative effects are expected from the Proposed Action short-use or long-term productivity.

5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects result primarily from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

The Proposed Action would use existing airspace to conduct ADAIR activities and would not result in an irreversible and irretrievable commitment of airspace resources; however, the Proposed Action calls for an additional 1,130 sorties which represent an increase of 32 percent in the number of operations. As such, flight operations and training would result in the consumption of additional fuel which increases the irreversible and irretrievable commitment of fuels. The addition of 55 contract personnel to support the Proposed Action also would create additional fuel consumption from daily commute travel to and from Kelly Field Annex. Consumption of fuel associated with the Proposed Action, in addition to the total use of available fuels, is expected to result in a negligible decrease to the overall supply of regional petroleum resources. No significant irreversible or irretrievable commitment of resources is anticipated from implementing the Proposed Action.

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APPENDICES

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APPENDIX A

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

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Table of Contents

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Appendix A-1

Interagency and Intergovernmental Coordination for Environmental Planning – DOPAA

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Mark Wolfe
Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Dear Mr. Wolfe

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

Pursuant to 36 CFR Sections 800.4(a) and (b), we request your assistance defining the Area of Potential Effects and information on any historic properties located therein that may be affected by our undertaking. A summary of the Description of Proposed Action and Alternatives (DOPAA) and location maps are attached for your review. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

To ensure the U.S. Air Force has sufficient time to consider your input in the preparation of the Draft EA, and for compliance with Section 106 of the National Historic Preservation Act, please provide written questions or comments at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:34:13 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Mr. Adam Zerrenner
Field Supervisor
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, TX 78758

Dear Mr. Zerrenner

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

The Proposed Action is to contract the support of up to 1,200 ADAIR flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Further, pursuant to Section 7 of the Endangered Species Act, we request additional information on what listed, proposed, and candidate species or designated or proposed critical habitats may be in the action area. This information and your comments on the Proposed Action will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide additional information and your written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:35:01 -05'00'
EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. William Nelson, Sr.
Chairman, Comanche Nation, Oklahoma
HC-32, Box 1720
584 NW Bingo Road, Highway 281
Lawton, OK 73520

Dear Chairman William Nelson, Sr.

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Comanche Nation, Oklahoma may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:50:31 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Arthur "Butch" Blazer
President, Mescalero Apache Tribe of the Mescalero Reservation
P.O. Box 227
Mescalero, NM 88340

Dear President Blazer

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Mescalero Apache Tribe of the Mescalero Reservation may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

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EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Mr. Russell Martin
President, Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4499

Dear President Russell Martin

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Tonkawa Tribe of Indians of Oklahoma may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:49:37 -05'00'

EDWARD L. ROBERSON, P.E.

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland, TX 78236-5645

Ms. Terri Parton
President, Wichita and Affiliated Tribes
P.O. Box 729
Andarko, OK 73005

Dear President Terri Parton

The purpose of this letter is to give you an opportunity to review and comment on a proposed action at Joint Base San Antonio (JBSA) TX, pursuant to Section 106 of the National Historic Preservation Act (NHPA), in which the Wichita and Affiliated Tribes may have an interest.

The Proposed Action is to contract the support of up to 1,200 Adversary Air (ADAIR) flights by individual aircraft at JBSA-Kelly Field Annex. Contract ADAIR would use different types of fighter aircraft with acceptable capabilities to support training requirements. An estimated seven (7) contractor aircraft would be stationed at JBSA-Kelly Field Annex. Training activities would use airspace located in Texas near JBSA-Kelly Field Annex (see attachment). JBSA-Kelly Field Annex has existing facilities to support the stand-up of the ADAIR mission. These facilities would be available for use, and would require minimal modification to be made ready for the ADAIR mission.

A summary of the Description of Proposed Action and Alternatives (DOPAA) is attached for your review. Pursuant to Section 106 of the NHPA, implementing regulations at 36 CFR Part 800, and Department of Defense Instruction 4710.02 section 6, DoD Interactions with Federally-Recognized Tribes, we request your review and input concerning this Proposed Action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Tribe chooses to comment on this project, the U.S. Air Force will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Please provide information, your written questions or comments, or requests for additional information at your earliest convenience.

This will ensure the U.S. Air Force has sufficient time to fully consider them when preparing the Draft Environmental Assessment. Address all questions and comments to Mr. Arlan Kalina, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to arlan.kalina@us.af.mil.

For questions, please email or call Mr. Kalina at (210) 652-7461.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:48:06 -05'00'

EDWARD L. ROBERSON, P.E.

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1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Diane Bartlett
Bexar County Public Works
233 North Pecos Street, Suite 420
San Antonio, TX 78207

Dear Ms. Bartlett

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:23:18 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Stephen Brooks, Chief
Regulatory Branch
U. S. Army Corps of Engineers, Fort Worth District
819 Taylor Street
Fort Worth, TX 76102

Dear Mr. Brooks

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

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questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:23:59 -05'00'
EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

John E. Cantu, Environmental Manager
Municipal Plaza Building
114 W. Commerce, 2nd Floor
P.O. Box 839966
San Antonio, TX 78283-3966

Dear Mr. Cantu

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:24:36 -05'00'
EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Tiffany Harris
Public Relations Coordinator
Alamo Area Council of Governments
8700 Tesoro Drive #700
San Antonio, TX 78217

Dear Ms. Harris

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:25:13 -05'00'
EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Russell Hooten, Habitat Assessment Biologist
Wildlife Division, Wildlife Habitat Assessment Program
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744-3291

Dear Mr. Hooten

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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In accordance with Executive Order 12372, *Intergovernmental Review of Federal Programs*, we request your participation and review of the attached Description of Proposed Action and Alternatives (DOPAA) summary. Your comments will help us develop the scope of our environmental review. The U.S. Air Force anticipates publishing the Draft EA in January 2019 and the Final EA by March 2019.

Please provide written questions or comments on the attached DOPAA summary at your earliest convenience but no later than 35 days from the date of this correspondence. Address all

questions and comments to Mr. Jock Flores, 502 CES/CEIEA, 1555 Gott St, JBSA Lackland TX 78236-5645. Comments are encouraged to be sent by email to jock.flores@us.af.mil.

For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:26:17 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Richard A. Hyde, PE
Executive Director
TCEQ
Mail Code 122, P.O. Box 13087
Austin, TX 78711-3087

Dear Mr. Hyde

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:27:07 -05'00'
EDWARD L. ROBERSON, P.E.

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Anne L. Idsal, Administrator
USEPA Region 6
1445 Ross Avenue, Suite 1200
Mail Code: 6RA
Dallas, TX 75202-2733

Dear Ms. Idsal

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:28:58 -05'00'
EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Patrice Melancon, PE, CFM
Watershed Engineering Manager
San Antonio River Authority
100 East Guenther Street
San Antonio, TX 78204

Dear Ms. Melancon

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:29:45 -05'00'
EDWARD L. ROBERSON, P.E.

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

NEPA Coordinator
TCEQ
P.O. Box 13087
Austin, TX 78711-3087

Dear Sir/Madam

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:30:23 -05'00'
EDWARD L. ROBERSON, P.E.

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Ross Richardson
Branch Chief
Federal Emergency Management Agency
FRC 800 North Loop 288
Denton, TX 76209-3698

Dear Mr. Richardson

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For questions, please email or call Mr. Flores at (210) 671-3944.

Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:32:44 -05'00'
EDWARD L. ROBERSON, P.E.

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DEPARTMENT OF THE AIR FORCE
502D AIR BASE WING
JOINT BASE SAN ANTONIO

September 19, 2018

Mr. Edward L. Roberson, P.E.
Deputy, 802d Civil Engineer Squadron
1555 Gott Street
JBSA Lackland TX 78236-5645

Michael Segner, CFM
NFIP State Coordinator
Texas Water Development Board
1700 North Congress Avenue
Austin, TX 78701

Dear Mr. Segner

Joint Base San Antonio (JBSA) has initiated the development of an Environmental Assessment (EA) to support a proposal by the U.S. Air Force and Headquarters Air Combat Command to provide Combat Air Forces contract Adversary Air (ADAIR) support at JBSA-Kelly Field Annex TX. ADAIR support is needed to address shortfalls in combat readiness and provide the necessary capability and capacity to employ adversary tactics across the training spectrum from basic fighter maneuvers to high-end, advance combat training missions.

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Sincerely

ROBERSON.EDWARD.LEWIS.1124911636 Digitally signed by ROBERSON.EDWARD.LEWIS.1124911636 Date: 2018.09.19 18:33:21 -05'00'

EDWARD L. ROBERSON, P.E.

Attachment:
1. DOPAA Summary

Attachment 1: DOPAA Summary

To accomplish the United States Air Force's (Air Force) mission, it is critical that combat pilots, and the Airmen supporting them, adequately train to attain proficiency on tasks they must execute during times of war and further to sustain this proficiency as they serve in the Air Force. Increasingly, fighter pilots of the Combat Air Force (CAF) have been operating at degraded levels of proficiency and training readiness due to diminishing fiscal resources. Along with insufficient budgets to support the flying hours/training requirements needed by CAF pilots, they have also been supporting adversary air (ADAIR) flying missions, which have minimal training value to the CAF pilots themselves. ADAIR sorties simulate an opposing force that provide a necessary and realistic combat environment during CAF training missions. Flying these ADAIR sorties requires the use of potential adversaries' tactics and procedures that may differ significantly from CAF tactics and procedures; therefore, ADAIR sorties provide minimal CAF training while taking up valuable flying hours that could otherwise be spent on core training tasks. Contract ADAIR would provide the Air Force another way to fill ADAIR sorties, improve the quality of training and readiness of CAF pilots, and allow the Air Force to recapitalize other valuable assets and training time.

The Air Force is proposing to provide dedicated contract ADAIR sorties for CAF training at Joint Base San Antonio – Lackland, Kelly Field Annex (**Figure 1**), to address shortfalls in F-16 pilot training and production capability. The Proposed Action at Kelly Field Annex would include the establishment of an estimated 46 contracted maintainers and 9 contracted pilots who would operate an estimated seven contractor aircraft to fly an estimated 1,200 annual sorties in support of the 149th Fighter Wing at Kelly Field Annex. This number of contract ADAIR sorties also includes sorties expected for aircraft leaving for or returning from either maintenance or other deployments. Contract ADAIR would fly up to a projected 5 percent of the estimated 1,200 sorties during environmental night hours when the effects of aircraft noise are accentuated (10:00 pm to 7:00 am local time).

Kelly Field Annex has existing facilities to support the Proposed Action. The proposed facilities are available for use and require minimal modification. They are located around the existing airfield and runway and include the necessary ramp space; maintenance space, operational space; petroleum, oil, and lubricants storage; runway access; and associated parking to support the contract ADAIR mission. Kelly Field Annex has three options for providing proposed operations facilities which include operations and aircraft maintenance functions (**Figures 2** and **3**). Under Option 1, both Operations and Maintenance office and hangar space would be consolidated in Hangar 1612 with aircrew briefings in Building 917. Option 2 is similar to Option 1, but Operations and Maintenance would instead be consolidated in Hangar 1610 with aircrew briefings occurring in Building 917. Under Option 3, Operations would be integrated with the 182d Fighter Squadron in Building 917, and maintenance space would be located in Hangar 1610. Under all three options, aircraft would be parked on the East Ramp near Hangars 1610 and 1612. Hangars 1610 and 1612 are owned by Port San Antonio and leased by the Air Force.

CAF training activities utilize special use airspace proximate to Kelly Field Annex. Special use airspace includes Military Operations Areas (MOAs), which provide airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The primary operational airspace that would be used by contract ADAIR aircraft includes the Crystal and Laughlin MOAs located approximately 75 miles southwest of Kelly Field Annex (**Figure 4**). Other airspace available for use by ADAIR missions includes the Kingsville 3 MOA located approximately 80 miles south-southeast of Kelly Field Annex and the Brady MOAs located approximately 110 miles north-northwest of Kelly Field Annex. Kelly Field Annex and the surrounding MOAs provide a critical venue to train F-16 pilots. No airspace modifications would be required for contract ADAIR as part of the Proposed Action.

Contract ADAIR aircraft would employ chaff and flares (e.g., RR-188 chaff and M206 flares or similar) during 100 percent of their training sortie operations on the Crystal and Crystal North MOAs; Laughlin 2, Laughlin 3 Low, and Laughlin 3 High MOAs; and Kingsville 3 MOA. Chaff and flares would not be used in the Brady MOAs. Chaff and flares can be dispensed in the airspace without altitude restrictions. Chaff and flares are the principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems.

Figure 1. Location of Joint Base San Antonio-Lackland, Kelly Field Annex.

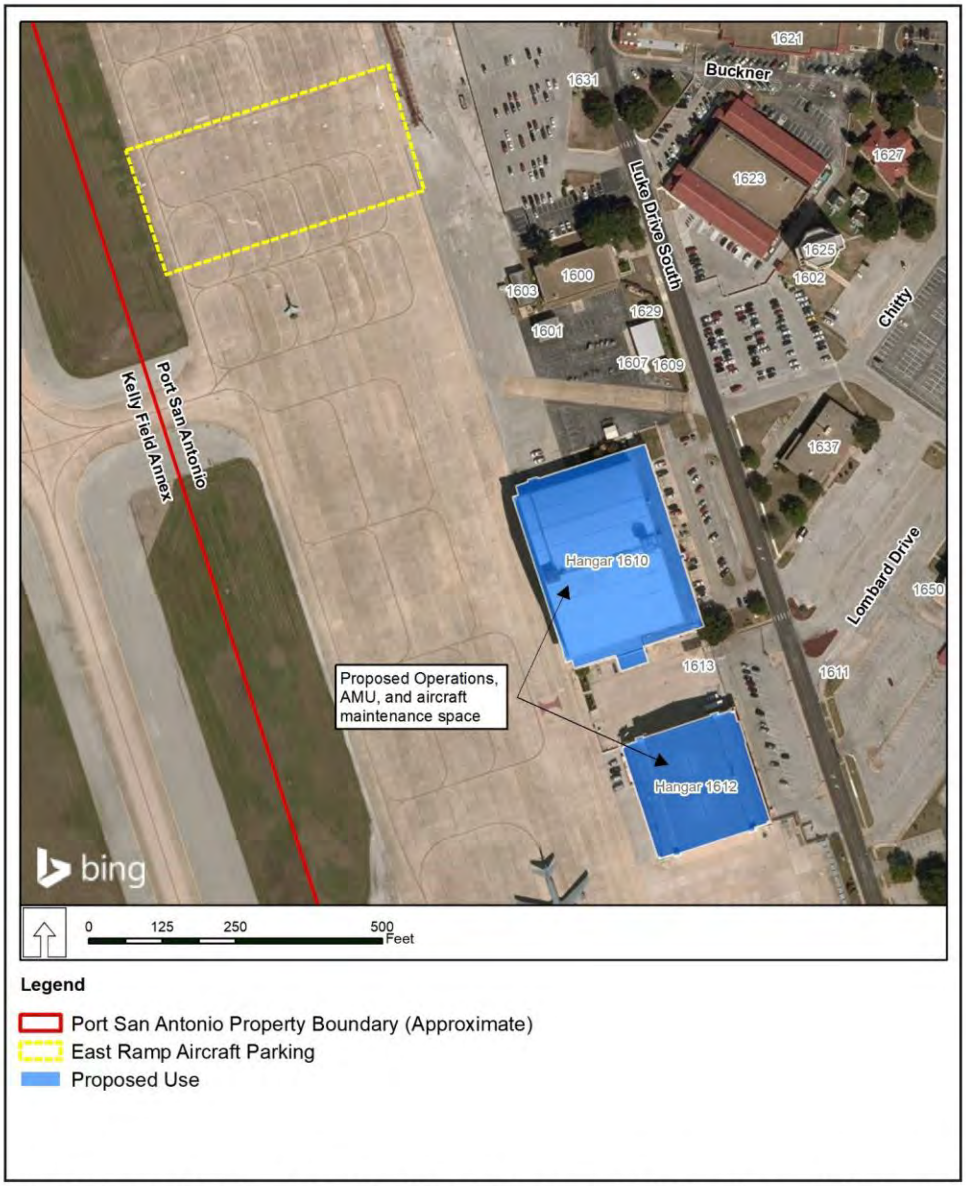

Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space at Hangars 1612 and 1610 and Aircraft Parking on the East Ramp.

Figure 3. Proposed Location for Operations Space at Building 917.

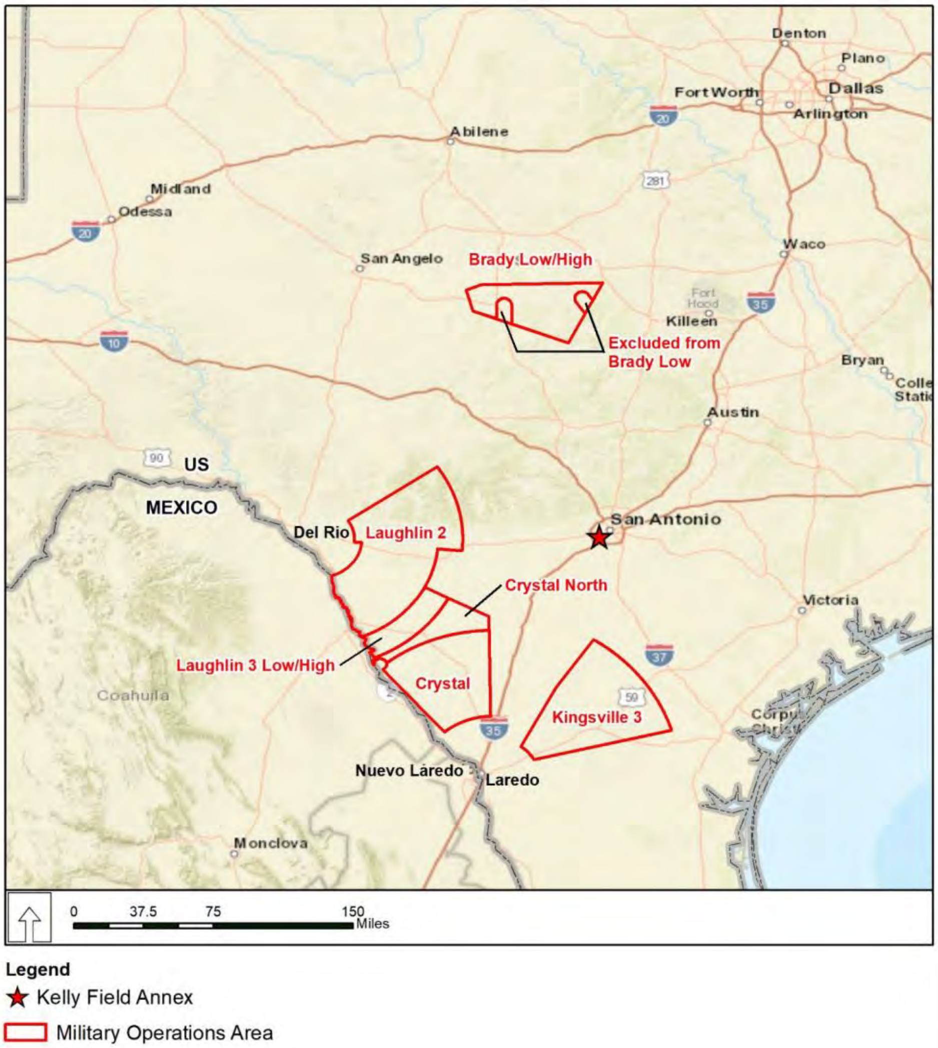

Figure 4. Military Operations Areas Proposed for Contract Adversary Air Sorties

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Interagency and Intergovernmental Coordination and Consultations Mailing List

Mark Wolfe, Executive Director
Texas Historical Commission
P.O. Box 12276
Austin, TX 78711

Adam Zerrenner, Field Supervisor
U.S. Fish and Wildlife Service
10711 Burnet Road, Suite 200
Austin, TX 78758

Honorable William Nelson, Sr., Chairman
Comanche Nation, Oklahoma
584 NW Bingo Road
8 Miles North of Lawton, Highway 281
Lawton, OK 73507

Honorable Arthur "Butch" Blazer, President
Mescalero Apache Tribe of the Mescalero Reservation, New Mexico
P.O. Box 227
Mescalero, NM 88340

Honorable Russell Martin, President
Tonkawa Tribe of Indians of Oklahoma
1 Rush Buffalo Road
Tonkawa, OK 74653-4449

Honorable Terri Parton, President
Wichita and Affiliated Tribes
PO Box 729
1¼ Mile North on Highway 281
Andarko, OK 73005

Diane Bartlett, P.E., Civil Engineer
Bexar County Public Works
233 North Pecos Street, Suite 420
San Antonio, TX 78207

Stephen Brooks, Chief, Regulatory Branch
U. S. Army Corps of Engineers
Fort Worth District
819 Taylor Street
Fort Worth, TX 76102

John E. Cantu, Environmental Manager
Municipal Plaza Building
114 W. Commerce, 2nd Floor
P.O. Box 839966
San Antonio, TX 78283-3966

Tiffany Harris, Communications Coordinator
Alamo Area Council of Governments
8700 Tesoro Drive #700
San Antonio, TX 78217

Russell Hooten, Habitat Assessment Biologist
Wildlife Division, Wildlife Habitat Assessment Program
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, TX 78744-3291

Toby Baker, Executive Director
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1445 Ross Avenue, Suite 1200
Mail Code: 6RA
Dallas, TX 75202-2733

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Manager, Watershed Engineering Department
San Antonio River Authority
100 East Guenther Street
San Antonio, TX 78204

NEPA Coordinator
TCEQ
P.O. Box 13087
Austin, TX 78711-3087

Ross Richardson, Branch Chief
Federal Emergency Management Agency
FRC 800 North Loop 288
Denton, TX 76209-3698

Michael Segner, CFM
NFIP State Coordinator
Texas Water Development Board
1700 North Congress Avenue
Austin, TX 78701

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Appendix A-2

Agency and Government-to-Government Comment Letters

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

October 10, 2018

Mr. Jock Flores
502 CES/CEIEA
1555 Gott St.
JBSA Lackland, Texas 78236-5645

Via: E-Mail

Re: TCEQ NEPA Request #2018-265, DOPAA Summary for Kelly Field Annex Combat Air Force Adversary Air; San Antonio, Texas, Bexar County

Dear Mr. Flores:

The Texas Commission on Environmental Quality (TCEQ) has reviewed the above-referenced project and offers the following comments:

The proposed action is located in Bexar County, which is designated nonattainment for the ozone National Ambient Air Quality Standards (NAAQS) with a classification of marginal, effective September 24, 2018. General Conformity regulations under 40 CFR Part 93 apply one year after designation, or on September 24, 2019 for Bexar County. Actions that commence before that date do not have to meet the new conformity requirements. However, actions that commence on or after that date will have to meet the requirements for the area's new designation.

Volatile organic compounds (VOC) and nitrogen oxides (NOX) are precursor pollutants that lead to the formation of ozone. Once applicable, a general conformity demonstration may be required when the total projected direct and indirect VOC or NOX emissions from an applicable action are equal to or exceed the de minimis emissions level, which is 100 tons per year for ozone NAAQS marginal nonattainment areas.

The Office of Water has no comment on this project.

Any debris or waste disposal should be at an appropriately authorized disposal facility.

Thank you for the opportunity to review this project. If you have any questions, please contact the agency NEPA Coordinator, at (512) 239-3500 or NEPA@tceq.texas.gov.

Sincerely,

Ryan Vise
Division Director
Intergovernmental Relations

P.O. Box 13087 • Austin, Texas 78711-3087 • 512-239-1000 • tceq.texas.gov

Subject: RE: TPWD Review (#40776) Proposed Combat Air Forces contract Adversary Air (ADAIR) Support at JBSA-Kelly Field Annex, Bexar County

From: Russell Hooten [redacted]
Sent: Tuesday, October 16, 2018 1:16 PM
To: FLORES, JOCK GS-12 USAF AETC 502 CES/CENPL [redacted]
Cc: Russell Hooten [redacted]
Subject: [Non-DoD Source] TPWD Review (#40776) Proposed Combat Air Forces contract Adversary Air (ADAIR) Support at JBSA-Kelly Field Annex, Bexar County

Mr. Flores,

Texas Parks and Wildlife Department (TPWD) has received the request for comments regarding the development of an Environmental Assessment for the proposed action referenced in the Subject line above. Following a review of the documentation and project description provided, TPWD - Wildlife Habitat Assessment Program does not anticipate significant adverse impacts to rare, threatened, or endangered species, or other fish and wildlife resources. Provided the current project plans do not change, TPWD has no further comment and considers coordination to be complete. Please note it is the responsibility of the project proponent to comply with all federal, state, and local laws that protect fish and wildlife.

Sincerely,

Russell

Russell Hooten

Wildlife Habitat Assessment Program

TPWD-Wildlife Division

6300 Ocean Drive, NRC 2501

Unit 5846

Corpus Christi, TX 78412

[redacted]

[redacted] <mailto:[redacted]>

1

APPENDIX B

NOISE

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Appendix B-1

Sound, Noise, and Potential Effects

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B.1 SOUND, NOISE, AND POTENTIAL EFFECTS

B.1.1 Introduction

This appendix discusses sound and noise and their potential effects on the human and natural environment. Section B.1.2 provides an overview of the basics of sound and noise. Section B.1.3 defines and describes the different metrics used to describe noise. The largest section, Section B.1.4, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. Section B.1.5 contains the list of references cited. Appendix B-2 contains data used in the noise modeling process. A number of noise metrics are defined and described in this appendix. Some metrics are included for the sake of completeness when discussing each metric and to provide a comparison of cumulative noise metrics.

B.1.2 Basics of Sound

B.1.2.1 Sound Waves and Decibels

Sound consists of minute vibrations in the air that travel through the air and are sensed by the human ear. **Figure B-1** is a sketch of sound waves from a tuning fork. The waves move outward as a series of crests where the air is compressed and troughs where the air is expanded. The height of the crests and the depth of the troughs are the amplitude or sound pressure of the wave. The pressure determines its energy or intensity. The number of crests or troughs that pass a given point each second is called the frequency of the sound wave.

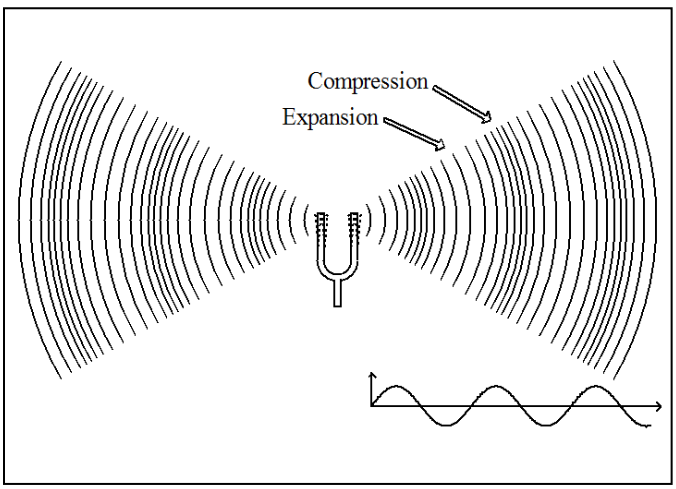


Figure B-1. Sound Waves from a Vibrating Tuning Fork.

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 and is related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- Duration or the length of time the sound can be detected.

The loudest sounds that can be comfortably heard by the human ear have intensities a trillion times higher than those of sounds barely heard. Because of this vast range, it is unwieldy to use a linear scale to represent the intensity of sound. As a result, a logarithmic unit known as the decibel (abbreviated dB) is used to represent the intensity of a sound. Such a representation is called a sound level. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure B-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, the temperature, and the humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover) and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

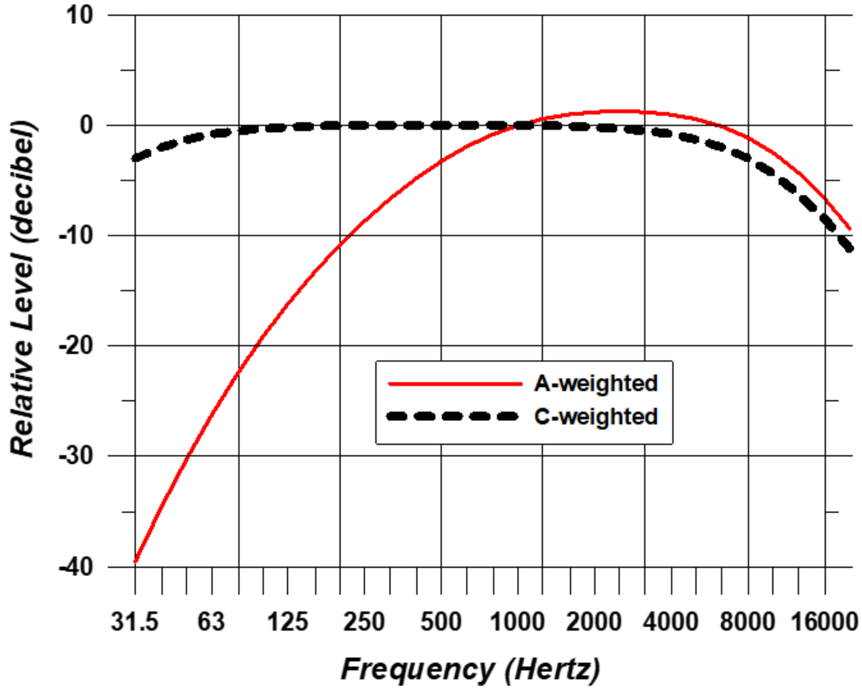
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness. This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 Hz to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure B-1**, but contain a mix, or spectrum, of many frequencies.

Sounds with different spectra are perceived differently even if the sound levels are the same. Weighting curves have been developed to correspond to the sensitivity and perception of different types of sound. A-weighting and C-weighting are the two most common weightings. These two curves, shown on **Figure B-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000 to 4,000 Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt, and can cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure B-2. Frequency Characteristics of A- and C-Weighting.

B.1.2.2 Sound Levels and Types of Sounds

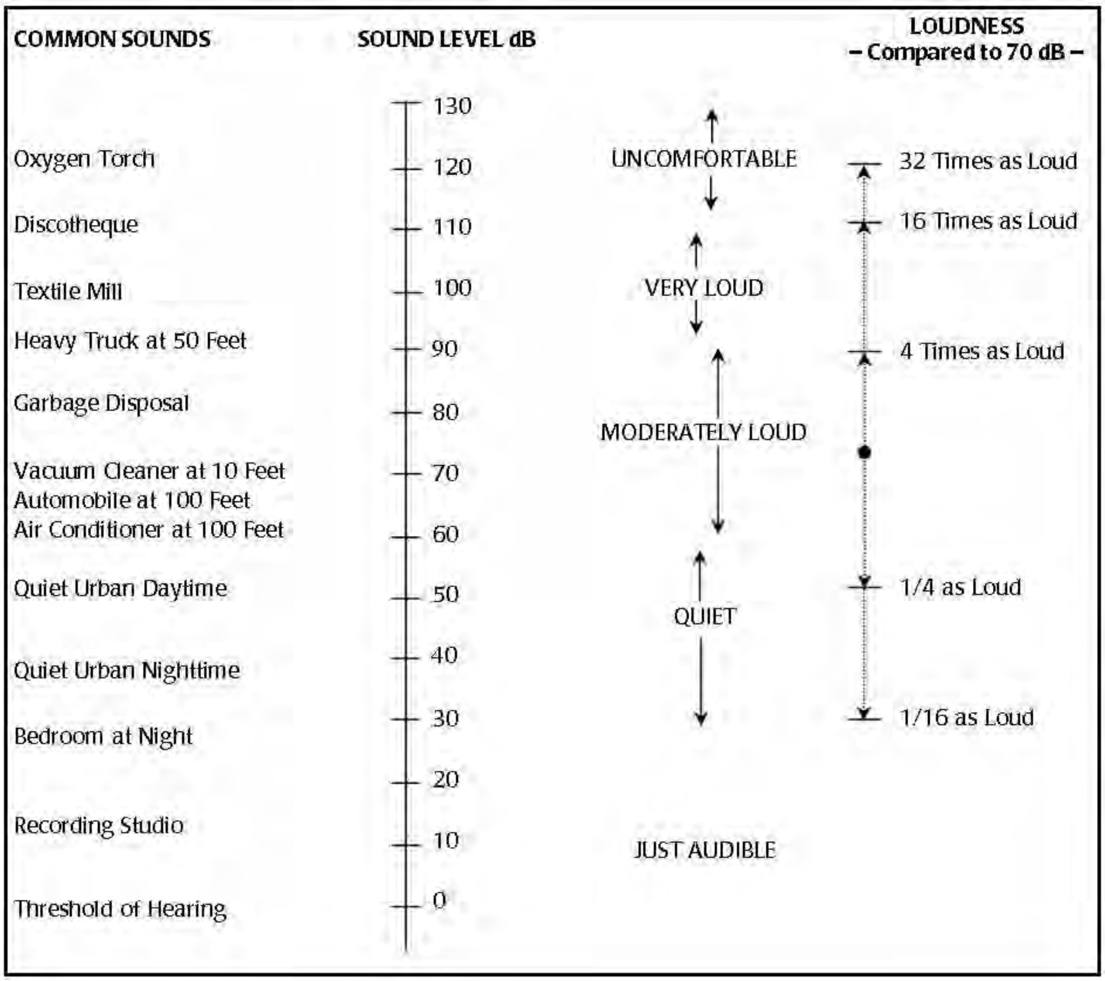
Most environmental sounds are measured using A-weighting. They're called A-weighted sound levels, and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer to A weighted sound levels.

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (USEPA, 1978).

Figure B-3 shows A-weighted sound levels from common sources. Some sources, like the air conditioner and vacuum cleaner, are continuous sounds whose levels are constant for some time. Some sources, like the automobile and heavy truck, are the maximum sound during an intermittent event like a vehicle pass-by. Some sources like "urban daytime" and "urban nighttime" are averages over extended periods. A variety of noise metrics have been developed to describe noise over different time periods. These are discussed in detail in Section B.1.3.

Aircraft noise consists of two major types of sound events: flight (including takeoffs, landings and flyovers), and stationary, such as engine maintenance run-ups. The former is intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths, in local air traffic patterns around the airfield, and in areas near aircraft parking ramps and staging areas. As aircraft climb, the noise received on the ground drops to lower levels, eventually fading into the background or ambient levels.

Impulsive noises are generally short, loud events. Their single-event duration is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during rail-yard shunting operations, and riveting. Examples of high-energy impulsive sounds are quarry/mining explosions, sonic booms, demolition, and industrial processes that use high explosives, military ordnance (e.g., armor, artillery and mortar fire, and bombs), explosive ignition of rockets and missiles, and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (American National Standards Institute [ANSI], 1996).



Sources: Harris 1979.

Figure B-3. Typical A-weighted Sound Levels of Common Sounds.

B.1.3 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other, and with their effects, in a standard way. There are a number of metrics that can be used to describe a range of situations, from a particular individual event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis.

B.1.3.1 Single Events

Maximum Sound Level (L_{max})

The simplest metric is the A-weighted level, which is appropriate by itself for constant noise such as an air conditioner. The highest A-weighted sound level measured during a single event in which the sound changes with time is called the maximum A-weighted sound level or Maximum Sound Level and is abbreviated L_{max}. The L_{max} is depicted for a sample event on **Figure B-4**.

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted "slow" response. L_{max} is important in judging if a noise event will interfere with conversation, television or radio listening, or other common activities. Although it provides some measure of the event, it does not fully describe the noise, because it does not account for how long the sound is heard.

Peak Sound Pressure Level (L_{pk})

The Peak Sound Pressure Level is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds, and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the US Department of Defense (DOD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level (SEL)

Sound Exposure Level combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure B-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.

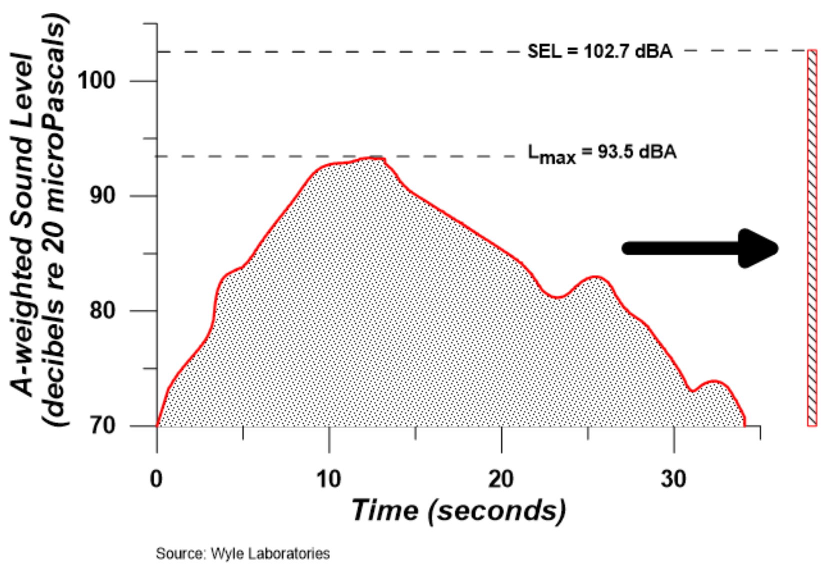


Figure B-4. Example Time History of Aircraft Noise Flyover.

Aircraft noise varies with time. During an aircraft overflight, noise starts at the background level, rises to a maximum level as the aircraft flies close to the observer, then returns to the background as the aircraft recedes into the distance. This is sketched on **Figure B-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time, but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

The single event metrics commonly used to assess supersonic noise are overpressure in psf and C-Weighted Sound Exposure Level (CSEL). Overpressure is the peak pressure at any location within the sonic boom footprint.

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section B.1.2.2**) except that C-weighting places more emphasis on low frequencies below 1,000 hertz.

B.1.3.2 Cumulative Events

Equivalent Sound Level (L_{eq})

Equivalent Sound Level is a "cumulative" metric that combines a series of noise events over a period of time. L_{eq} is the sound level that represents the decibel average SEL of all sounds in the time period. Just as SEL has proven to be a good measure of a single event, L_{eq} has proven to be a good measure of series of events during a given time period.

The time period of an L_{eq} measurement is usually related to some activity, and is given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

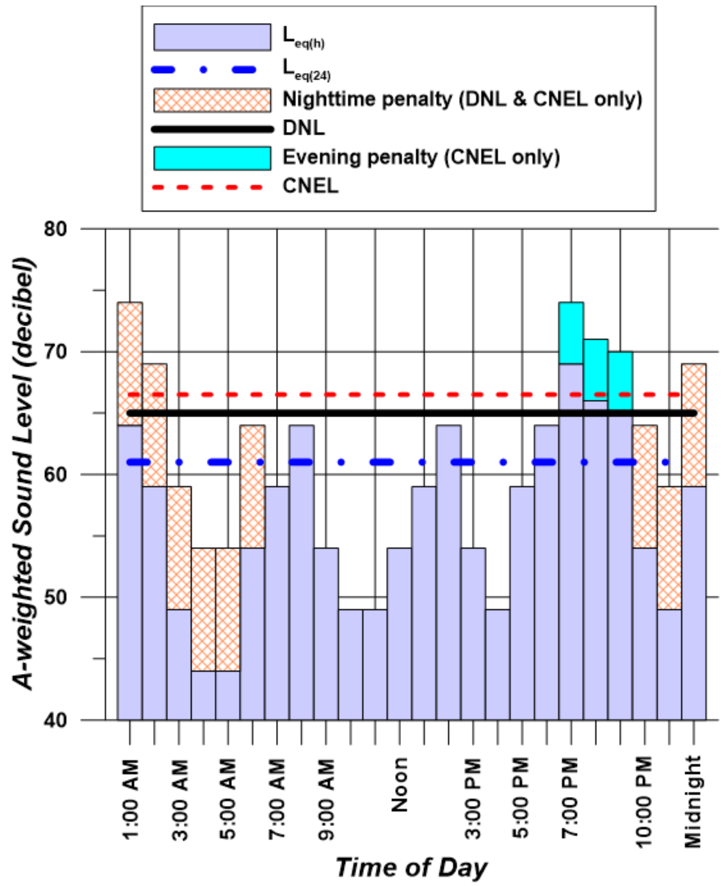
Figure B-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}(h)) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.

Day-Night Average Sound Level (DNL or L_{dn}) and Community Noise Equivalent Level (CNEL)

Day-Night Average Sound Level is a cumulative metric that accounts for all noise events in a 24-hour period. However, unlike L_{eq}(24), DNL contains a nighttime noise penalty. To account for our increased sensitivity to noise at night, DNL applies a 10-dB penalty to events during the nighttime period, defined as 10:00 p.m. to 7:00 a.m. The notations DNL and L_{dn} are both used for Day-Night Average Sound Level and are equivalent.

CNEL is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1970). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure B-5 gives an example of DNL and CNEL using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. Note the L_{eq}(h) for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL the hours between 7p.m. and 10 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.



Source: Wyle Laboratories

Figure B-5. Example of L_{eq}(24), DNL and CNEL Computed from Hourly Equivalent Sound Levels.

Figure B-6 shows the ranges of DNL or CNEL that occur in various types of communities. Under a flight path at a major airport the DNL may exceed 80 dB, while rural areas may experience DNL less than 45 dB. The decibel summation nature of these metrics causes the noise levels of the loudest events to control the 24-hour average. As a simple example, consider a case in which only one aircraft overflight occurs during the daytime over a 24-hour period, creating a sound level of 100 dB for 30 seconds. During the remaining 23 hours, 59 minutes, and 30 seconds of the day, the ambient sound level is 50 dB. The DNL for this 24-hour period is 65.9 dB. Assume, as a second example that 10 such 30-second overflights occur during daytime hours during the next 24-hour period, with the same ambient sound level of 50 dB during the remaining 23 hours and 55 minutes of the day. The DNL for this 24-hour period is 75.5 dB. Clearly, the averaging of noise over a 24-hour period does not ignore the louder single events and tends to emphasize both the sound levels and number of those events.

A feature of the DNL metric is that a given DNL value could result from a very few noisy events or a large number of quieter events. For example, one overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL does not represent a level heard at any given time but represent long-term exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

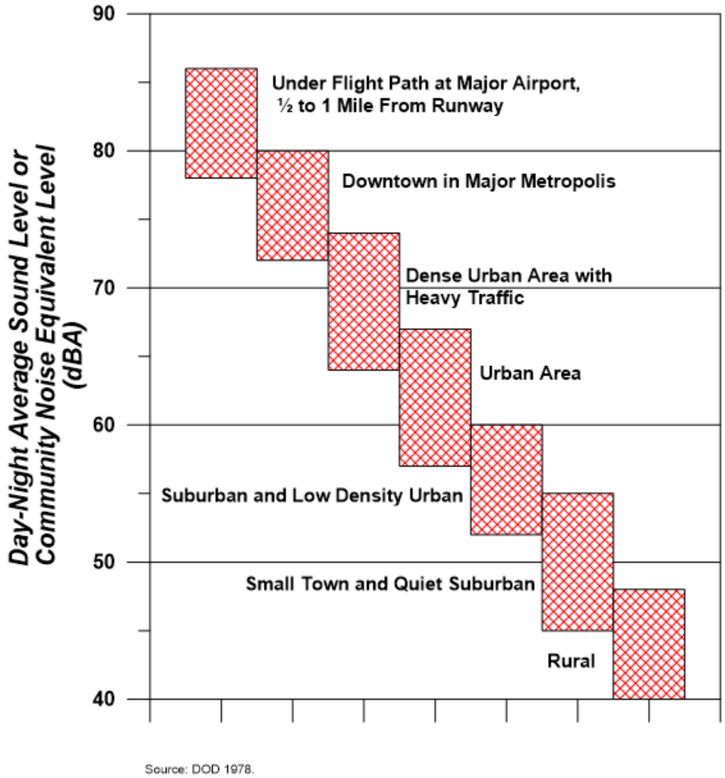


Figure B-6. Typical DNL or CNEL Ranges in Various Types of Communities.

Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) and Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$)

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes (MTRs), Military Operations Areas (MOAs), and Restricted Areas/Ranges generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUAs is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

The cumulative daily noise metric devised to account for the “surprise” effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is the Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}). Onset rates between 15 and 150 dB per second require an adjustment of 0 to 11 dB to the event’s SEL, while onset rates below 15 dB per second require no adjustment to the event’s SEL (Stusnick et al., 1992). The term ‘monthly’ in L_{dnmr} refers to the noise assessment being conducted for the month with the most operations or sorties -- the so-called busiest month.

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted $CNEL_{mr}$.

B.1.3.3 Supplemental Metrics

Number-of-Events Above (NA) a Threshold Level (L)

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted

NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest (POI), NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above (TA) a Specified Level (L)

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

B.1.4 Noise Effects

Noise is of concern because of potential adverse effects. The following subsections describe how noise can affect communities and the environment, and how those effects are quantified. The specific topics discussed are

- annoyance;
- speech interference;
- sleep disturbance;
- noise effects on children; and
- noise effects on domestic animals and wildlife.

B.1.4.1 Annoyance

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its “Levels Document” (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as Ldn at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people "highly annoyed," defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure B-7** shows the result of his study relating DNL to individual annoyance measured by percent highly annoyed (%HA).

Schultz's original synthesis included 161 data points. **Figure B-8** shows a comparison of the predicted response of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form is the preferred form in the United States, endorsed by the Federal Interagency Committee on Aviation Noise (FICAN, 1997). Other forms have been proposed, such as that of Fidell and Silvati (2004) but have not gained widespread acceptance.

When the goodness of fit of the Schultz curve is examined, the correlation between groups of people is high, in the range of 85 to 90 percent; however, the correlation between individuals is much lower, at 50 percent or less. This is not surprising, given the personal differences between individuals. The surveys underlying the Schultz curve include results that show that annoyance to noise is also affected by nonacoustical factors. Newman and Beattie (1985) divided the nonacoustic factors into the emotional and physical variables shown in **Table B-1**.

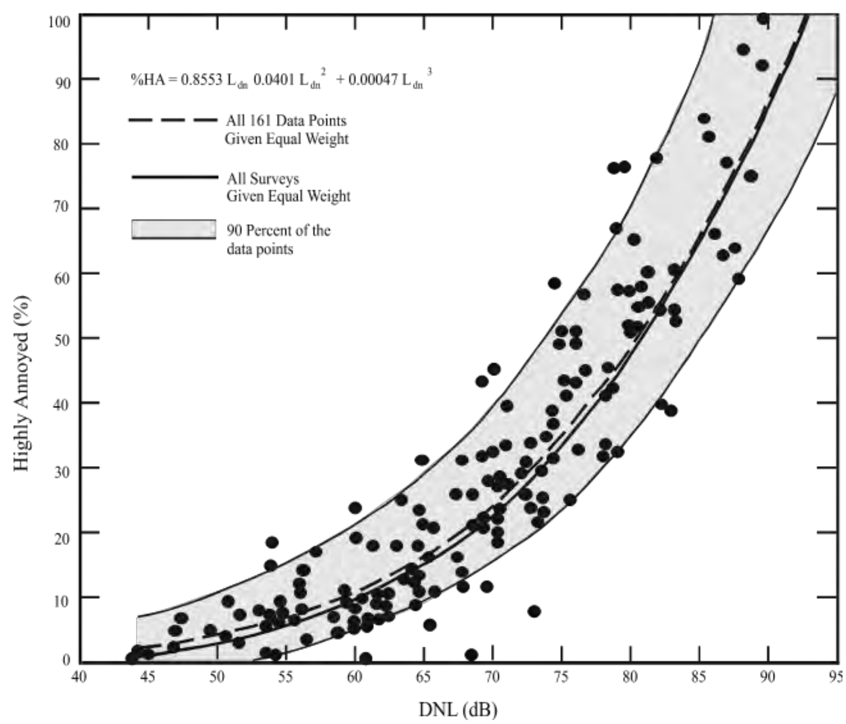


Figure B-7. Schultz Curve Relating Noise Annoyance to DNL (Schultz, 1978).

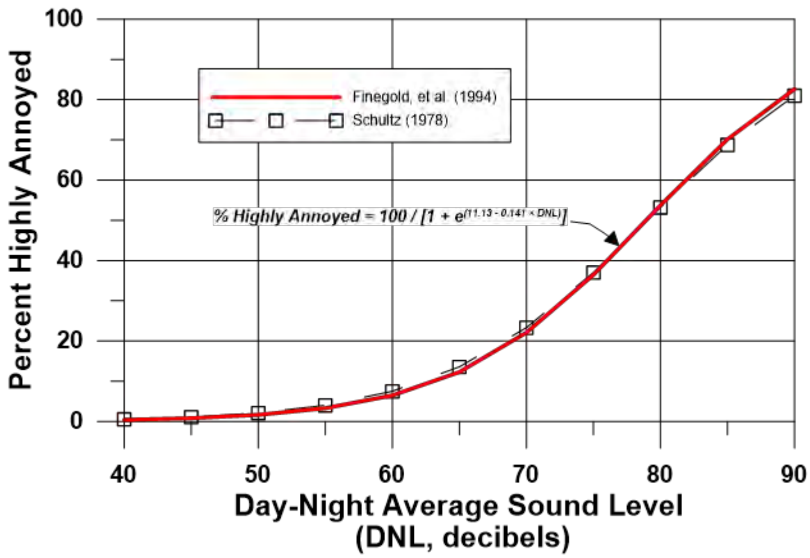


Figure B-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al (1994).

Table B-1
Nonacoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables
Feeling about the necessity or preventability of the noise
Judgement of the importance and value of the activity that is producing the noise
Activity at the time an individual hears the noise
Attitude about the environment
General sensitivity to noise
Belief about the effect of noise on health
Feeling of fear associated with the noise

Physical Variables
Type of neighborhood
Time of day
Season
Predicitabiltiy of the noise
Control over the noise source
Length of time individual is exposed to a noise

Schreckenberg and Schuemer (2010) recently examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A recent study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public, and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DOD, 2009a).

A factor that is partially nonacoustical is the source of the noise. Miedema and Vos (1998) presented synthesis curves for the relationship between DNL and percentage “Annoyed” and percentage “Highly Annoyed” for three transportation noise sources. Different curves were found for aircraft, road traffic, and railway noise. **Table B-2** summarizes their results. Comparing the updated Schultz curve suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Miedema and Oudshoorn (2001) authors supplemented that investigation with further derivation of percent of population highly annoyed as a function of either DNL or DENL along with the corresponding 95 percent confidence intervals with similar results.

Table B-2
Percent Highly Annoyed for Different Transportation Noise Sources

DNL (dB)	Percent Hightly Annoyed (%HA)			
	Miedema and Vos			Schultz Combined
	Air	Road	Rail	
55	12	7	4	3
60	19	12	7	6
65	28	18	11	12
70	37	29	16	22
75	48	40	22	36

Source: Miedema and Vos, 1998

As noted by the World Health Organization (WHO), however, even though aircraft noise seems to produce a stronger annoyance response than road traffic, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with WHO's recommendations, the Federal Interagency Committee on Noise (FICON, 1992) considered the Schultz curve to be the best source of dose information to predict community response to noise but recommended further research to investigate the differences in perception of noise from different sources.

The International Standard (ISO 1996:1-2016) update introduced the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested a +3 dB to +6 dB for aircraft noise relative to road noise while the latest editions recommends an adjustment range of +5 dB to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at 65 dB DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure B-9** depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater than previous thought and reliance solely on DNL for impact analysis may be insufficient if utilizing the FICON 1992 method.

The US Federal Aviation Administration (FAA) is currently conducting a major airport community noise survey at approximately 20 US airports in order to update the relationship between aircraft noise and annoyance. Results from this study are expected to be released in 2018.

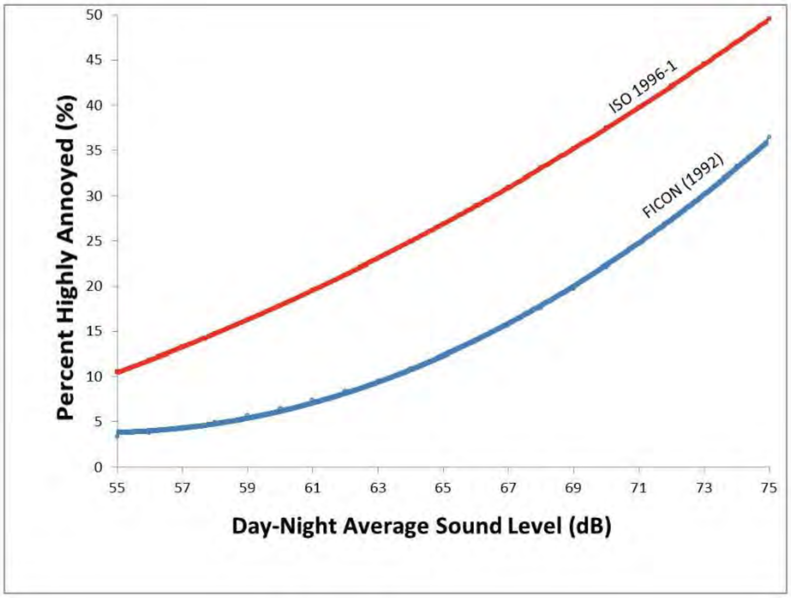


Figure B-9. Percent Highly Annoyed Comparison of ISO 1996-1 to FICON (1992).

B.1.4.2 Speech Interference

Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is important in classrooms and offices. In the workplace, speech interference from noise can cause fatigue and vocal strain in those who attempt to talk over the noise. In schools it can impair learning.

There are two measures of speech comprehension:

1. Word Intelligibility - the percent of words spoken and understood. This might be important for students in the lower grades who are learning the English language, and particularly for students who have English as a Second Language.
2. Sentence Intelligibility – the percent of sentences spoken and understood. This might be important for high-school students and adults who are familiar with the language, and who do not necessarily have to understand each word in order to understand sentences.

US Federal Criteria for Interior Noise

In 1974, the USEPA identified a goal of an indoor L_{eq}(24) of 45 dB to minimize speech interference based on sentence intelligibility and the presence of steady noise (USEPA 1974). **Figure B-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than 45 dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure B-10** shows 99 percent intelligibility at L_{eq} below 54 dB, and less than 10 percent above 73 dB. Recalling that L_{eq} is dominated by louder noise events, the USEPA L_{eq}(24) goal of 45 dB generally ensures that sentence intelligibility will be high most of the time.

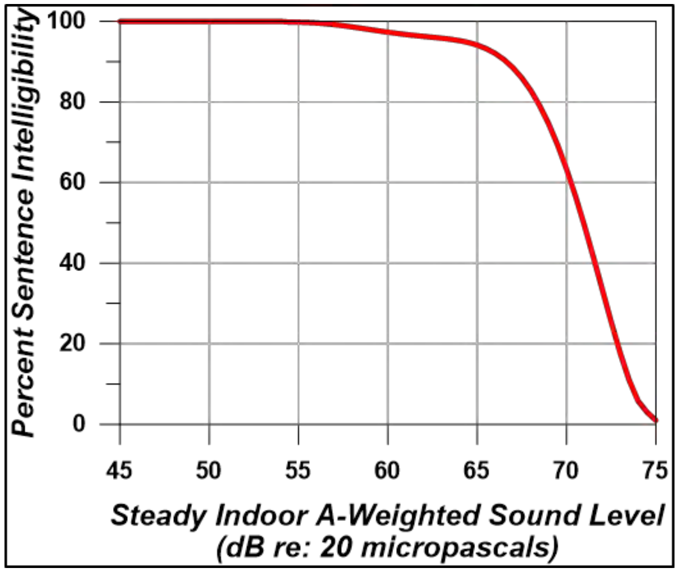


Figure B-10. Speech Intelligibility Curve (digitized from USEPA, 1974).

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI classroom noise standard (ANSI, 2002) and American Speech-Language-Hearing Association (ASLHA, 2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is 45 dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure B-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500-2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table B-3 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, they are consistent with a limit on indoor background noise of 35 to 40 dB L_{eq} and a single event limit of 50 dB L_{max}. It should be noted that these limits were set based on students with normal hearing and no special needs. At-risk students may be adversely affected at lower sound levels.

Table B-3
Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
US FAA (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / SIL 45	Single event level permissible in the classroom.
WHO (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
US ANSI (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
UK DFES (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

B.1.4.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A number of studies have attempted to quantify the effects of noise on sleep. This section provides an overview of the major noise-induced sleep disturbance studies. Emphasis is on studies that have influenced US federal noise policy. The studies have been separated into two groups:

1. Initial studies performed in the 1960s and 1970s, where the research was focused on sleep observations performed under laboratory conditions.
2. Later studies performed in the 1990s up to the present, where the research was focused on field observations.

Initial Studies

The relation between noise and sleep disturbance is complex and not fully understood. The disturbance depends not only on the depth of sleep and the noise level, but also on the nonacoustic factors cited for annoyance. The easiest effect to measure is the number of arousals or awakenings from noise events.

Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et. al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Finegold, 1994). The data included most of the research performed up to that point and predicted a 10 percent probability of awakening when exposed to an interior SEL of 58 dB. The data used to derive this curve were primarily from controlled laboratory studies.

Recent Sleep Disturbance Research – Field and Laboratory Studies

It was noted that early sleep laboratory studies did not account for some important factors. These included habituation to the laboratory, previous exposure to noise, and awakenings from noise other than aircraft. In the early 1990s, field studies in people's homes were conducted to validate the earlier laboratory work conducted in the 1960s and 1970s. The field studies of the 1990s (e.g., Horne, 1994) found that 80-90 percent of sleep disturbances were not related to outdoor noise events, but rather to indoor noises and nonnoise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure B-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994; Fidell et al., 1995a, 1995b), along with the data from six previous field studies.

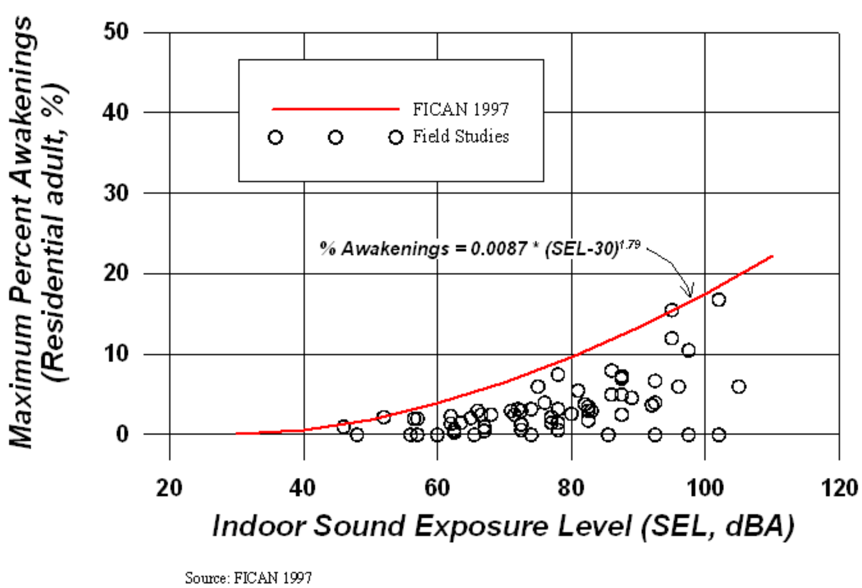


Figure B-11. FICAN 1997 Recommended Sleep Disturbance Dose-Response Relationship.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner, 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise lead to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure B-10** rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise, although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at noise levels of 90 dB SEL is shown in **Table B-4**.

Table B-4
Probability of Awakening from NA90SEL

Number of Aircraft Events at 90 dB SEL for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DOD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN 2008).

Summary

Sleep disturbance research still lacks the details to accurately estimate the population awakened for a given noise exposure. The procedure described in the ANSI (2008) Standard and endorsed by FICAN is based on probability calculations that have not yet been scientifically validated. While this procedure certainly provides a much better method for evaluating sleep awakenings from multiple aircraft noise events, the estimated probability of awakenings can only be considered approximate.

B.1.4.4 Noise Effects on Children

Recent studies on school children indicate a potential link between aircraft noise and both reading comprehension and learning motivation. The effects may be small but may be of particular concern for children who are already scholastically challenged.

Effects on Learning and Cognitive Abilities

Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies noise exposed children were less likely to solve difficult puzzles or more likely to give up.

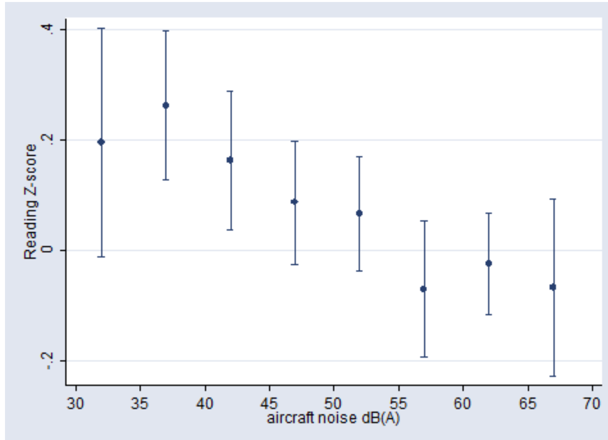
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of the airport, these deficits disappeared, indicating that noise effects on cognition may be reversible if exposure to the noise ceases. Most convincing was the finding that deficits in memory and reading comprehension developed over the 2-year follow-up for children who became newly noise exposed near the new airport; deficits were also observed in speech perception for the newly noise-exposed children.

More recently, the Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health (RANCH) study (Stansfeld et al., 2005; Clark et al., 2005) compared the effect of aircraft and road traffic noise on over 2,000 children in three countries. This was the first study to derive exposure-effect associations for a range of cognitive and health effects and was the first to compare effects across countries.

The study found a linear relation between chronic aircraft noise exposure and impaired reading comprehension and recognition memory. No associations were found between chronic road traffic noise exposure and cognition. Conceptual recall and information recall surprisingly showed better performance in high road traffic noise areas. Neither aircraft noise nor road traffic noise affected attention or working memory (Stansfeld et al., 2005; Clark et al., 2006).

Figure B-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at Leq greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools. An additional study utilizing the same data set (Clark et al., 2012) investigated the effects of traffic-related air pollution and found little evidence that air pollution moderated the association of noise exposure on children's cognition.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure B-12. RANCH Study Reading Scores Varying with L_{eq}.

There was also a trend for reading comprehension to be poorer in aircraft noise exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years, (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing, and is needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students, but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2013) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding 55 dB DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health (NORAH) study conducted at Frankfurt airport, reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a one-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport (LAX) found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

B.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988), assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al., 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

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Appendix B-2

Noise Modeling

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B.2 NOISE MODELING

The following sections describe input data used in the noise modeling process. This data was developed in coordination with the Air Force Air Combat Command (ACC), Air Force Civil Engineer Center (AFCEC), and Kelly Field Annex personnel.

B.2.1 Airfield Operations

The first step in estimating the effects of the contract ADAIR action was to determine the baseline operations at Kelly Field Annex. The baseline operations were identified through a recent evaluation of the interim relocation of two F-16 Formal Training Units (FTUs). The FTUs were not relocated to Kelly Field Annex, but the aircraft operations identified from that project were determined appropriate by the Air Force for use as the baseline for the contract ADAIR action with one update: Boeing 767 sorties from the Amazon Corporation (Amazon). The Amazon Boeing 767 sorties were updated to include three sorties per day with the possibility of up to eight sorties per day. Five sorties per day will be used for the baseline as it represents an average number of operations that could occur at the airfield in the near term for Amazon Boeing 767s. The baseline has a total of 64,000 operations at the airfield. **Table B-5** contains the break out of those operations by aircraft type and organization. **Table B-6** contains the operations to be modeled for the baseline as well as the contract ADAIR aircraft operations.

A SORTIE IS A SINGLE FLIGHT, BY ONE AIRCRAFT, FROM TAKEOFF TO LANDING, WHILE A SORTIE-OPERATION IS THE USE OF ONE AIRSPACE UNIT (E.G., MOA) BY ONE AIRCRAFT. THE NUMBER OF SORTIE-OPERATIONS IS USED TO QUANTIFY THE NUMBER OF USES BY AIRCRAFT AND TO ACCURATELY MEASURE POTENTIAL IMPACTS; E.G. NOISE, AIR QUALITY, AND SAFETY IMPACTS. A SORTIE-OPERATION IS NOT A MEASURE OF HOW LONG AN AIRCRAFT USES AN AIRSPACE UNIT, NOR DOES IT INDICATE THE NUMBER OF AIRCRAFT IN AN AIRSPACE UNIT DURING A GIVEN PERIOD; IT IS A MEASUREMENT FOR THE NUMBER OF TIMES A SINGLE AIRCRAFT USES A PARTICULAR AIRSPACE UNIT.

Table B-5
Baseline Operations at Kelly Field Annex

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / Mil Departure			Straight In Arrivals			Tactical Arrivals			Overhead Break Arrivals			Closed Pattern			Total Annual Operations		
				Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total
Based	149 FW TX ANG	F-16C		1680	70	1750	1680	70	1750	1089	108	1197	417	41	458	1678	167	1845	11200	-	11200	17744	456	18200
	68 AS FTU	C-5M		-	-	-	1014	26	1040	841	199	1040	-	-	-	-	-	-	32606	674	33280	34461	899	35360
	Boeing	C-17		-	-	-	120	-	120	120	-	120	-	-	-	-	-	-	240	-	240	480	-	480
		KC-135 and 747-200	KC-135R	-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-747-400		-	-	-	16	-	16	16	-	16	-	-	-	-	-	-	-	-	-	32	-	32
		C-32	B-757-200-RR	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
		F-15E		-	-	-	22	-	22	22	-	22	-	-	-	-	-	-	-	-	-	44	-	44
		C-40	B-737-D9 (N)	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
	Amazon	B-767		-	-	-	1825	-	1825	1825	-	1825	-	-	-	-	-	-	-	-	-	3650	-	3650
	Gen Aviation	B-757-200-RR		-	-	-	26	2	28	27	1	28	-	-	-	-	-	-	-	-	-	53	3	56
		C-130H&N&P		-	-	-	3	2	5	4	1	5	-	-	-	-	-	-	-	-	-	7	3	10
		COMPOS 1985 PISTON		-	-	-	95	-	95	95	-	95	-	-	-	-	-	-	-	-	-	190	-	190
		DC-9-30D9 (N)		-	-	-	87	4	91	87	4	91	-	-	-	-	-	-	-	-	-	174	8	182
		LEARJET-35		-	-	-	373	15	388	376	12	388	-	-	-	-	-	-	-	-	-	749	27	776
		C-12		-	-	-	79	1	80	79	1	80	-	-	-	-	-	-	-	-	-	158	2	160
		T-6		-	-	-	5	2	7	5	2	7	-	-	-	-	-	-	-	-	-	10	4	14
		UH60A		-	-	-	1163	-	1163	1163	-	1163	-	-	-	-	-	-	-	-	-	2326	-	2326
	Based Totals			**1680**	**70**	**1750**	**6518**	**122**	**6640**	**5759**	**328**	**6087**	**417**	**41**	**458**	**1678**	**167**	**1845**	**44046**	**674**	**44720**	**60098**	**1402**	**61500**
Transient		B-747-200 (N)		-	-	-	25	-	25	25	-	25	-	-	-	-	-	-	-	-	-	50	-	50
		A-10A		-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-737-D9 (N)		-	-	-	32	-	32	31	1	32	-	-	-	-	-	-	-	-	-	63	1	64
		C-12		-	-	-	100	2	102	100	2	102	-	-	-	-	-	-	-	-	-	200	4	204
		C-130H&N&P		-	-	-	183	8	191	176	15	191	-	-	-	-	-	-	-	-	-	359	23	382
		C-17		-	-	-	98	4	102	94	8	102	-	-	-	-	-	-	-	-	-	192	12	204
		C-21A		-	-	-	120	-	120	118	2	120	-	-	-	-	-	-	-	-	-	238	2	240
		C-5A		-	-	-	6	-	6	6	-	6	-	-	-	-	-	-	-	-	-	12	-	12
		F-15E		-	-	-	11	-	11	11	-	11	-	-	-	-	-	-	-	-	-	22	-	22
		F-16A		-	-	-	42	-	42	42	-	42	-	-	-	-	-	-	-	-	-	84	-	84
		F-18A/C		-	-	-	55	-	55	55	-	55	-	-	-	-	-	-	-	-	-	110	-	110
		KC-135R		-	-	-	69	3	72	66	6	72	-	-	-	-	-	-	-	-	-	135	9	144
		T-1		-	-	-	34	-	34	33	1	34	-	-	-	-	-	-	-	-	-	67	1	68
		T-38A		-	-	-	381	8	389	375	14	389	-	-	-	-	-	-	-	-	-	756	22	778
		T-6		-	-	-	21	6	27	19	8	27	-	-	-	-	-	-	-	-	-	40	14	54
		UH60A		-	-	-	38	-	38	38	-	38	-	-	-	-	-	-	-	-	-	76	-	76
	Transient Totals			**-**	**-**	**-**	**1219**	**31**	**1250**	**1193**	**57**	**1250**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2412**	**88**	**2500**
Grand Totals				1680	70	1750	7737	153	7890	6952	385	7337	417	41	458	1678	167	1845	44046	674	44720	62510	1490	64000

Notes: 1 closed pattern circuit is 2 operations in this table.

Table B-6
Baseline Operations at Kelly Field Annex Plus Contract Adversary Air Operations

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / Mil Departure			Straight In Arrivals			Tactical Arrivals			Overhead Break Arrivals			Closed Pattern			Total Annual Operations		
				Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total	Day (0700-1900)	Night (2200-0700)	Total
Based	149 FW TX AN	F-16C		1680	70	1750	1680	70	1750	1089	108	1197	417	41	458	1678	167	1845	11200	-	11200	17744	456	18200
	ADAIR	CAT A	See note (2)	1152	48	1200	-	-	-	282	108	390	608	-	608	202	-	202	324	-	324	2568	156	2724
	68 AS FTU	C-5M		-	-	-	1014	26	1040	841	199	1040	-	-	-	-	-	-	32606	674	33280	34461	899	35360
	Boeing	C-17		-	-	-	120	-	120	120	-	120	-	-	-	-	-	-	240	-	240	480	-	480
		KC-135 and 747-200	KC-135R	-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-747-400		-	-	-	16	-	16	16	-	16	-	-	-	-	-	-	-	-	-	32	-	32
		C-32	B-757-200-RR	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
		F-15E		-	-	-	22	-	22	22	-	22	-	-	-	-	-	-	-	-	-	44	-	44
		C-40	B-737-D9 (N)	-	-	-	3	-	3	3	-	3	-	-	-	-	-	-	-	-	-	6	-	6
	Amazon	B-767		-	-	-	1825	-	1825	1825	-	1825	-	-	-	-	-	-	-	-	-	3650	-	3650
	Gen Aviation	B-757-200-RR		-	-	-	26	2	28	27	1	28	-	-	-	-	-	-	-	-	-	53	3	56
		C-130H&N&P		-	-	-	3	2	5	4	1	5	-	-	-	-	-	-	-	-	-	7	3	10
		COMPOS 1985 PISTON		-	-	-	95	-	95	95	-	95	-	-	-	-	-	-	-	-	-	190	-	190
		DC-9-30D9 (N)		-	-	-	87	4	91	87	4	91	-	-	-	-	-	-	-	-	-	174	8	182
		LEARJET-35		-	-	-	373	15	388	376	12	388	-	-	-	-	-	-	-	-	-	749	27	776
		C-12		-	-	-	79	1	80	79	1	80	-	-	-	-	-	-	-	-	-	158	2	160
		T-6		-	-	-	5	2	7	5	2	7	-	-	-	-	-	-	-	-	-	10	4	14
		UH60A		-	-	-	1163	-	1163	1163	-	1163	-	-	-	-	-	-	-	-	-	2326	-	2326
	Based Totals			**2832**	**118**	**2950**	**6518**	**122**	**6640**	**6041**	**436**	**6477**	**1025**	**41**	**1066**	**1880**	**167**	**2047**	**44370**	**674**	**45044**	**62666**	**1558**	**64224**
Transient		B-747-200 (N)		-	-	-	25	-	25	25	-	25	-	-	-	-	-	-	-	-	-	50	-	50
		A-10A		-	-	-	4	-	4	4	-	4	-	-	-	-	-	-	-	-	-	8	-	8
		B-737-D9 (N)		-	-	-	32	-	32	31	1	32	-	-	-	-	-	-	-	-	-	63	1	64
		C-12		-	-	-	100	2	102	100	2	102	-	-	-	-	-	-	-	-	-	200	4	204
		C-130H&N&P		-	-	-	183	8	191	176	15	191	-	-	-	-	-	-	-	-	-	359	23	382
		C-17		-	-	-	98	4	102	94	8	102	-	-	-	-	-	-	-	-	-	192	12	204
		C-21A		-	-	-	120	-	120	118	2	120	-	-	-	-	-	-	-	-	-	238	2	240
		C-5A		-	-	-	6	-	6	6	-	6	-	-	-	-	-	-	-	-	-	12	-	12
		F-15E		-	-	-	11	-	11	11	-	11	-	-	-	-	-	-	-	-	-	22	-	22
		F-16A		-	-	-	42	-	42	42	-	42	-	-	-	-	-	-	-	-	-	84	-	84
		F-18A/C		-	-	-	55	-	55	55	-	55	-	-	-	-	-	-	-	-	-	110	-	110
		KC-135R		-	-	-	69	3	72	66	6	72	-	-	-	-	-	-	-	-	-	135	9	144
		T-1		-	-	-	34	-	34	33	1	34	-	-	-	-	-	-	-	-	-	67	1	68
		T-38A		-	-	-	381	8	389	375	14	389	-	-	-	-	-	-	-	-	-	756	22	778
		T-6		-	-	-	21	6	27	19	8	27	-	-	-	-	-	-	-	-	-	40	14	54
		UH60A		-	-	-	38	-	38	38	-	38	-	-	-	-	-	-	-	-	-	76	-	76
	Transient Totals			**-**	**-**	**-**	**1219**	**31**	**1250**	**1193**	**57**	**1250**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2412**	**88**	**2500**
Grand Totals				2832	118	2950	7737	153	7890	7234	493	7727	1025	41	1066	1880	167	2047	44370	674	45044	65078	1646	66724

Notes:
(0) This table represents operations at the airfield. Every operation is an aircraft departing or arriving. 2 closed pattern operations = 1 circuit (1 departing + 1 arriving). 1 sortie = 1 departure + 1 arrival.
(1) F-16C departures are either with AB or MIL power.
(2) ADAIR operations apply only to the Proposed Action scenario to be modeled as F-104D&G, A-4C, and T-45 for high, med, and low noise Category A Proposed Action scenarios, respectively.
(3) Only the F-104D&G has afterburner capability. Other ADAIR aircraft will be modeled with military power departures.
(4) Amazon operations estimated for 5 sorties/day.

B.2.2 Runway and Flight Track Use

This section describes the flight tracks used by the aircraft operating out of Kelly Field Annex as well as the runway utilization. Utilization percentages are provided for each runway in **Table B-7**. Flight track maps for all aircraft are presented on **Figure B-13** (departures), **Figure B-14** (arrivals), and **Figure B-15** (closed patterns).

Table B-7
Runway Usage for Based Aircraft at Kelly Field Annex

Op Type	Runway		
	Runway	Day (0700-2200)	Night (2200-0700)
Departure	16	77%	3%
	34	19%	1%
Arrival	16	71%	9%
	34	18%	2%
Closed Pattern	16	79%	1%
	34	20%	0%
149th FW usage:	80%/20% for Runways 15/33 all ops 96%/4% for Day/Night Departures 91%/9% for Day/Night Arrivals No Closed Patterns at Night		
443rd AW usage:	80%/20% for Runways 15/33 all ops 97.5%/2.5% for Day/Night Departures 81%/19% for Day/Night Arrivals 98%/2% for Day/Night Closed Patterns		

Figure B-13. Departure Flight Tracks at Kelly Field Annex.

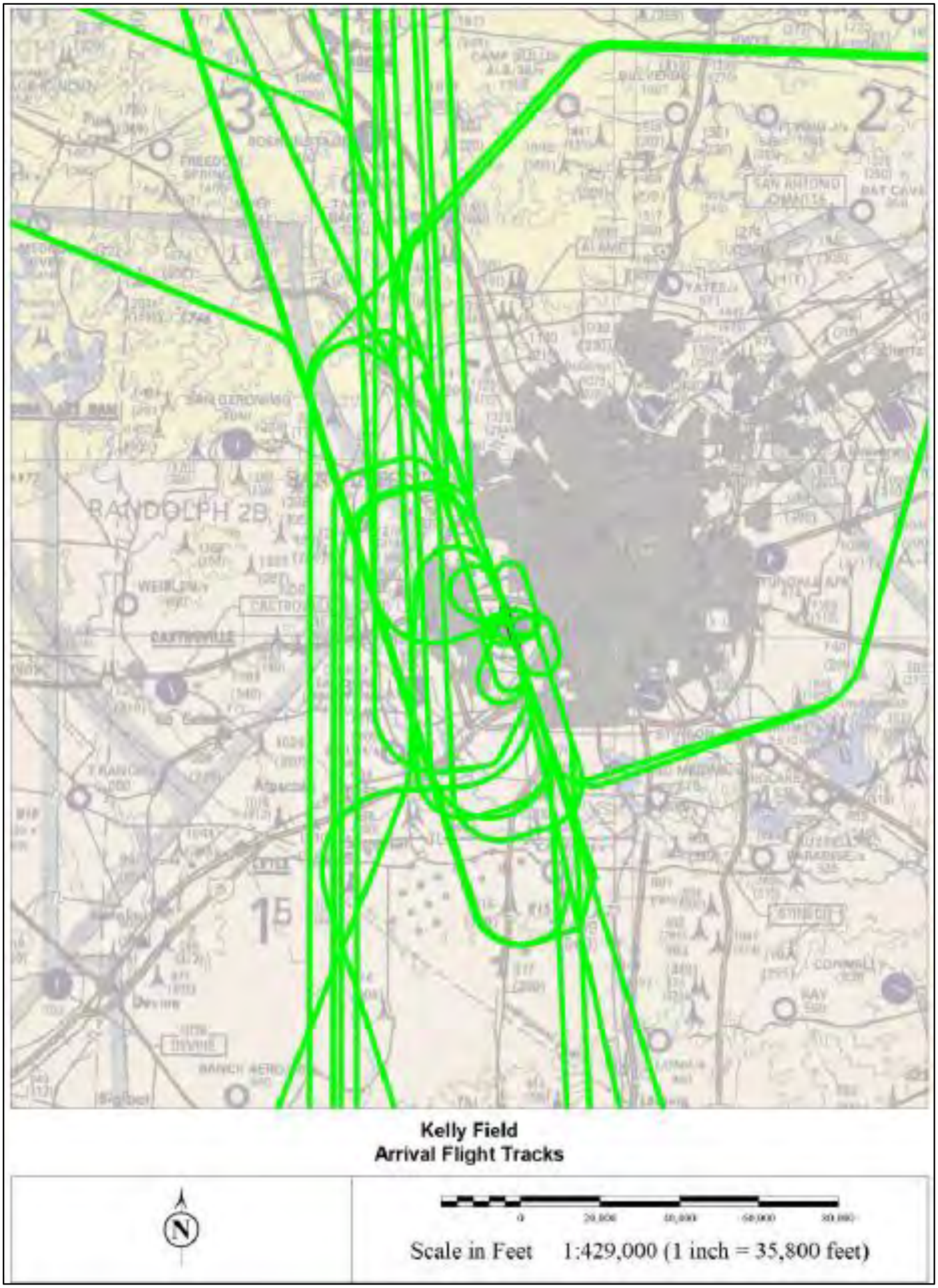
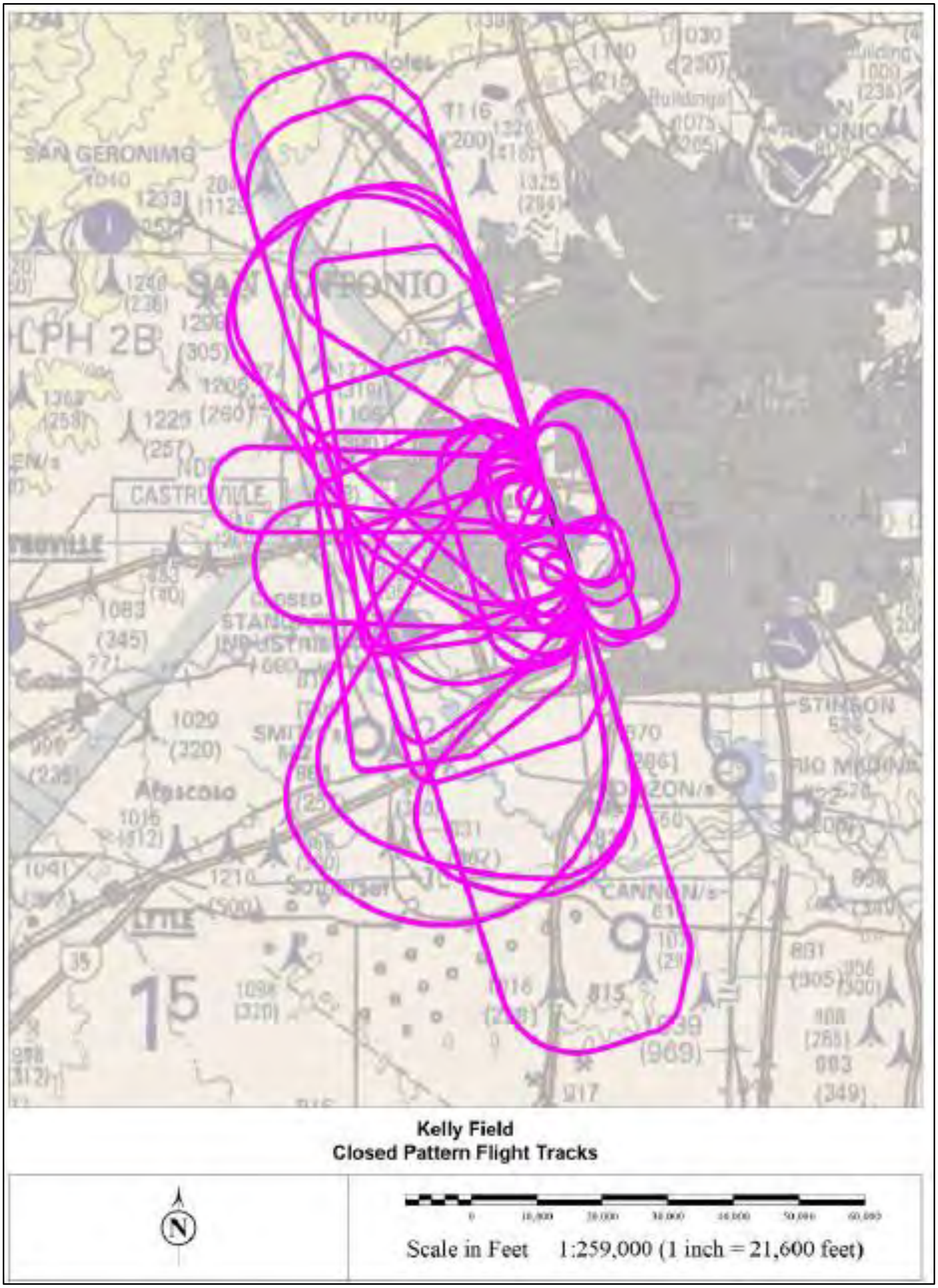


Figure B-14. Arrival Flight Tracks at Kelly Field Annex.



Kelly Field
Closed Pattern Flight Tracks

Figure B-15. Closed Pattern Flight Tracks at Kelly Field Annex.

B.2.3 Flight Profiles and Aircraft

The ADAIR program would locate contractor aircraft at Kelly Field Annex with the appropriate capabilities to respond to the needs of the fighters at the bases. The Air Force identified three categories of aircraft with differing capabilities (A, B, and C) as appropriate for contract ADAIR. To fulfill the requirements of a category the contractor could provide a variety of aircraft with the appropriate specifications. Because the type of aircraft for contract ADAIR are not known at this time, representative noise surrogates were selected for the lowest through highest potential noise emission scenarios for the aircraft that contractors may select to provide for each of the categories. The surrogate selected for the different categories and scenarios are presented in **Table B-8**. To model a given noise scenario for a certain category, all contract ADAIR flight operations were assigned to the surrogate. The Air Force determined that contract ADAIR at Kelly Field Annex could be provided by Category A aircraft. All three scenarios for Category A will be modeled separately in the final analysis for Kelly Field Annex.

Table B-8
Aircraft Scenarios

Category	High Noise Scenario	Medium Noise Scenario	Low Noise Scenario
A	A-4N (A-4C surrogate)	MiG-21 (F-104D&G surrogate)	L-59 (T-45 surrogate)
B	F-5 (F-5E surrogate)	A-4K (A-4C surrogate)	T-59 Hawk (T-45 surrogate)
C	Eurofighter Typhoon (F-18E/F surrogate)	Dassault Mirage (F-16C surrogate)	JAS 39 Gripen (F-16A surrogate)

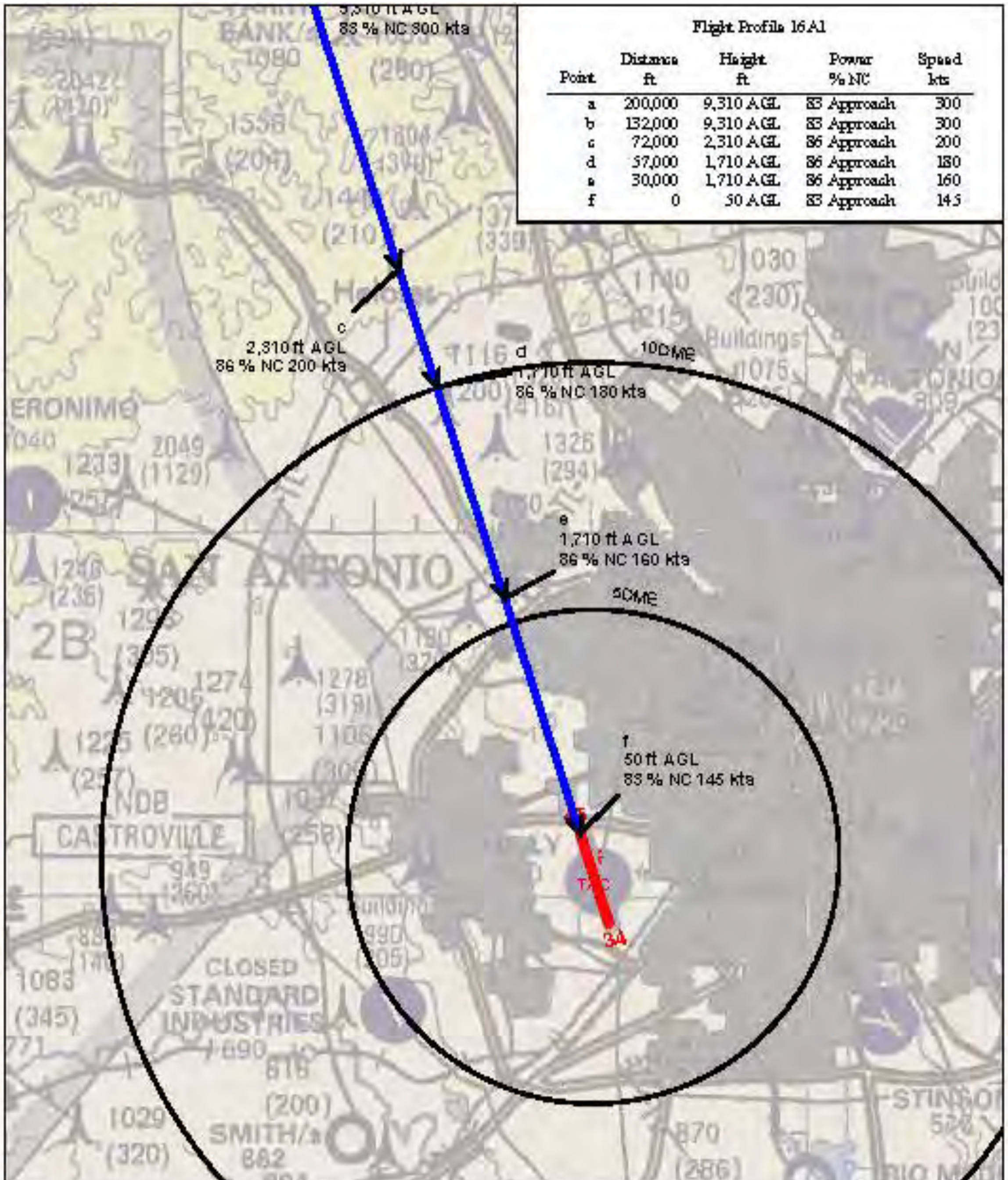
This section details the representative profiles for each aircraft that is based at Kelly Field Annex. This includes the F-16C aircraft of the 149th FW, the C-5Ms of the 433rd AW, and the proposed contract ADAIR aircraft for Category A. The Category A aircraft are modeled as the T-45 for the low-noise scenario, the F-104 for the medium-noise scenario, and the A-4C for the high-noise scenario. Because it is unknown which aircraft type or combination thereof that the contractor will bring to Kelly Field Annex, each scenario is modeled separately as if it were the only aircraft in the contract ADAIR inventory.

Representative profiles provide the speed and power setting of each type of aircraft as a function of distance along the flight track for the representative maneuvers. For modeling purposes, the appropriate profile is used for all flight tracks that conform to that maneuver type. For example, all overhead break arrival tracks utilize the representative profile for modeling that maneuver.

A note on the runways at Kelly Field Annex: they recently were renamed from 15 to 16 and 33 to 34. The figures below have descriptions that reference the profiles in terms of the old runway names. Because the noise model anchors the profile to the location of the runway the name of the runway does not affect the resulting noise calculations.

B.2.3.1 Based Aircraft Representative Flight Profiles

Flight Profiles for 149th Fight Wing F-16Cs



Flight Profile 16A1

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	9,310 AGL	83 Approach	300
b	132,000	9,310 AGL	83 Approach	300
c	72,000	2,310 AGL	86 Approach	200
d	57,000	1,710 AGL	86 Approach	180
e	30,000	1,710 AGL	86 Approach	160
f	0	50 AGL	83 Approach	145

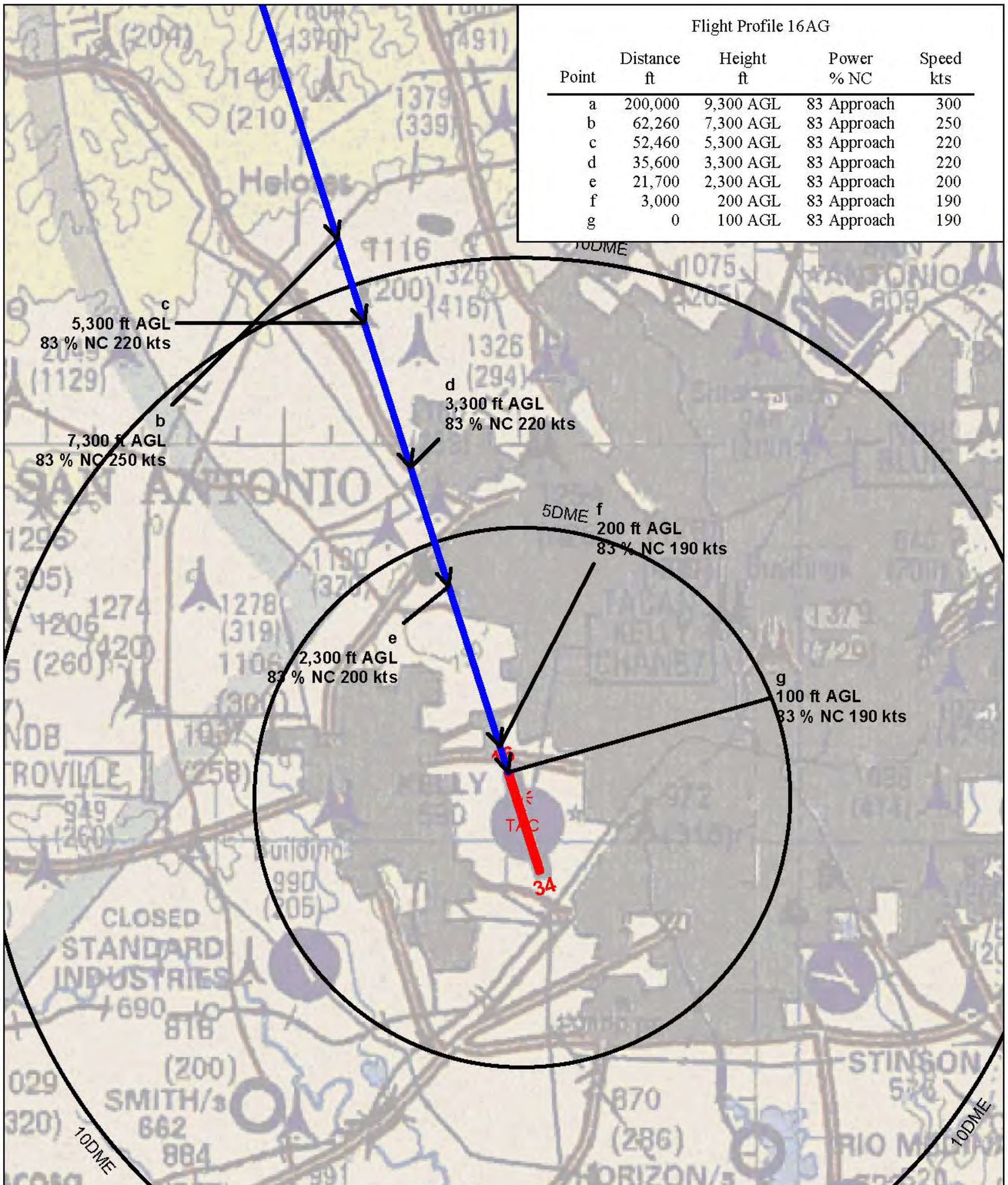
Flight Profile 16A1
ILS FROM NORTH
Flight Track: 15A1 - STRAIGHT-IN ARRIVAL
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:225,000 (1 inch = 18,700 feet)

Flight Profile 16AG

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	9,300 AGL	83 Approach	300
b	62,260	7,300 AGL	83 Approach	250
c	52,460	5,300 AGL	83 Approach	220
d	35,600	3,300 AGL	83 Approach	220
e	21,700	2,300 AGL	83 Approach	200
f	3,000	200 AGL	83 Approach	190
g	0	100 AGL	83 Approach	190

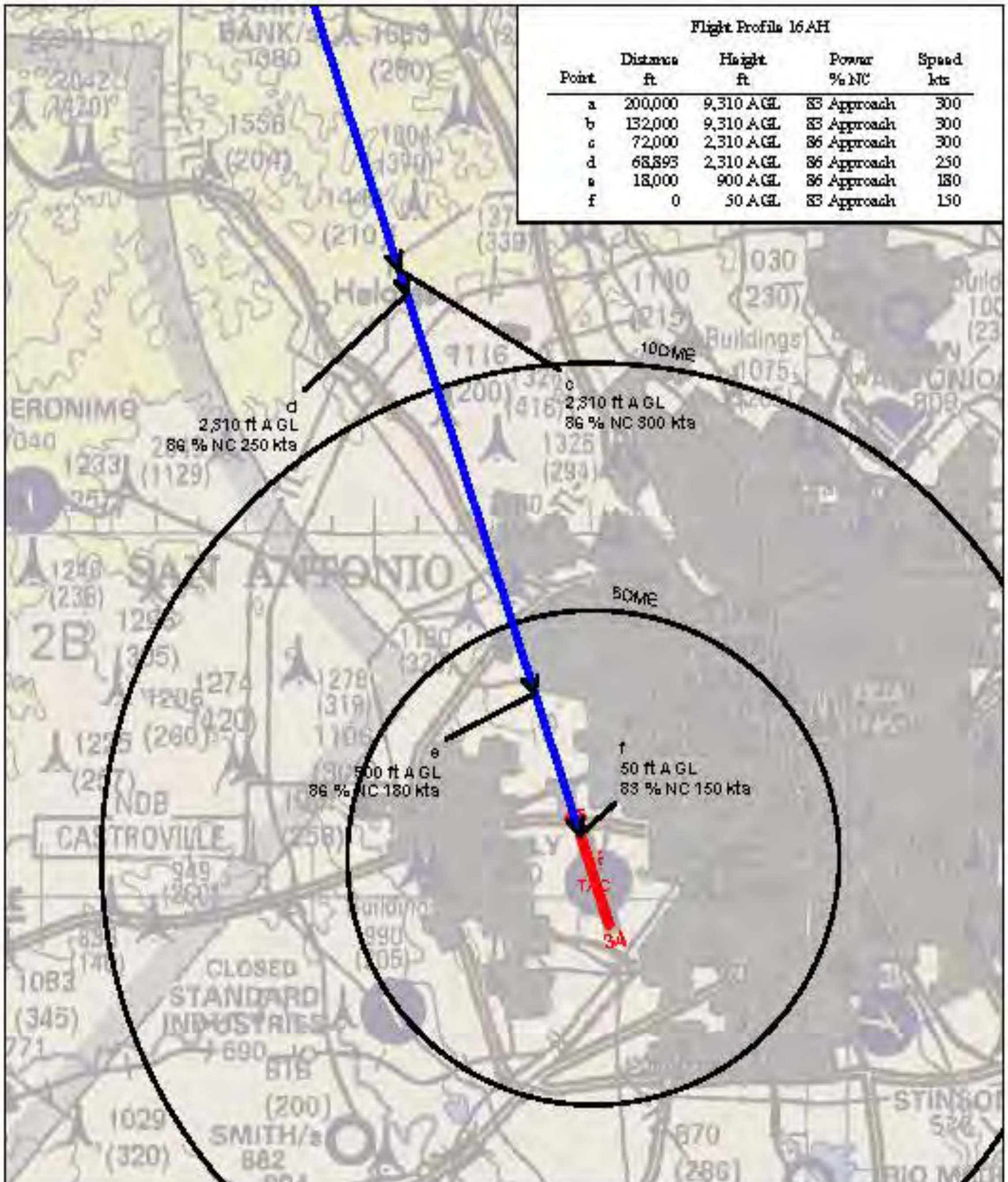


Flight Profile 16AG
STRAIGHT IN SFO FROM NORTH
Flight Track: 15A1 - STRAIGHT-IN ARRIVAL
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:207,000 (1 inch = 17,200 feet)

N



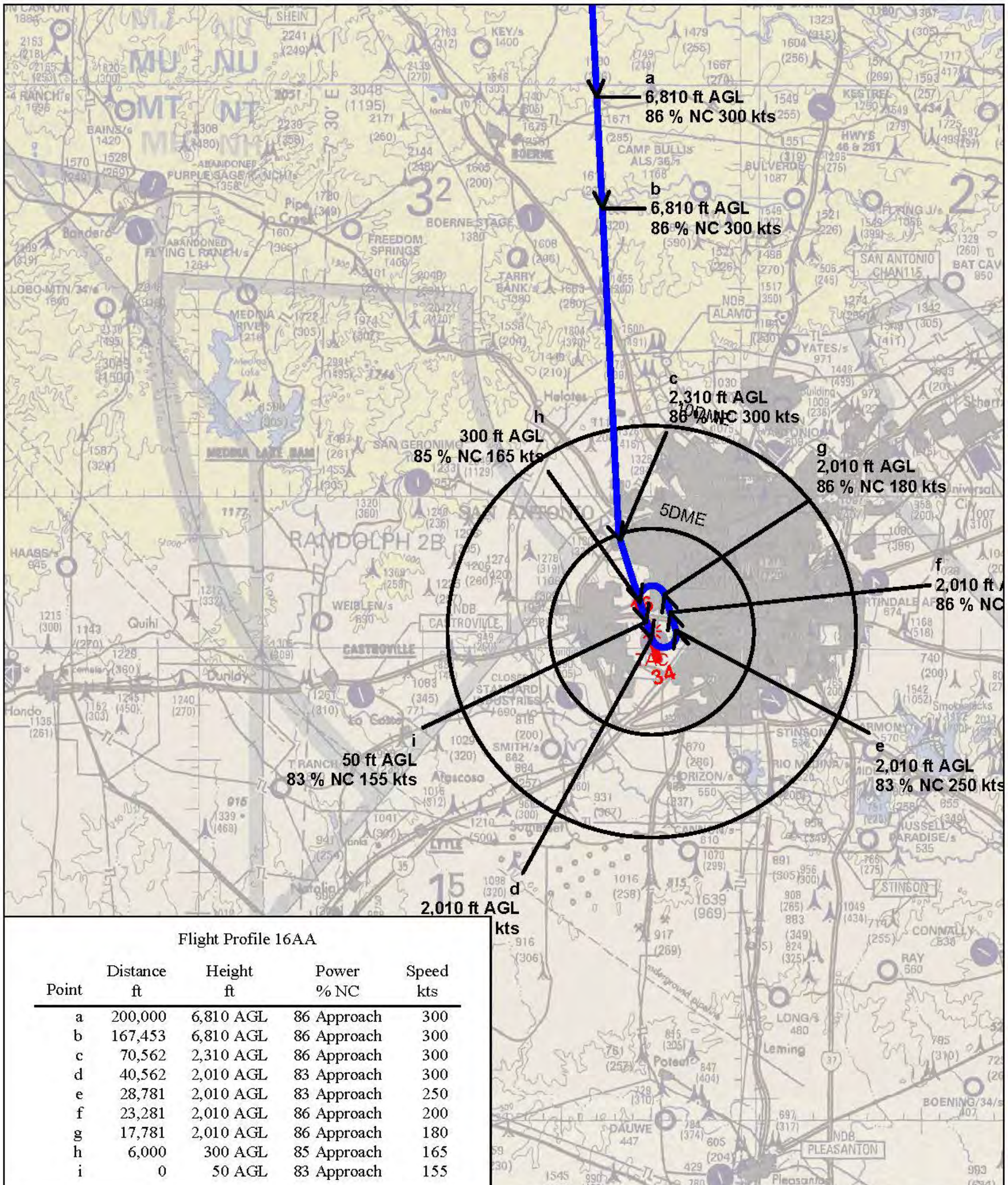
Flight Profile 16AH

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	9,310 AGL	83 Approach	300
b	132,000	9,310 AGL	83 Approach	300
c	72,000	2,310 AGL	86 Approach	300
d	68,893	2,310 AGL	86 Approach	250
e	18,000	900 AGL	86 Approach	180
f	0	50 AGL	83 Approach	150

Flight Profile 16AH
VFR STRAIGHT-IN FROM NORTH
Flight Track: 15A1 - STRAIGHT-IN ARRIVAL
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000
Scale in Feet 1:225,000 (1 inch = 18,700 feet)

N



Flight Profile 16AA

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	86 Approach	300
b	167,453	6,810 AGL	86 Approach	300
c	70,562	2,310 AGL	86 Approach	300
d	40,562	2,010 AGL	83 Approach	300
e	28,781	2,010 AGL	83 Approach	250
f	23,281	2,010 AGL	86 Approach	200
g	17,781	2,010 AGL	86 Approach	180
h	6,000	300 AGL	85 Approach	165
i	0	50 AGL	83 Approach	155

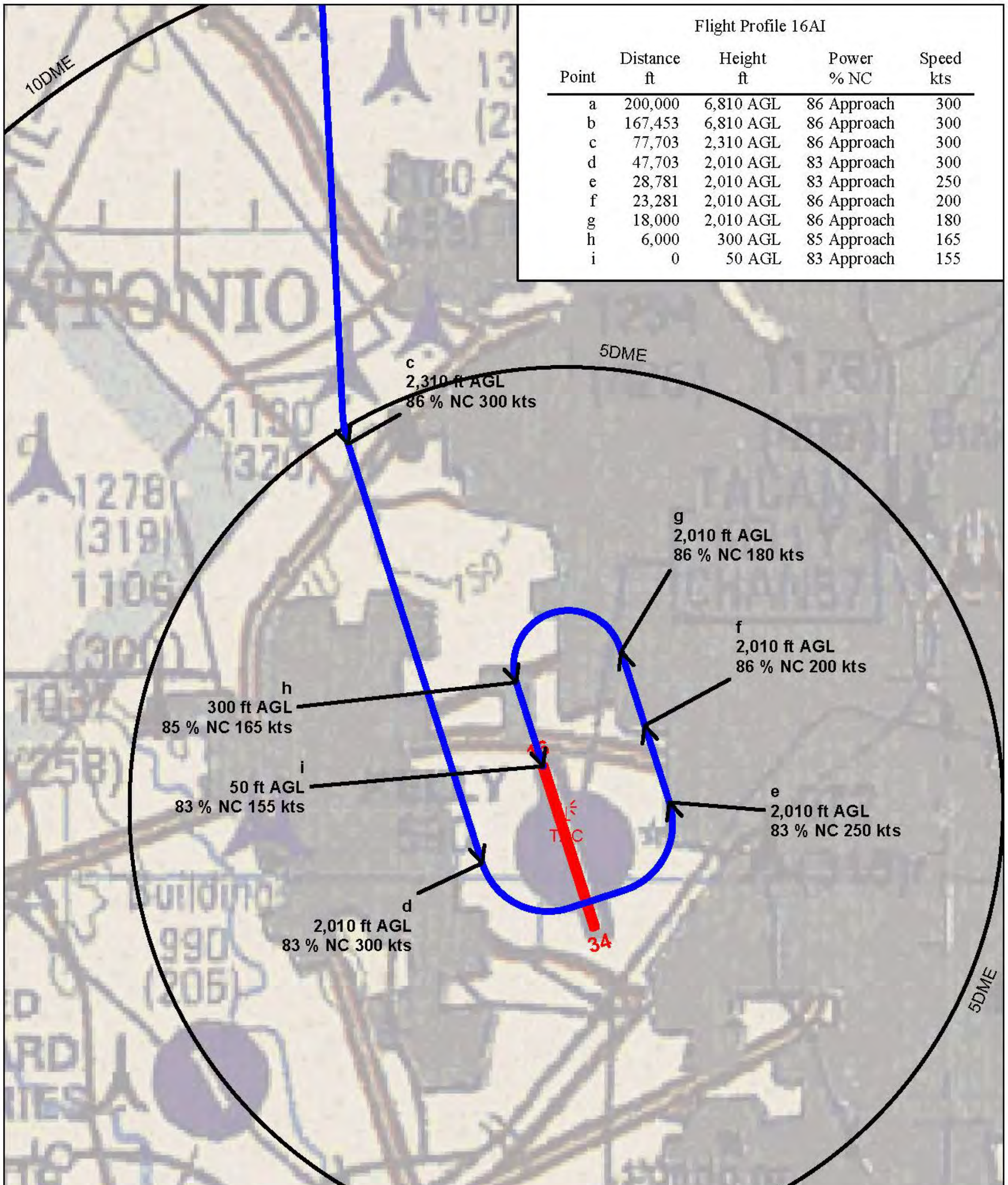
Flight Profile 16AA
PITCH TO EAST FROM NORTH
Flight Track: 15A2 - FROM NORTH PITCH TO EAST (MIDFIELD)
Aircraft: Based F-16C ANG

0 20,000 40,000 60,000 80,000 100,000 120,000 140,000 160,000 180,000

Scale in Feet 1:542,000 (1 inch = 45,100 feet)

Flight Profile 16AI

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	86 Approach	300
b	167,453	6,810 AGL	86 Approach	300
c	77,703	2,310 AGL	86 Approach	300
d	47,703	2,010 AGL	83 Approach	300
e	28,781	2,010 AGL	83 Approach	250
f	23,281	2,010 AGL	86 Approach	200
g	18,000	2,010 AGL	86 Approach	180
h	6,000	300 AGL	85 Approach	165
i	0	50 AGL	83 Approach	155

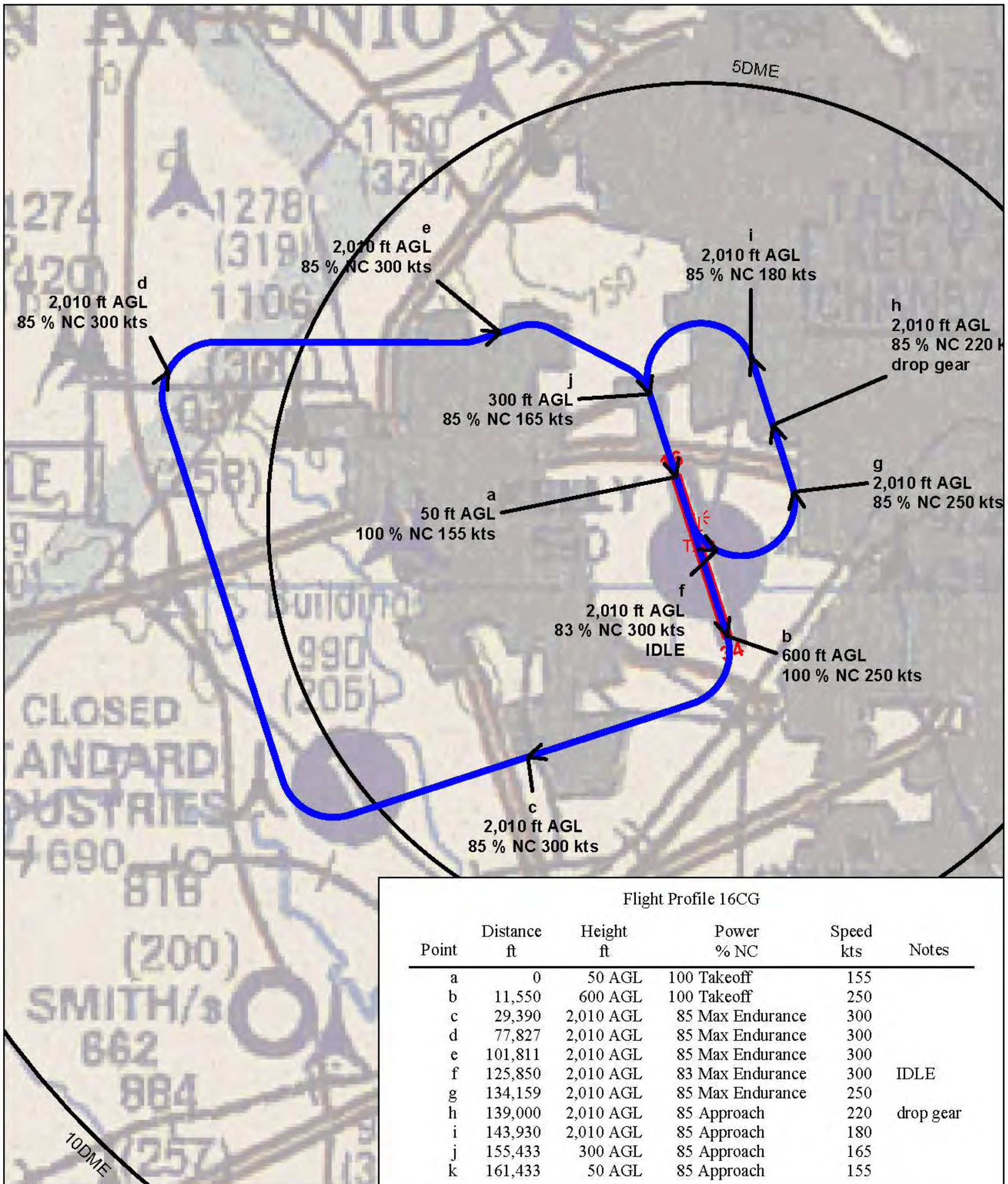


Flight Profile 16AI
TACTICAL PITCH TO EAST FROM NORTH
Flight Track: 15A2T - TACTICAL FROM NORTH PITCH EAST (MIDFIELD)
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,600 feet)

N

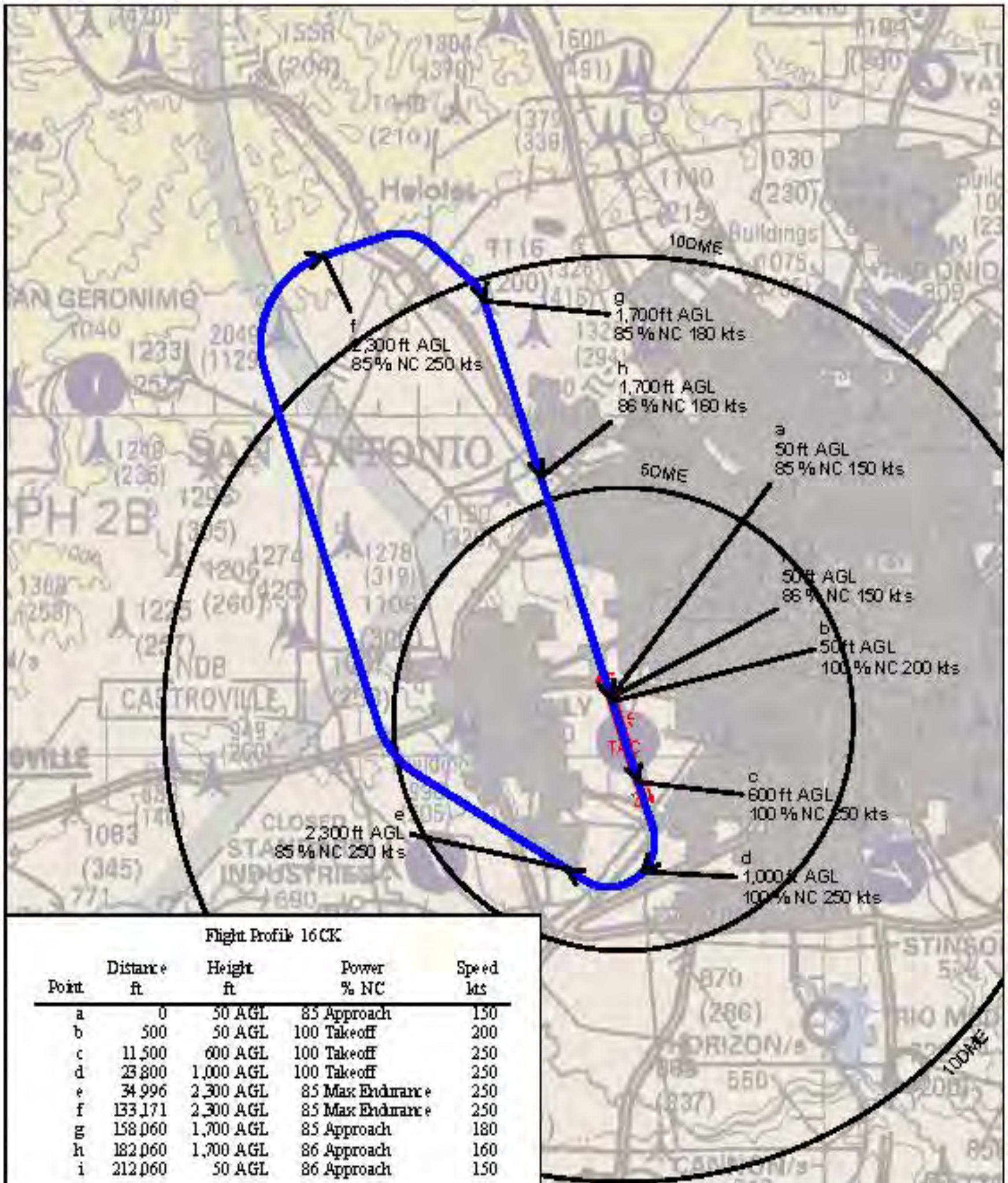


Flight Profile 16CG

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	155	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	85 Max Endurance	300	
d	77,827	2,010 AGL	85 Max Endurance	300	
e	101,811	2,010 AGL	85 Max Endurance	300	
f	125,850	2,010 AGL	83 Max Endurance	300	IDLE
g	134,159	2,010 AGL	85 Max Endurance	250	
h	139,000	2,010 AGL	85 Approach	220	drop gear
i	143,930	2,010 AGL	85 Approach	180	
j	155,433	300 AGL	85 Approach	165	
k	161,433	50 AGL	85 Approach	155	

Flight Profile 16CG
REENTRY TO PITCH
Flight Track: 15C0 - VFR REENTRY PATTERN TO PITCH (E)
Aircraft: Based F-16C ANG

Scale in Feet 1:128,000 (1 inch = 10,700 feet)



Flight Profile 16CK

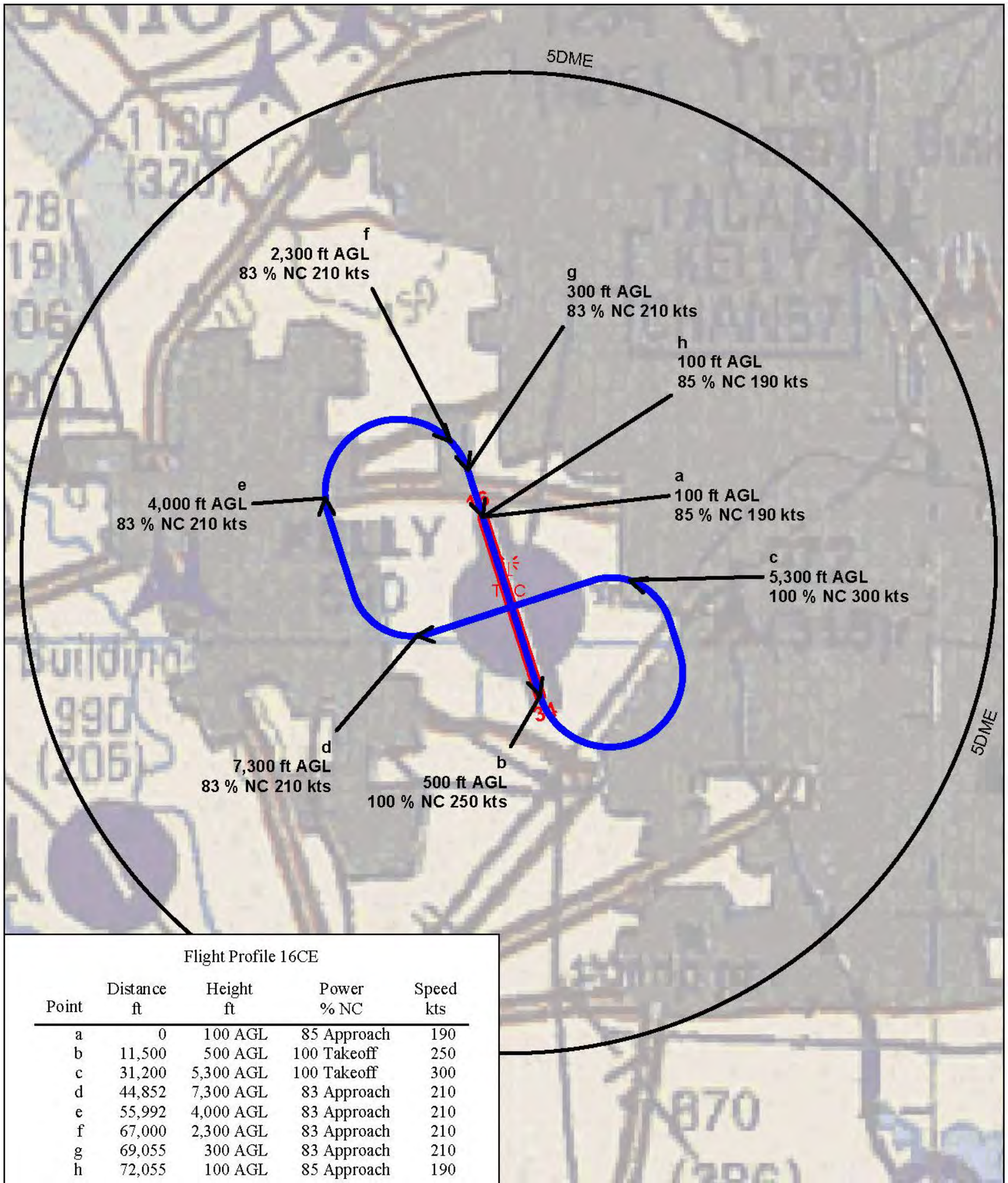
Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	50 AGL	85 Approach	150
b	500	50 AGL	100 Takeoff	200
c	11,500	600 AGL	100 Takeoff	250
d	23,800	1,000 AGL	100 Takeoff	250
e	34,996	2,300 AGL	85 Max Endurance	250
f	133,171	2,300 AGL	85 Max Endurance	250
g	158,060	1,700 AGL	85 Approach	180
h	182,060	1,700 AGL	86 Approach	160
i	212,060	50 AGL	86 Approach	150

Flight Profile 16CK
ILS PROFILE
Flight Track: 15C1 - RADAR PATTERN
Aircraft: Based F-16C ANG

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000

Scale in Feet 1:240,000 (1 inch = 20,000 feet)

N

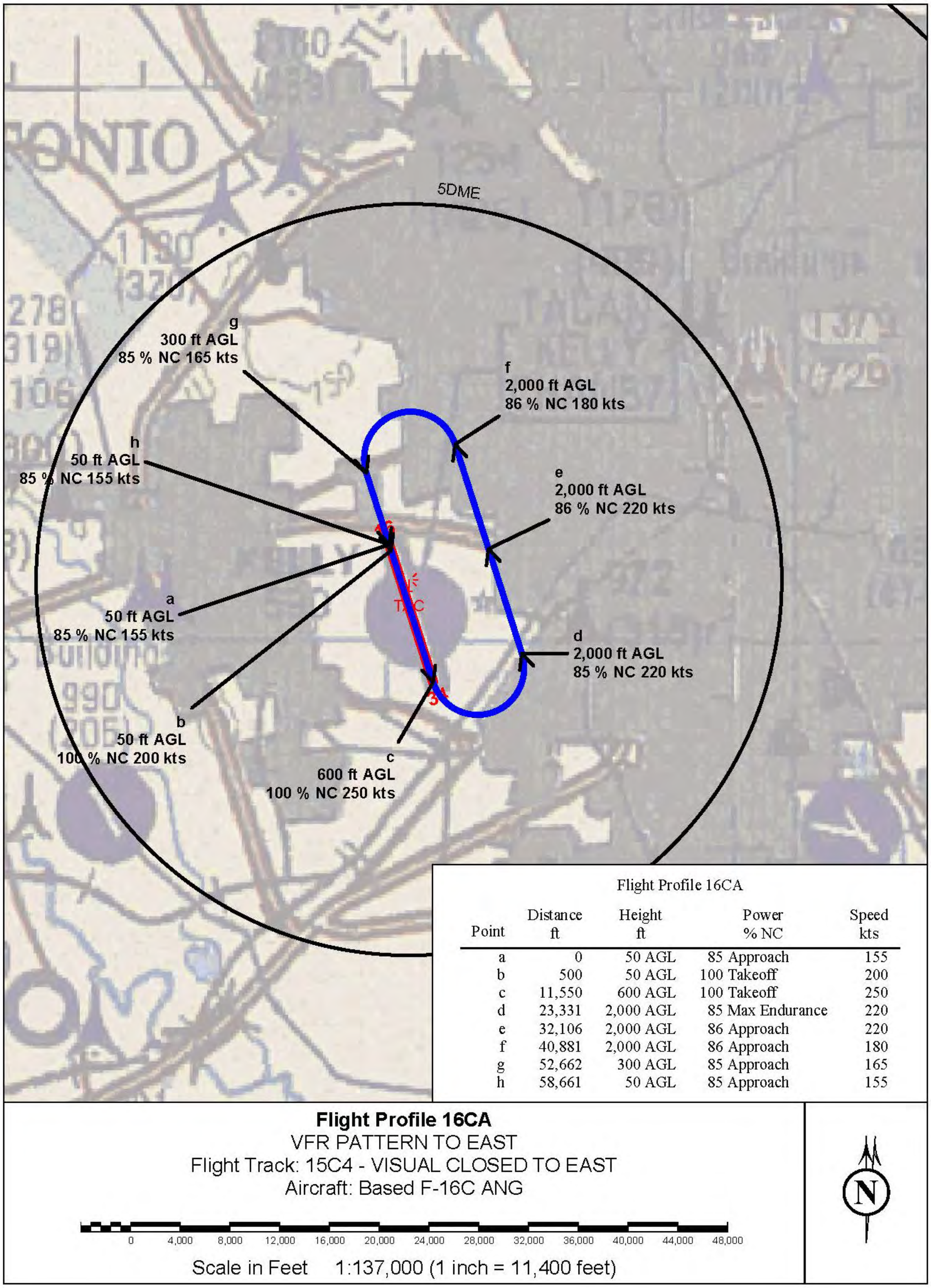


Flight Profile 16CE

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	100 AGL	85 Approach	190
b	11,500	500 AGL	100 Takeoff	250
c	31,200	5,300 AGL	100 Takeoff	300
d	44,852	7,300 AGL	83 Approach	210
e	55,992	4,000 AGL	83 Approach	210
f	67,000	2,300 AGL	83 Approach	210
g	69,055	300 AGL	83 Approach	210
h	72,055	100 AGL	85 Approach	190

Flight Profile 16CE
SFO PROFILE
Flight Track: 15C3 - CLOSED SFO
Aircraft: Based F-16C ANG

Scale in Feet 1:113,000 (1 inch = 9,460 feet)

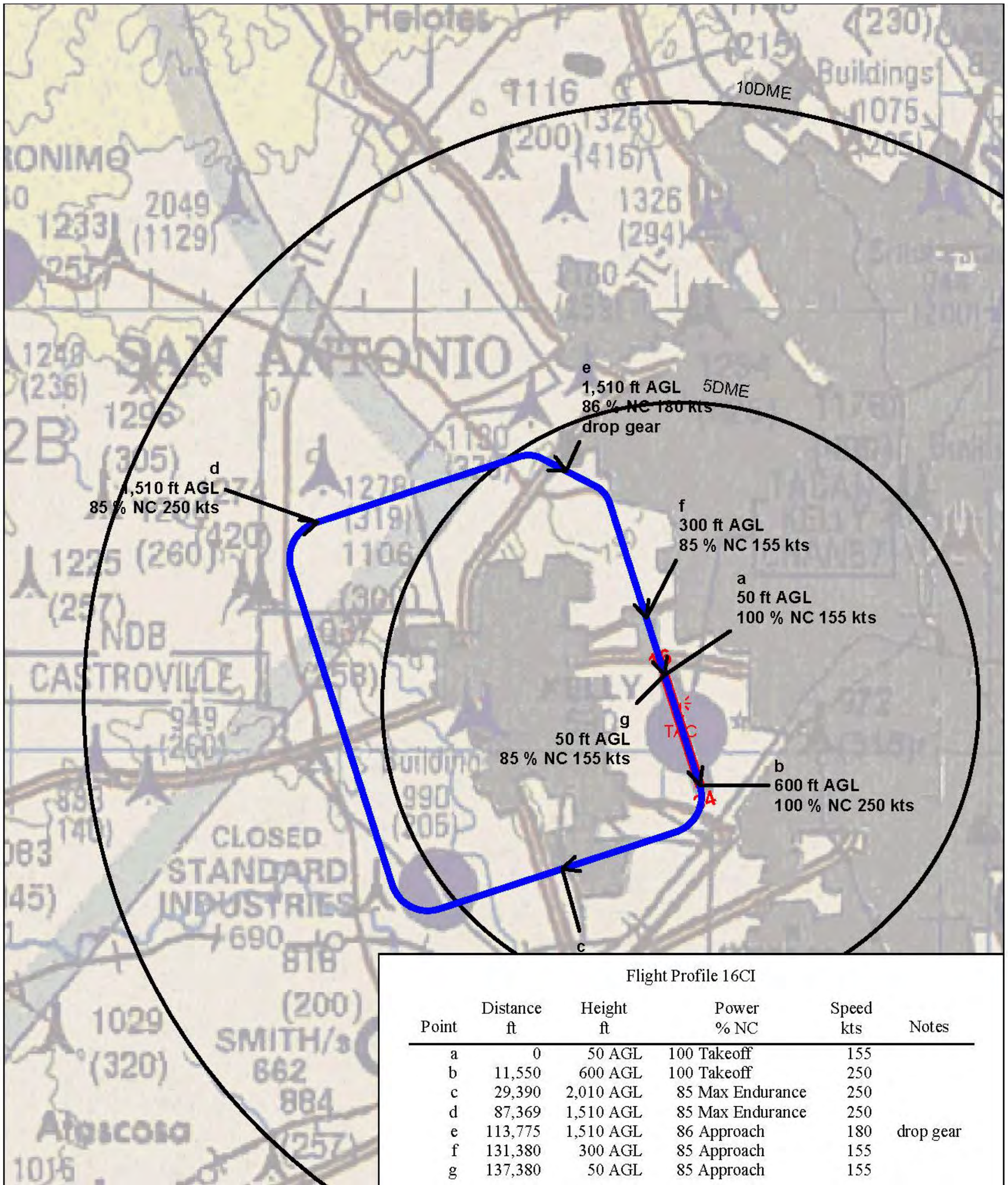


Flight Profile 16CA

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	50 AGL	85 Approach	155
b	500	50 AGL	100 Takeoff	200
c	11,550	600 AGL	100 Takeoff	250
d	23,331	2,000 AGL	85 Max Endurance	220
e	32,106	2,000 AGL	86 Approach	220
f	40,881	2,000 AGL	86 Approach	180
g	52,662	300 AGL	85 Approach	165
h	58,661	50 AGL	85 Approach	155

Flight Profile 16CA
VFR PATTERN TO EAST
Flight Track: 15C4 - VISUAL CLOSED TO EAST
Aircraft: Based F-16C ANG

Scale in Feet 1:137,000 (1 inch = 11,400 feet)



Flight Profile 16CI

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	155	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	85 Max Endurance	250	
d	87,369	1,510 AGL	85 Max Endurance	250	
e	113,775	1,510 AGL	86 Approach	180	drop gear
f	131,380	300 AGL	85 Approach	155	
g	137,380	50 AGL	85 Approach	155	

Flight Profile 16CI
REENTRY TO STRAIGHT-IN 3 MILE FINAL
Flight Track: 15C9 - VFR REENTRY PATTERN 3 MILE FINAL TO STRAIGHT-IN
Aircraft: Based F-16C ANG

Scale in Feet 1:185,000 (1 inch = 15,500 feet)

Flight Profile 16DK

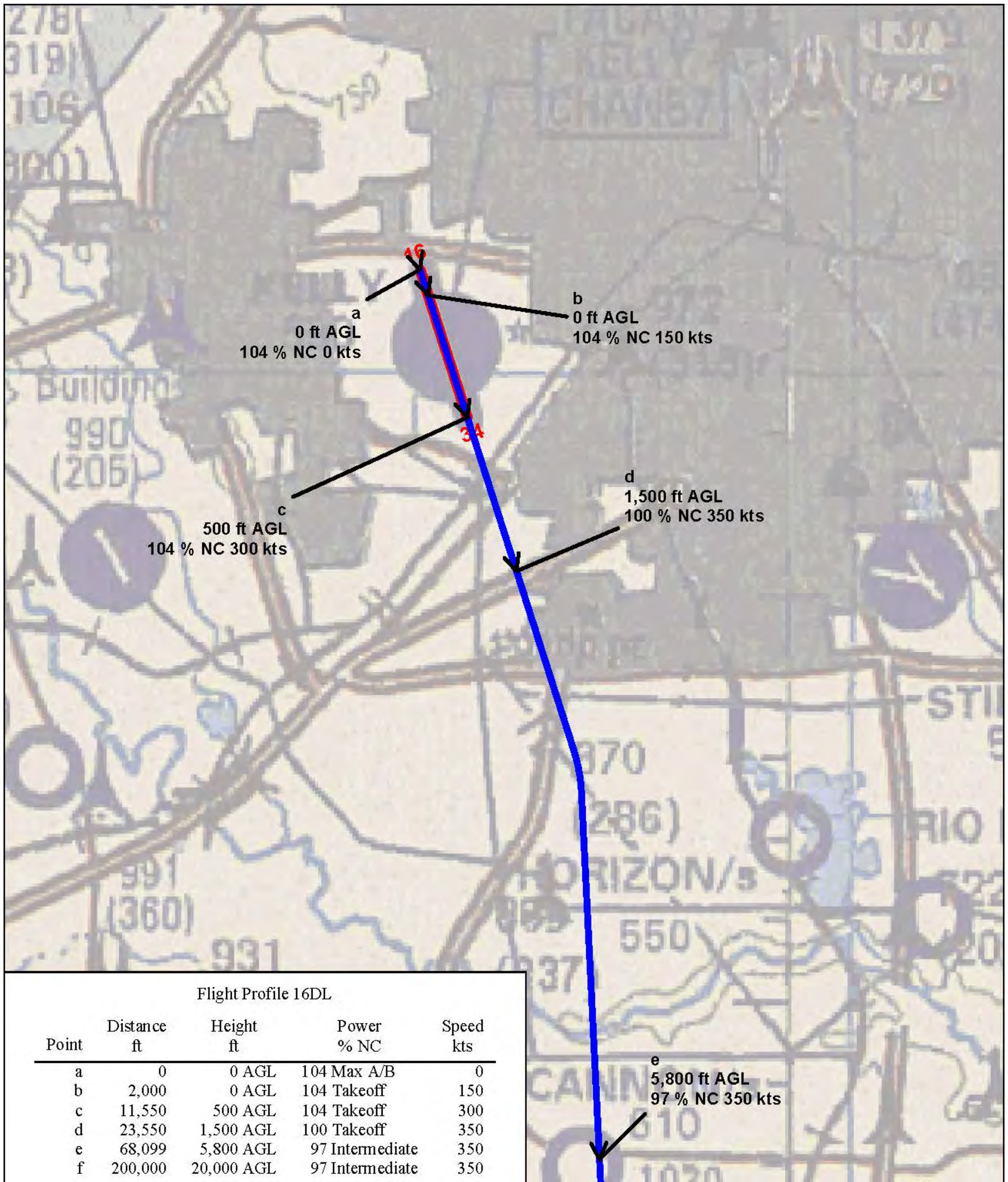
Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	104 Max A/B	0
b	1,600	0 AGL	105 Afterburner	170
c	11,550	500 AGL	104 Takeoff	300
d	14,550	1,500 AGL	100 Takeoff	350
e	68,099	5,800 AGL	97 Intermediate	350
f	200,000	20,000 AGL	97 Intermediate	350

Flight Profile 16DK
A/B TO CRYSTAL MOA AIR TO AIR OPS
Flight Track: 15D6 - TO CRYSTAL MOA OR 170 HDG
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:138,000 (1 inch = 11,500 feet)

N



Flight Profile 16DL

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	104 Max A/B	0
b	2,000	0 AGL	104 Takeoff	150
c	11,550	500 AGL	104 Takeoff	300
d	23,550	1,500 AGL	100 Takeoff	350
e	68,099	5,800 AGL	97 Intermediate	350
f	200,000	20,000 AGL	97 Intermediate	350

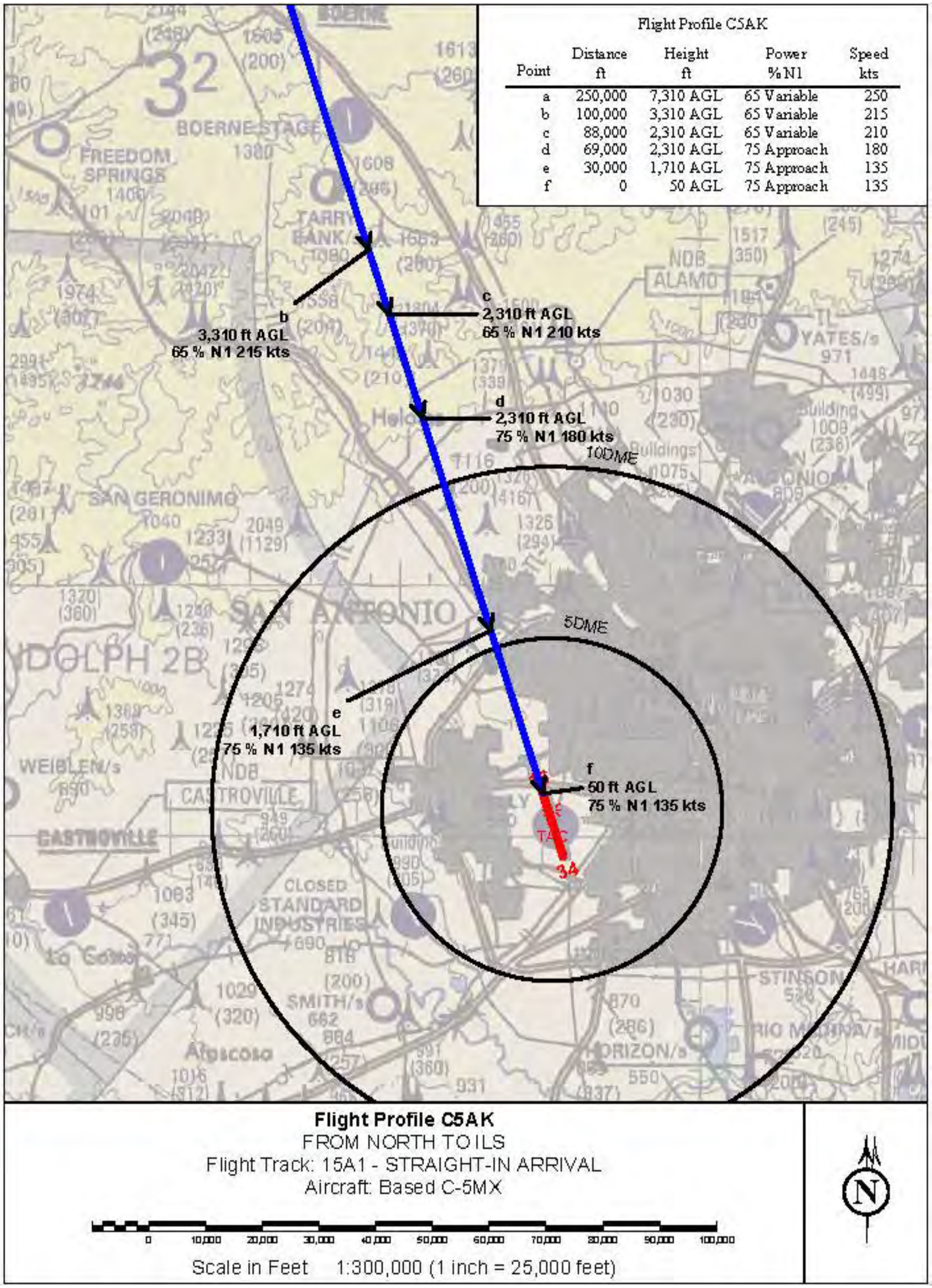
Flight Profile 16DL
MILITARY TO CRYSTAL MOA AIR TO AIR OPS
Flight Track: 15D6 - TO CRYSTAL MOA OR 170 HDG
Aircraft: Based F-16C ANG

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

Scale in Feet 1:138,000 (1 inch = 11,500 feet)

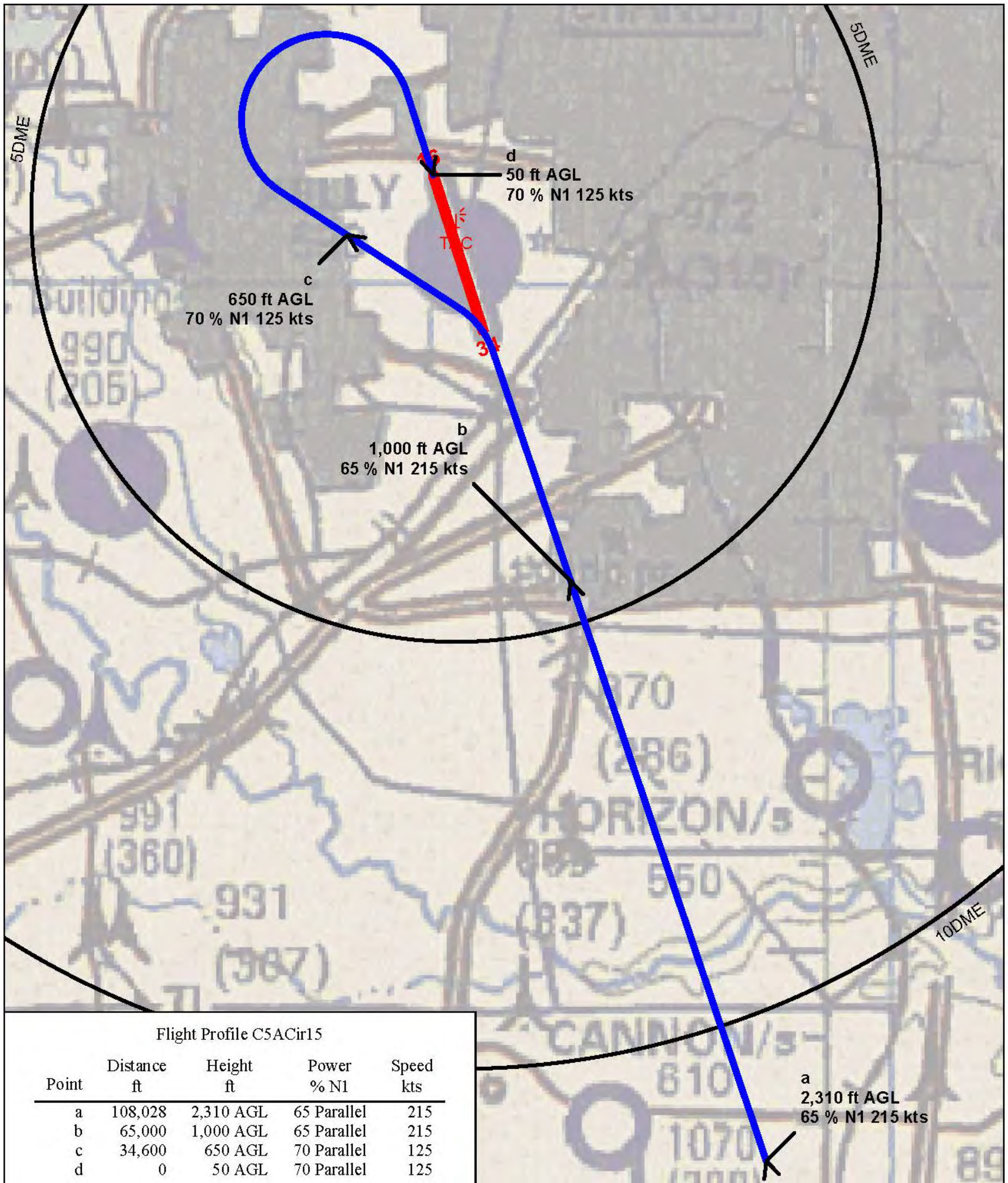
N

Flight Profiles for 433rd Airlift Wing C-5Ms



Flight Profile C5AK

Point	Distance ft	Height ft	Power % N1	Speed kts
a	250,000	7,310 AGL	65 Variable	250
b	100,000	3,310 AGL	65 Variable	215
c	88,000	2,310 AGL	65 Variable	210
d	69,000	2,310 AGL	75 Approach	180
e	30,000	1,710 AGL	75 Approach	135
f	0	50 AGL	75 Approach	135



Flight Profile C5ACir15

Point	Distance ft	Height ft	Power % N1	Speed kts
a	108,028	2,310 AGL	65 Parallel	215
b	65,000	1,000 AGL	65 Parallel	215
c	34,600	650 AGL	70 Parallel	125
d	0	50 AGL	70 Parallel	125

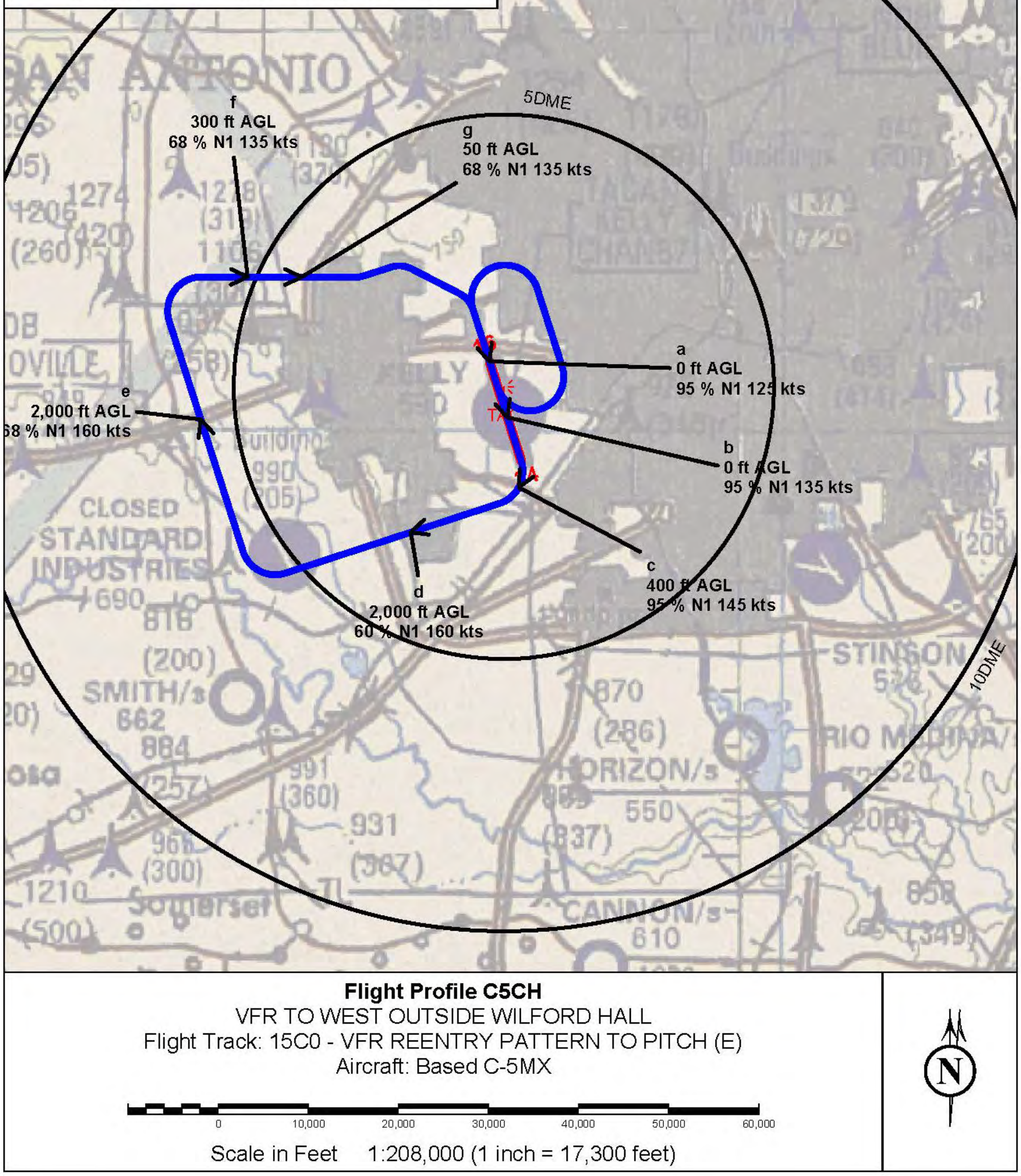
Flight Profile C5ACir15
R33 to R15 Circle
Flight Track: 15AEa - Circle arrival from R33 to R15
Aircraft: Based C-5MX

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:130,000 (1 inch = 10,900 feet)

Flight Profile C5CH

Point	Distance ft	Height ft	Power % N1	Speed kts
a	0	0 AGL	95 Takeoff	125
b	6,500	0 AGL	95 Takeoff	135
c	14,550	400 AGL	95 Takeoff	145
d	27,760	2,000 AGL	60 Cruise	160
e	63,520	2,000 AGL	68 Approach	160
f	87,082	300 AGL	68 Approach	135
g	93,082	50 AGL	68 Approach	135

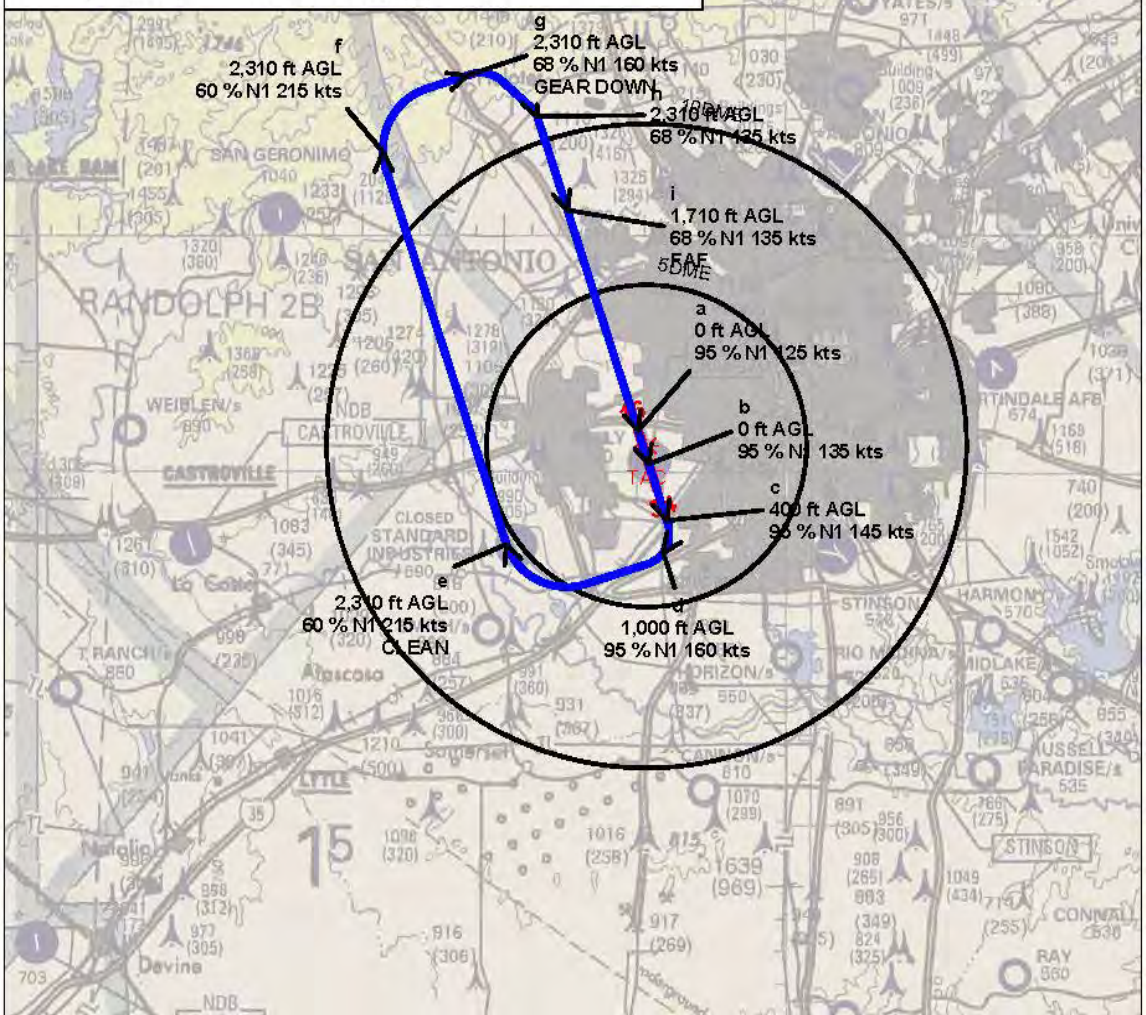


Flight Profile C5CH
VFR TO WEST OUTSIDE WILFORD HALL
Flight Track: 15C0 - VFR REENTRY PATTERN TO PITCH (E)
Aircraft: Based C-5MX

Scale in Feet 1:208,000 (1 inch = 17,300 feet)

Flight Profile C5CA

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	0 AGL	95 Takeoff	125	
b	6,500	0 AGL	95 Takeoff	135	
c	17,550	400 AGL	95 Takeoff	145	
d	23,800	1,000 AGL	95 Takeoff	160	
e	58,031	2,310 AGL	60 Cruise	215	CLEAN
f	134,704	2,310 AGL	60 Cruise	215	
g	158,060	2,310 AGL	68 Approach	160	GEAR DOWN
h	174,432	2,310 AGL	68 Approach	135	
i	192,800	1,710 AGL	68 Approach	135	FAF
j	236,012	50 AGL	68 Approach	135	



Flight Profile C5CA
PROFICIENCY SORTIE ILS PROFILE
Flight Track: 15C1a - TRACK CHANGED MAY 2002 and validated 2014
Aircraft: Based C-5MX

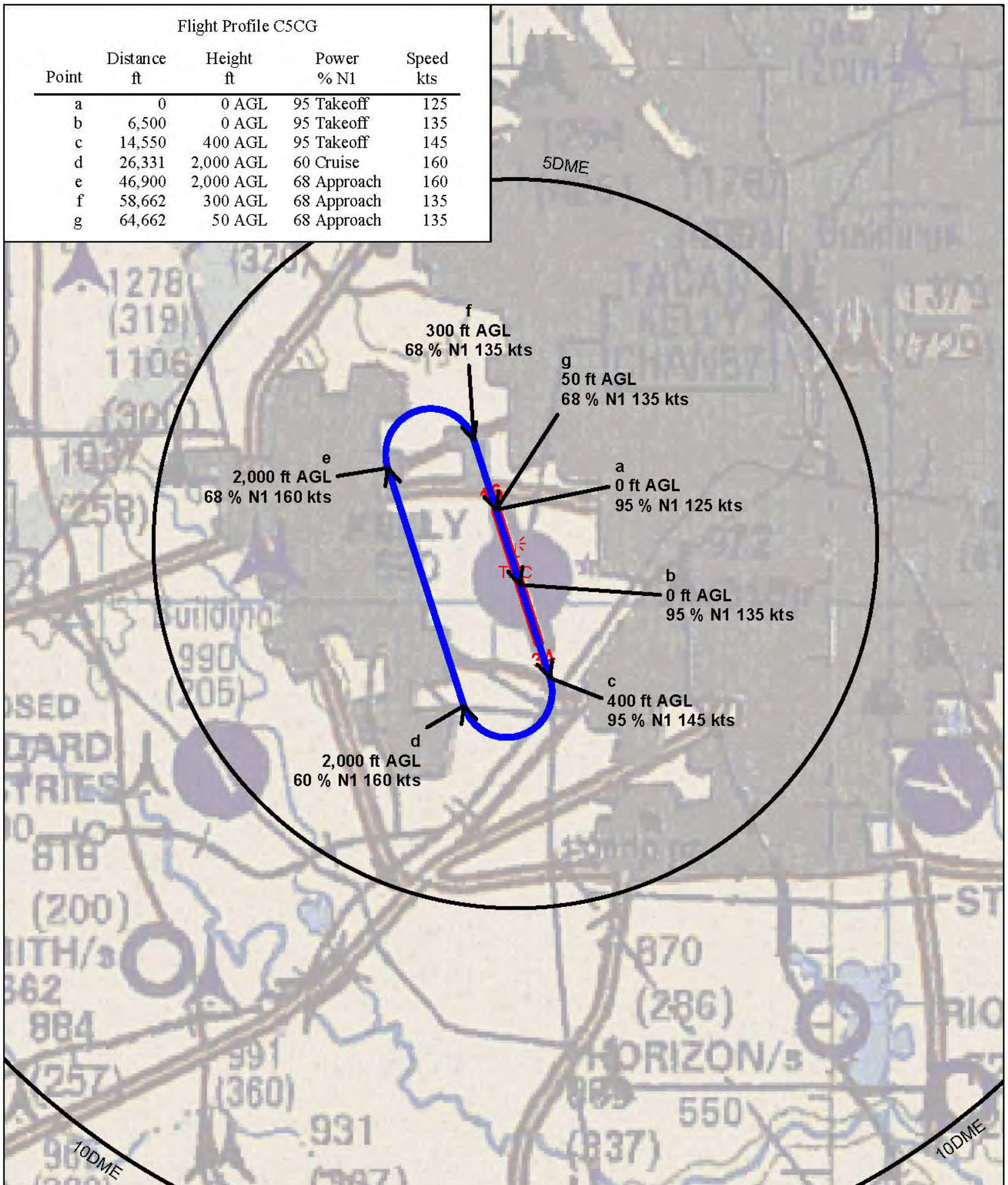
0 20,000 40,000 60,000 80,000 100,000 120,000

Scale in Feet 1:393,000 (1 inch = 32,800 feet)

N

Flight Profile C5CG

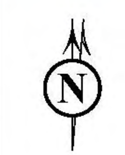
Point	Distance ft	Height ft	Power % N1	Speed kts
a	0	0 AGL	95 Takeoff	125
b	6,500	0 AGL	95 Takeoff	135
c	14,550	400 AGL	95 Takeoff	145
d	26,331	2,000 AGL	60 Cruise	160
e	46,900	2,000 AGL	68 Approach	160
f	58,662	300 AGL	68 Approach	135
g	64,662	50 AGL	68 Approach	135



Flight Profile C5CG
VFR TO WEST INSIDE WILFORD HALL
Flight Track: 15C8 - INSIDE WILFORD HALL
Aircraft: Based C-5MX

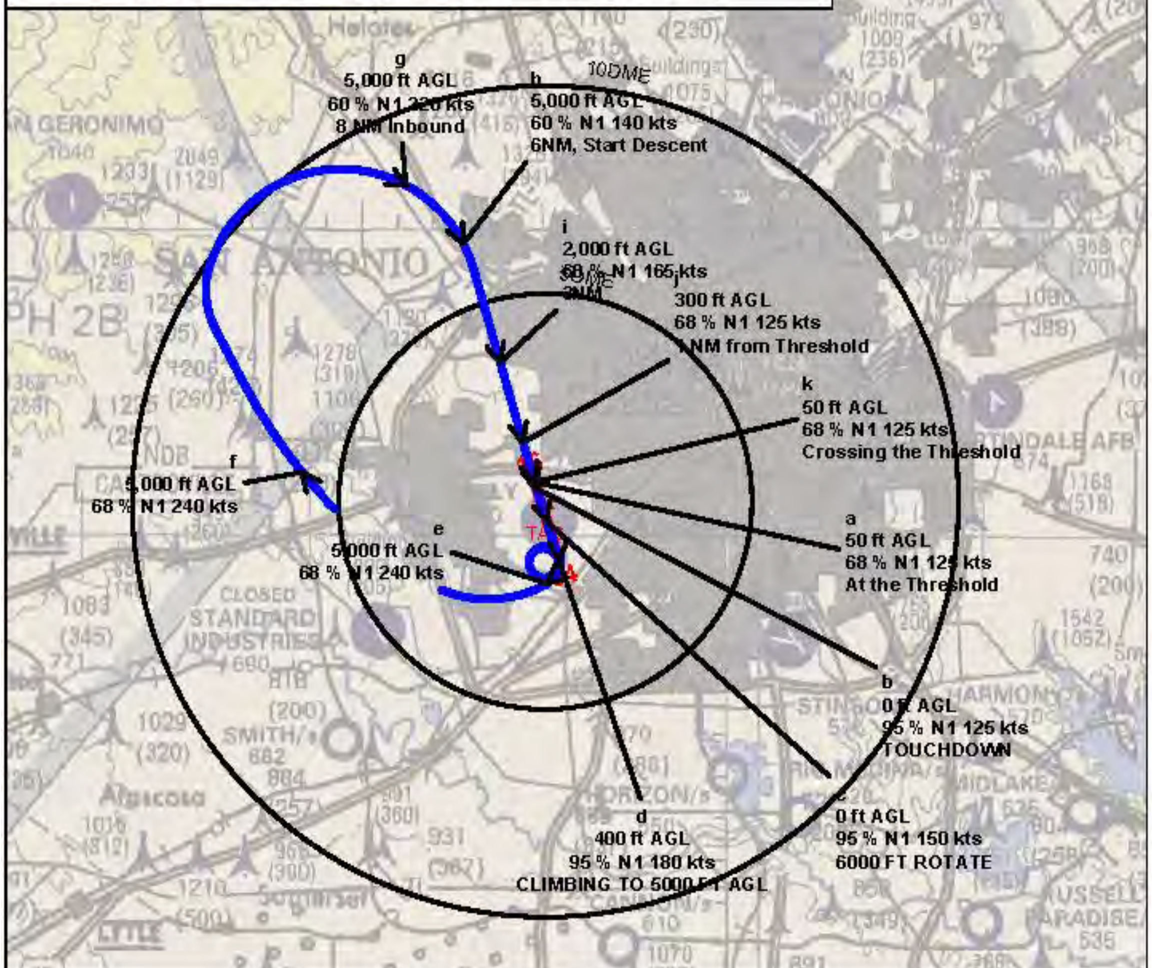
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000

Scale in Feet 1:153,000 (1 inch = 12,700 feet)



Flight Profile C5TA

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Takeoff	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	125	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	12,000	400 AGL	95 Takeoff	180	CLIMBING TO 5000 FT AGL
e	57,400	5,000 AGL	68 Cruise	240	
f	100,000	5,000 AGL	68 Cruise	240	
g	168,711	5,000 AGL	60 Cruise	220	8 NM Inbound
h	180,711	5,000 AGL	60 Cruise	140	6NM, Start Descent
i	198,711	2,000 AGL	60 Approach	165	3NM
j	210,711	300 AGL	68 Approach	125	1 NM from Threshold
k	216,711	50 AGL	68 Approach	125	Crossing the Threshold



Flight Profile C5TA

TACTICAL SPIRAL DEPARTURE TO 5000 AGL HIGH STRAIGHT-IN APPROACH

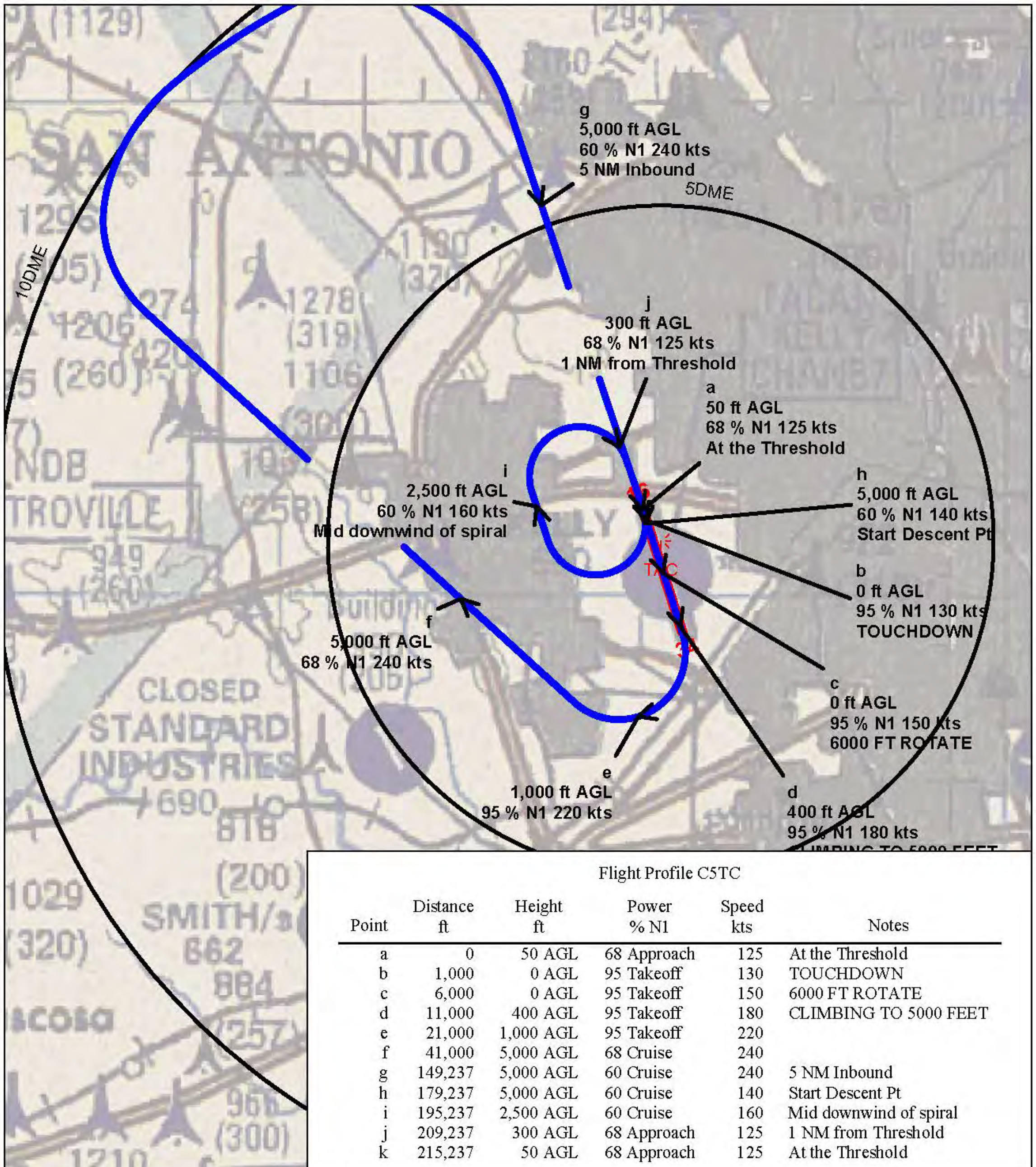
Flight Track: 15TCAa - TACTICAL SPIRAL DEPARTURE TO 5000 AGL HIGH STRAIGHT-IN APPROACH

Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000 100,000

Scale in Feet 1:306,000 (1 inch = 25,500 feet)

N



Flight Profile C5TC

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 5000 FEET
e	21,000	1,000 AGL	95 Takeoff	220	
f	41,000	5,000 AGL	68 Cruise	240	
g	149,237	5,000 AGL	60 Cruise	240	5 NM Inbound
h	179,237	5,000 AGL	60 Cruise	140	Start Descent Pt
i	195,237	2,500 AGL	60 Cruise	160	Mid downwind of spiral
j	209,237	300 AGL	68 Approach	125	1 NM from Threshold
k	215,237	50 AGL	68 Approach	125	At the Threshold

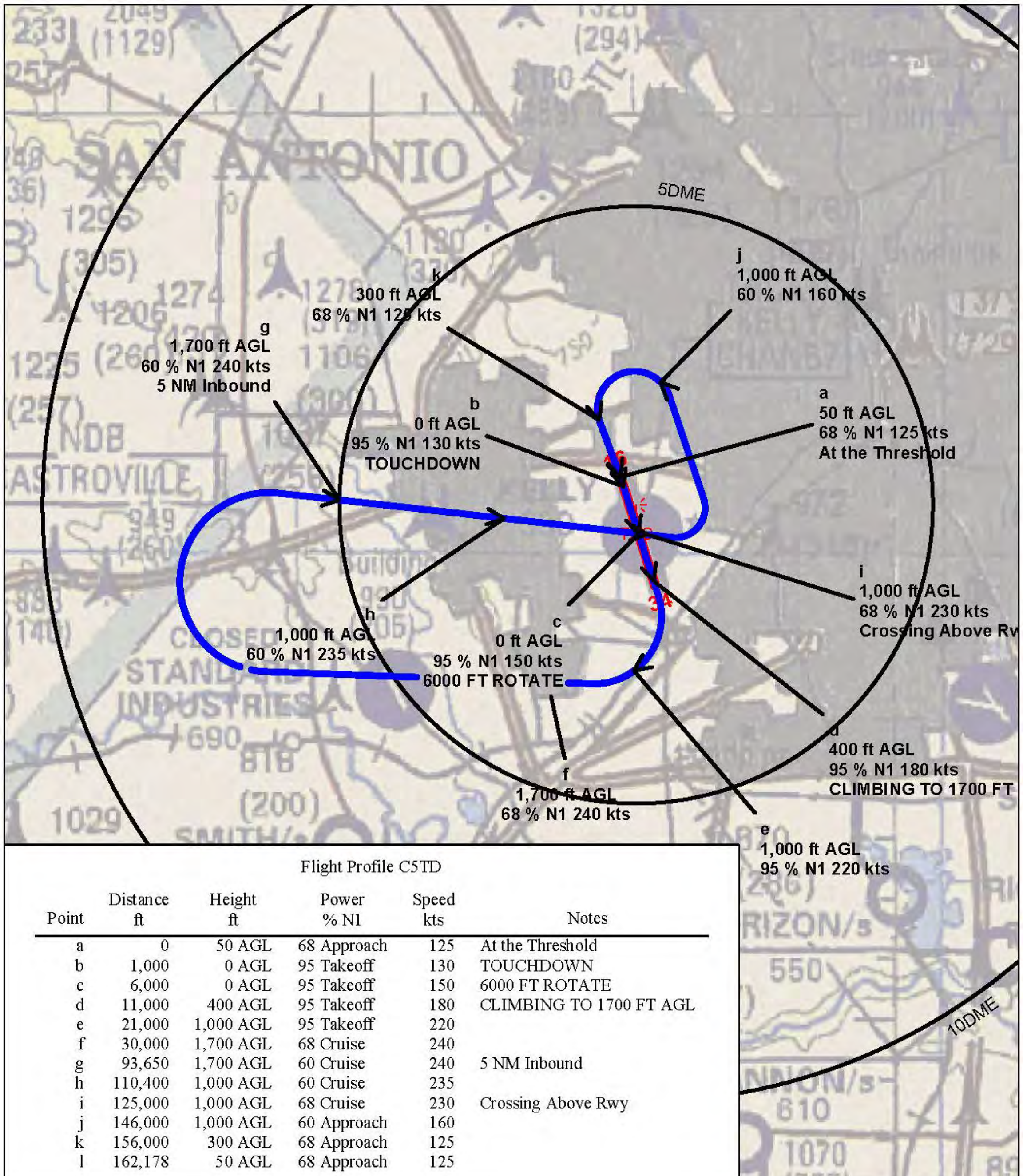
Flight Profile C5TC

TACTICAL DEPARTURE TO 5000 AGL TO A RANDOM STEEP/SPIRAL DOWN APPROACH

Flight Track: 15TCBa - TACTICAL DEPARTURE TO 5000 AGL TO A RANDOM STEEP/SPIRAL DOWN APPROACH

Aircraft: Based C-5MX

Scale in Feet 1:171,000 (1 inch = 14,200 feet)



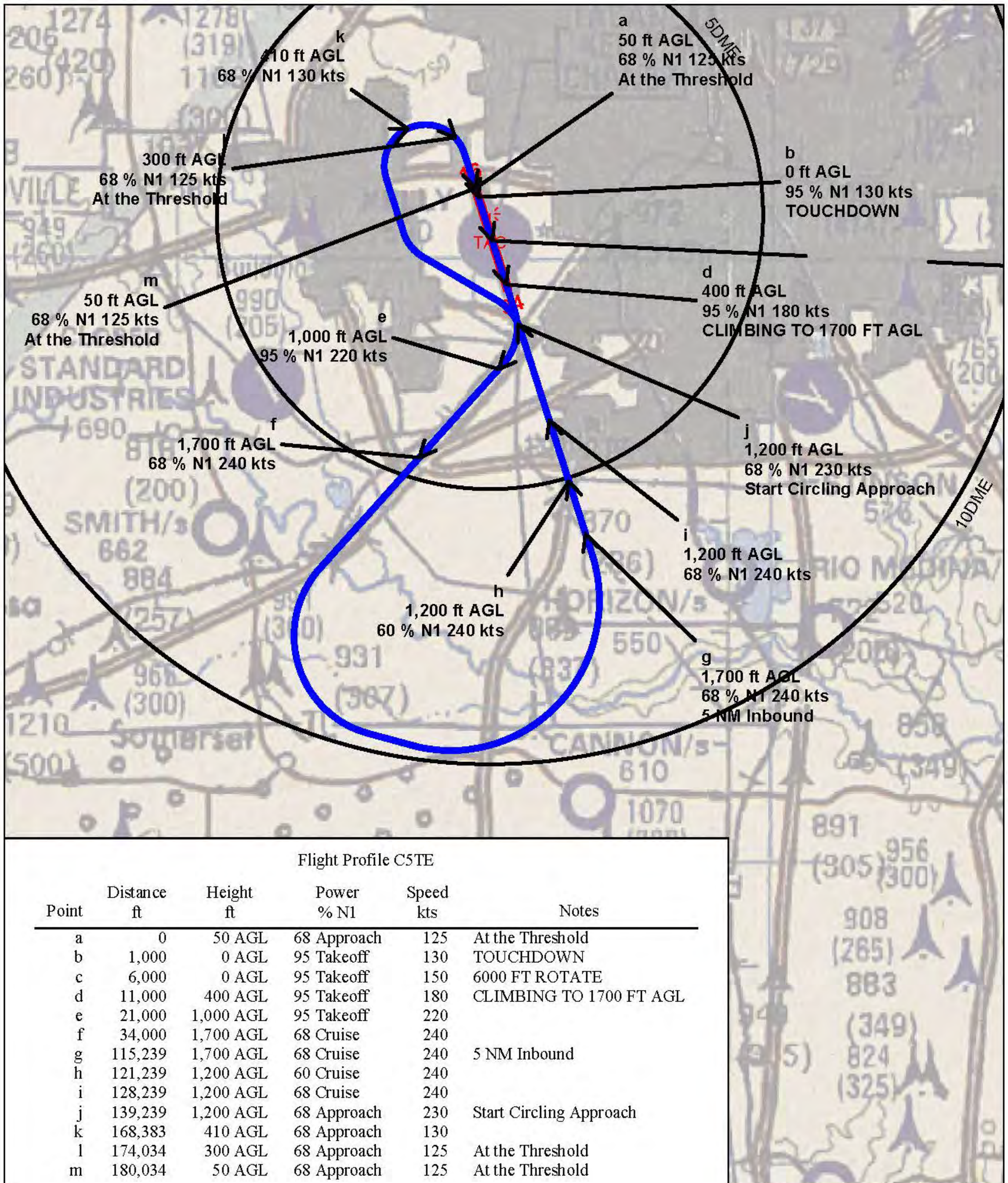
Flight Profile C5TD

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 1700 FT AGL
e	21,000	1,000 AGL	95 Takeoff	220	
f	30,000	1,700 AGL	68 Cruise	240	
g	93,650	1,700 AGL	60 Cruise	240	5 NM Inbound
h	110,400	1,000 AGL	60 Cruise	235	
i	125,000	1,000 AGL	68 Cruise	230	Crossing Above Rwy
j	146,000	1,000 AGL	60 Approach	160	
k	156,000	300 AGL	68 Approach	125	
l	162,178	50 AGL	68 Approach	125	

Flight Profile C5TD
TACTICAL DEPARTURE TO 1700 AGL TO LOW ABEAM APPROACH
Flight Track: 15TCCa - TACTICAL DEPARTURE TO 1700 AGL TO LOW ABEAM APPROACH
Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:189,000 (1 inch = 15,800 feet)



Flight Profile C5TE

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	11,000	400 AGL	95 Takeoff	180	CLIMBING TO 1700 FT AGL
e	21,000	1,000 AGL	95 Takeoff	220	
f	34,000	1,700 AGL	68 Cruise	240	
g	115,239	1,700 AGL	68 Cruise	240	5 NM Inbound
h	121,239	1,200 AGL	60 Cruise	240	
i	128,239	1,200 AGL	68 Cruise	240	
j	139,239	1,200 AGL	68 Approach	230	Start Circling Approach
k	168,383	410 AGL	68 Approach	130	
l	174,034	300 AGL	68 Approach	125	At the Threshold
m	180,034	50 AGL	68 Approach	125	At the Threshold

Flight Profile C5TE

TACTICAL DEPARTURE TO 1700 AGL TO TEARDROP APPROACH

Flight Track: 15TCD - TACTICAL DEPARTURE TO TEARDROP APPROACH

Aircraft: Based C-5MX

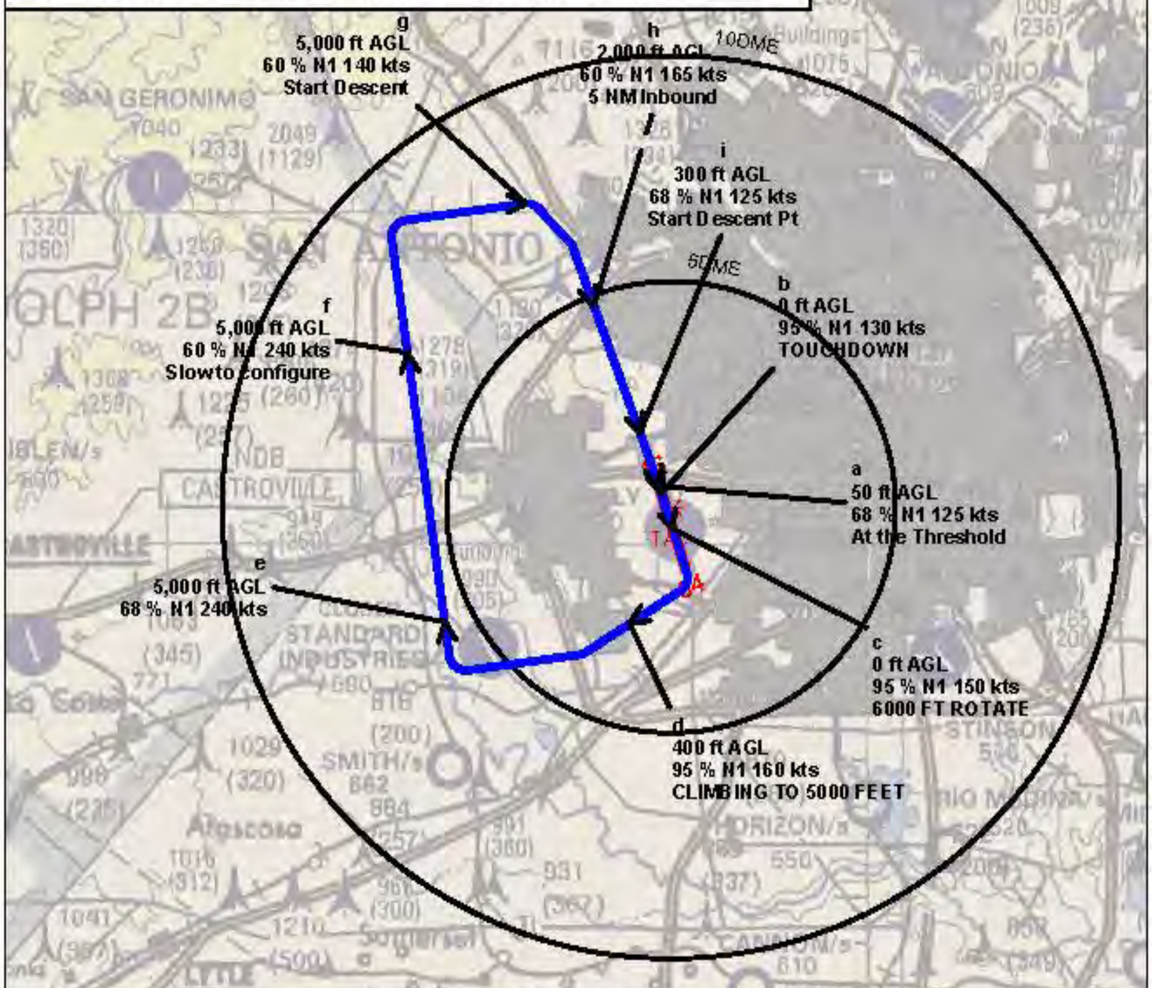
0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:202,000 (1 inch = 16,900 feet)

N

Flight Profile C5TK

Point	Distance ft	Height ft	Power % N1	Speed kts	Notes
a	0	50 AGL	68 Approach	125	At the Threshold
b	1,000	0 AGL	95 Takeoff	130	TOUCHDOWN
c	6,000	0 AGL	95 Takeoff	150	6000 FT ROTATE
d	22,880	400 AGL	95 Takeoff	160	CLIMBING TO 5000 FEET
e	53,850	5,000 AGL	68 Cruise	240	
f	90,000	5,000 AGL	60 Cruise	240	Slow to configure
g	125,000	5,000 AGL	60 Approach	140	Start Descent
h	142,000	2,000 AGL	60 Approach	165	5 NM Inbound
i	160,000	300 AGL	68 Approach	125	Start Descent Pt
j	167,503	50 AGL	68 Approach	125	At the Threshold



Flight Profile C5TK

TACTICAL DEPARTURE TO CURVILINEAR APPROACH TO RWY 15

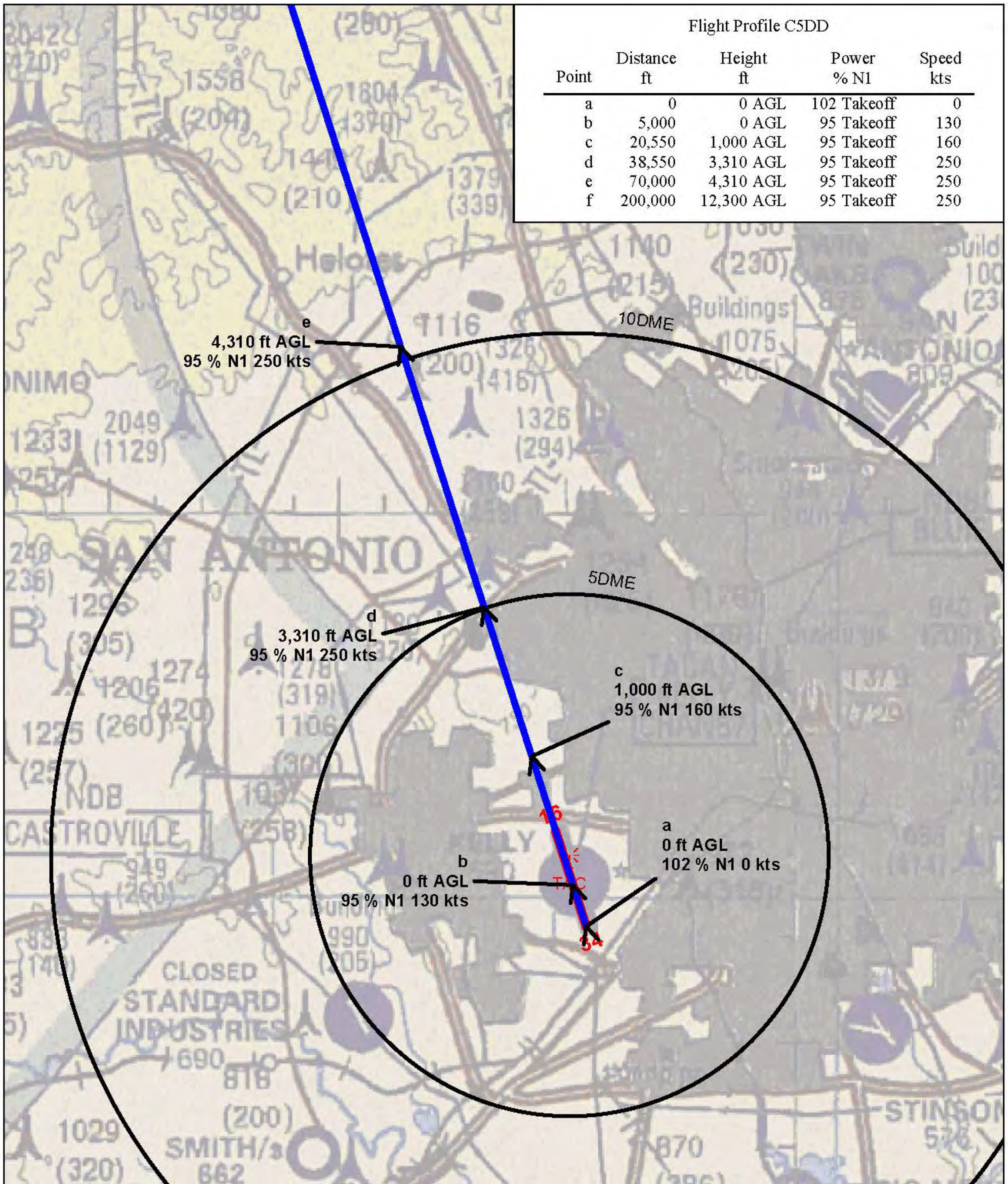
Flight Track: 15TCFa - TACTICAL DEPARTURE TO CURVILINEAR APPROACH TO RWY 33

Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000 80,000 90,000

Scale in Feet 1:282,000 (1 inch = 23,500 feet)

N



Flight Profile C5DD

Point	Distance ft	Height ft	Power % N1	Speed kts
a	0	0 AGL	102 Takeoff	0
b	5,000	0 AGL	95 Takeoff	130
c	20,550	1,000 AGL	95 Takeoff	160
d	38,550	3,310 AGL	95 Takeoff	250
e	70,000	4,310 AGL	95 Takeoff	250
f	200,000	12,300 AGL	95 Takeoff	250

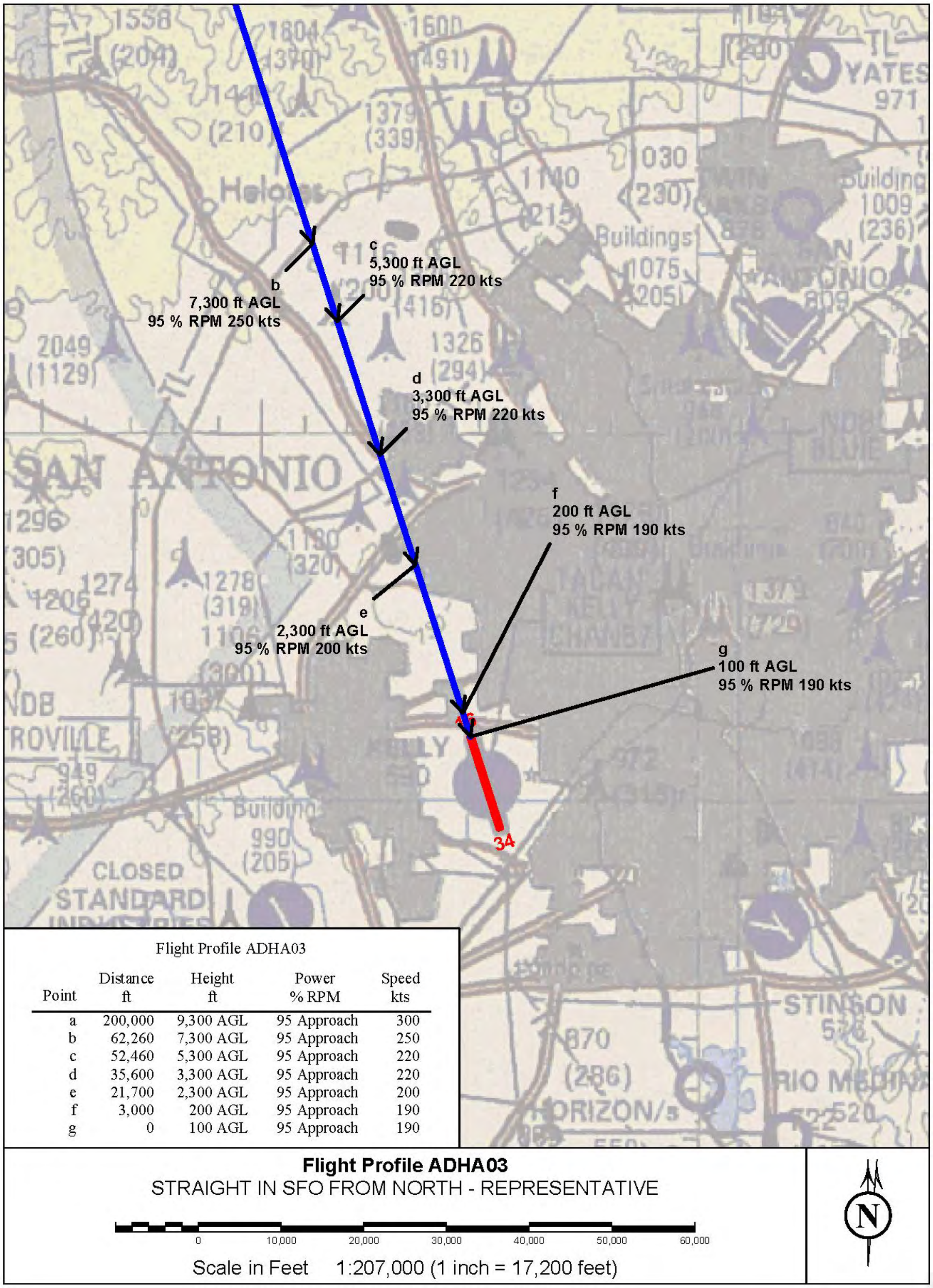
Flight Profile C5DD
MISSION DEPART TO NORTH
Flight Track: 33D9 - STRAIGHT OUT RUNWAY HEADING
Aircraft: Based C-5MX

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000
Scale in Feet 1:213,000 (1 inch = 17,800 feet)

N

B.2.3.2 Contract ADAIR Aircraft Representative Flight Profiles

Contract ADAIR High Noise A-4N (A-4C Surrogate)



Flight Profile ADHA03

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	9,300 AGL	95 Approach	300
b	62,260	7,300 AGL	95 Approach	250
c	52,460	5,300 AGL	95 Approach	220
d	35,600	3,300 AGL	95 Approach	220
e	21,700	2,300 AGL	95 Approach	200
f	3,000	200 AGL	95 Approach	190
g	0	100 AGL	95 Approach	190

Flight Profile ADHA03
STRAIGHT IN SFO FROM NORTH - REPRESENTATIVE

Scale in Feet 1:207,000 (1 inch = 17,200 feet)

Flight Profile ADHA17

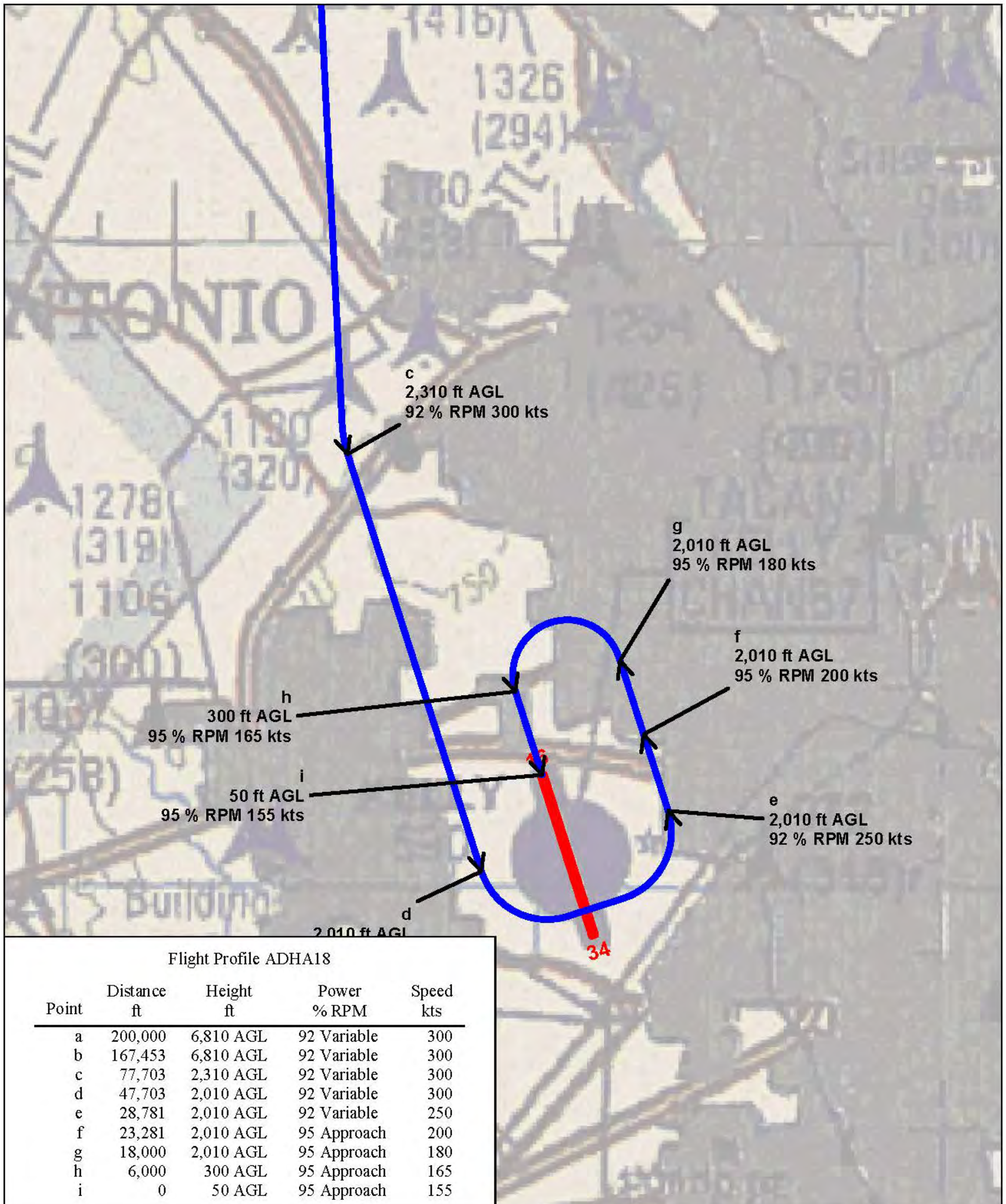
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	92 Variable	300
b	167,453	6,810 AGL	92 Variable	300
c	70,562	2,310 AGL	92 Variable	300
d	40,562	2,010 AGL	92 Variable	300
e	28,781	2,010 AGL	92 Variable	300
f	23,281	2,010 AGL	95 Approach	200
g	18,000	2,010 AGL	95 Approach	120
h	6,000	300 AGL	95 Approach	120
i	0	50 AGL	95 Approach	126

Flight Profile ADHA17

ADAIR Type A High Noise - OH Break Arrival - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:75,300 (1 inch = 6,280 feet)



Flight Profile ADHA18

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	92 Variable	300
b	167,453	6,810 AGL	92 Variable	300
c	77,703	2,310 AGL	92 Variable	300
d	47,703	2,010 AGL	92 Variable	300
e	28,781	2,010 AGL	92 Variable	250
f	23,281	2,010 AGL	95 Approach	200
g	18,000	2,010 AGL	95 Approach	180
h	6,000	300 AGL	95 Approach	165
i	0	50 AGL	95 Approach	155

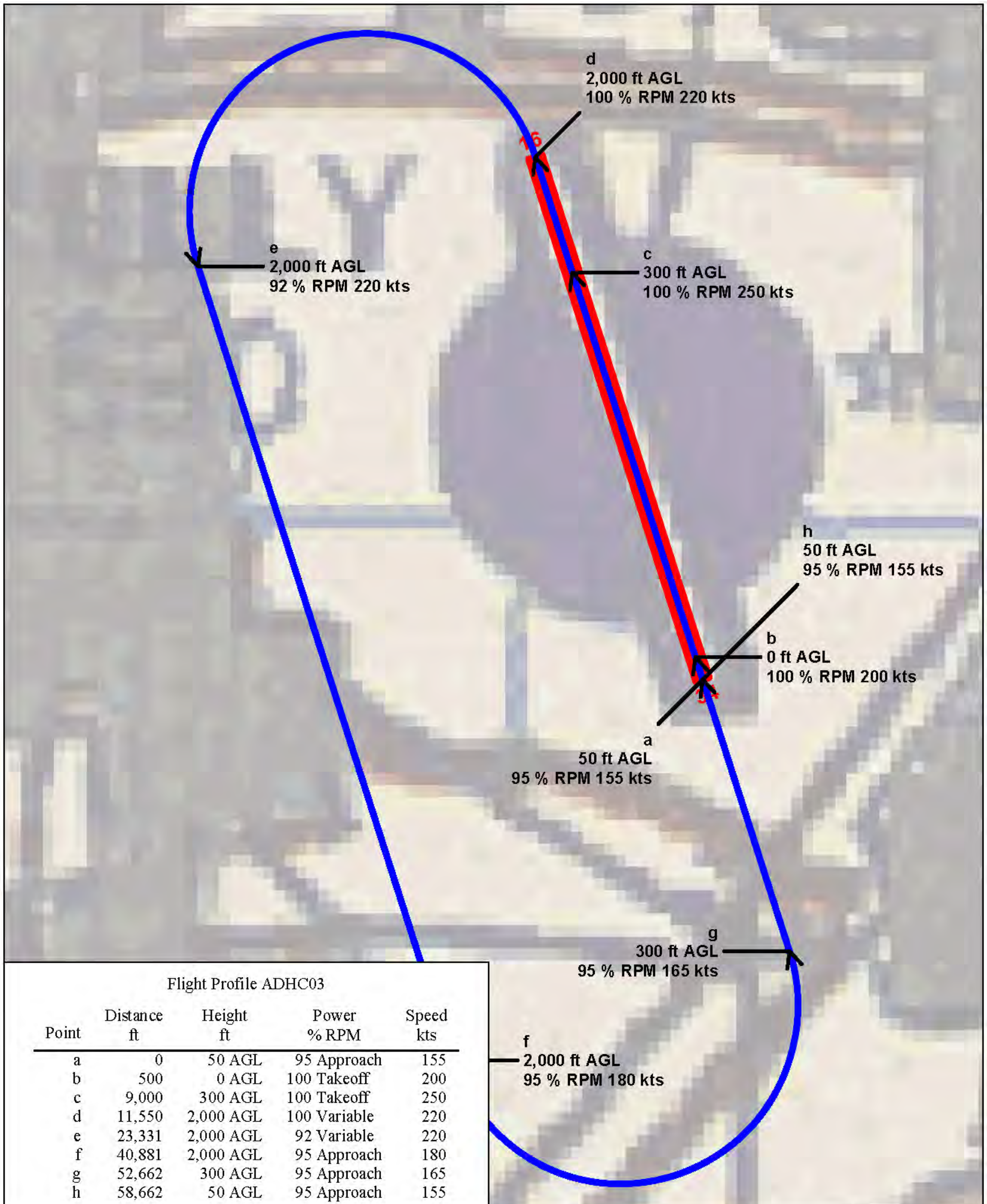
Flight Profile ADHA18

ADAIR Type A High Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,600 feet)

N



Flight Profile ADHC03

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	50 AGL	95 Approach	155
b	500	0 AGL	100 Takeoff	200
c	9,000	300 AGL	100 Takeoff	250
d	11,550	2,000 AGL	100 Variable	220
e	23,331	2,000 AGL	92 Variable	220
f	40,881	2,000 AGL	95 Approach	180
g	52,662	300 AGL	95 Approach	165
h	58,662	50 AGL	95 Approach	155

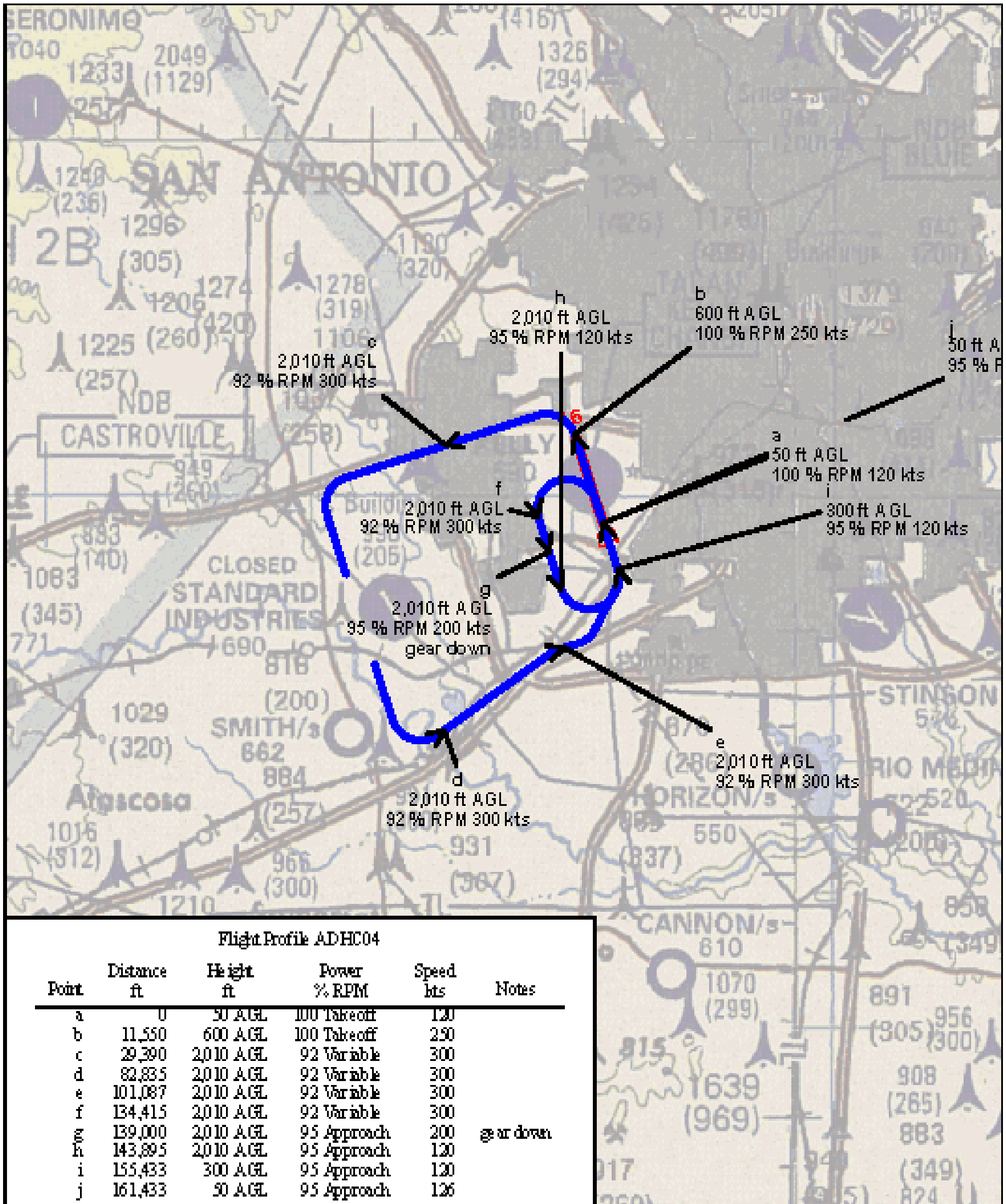
Flight Profile ADHC03

ADAIR Type A High Noise - Closed Pattern - Touch and Go - REPRESENTATIVE

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:38,200 (1 inch = 3,180 feet)

N



Flight Profile ADHC04

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	92 Variable	300	
d	82,835	2,010 AGL	92 Variable	300	
e	101,087	2,010 AGL	92 Variable	300	
f	134,415	2,010 AGL	92 Variable	300	
g	139,000	2,010 AGL	95 Approach	200	gear down
h	143,895	2,010 AGL	95 Approach	120	
i	155,433	300 AGL	95 Approach	120	
j	161,433	50 AGL	95 Approach	126	

Flight Profile ADHC04

ADAIR Type A High Noise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

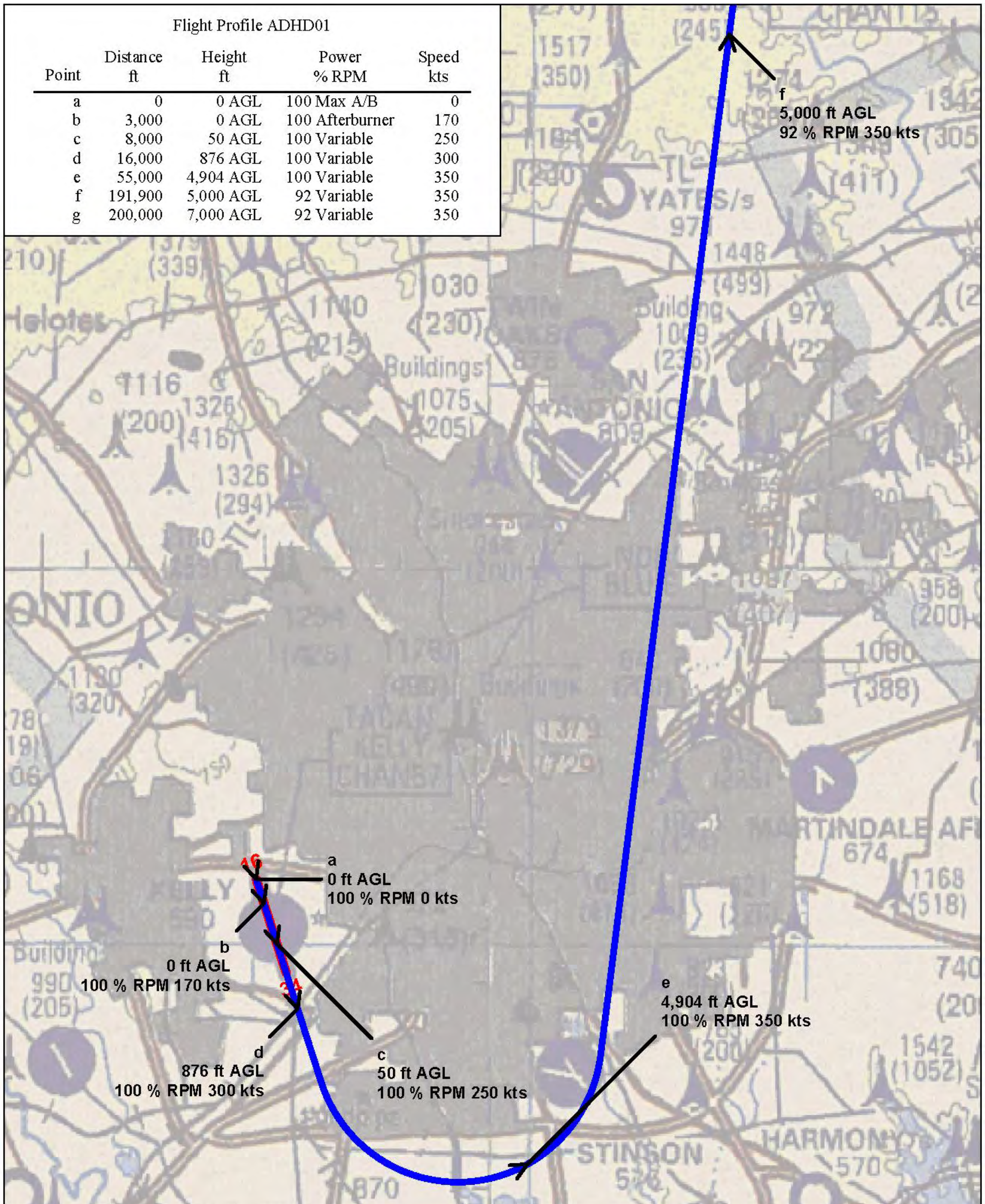
0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:230,000 (1 inch = 19,100 feet)

N

Flight Profile ADHD01

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	100 Max A/B	0
b	3,000	0 AGL	100 Afterburner	170
c	8,000	50 AGL	100 Variable	250
d	16,000	876 AGL	100 Variable	300
e	55,000	4,904 AGL	100 Variable	350
f	191,900	5,000 AGL	92 Variable	350
g	200,000	7,000 AGL	92 Variable	350



Flight Profile ADHD01
ADAIR Type A High Noise - Departure - REPRESENTATIVE

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:213,000 (1 inch = 17,700 feet)

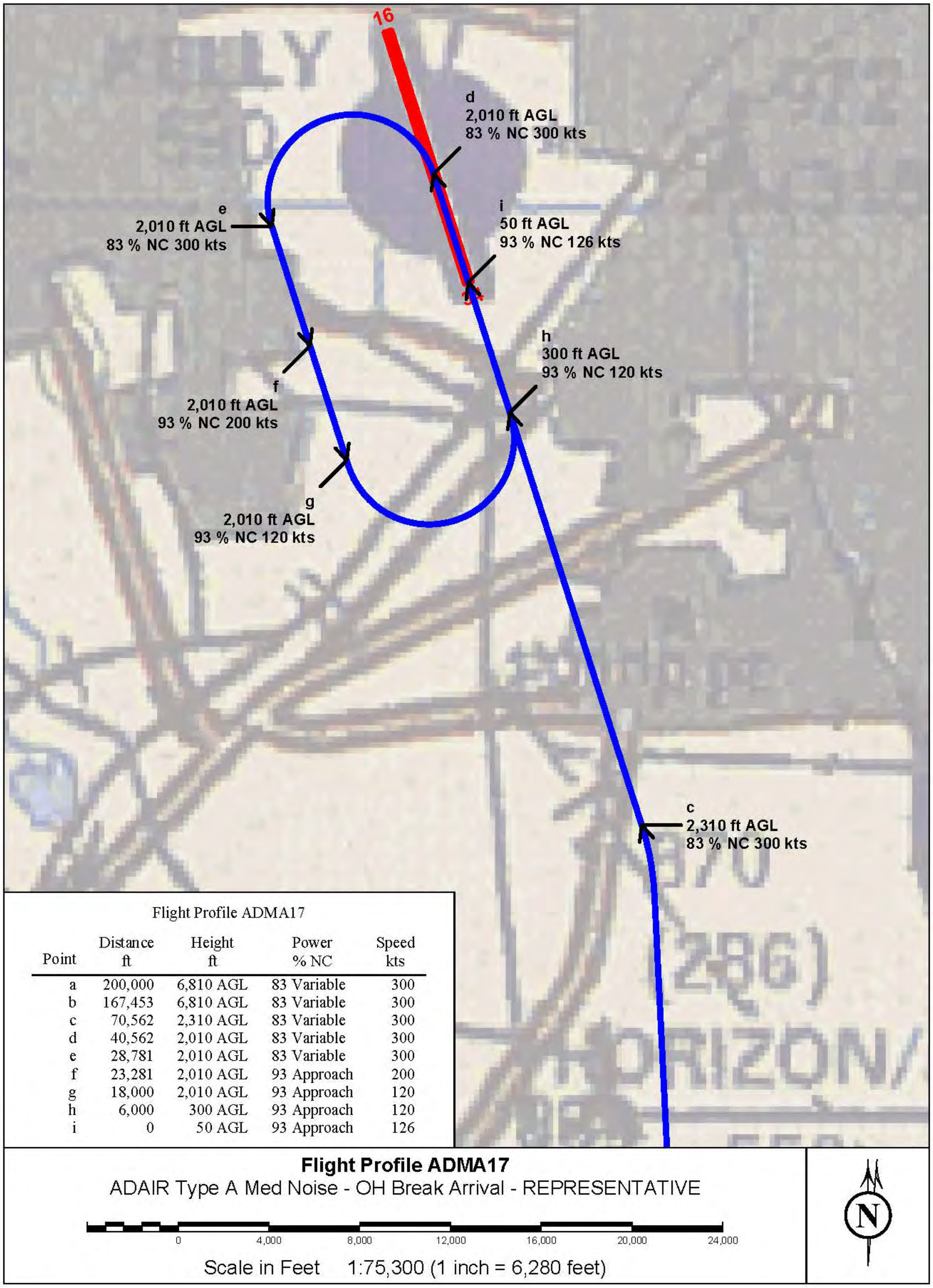
<u>Contract ADAIR Medium Noise MiG-21 (F-104D&G Surrogate)</u>

Flight Profile ADMA01

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	15,000 AGL	83 Cruise	250
b	75,000	4,500 AGL	83 Cruise	150
c	28,000	2,500 AGL	93 Approach	150
d	9,000	1,200 AGL	93 Approach	115
e	0	50 AGL	93 Approach	115

Flight Profile ADMA01
ADAIR Type A Med Noise - Straight-In Arrival - REPRESENTATIVE

Scale in Feet 1:130,000 (1 inch = 10,800 feet)



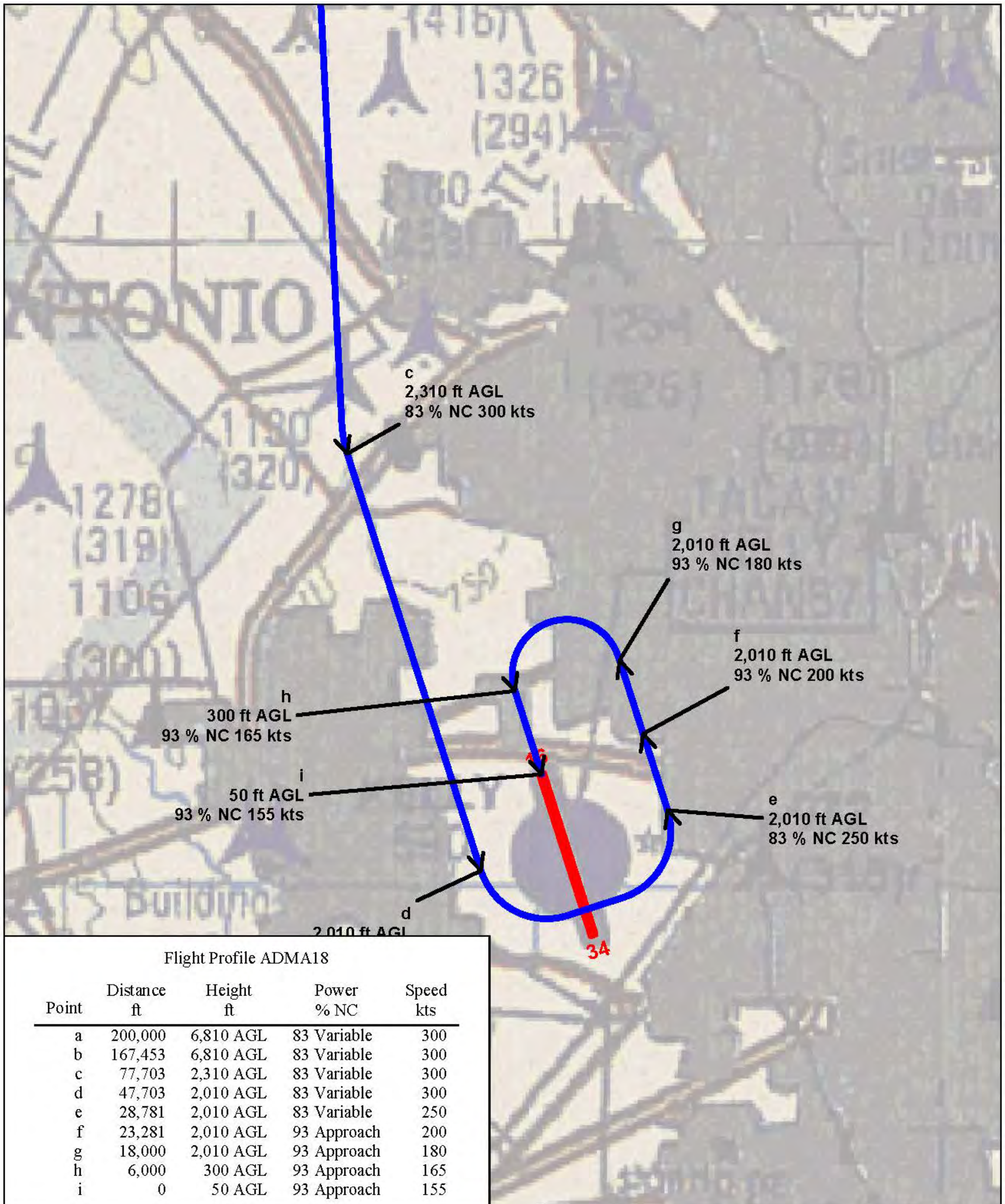
Flight Profile ADMA17

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	83 Variable	300
b	167,453	6,810 AGL	83 Variable	300
c	70,562	2,310 AGL	83 Variable	300
d	40,562	2,010 AGL	83 Variable	300
e	28,781	2,010 AGL	83 Variable	300
f	23,281	2,010 AGL	93 Approach	200
g	18,000	2,010 AGL	93 Approach	120
h	6,000	300 AGL	93 Approach	120
i	0	50 AGL	93 Approach	126

Flight Profile ADMA17

ADAIR Type A Med Noise - OH Break Arrival - REPRESENTATIVE

Scale in Feet 1:75,300 (1 inch = 6,280 feet)



Flight Profile ADMA18

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	6,810 AGL	83 Variable	300
b	167,453	6,810 AGL	83 Variable	300
c	77,703	2,310 AGL	83 Variable	300
d	47,703	2,010 AGL	83 Variable	300
e	28,781	2,010 AGL	83 Variable	250
f	23,281	2,010 AGL	93 Approach	200
g	18,000	2,010 AGL	93 Approach	180
h	6,000	300 AGL	93 Approach	165
i	0	50 AGL	93 Approach	155

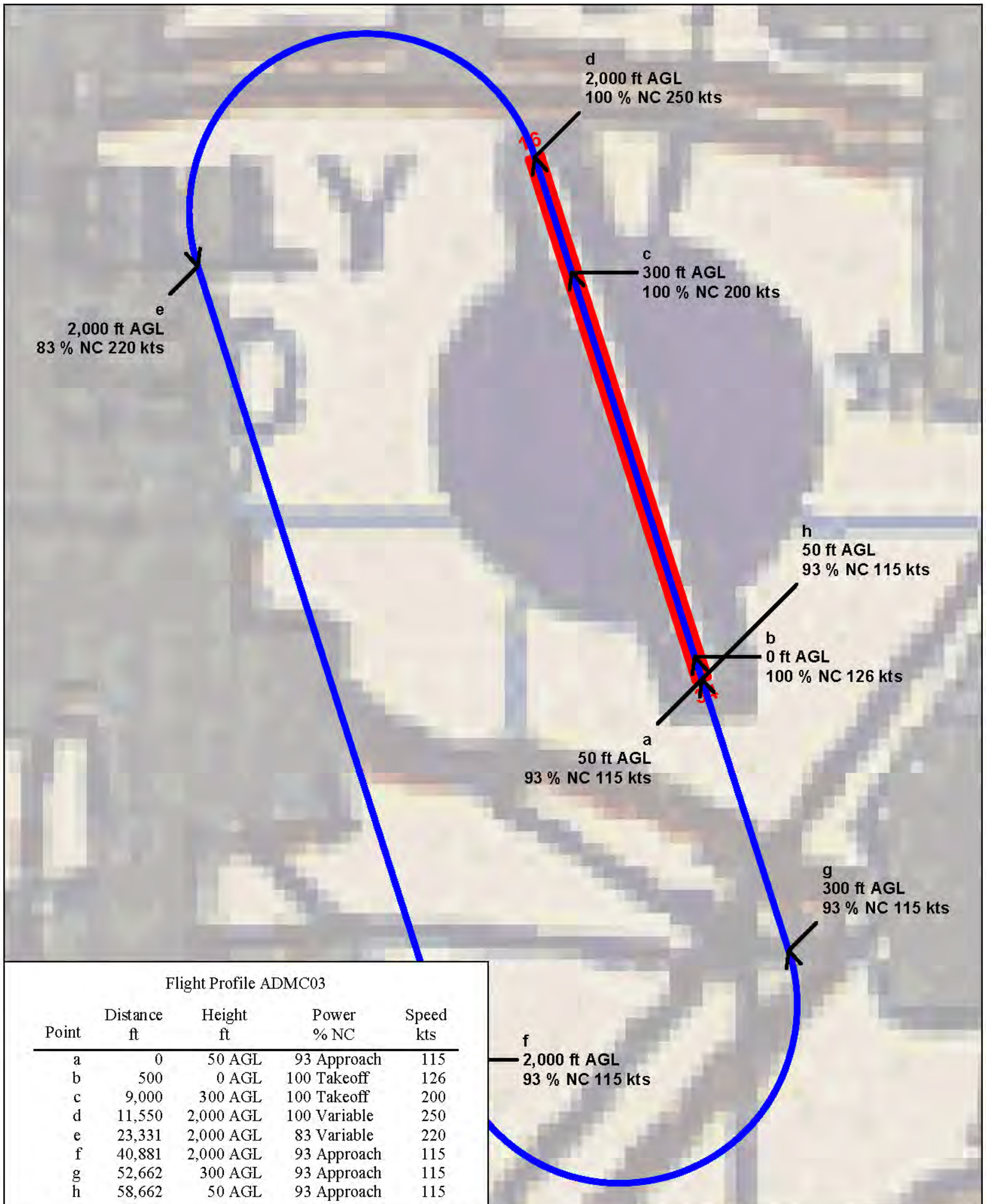
Flight Profile ADMA18

ADAIR Type A Med Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000

Scale in Feet 1:127,000 (1 inch = 10,600 feet)

N



Flight Profile ADMC03

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	50 AGL	93 Approach	115
b	500	0 AGL	100 Takeoff	126
c	9,000	300 AGL	100 Takeoff	200
d	11,550	2,000 AGL	100 Variable	250
e	23,331	2,000 AGL	83 Variable	220
f	40,881	2,000 AGL	93 Approach	115
g	52,662	300 AGL	93 Approach	115
h	58,662	50 AGL	93 Approach	115

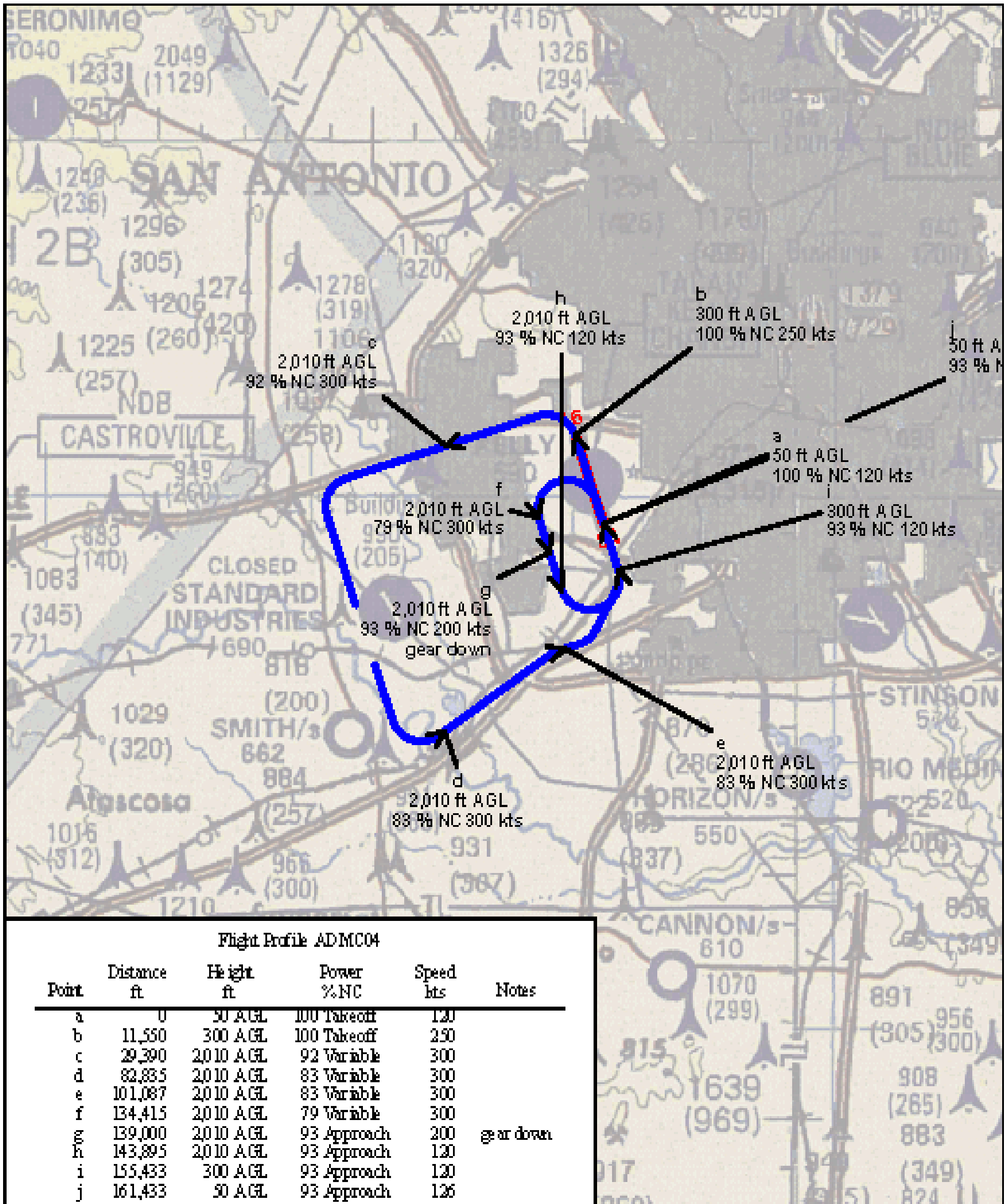
Flight Profile ADMC03

ADAIR Type A Med Noise - Closed Pattern - Touch and Go - REPRESENTATIVE

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:38,200 (1 inch = 3,180 feet)

N



Flight Profile ADMC04

Point	Distance ft	Height ft	Power %NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	300 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	92 Variable	300	
d	82,835	2,010 AGL	83 Variable	300	
e	101,087	2,010 AGL	83 Variable	300	
f	134,415	2,010 AGL	79 Variable	300	
g	139,000	2,010 AGL	93 Approach	200	gear down
h	143,895	2,010 AGL	93 Approach	120	
i	155,433	300 AGL	93 Approach	120	
j	161,433	50 AGL	93 Approach	126	

Flight Profile ADMC04

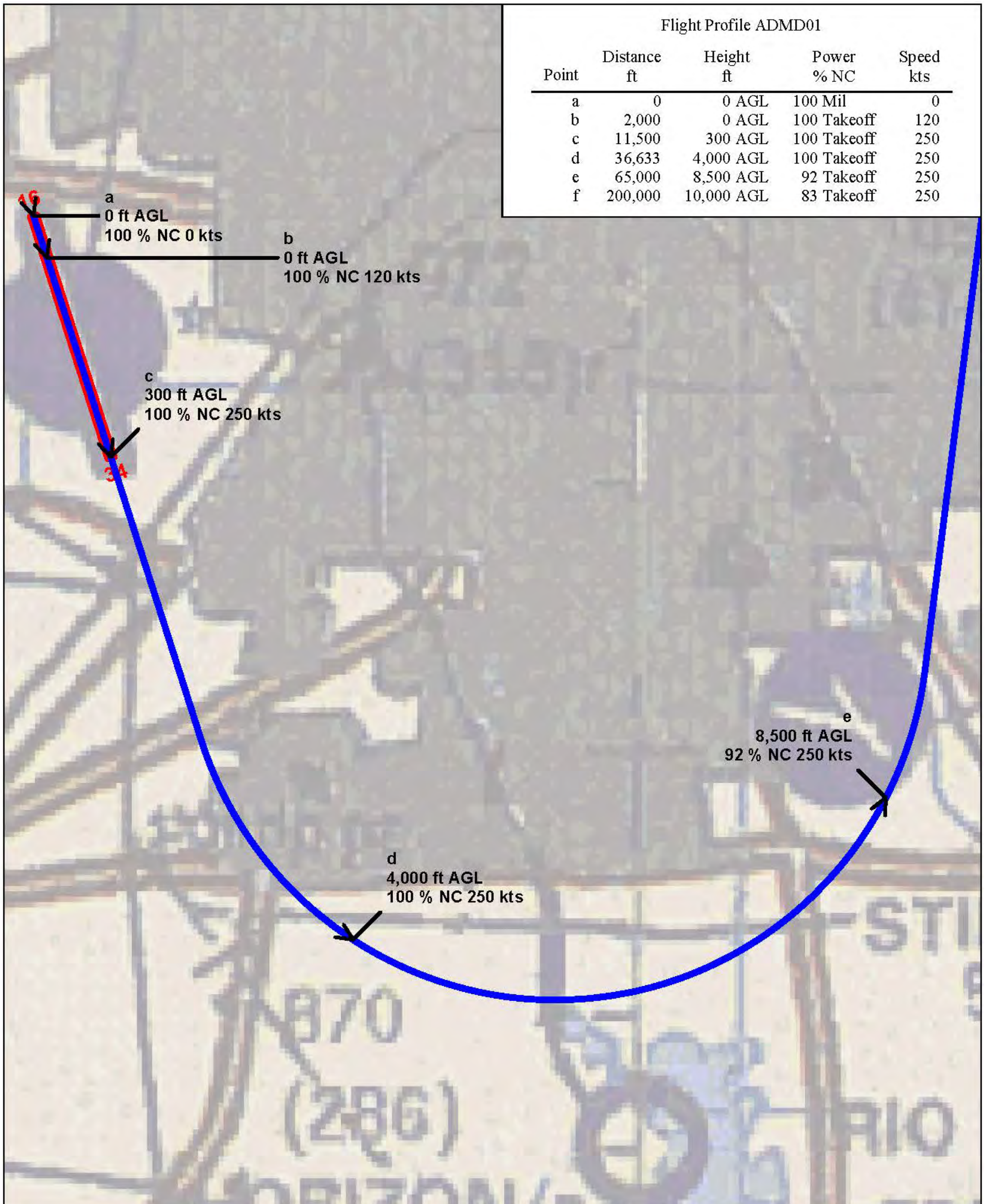
ADAIR Type A Med Noise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:230,000 (1 inch = 19,100 feet)

Flight Profile ADMD01

Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	100 Mil	0
b	2,000	0 AGL	100 Takeoff	120
c	11,500	300 AGL	100 Takeoff	250
d	36,633	4,000 AGL	100 Takeoff	250
e	65,000	8,500 AGL	92 Takeoff	250
f	200,000	10,000 AGL	83 Takeoff	250



Flight Profile ADMD01

ADAIR Type A Med Noise - Departure - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:82,300 (1 inch = 6,860 feet)

N

Contract ADAIR Low Noise L-59 (T-45 Surrogate)

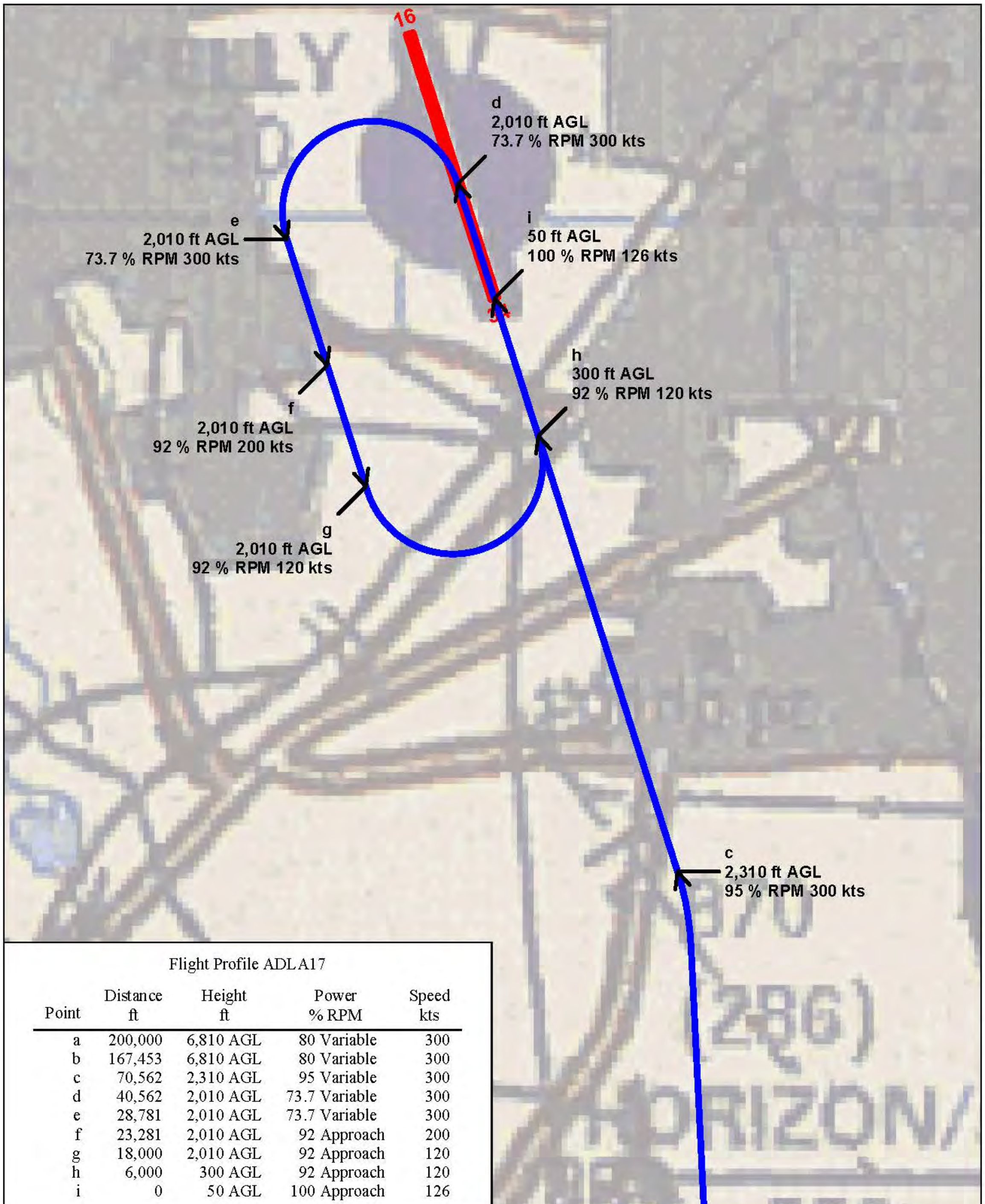
Flight Profile ADLA01

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	15,000 AGL	89.3 Cruise	250
b	75,000	4,500 AGL	89.3 Cruise	150
c	28,000	2,500 AGL	95 Approach	150
d	9,000	1,200 AGL	95 Approach	115
e	0	50 AGL	95 Approach	115

Flight Profile ADLA01

ADAIR Type A Low Noise - Straight-In Arrival - REPRESENTATIVE

Scale in Feet 1:130,000 (1 inch = 10,800 feet)



Flight Profile ADLA17

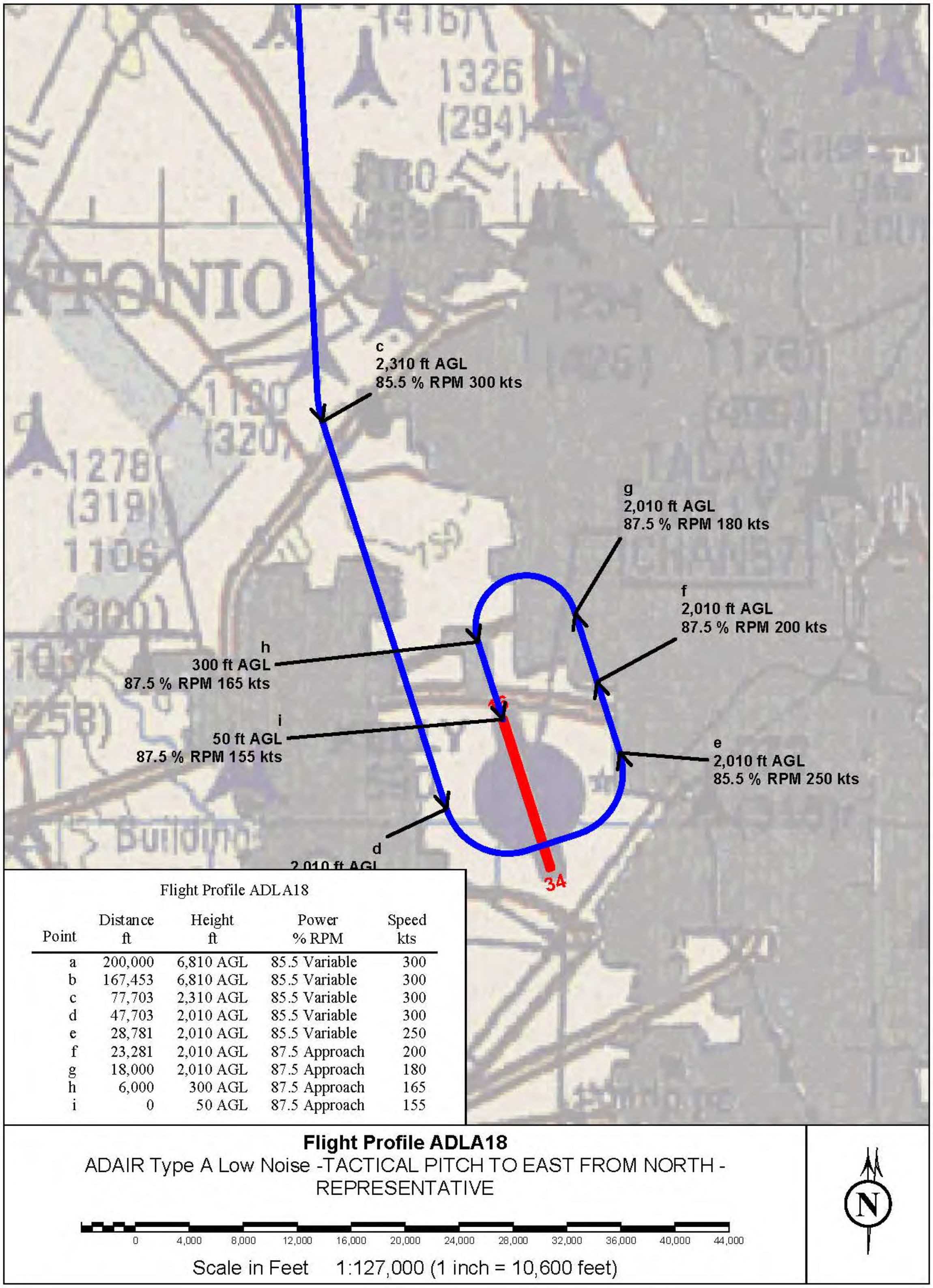
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	80 Variable	300
b	167,453	6,810 AGL	80 Variable	300
c	70,562	2,310 AGL	95 Variable	300
d	40,562	2,010 AGL	73.7 Variable	300
e	28,781	2,010 AGL	73.7 Variable	300
f	23,281	2,010 AGL	92 Approach	200
g	18,000	2,010 AGL	92 Approach	120
h	6,000	300 AGL	92 Approach	120
i	0	50 AGL	100 Approach	126

Flight Profile ADLA17
ADAIR Type A Low Noise - OH Break Arrival - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:75,300 (1 inch = 6,280 feet)

N

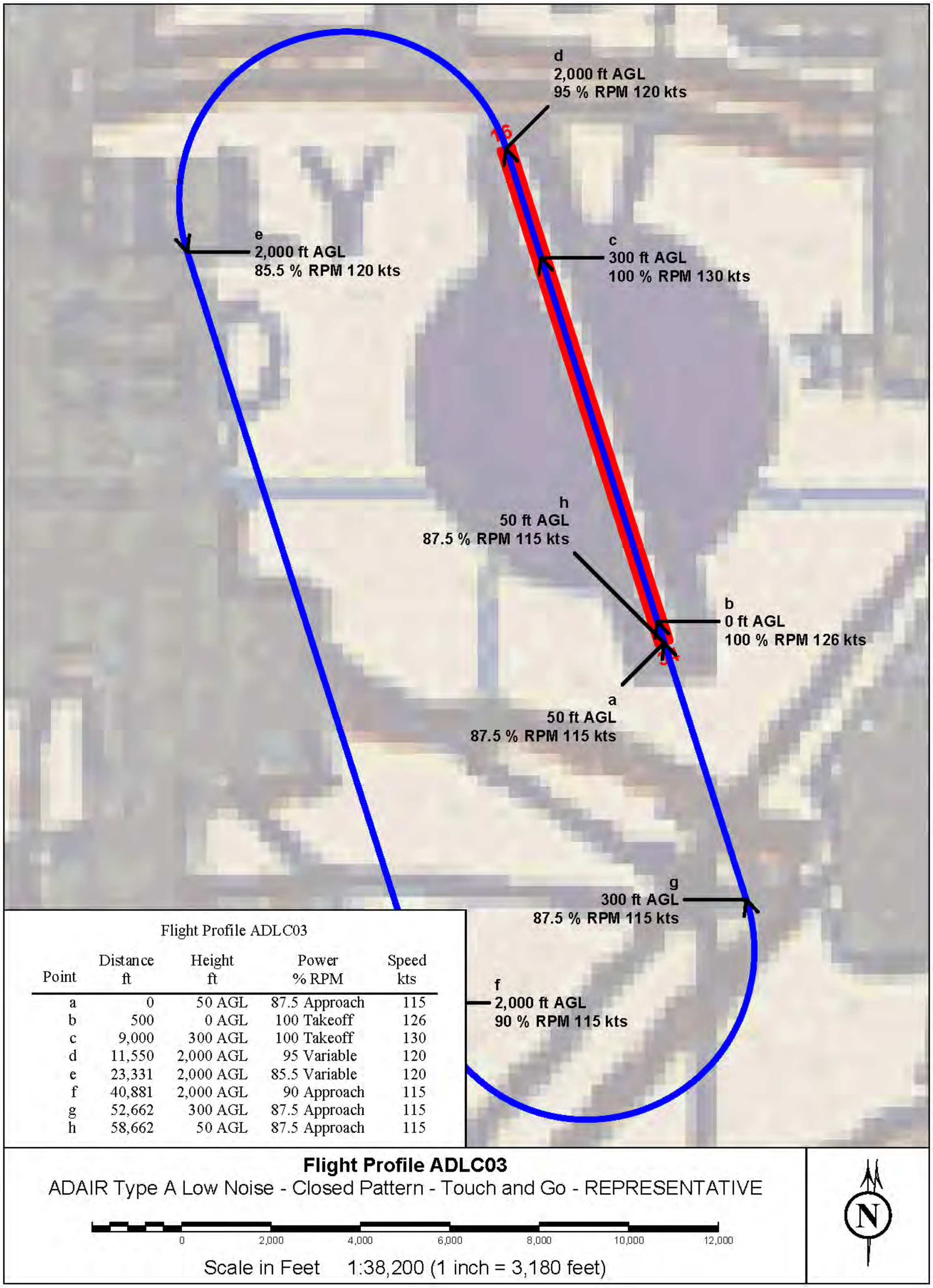


Flight Profile ADLA18

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	6,810 AGL	85.5 Variable	300
b	167,453	6,810 AGL	85.5 Variable	300
c	77,703	2,310 AGL	85.5 Variable	300
d	47,703	2,010 AGL	85.5 Variable	300
e	28,781	2,010 AGL	85.5 Variable	250
f	23,281	2,010 AGL	87.5 Approach	200
g	18,000	2,010 AGL	87.5 Approach	180
h	6,000	300 AGL	87.5 Approach	165
i	0	50 AGL	87.5 Approach	155

Flight Profile ADLA18
ADAIR Type A Low Noise -TACTICAL PITCH TO EAST FROM NORTH - REPRESENTATIVE

Scale in Feet 1:127,000 (1 inch = 10,600 feet)

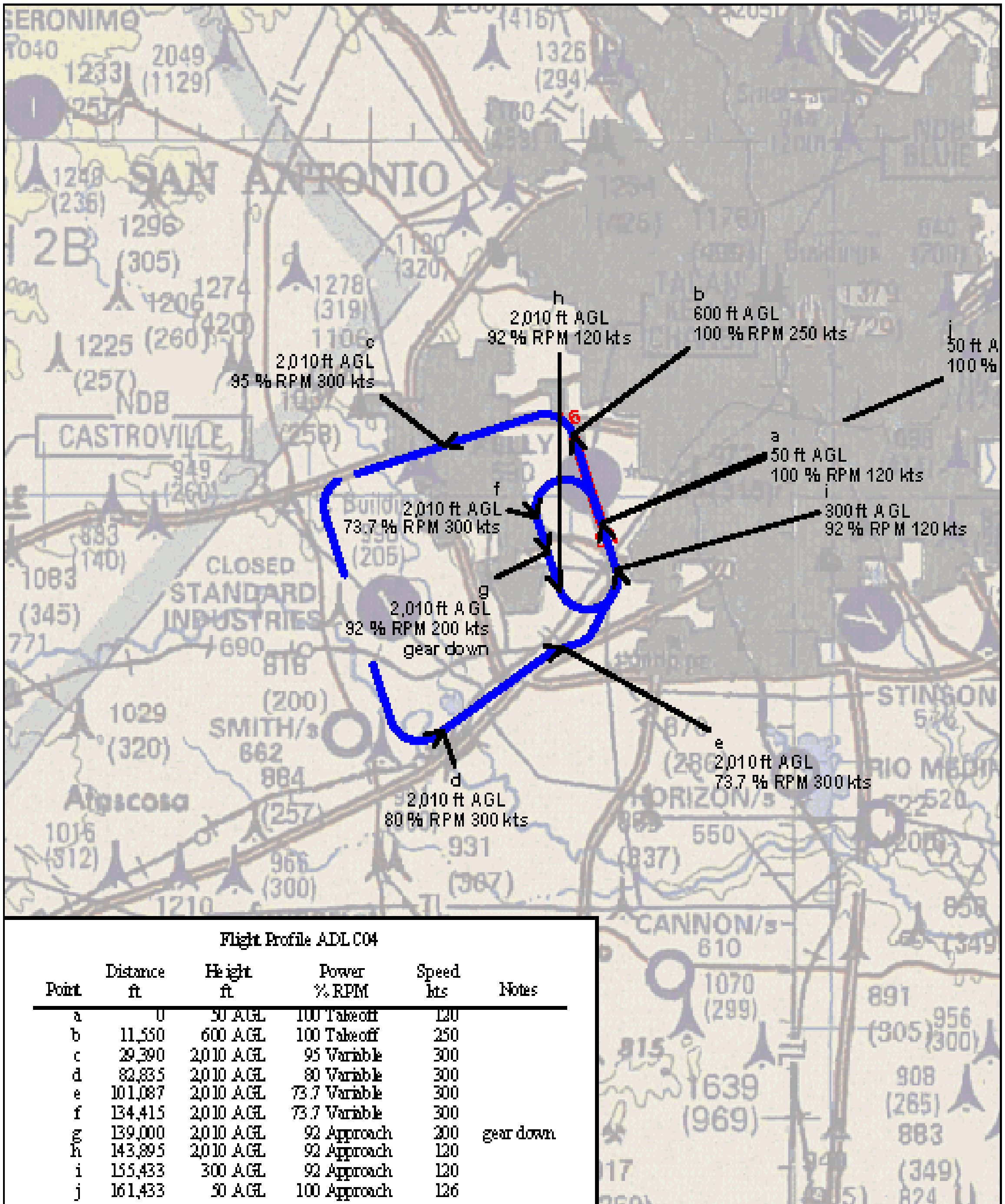


Flight Profile ADLC03

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	50 AGL	87.5 Approach	115
b	500	0 AGL	100 Takeoff	126
c	9,000	300 AGL	100 Takeoff	130
d	11,550	2,000 AGL	95 Variable	120
e	23,331	2,000 AGL	85.5 Variable	120
f	40,881	2,000 AGL	90 Approach	115
g	52,662	300 AGL	87.5 Approach	115
h	58,662	50 AGL	87.5 Approach	115

Flight Profile ADLC03
ADAIR Type A Low Noise - Closed Pattern - Touch and Go - REPRESENTATIVE

Scale in Feet 1:38,200 (1 inch = 3,180 feet)



Flight Profile ADLC04

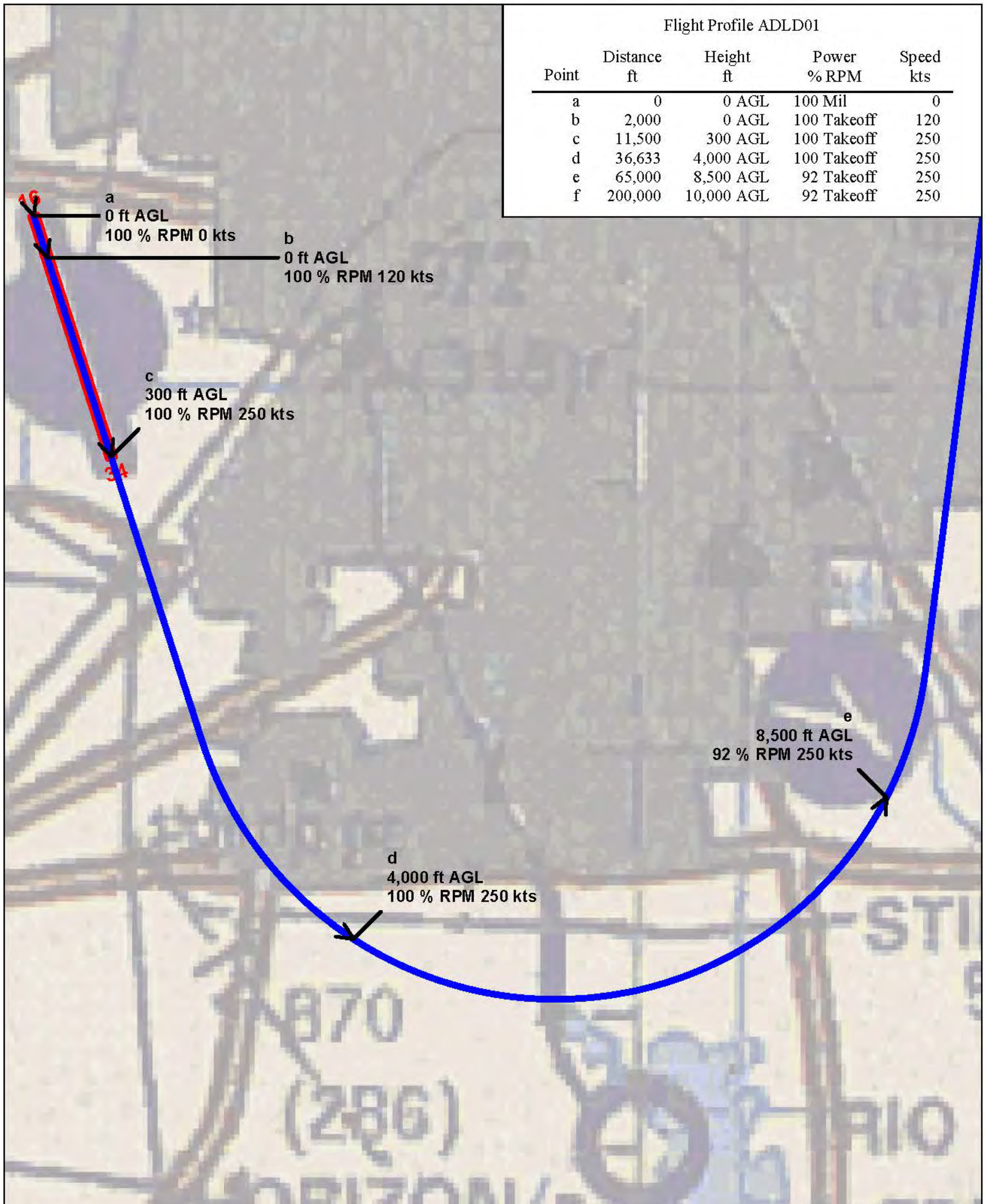
Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	100 Takeoff	120	
b	11,550	600 AGL	100 Takeoff	250	
c	29,390	2,010 AGL	95 Variable	300	
d	82,835	2,010 AGL	80 Variable	300	
e	101,087	2,010 AGL	73.7 Variable	300	
f	134,415	2,010 AGL	73.7 Variable	300	
g	139,000	2,010 AGL	92 Approach	200	gear down
h	143,895	2,010 AGL	92 Approach	120	
i	155,433	300 AGL	92 Approach	120	
j	161,433	50 AGL	100 Approach	126	

Flight Profile ADLC04

AD AIR Type A LowNoise - Closed Pattern - REENTRY TO PITCH - REPRESENTATIVE

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:230,000 (1 inch = 19,100 feet)



Flight Profile ADLD01

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	100 Mil	0
b	2,000	0 AGL	100 Takeoff	120
c	11,500	300 AGL	100 Takeoff	250
d	36,633	4,000 AGL	100 Takeoff	250
e	65,000	8,500 AGL	92 Takeoff	250
f	200,000	10,000 AGL	92 Takeoff	250

Flight Profile ADLD01

ADAIR Type A Low Noise - Departure - REPRESENTATIVE

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:82,300 (1 inch = 6,860 feet)

N

B.2.4 Ground/Maintenance Run-ups

This section details the number, type, and duration of the ground and maintenance engine run-up operations at the airfield. Because the contract ADAIR aircraft would be doing maintenance off site, the only ground operations expected to increase with the addition of contract ADAIR aircraft would be the pre-flight run-up checks and trim tests. **Figure B-16** shows the location of all the static run-up locations at Kelly Field Annex. The proposed location for contract ADAIR aircraft parking is also noted on the figure. The locations at the ends of the runway 15RU and 33RU (named after the old runway names) are the locations for the arming and dearming of the F-16C aircraft. The trim pad is where trim test operations for ADAIR aircraft would be performed as well as the based F-16C aircraft. **Table B-9** details the number, type and duration of the on-field maintenance operations.

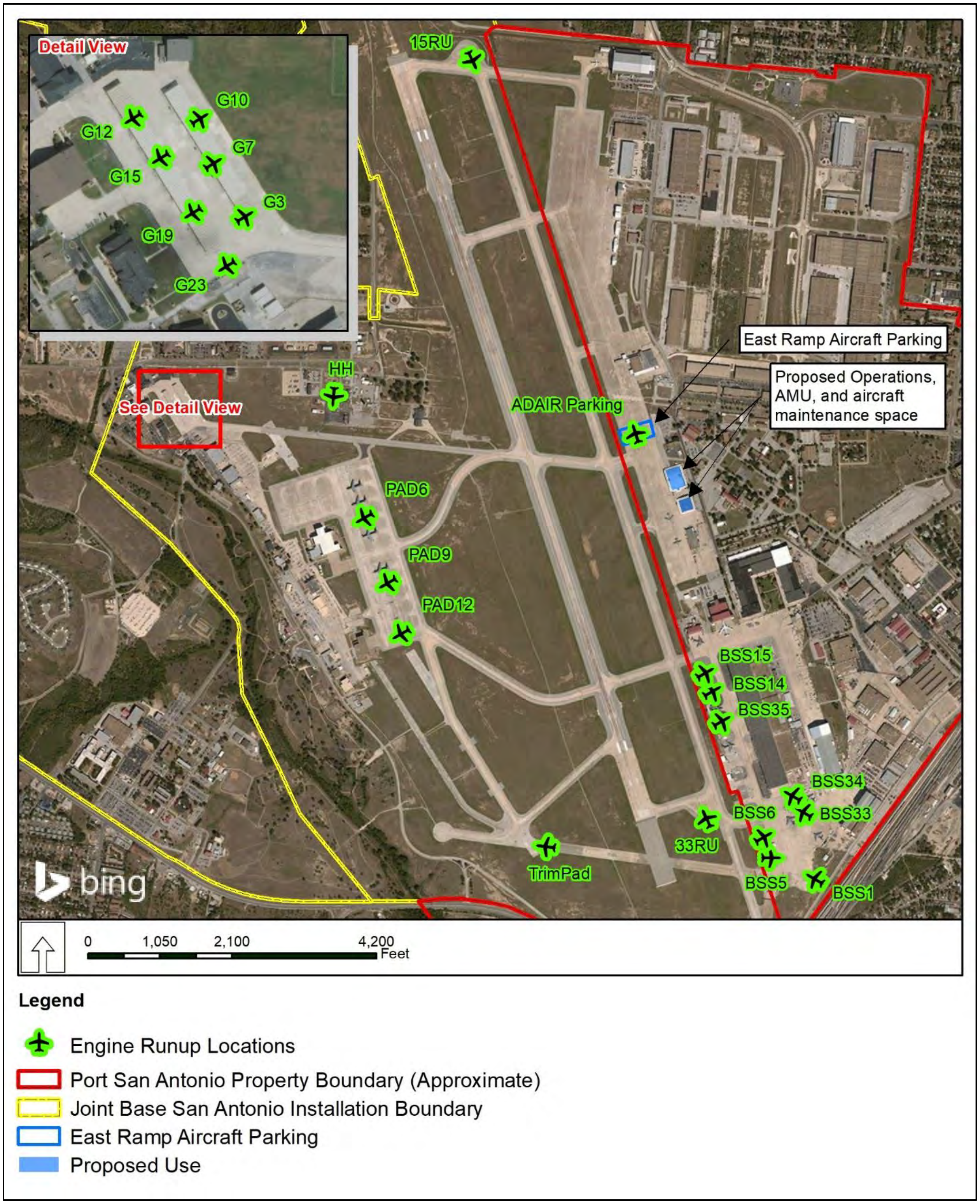


Figure B-16. Static Operations Locations.

Table B-9
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Kelly Field Annex

Aircraft Type	Engine Type	Run-up Type	Baseline Annual Events	ADAIR Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration Per Event (Minutes)	# of Engines Running Per Event
Hush House	F100-PW-100	Uninstalled F-16C using PW engine as substitute[1]	22	0	90%	10%	HH	100%	184	67%	30	1
										92%	30	
										A/B	25	
										80%	25	
F-16C	F110-GE-100	Arming	1/sortie	0	96%	4%	15RU/33RU	50/50%	156/336	67%-Idle	10	1
		Disarming	1/sortie	0	91%	9%	15RU/33RU	50/50%	156/336	67%-Idle	10	1
		Preflight	1/sortie	0	96%	4%	G 3,7,10,12,15,19,23	even	58/238	67%-Idle	15	1
		Engine Operations Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	13	1
										103%-Mil	8 1/3	
										95%	2 1/3	
		Interface Checkout	10	0	100%	0%	Trim Pad	100%	278	74%	10	1
		Primary/Secondary Checkout	1	0	100%	0%	Trim Pad	100%	278	74%	10	1
		Intermediate Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	11	1
										103%-Mil	3.5	
		Minimum Augmentor Checkout	13	0	100%	0%	Trim Pad	100%	278	74%	10	1
										103% - Mil	2	
										95%	1	
		Oile Consumption Checkout	3	0	100%	0%	Trim Pad	100%	278	74%	30	1
										103% - Mil	30	
										95%	25	
										80%	25	
		Oil Contamination Checkout	2	0	100%	0%	Trim Pad	100%	278	74%	10	1
										103% - Mil	10	
										95%	10	
		Isolation Checkout	2	0	100%	0%	Trim Pad	100%	278	74%	14	1
										103% - Mil	9	
										95%	2	
										95%	3	
										80%	7	
C-17	F117-PW-100	General Maintenance	52	0	95%	5%	BSS 33/34	50/50%	300	70%-Idle	30	2
										75%	15	
		Pre-Flight	1/sortie	0	100%	0%	BSS 33/34	50/50%	300	70%-Idle	5	2

Table B-9 (*continued*)
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Kelly Field Annex

Aircraft Type	Engine Type	Run-up Type	Baseline Annual Events	ADAIR Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration Per Event (Minutes)	# of Engines Running Per Event
C-5MX	CF6-80C2L1F	1 engine idle run	24	0	95%	5%	PAD 6,9,12	even	240	67%	30	1
		2 engine idle run	36	0	87%	13%	PAD 6,9,12	even	240	67%	30	2
		2 engine power run	108	0	87%	13%	PAD 6,9,12	even	240	67%	5	2
										80%	120	
		4 engine power run	108	0	93%	7%	PAD 6,9,12	even	240	67%	5	4
										80%	180	
		Preflight	1/sortie	0	80%	20%	PAD 6,9,12	even	240	67%	5	1
										67%	5	2
										67%	5	3
										67%	5	4
										67%-Trans. to Taxi.	20	4
C-32	JT8D-9A (C-9A used as surrogate)	General Maintenance	1	0	100%	0%	BSS33	100%	300	70%-Idle	45	2
										75%	45	
C-40	JT8D-9A (C-9A used as surrogate)	General Maintenance	1	0	100%	0%	BSS33	100%	300	70%-Idle	45	2
										75%	45	
C-32	JT8D-9A (C-9A used as surrogate)	Preflight	1	0	100%	0%	BSS35	100%	300	70%-Idle	45	2
C-40	JT8D-9A (C-9A used as surrogate)	Preflight	1	0	100%	0%	BSS35	100%	300	70%-Idle	45	2
B 747-800	F108-CF-100 (KC-135R used as surrogate)	Preflight	1/sortie	0	100%	0%	BSS1	100%	300	50%-Idle	15	4
		General Maintenance	12	0	100%	0%	BSS1	100%	300	100%	15	4
KC-135R/ B747-200	F108-CF-100 (KC-135R used as surrogate for B747-200)	Preflight - 2 for each aircraft	4	0	100%	0%	BSS 6,14,15	even	60	50% - Idle	15	4
		Engine Trim	2	0	100%	0%	BSS 5,6	50/50%	90/60	100% - Mil	15	2
			2	0	100%	0%	BSS 5,6	50/50%	90/60	100% - Mil	15	2
ADAIR CAT A		Pre/Post-Flight 2 Engine Run	0	1/sortie	100%	0%	ADAIR Parking	100%	342	Idle	20	1
		Trim	0	168	100%	0%	Trim Pad	100%	278	Idle	12	1
										Approach	27	
										Intermediate	9	
										Military	9	
										Afterburner	3	

(1) Beddown baseline provided maintenance records for 3888 and scaled to 3500.
(2) ADAIR trim testing based on ACAM model with 24 test/year/aircraft expecting 7 ADAIR aircraft.

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APPENDIX C

AIR QUALITY

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Appendix C-1

Air Conformity Applicability Analysis

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C.1 AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the state of Texas air quality regulations. It also presents calculations, including the assumptions used for the air quality analyses presented in the Air Quality sections of this Environmental Assessment.

C.1.1 Air Quality Program Overview

To protect public health and welfare, the US Environmental Protection Agency (USEPA) has developed numerical concentration-based standards, or National Ambient Air Quality Standards (NAAQS), for six “criteria” pollutants (based on health-related criteria) under the provisions of the CAA Amendments of 1970. There are two kinds of NAAQS: Primary and Secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air to protect public health, including the health of “sensitive” populations such as asthmatics, children, and the elderly. Secondary standards prescribe the maximum concentration or level of air quality required to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings (40 Code of Federal Regulations [CFR] 50).

The CAA gives states the authority to establish air quality rules and regulations. These rules and regulations must be equivalent to, or more stringent than, the Federal program. The Texas Commission on Environmental Quality (TCEQ) oversees the state’s air pollution control program under the authority of the Federal CAA and amendments, Federal regulations, and state laws. Texas has adopted the Federal NAAQS (TAC Title 30 §101.21). These standards are shown in **Table C-1**.

TCEQ, operates and maintains an ambient air monitoring network that follows the USEPA protocols and quality assurance/control procedures. Based on measured ambient air pollutant concentrations, the USEPA designates areas of the United States as having air quality better than (attainment) the NAAQS, worse than (nonattainment) the NAAQS, and unclassifiable. The areas that cannot be classified (on the basis of available information) as meeting or not meeting the NAAQS for a particular pollutant are “unclassifiable” and are treated as attainment until proven otherwise. Attainment areas can be further classified as “maintenance” areas, which are areas previously classified as nonattainment but where air pollutant concentrations have been successfully reduced to below the standard. Maintenance areas are under special maintenance plans and must operate under some of the nonattainment area plans to ensure compliance with the NAAQS.

Section 176(c) (1) of the CAA contains legislation that ensures Federal activities conform to relevant State Implementation Plans (SIP) and thus do not hamper local efforts to control air pollution. Conformity to a SIP is defined as conformity to a SIP’s purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards. As such a general conformity analysis is required for areas of nonattainment or maintenance where a Federal action is proposed.

The action can be shown to conform by demonstrating that the total direct and indirect emissions are below the *de minimis* levels (**Table C-2**), and/or showing that the proposed action emissions are within the State- or Tribe-approved budget of the facility as part of the SIP or Tribal Implementation Plan (USEPA 2010).

Direct emissions are those that occur as a direct result of the action. For example, emissions from new equipment that are a permanent component of the completed action (e.g. boilers, heaters, generators, paint booths, etc.) are considered direct emissions. Indirect emissions are those that occur at a later time or at a distance from the proposed action. For example, increased vehicular/commuter traffic because of the action is considered an indirect emission. Construction emissions must also be considered. For example, the emissions from vehicles and equipment used to clear and grade building sites, build new buildings, and construct new roads must be evaluated. These types of emissions are considered direct.

Table C-1
National Ambient Air Quality Standards

Pollutant	Standard Value[6]		Standard Type
Carbon Monoxide (CO)			
8-hour average	9 ppm	(10 mg/m^3)	Primary
1-hour average	35 ppm	(40 mg/m^3)	Primary
Nitrogen Dioxide (NO_2)			
Annual arithmetic mean	0.053 ppm	(100 μg/m^3)	Primary and Secondary
1-hour average[1]	0.100 ppm	(188 μg/m^3)	Primary
Ozone (O_3)			
8-hour average[2]	0.070 ppm	(137 μg/m^3)	Primary and Secondary
Lead (Pb)			
3-month average[3]		0.15 μg/m^3	Primary and Secondary
Particulate <10 Micrometers (PM_{10})			
24-hour average[4]		150 μg/m^3	Primary and Secondary
Particulate <2.5 Micrometers ($PM_{2.5}$)			
Annual arithmetic mean[4]		12 μg/m^3	Primary
Annual arithmetic mean[4]		15 μg/m^3	Secondary
24-hour average[4]		35 μg/m^3	Primary and Secondary
Sulfur Dioxide (SO_2)			
1-hour average[5]	0.075 ppm	(196 μg/m^3)	Primary
3-hour average[5]	0.5 ppm	(1,300 μg/m^3)	Secondary

Source: USEPA, 2016

Notes:

1 In February 2010, the USEPA established a new 1-hour standard for NO_2 at a level of 0.100 ppm, based on the 3-year average of the 98th percentile of the yearly distribution concentration, to supplement the then-existing annual standard.

2 In October 2015, the USEPA revised the level of the 8-hour standard to 0.070 ppm, based on the annual 4th highest daily maximum concentration, averaged over 3 years; the regulation became effective on 28 December 2015. The previous (2008) standard of 0.075 ppm remains in effect for some areas. A 1-hour standard no longer exists.

3 In November 2008, USEPA revised the primary lead standard to 0.15 μg/m^3. USEPA revised the averaging time to a rolling 3-month average.

4 In October 2006, USEPA revised the level of the 24-hour $PM_{2.5}$ standard to 35 μg/m^3 and retained the level of the annual $PM_{2.5}$ standard at 15 μg/m^3. In 2012, USEPA split standards for primary and secondary annual $PM_{2.5}$. All are averaged over 3 years, with the 24-hour average determined at the 98th percentile for the 24-hour standard. USEPA retained the 24-hour primary standard and revoked the annual primary standard for PM_{10}.

5 In 2012, the USEPA retained a secondary 3-hour standard, which is not to be exceeded more than once per year. In June 2010, USEPA established a new 1-hour SO_2 standard at a level of 75 ppb, based on the 3-year average of the annual 99th percentile of 1-hour daily maximum concentrations.

6 Parenthetical value is an approximately equivalent concentration for NO_2, O_3, and SO_2.

μg/m^3 = microgram(s) per cubic meter; mg/m^3 = milligram(s) per cubic meter; ppb = part(s) per billion; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

Table C-2
General Conformity Rule *De Minimis* Emission Thresholds

Pollutant	Attainment Classification	Tons per year
Ozone (VOC and NO_x)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region (applicable to Kelly Field Annex)	***100***
Ozone (NO_x)	Marginal and moderate non-attainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon Monoxide, SO_2 and NO_2	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions, SO_2, NO_x (unless determined not to be a significant precursor), VOC and ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Source: USEPA, 2017

Each state is required to develop a SIP that sets forth how CAA provisions will be imposed within the state. The SIP is the primary means for the implementation, maintenance, and enforcement of the measures needed to attain and maintain the NAAQS within each state and includes control measures, emissions limitations, and other provisions required to attain and maintain the ambient air quality standards. The purpose of the SIP is twofold. First, it must provide a control strategy that will result in the attainment and maintenance of the NAAQS. Second, it must demonstrate that progress is being made in attaining the standards in each nonattainment area.

In attainment areas, major new or modified stationary sources of air emissions on and in the area are subject to Prevention of Significant Deterioration (PSD) review to ensure that these sources are constructed without causing significant adverse deterioration of the clean air in the area. A major new source is defined as one that has the potential to emit any pollutant regulated under the CAA in amounts equal to or exceeding specific major source thresholds; that is, 100 or 250 tons/year based on the source's industrial category. These thresholds are applicable to stationary sources. A major modification is a physical change or change in the method of operation at an existing major source that causes a significant "net emissions increase" at that source of any regulated pollutant. **Table C-3** provides a tabular listing of the PSD significant emissions rate (SER) thresholds for selected criteria pollutants (USEPA, 1990).

Table C-3
Criteria Pollutant Significant Emissions Rate Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Significant Emission Rate (ton/year)
PM_{10}	15
$PM_{2.5}$	10
Total Suspended Particulate (TSP)	25
SO_2	40
NO_x	40
Ozone (VOCs)	40
CO	100

Source: Title 40 CFR Part 52 Subpart A, §52.21

The goals of the PSD program are to (1) ensure economic growth while preserving existing air quality; (2) protect public health and welfare from adverse effects that might occur even at pollutant levels better than the NAAQS; and (3) preserve, protect, and enhance the air quality in areas of special natural recreational, scenic, or historic value, such as national parks and wilderness areas. Sources subject to PSD review are required by the CAA to obtain a permit before commencing construction. The permit process requires an extensive review of all other major sources within a 50-mile radius and all Class I areas within a 62-mile radius of the facility. Emissions from any new or modified source must be controlled using Best Available Control Technology. The air quality, in combination with other PSD sources in the area, must not exceed the maximum allowable incremental increase identified in **Table C-4**. National parks and wilderness areas are designated as Class I areas, where any appreciable deterioration in air quality is considered significant. Class II areas are those where moderate, well-controlled industrial growth could be permitted. Class III areas allow for greater industrial development. There are no Class I areas near Kelly Field Annex.

Table C-4
Federal Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration (μg/m^3)		
		Class I	Class II	Class III
PM_{10}	Annual	4	17	34
	24-hour	8	30	60
SO_2	Annual	2	20	40
	24-hour	5	91	182
	3-hour	25	512	700
NO_2	Annual	2.5	25	50

Source: Title 40 CFR Part 52 Subpart A, §52.21

The Air Quality Monitoring Program monitors ambient air throughout the state. The purpose is to monitor, assess and provide information on statewide ambient air quality conditions and trends as specified by the state and federal CAA. The Air Quality Monitoring Program works in conjunction with local air pollution agencies and some industries, measuring air quality throughout the states.

The air quality monitoring network is used to identify areas where the ambient air quality standards are being violated and plans are needed to reduce pollutant concentration levels to be in attainment with the standards. Also included are areas where the ambient standards are being met, but plans are necessary to ensure maintenance of acceptable levels of air quality in the face of anticipated population or industrial growth.

The result of this attainment/maintenance analysis is the development of local and statewide strategies for controlling emissions of criteria air pollutants from stationary and mobile sources. The first step in this process is the annual compilation of the ambient air monitoring results, and the second step is the analysis of the monitoring data for general air quality, exceedances of air quality standards, and pollutant trends.

C.1.2 Assumptions

The following are assumptions were used in the air quality analysis for the proposed and alternative actions:

1. No construction (or negligible construction) would be associated with any of the proposed alternatives. This includes no demolition, earth moving, hauling, or paving. Some minor interior building fabrication would be possible but affected square footage is too small to result in outdoor air quality impacts. This may include upgrade to fire suppression/life support systems.
2. No installation of new boilers. No generators will be used for Alternatives 2 and 3.
3. No new storage tanks would be installed - Additional Jet A fuel needed by contractor aircraft is calculated for analysis calculated based on engine type, number of sorties, and engine fuel consumption rate.
4. Air force personnel would deliver fuel to the contractor at the airfield using tank trucks. Gas and diesel/Jet A fuel for the Contractor's Aerospace Ground Equipment (AGE) and flight line special purpose vehicles would be obtained by contract adversary air (ADAIR) personnel from the base military service station.
5. Chaff and flares to be used by contractor will be stored using current facilities (additional/new ammunition storage facilities not needed).
6. No new Hush House/Engine Test Cell facilities would be installed, and existing Hush House/Engine Test Cell facilities would not be used for ADAIR contractor aircraft.
7. No new paint booths would be installed, and existing paint booths would not be used for ADAIR contractor aircraft.
8. Contractor may bring their own parts cleaner (or share already installed unit unknown at this time) - for either case it is assumed contractor use would be minimal (no more than 0.5 gal/mo solvent used/lost).
9. Maintenance for contractor aircraft would be limited to minor repairs and minor routine maintenance /inspections (significant repairs, schedule/phased maintenance and inspections to be conducted off-site).
10. While ADAIR targeted performance is estimated to start in February 2020 with a 10-year contract, the emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. For air quality modeling purposes, these are representative years; the modeling generates air emissions estimates for the life of a representative 10-year contract. A full year is a reference year and partial years (start and end year) may be determined by dividing by the number of months estimated for that year.
11. Contractor aircraft takeoff and landing cycles - use/assume Air Conformity Applicability Model (ACAM) default "times in mode" to be conservative.
12. Assume once an aircraft is out of the landing and take-off (LTO) cycle the time spent traveling to/from the Military Operations Areas (MOAs) (10 to 20 minutes) would be at an altitude above 3,000 feet.
13. Assume mixing height is 3,000 feet (this matches USEPA and Air Force Guidance).
14. Air Force training sorties would not increase or decrease as result of this action. Roles may change (i.e., the Air Force no longer need to play the adversary, but this would not change in any substantial way the number of Air Force sorties flown). Thus, the change (increase) in emissions for Aircraft Flight Operations (AOPS) would be strictly due to the addition of the contractor ADAIR aircraft and associated ground and maintenance activities.
15. Assume the number of transient aircraft utilizing the airfield would not increase or decrease as a direct result of Contractor ADAIR.

16. Air Force use of engine test cells/hush house would not change as a result of the proposed action. No changes to Air Force trim tests also assumed.
17. For contactor AGE and auxiliary power units (APUs), until the contractor is selected what they would bring/use in terms of AGE and APUs in unknown thus ACAM defaults will be used based on the surrogate aircraft and engine type.
18. Assume contractor aircraft would engage in LTO cycles, and touch and go (TGO) or low approach activities only in the vicinity of the airfield.
19. Assume 5 percent of on-airfield daytime sorties (1,080) would include multiple patterns for contractor proficiency.
20. It is unknown what contractor requirements would be for trim tests, thus ACAM defaults will be assumed based on surrogate aircraft and engine type.
21. Assume all new ADAIR contractor personnel (pilots and maintenance staff) would live off-base and commute to the base 5 days per week. ACAM defaults will be used for commute distances.
22. ADAIR training sorties would utilize chaff and flares (as described in Chaff/Flare Allocations V5). Only RR-188 chaff and M206 flares would be considered in the analysis. Chaff and flares would be used in all MOAs except for Brady (Low and High).
23. Assume air quality impacts from chaff releases under actual flight conditions would be low and would have negligible impact on the PM_{10} and $PM_{2.5}$ NAAQS (1997 Report: *Environmental Effects of Self-protection Chaff and Flares*).
24. Only the use of flares and impulse cartridges (if applicable) used at or below 3,000 feet will be included in the air quality analysis. It is assumed that flares used above 3,000 feet would disperse and not affect air quality in the lowest 3,000 feet AGL. While, contract ADAIR aircraft would employ M206 flares or similar during 100 percent of their training sortie operations, without altitude restrictions, in the following MOAs: Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, Laughlin 3 High, and Kingsville 3; flares would not be used in the Brady Low and High MOAs (no flares would be used at altitudes less than 3,000 feet). As a result, flare emissions will not be included in the air quality analysis.
25. For the high air emission scenario, the surrogate for the MIG-21 is the F16 C/D with engine model F110-GE-100.
26. For the medium emission scenario, the surrogate for the A-4N is the A-4M with engine model J52-P408.
27. For the low emission scenario, the surrogate for the L-59 & L-159 is the A101A with engine model TF34-GE-100.
28. All ADAIR related training at Kelly Field Annex would occur in the Crystal, Crystal North, Laughlin 2, Laughlin 3 Low, and Laughlin 3 High; Kingsville 3; and Brady Low and High MOAs as designated in the description of the Proposed Action in this Environmental Assessment and as summarized in this appendix.
29. Contractor training/mission time in the MOAs would be approximately 45 to 60 minutes. Currently, only Brady MOA (Brady Low) would have a floor below 3,000 feet AGL (500 feet AGL).
30. Estimated amount of time each ADAIR contractor aircraft would spend within the Brady MOA at or below 3,000 feet AGL is proportioned based on percent time spent between 500 to 6,000 feet. Assuming an average mission time of 52.2 minutes, the time spent at or below 3,000 feet AGL would be 11.9 minutes (see **Table C-5**).
31. ACAM does not have separate inputs for time spent within a MOA. To represent the time spent within a MOA, the expected flight time at or below 3,000 feet (11.9 minutes) was assigned to Climbout/Intermmediate power mode within the ACAM LTO input fields. No time was assigned to any other power modes, but default ACAM output also lists Trim Tests and TGOs; however, all inputs for these fields were set to zero (see **Table C-6**).
32. Assume time spent below 3,000 feet AGL would be the same for all sorties.
33. The number of sorties in the Brady MOA would be 5 percent of the total sorties (0.05 * 1200 = 60 sorties) (see **Table C-5**).
34. No changes baseline Air Force Aircraft AOPS (sorties) due to Contract ADAIR and no changes to transient and civilian AOPS due to Contract ADAIR.
35. Emissions for Alternatives 2 and 3 would be identical (AOPS identical and no construction).
36. Alternative 1 would include the possibility of the installation of a new emergency generator (ACAM defaults used for size and average annual operating hours).

37. Installation Category for Air Emission = A.
38. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 feet AGL) and coinciding with the spatial distribution of the region of influence that is considered. Pollutants that are released above the mixing height typically would not disperse downward and thus would have little or no effect on ground level concentrations of pollutants. The mixing height is the altitude at which the lower atmosphere undergoes mechanical or turbulent mixing, producing a nearly uniform air mass. The height of the mixing level determines the volume of air within which pollutants can disperse. Mixing heights at any one location or region can vary by the season and time of day, but for air quality applications an average mixing height of 3,000 feet AGL is an acceptable default value [40 CFR 93.153(c)(2)]. Although the proposed ADAIR training is projected to occur within multiple MOAs coinciding with five separate Air Quality Control Regions (AQCRs), only the Brady Low and High MOAs, coinciding with the Midland-Odessa-San Angelo AQCR and the Austin-Waco AQCR is a concern because it is the only airspace where ADAIR sortie altitudes are proposed to extend below 3,000 feet AGL.
39. **Tables C-5** and **C-6** below show the data and assumptions used as input to ACAM for flight operations.

Table C-5
Airspace Assumptions and Air Conformity Applicability Model Data Inputs

MOA	Percent of Total Sorties	No. of Sorties in MOAs[1]	Minimum Mission Altitude	Total Mission Time (minutes) ≤3,000 ft AGL	Power Mode[5]
Brady (Low & High)[2]	5	60	500 ft AGL[3]	11.9[4]	Intermediate/Climbout
Crystal & Laughlin	85	1,020	6,000 ft AGL	0	N/A
Kingsville 3	10	120	8,000 ft AGL	0	N/A

Notes:
1 Based on 1,200 Total Sorties in MOAs (Source: CAF ADAIR EIS Calculator - NEPA 6)
2 Assume a portion of all sorties to occur in Brady will occur at or below 3,000 ft
3 Estimated 50 percent of time spent between 500 to 6,000 ft AGL
4 Based on 52.5 minutes per sortie (per the pre-final DOPAA, 45 to 60 minutes per sortie) and proportioned based on percent of time spent between 500 to 6,000 ft
Minutes @ 500 to 6,000 ft = 52.5 minutes * 50 percent (percent time in altitude range) = 26.25 minutes
Minutes @ 500 to 3,000 ft = 26.25 minutes - (26.25 minutes * 3,000 ft/5,500 ft) = 11.9 minutes
5 ACAM does not have separate inputs for time spent within a MOA. To represent the time spent within a MOA, the expected flight time at or below 3,000 ft (11.9 minutes) was assigned to Climbout/Intermediate power mode within the ACAM LTO input fields. No time was assigned to any other power modes.

ACAM = Air Conformity Applicability Model; ADAIR = adversary air; AGL = above ground level; CAF = Combat Air Forces; DOPAA = Description of Proposed Action and Alternatives; EIS = Environmental Impact Statement, ft = feet; LTO = landing and take-off; N/A = not applicable; NEPA = National Environmental Policy Act

Table C-6
Times in Mode[1] (minutes) for Aircraft Operations

Type of Operation	Number of Sorties	Taxi/Idle (out)	Take-off (Military and/or Afterburn	Climb Out	Approach	Taxi/Idle(in)
LTO	1200	18.5	0.4	0.8	3.5	11.3
TGO[2]	162	-	-	0.8	3.5	-

Notes:
[A] Given time in mode applicable to all emission scenarios (high, medium, and low)
[B] 5 percent of on-airfield daytime sorties (1,080) are expected to include multiple patterns for contractor proficiency. Each of those 5 percent sorties is assumed to include three TGO/low approaches.
LTO = landing and take-off; TGO = touch and go

C.1.3 Regulatory Comparisons

The CAA Section 176(c), General Conformity, requires Federal agencies to demonstrate that their proposed activities would conform to the applicable SIP for attainment of the NAAQS. General conformity applies only to nonattainment and maintenance areas. If the emissions from a Federal action proposed in a nonattainment area exceed annual *de minimis* thresholds identified in the rule, a formal conformity determination is required of that action. The thresholds are more restrictive as the severity of the nonattainment status of the region increases. The Council on Environmental Quality (CEQ) defines significance in terms of context and intensity in 40 CFR 1508.27. This requires that the significance of the action be analyzed with respect to the setting of the proposed action and based relative to the severity of the impact. The CEQ NEPA regulations (40 CFR 1508.27[b]) provide 10 key factors to consider in determining an impact's intensity.

Emissions from the proposed action in the vicinity of the Kelly Field Annex (Bexar County) were assessed against conformity standard *de minimis* thresholds of 100 tons per year for NO_x and VOC as stipulated by 40 CFR 93. The remaining criteria pollutants are compared to respective county emissions, which are in attainment. Estimates of emissions are summarized in **Chapter 4**. ACAM summary reports for each emission scenario for the Kelly Field Annex and Brady Low and High MOAs are provided as **Appendix C-2** of this Air Quality summary report.

C.2 REFERENCES

USEPA. 1990. Office of Air Quality Planning and Standards. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Permitting.* October.

USEPA. 2010. *40 CFR Parts 51 and 93, Revisions to the General Conformity Regulations*. 75 FR 14283, EPA-HQ-OAR-2006-0669; FRL-9131-7. 24 March.

USEPA. 2016. *NAAQS Table*. <https://www.epa.gov/criteria-air-pollutants/naaqs-table>. 20 December.

USEPA. 2017. General Conformity: *De Minimis* Tables. <https://www.epa.gov/general-conformity/de-minimis-tables>. 04 August.

Appendix C-2

Emission Factors and Calculation Algorithms
(Source: ACAM Output - Detail Report)

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Aircraft Operations

Engine Emission Factor(s)

Aircraft & Engine Emissions Factors (lb/1000lb fuel) - F-16, Engine Model F110-GE-100, 1 Engine

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1111.00	0.22	1.06	3.77	24.11	2.60	1.12	3234
Approach	5080.00	0.03	1.06	9.78	5.77	1.37	0.91	3234
Intermediate	7332.00	0.05	1.06	16.92	3.47	0.58	0.41	3234
Military	11358.00	0.04	1.06	29.00	3.38	0.14	0.00	3234
After Burn	18088.00	1.21	1.06	14.26	67.41	3.35	2.98	3234

Aircraft & Engine Emissions Factors (lb/1000lb fuel) - A-4M, Engine Model J52-P-408, 1 Engine

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1466.21	3.62	1.06	2.79	50.10	0.18	0.16	3234
Approach	3324.50	0.29	1.06	7.25	16.07	0.18	0.16	3234
Intermediate	6502.10	0.03	1.06	7.53	7.70	0.13	0.12	3234
Military	6482.85	0.03	1.06	7.53	7.70	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

Aircraft & Engine Emissions Factors (lb/1000lb fuel) – OA-10A, Engine Model TF34-GE-100, 2 Engines

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	390.00	39.45	1.06	2.10	106.70	8.13	3.60	3234
Approach	920.00	2.19	1.06	5.70	16.30	6.21	2.12	3234
Intermediate	460.00	23.35	1.06	2.60	78.00	8.93	6.95	3234
Military	2710.00	0.12	1.06	10.70	2.20	2.66	1.68	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

Flight Operations

Number of Aircraft: 7
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 1200
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 162
Number of Annual Trim Test(s) per Aircraft: 24

Flight Operations TIMs (Time in Mode)

Taxi/Idle Out [Idle] (mins): 18.5 (default)
Takeoff [Military and/or After Burn] (mins): 0.4 (default)
Climb Out [Intermediate] (mins): 0.8 (default)
Approach [Approach] (mins): 3.5 (default)
Taxi/Idle In [Idle] (mins): 11.3 (default)

Trim Test TIM (Time in Mode)

Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 9 (default)
AfterBurn (mins): 3 (default)

Flight Operations Formula(s)

AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

Aircraft Emissions for Trim per Year
$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

Aerospace Ground Equipment (AGE)

Aerospace Ground Equipment (AGE) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
MC-1A - 18.4hp	1.1	0.267	0.008	0.419	0.267	0.071	0.068	24.8
MJ-1B	0.0	3.040	0.219	4.780	3.040	0.800	0.776	141.2
A/M32A-86D	6.5	0.294	0.046	6.102	0.457	0.091	0.089	147.0
H1	0.4	0.100	0.011	0.160	0.180	0.006	0.006	8.9
MJ-2A	0.0	0.190	0.238	3.850	2.460	0.083	0.076	172.0
NF-2	0.0	0.010	0.043	0.110	0.080	0.010	0.010	22.1
A/M32A-60A	0.0	0.270	0.306	1.820	5.480	0.211	0.205	221.1

Aerospace Ground Equipment (AGE) (default)

Total Number of AGE	Operation Hours for Each LTO	Exempt Source?	AGE Type	Designation
1	0.33	No	Air Compressor	MC-1A - 18.4hp
1	1	No	Bomb Lift	MJ-1B
1	0.33	No	Generator Set	A/M32A-86D
1	0.5	No	Heater	H1
1	0.5	No	Hydraulic Test Stand	MJ-2/TTU-228 - 130hp
1	8	No	Light Cart	NF-2
1	0.33	No	Start Cart	A/M32A-60A

Aerospace Ground Equipment (AGE) Formula(s)

Aerospace Ground Equipment (AGE) Emissions per Year
$AGE_{POL} = AGE * OH * LTO * EF_{POL} / 2000$

AGE_{POL}: Aerospace Ground Equipment (AGE) Emissions per Pollutant (TONs)
AGE: Total Number of Aerospace Ground Equipment
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Auxiliary Power Unit (APU)

Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
T-62T-40-8	272.6	0.493	0.289	1.216	3.759	0.131	0.037	910.8

Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer
1	1	No	T-62T-40-8	

Auxiliary Power Unit (APU) Formula(s)

Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

Personnel on Road Vehicles

On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.292	000.002	000.232	003.373	000.006	000.006		000.024	00335.434
LDGT	000.379	000.003	000.412	004.908	000.008	000.007		000.025	00433.594
HDGV	000.810	000.005	001.116	016.538	000.019	000.017		000.045	00785.640
LDDV	000.100	000.003	000.141	002.747	000.004	000.004		000.008	00328.227
LDDT	000.267	000.004	000.433	005.052	000.007	000.007		000.008	00471.807
HDDV	000.480	000.013	004.936	001.769	000.190	000.175		000.028	01524.947
MC	002.743	000.003	000.699	012.761	000.026	000.023		000.054	00395.722

On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

Average Personnel Round Trip Commute (mile): 20 (default)

Personnel Work Schedule
Active Duty Personnel: 5 Days Per Week (default)
Civilian Personnel: 5 Days Per Week (default)
Support Contractor Personnel: 5 Days Per Week (default)
Air National Guard (ANG) Personnel: 4 Days Per Week (default)
Reserve Personnel: 4 Days Per Month (default)

Personnel Formula(s)

Personnel Vehicle Miles Travel for Work Days per Year
$VMT_P = NP * WD * AC$
VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

Total Vehicle Miles Travel per Year
$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_{C}: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Parts Cleaner/Degreaser

Solvent used:	Mineral Spirits CAS#64475-85-0 (default)
Specific gravity of solvent:	0.78 (default)
Solvent VOC content (%):	100 (default)
Efficiency of control device (%):	0 (default)

Parts Cleaner/Degreaser Formula(s)

Degreaser Emissions per Year

$DE_{VOC}= (VOC / 100) * NS * SG * 8.35 * (1 - (CD / 100)) / 2000$

DE_{VOC}: Degreaser VOC Emissions (TONs per Year)
VOC: Solvent VOC content (%)
(VOC / 100): Conversion Factor percent to decimal
NS: Net solvent usage (total less recycle) (gallons/year)
SG: Specific gravity of solvent
8.35: Conversion Factor the density of water
CD: Efficiency of control device (%)
(1 - (CD / 100)): Conversion Factor percent to decimal (Not effected by control device)
2000: Conversion Factor pounds to tons

Storage Tanks

Chemical Properties

Chemical Name:	Jet kerosene (JP-5, JP-8 or Jet-A)
Chemical Category:	Petroleum Distillates
Chemical Density:	7
Vapor Molecular Weight (lb/lb-mole):	130
Stock Vapor Density (lb/ft^3):	0.000170775135930213
Vapor Pressure:	0.00725
Vapor Space Expansion Factor (dimensionless):	0.068

Tank Characteristics

Type of Tank:	Vertical Tank
Tank Height (ft):	50
Tank Diameter (ft):	63
Annual Net Throughput (gallon/year):	187348

Tank Formula(s)

Vapor Space Volume

$VSV = (PI / 4) * D^2 * H / 2$

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
H: Tank Height (ft)
2: Conversion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

Vented Vapor Saturation Factor

VVSF = 1 / (1 + (0.053 * VP * H / 2))

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
H: Tank Height (ft)

Standing Storage Loss per Year

SSL_{VOC} = 365 * VSV * SVD * VSEF * VVSF / 2000

SSL_{VOC}: Standing Storage Loss Emissions (TONs)
365: Number of Daily Events in a Year (Constant)
VSV: Vapor Space Volume (ft^3)
SVD: Stock Vapor Density (lb/ft^3)
VSEF: Vapor Space Expansion Factor (dimensionless)
VVSF: Vented Vapor Saturation Factor (dimensionless)
2000: Conversion Factor pounds to tons

Number of Turnovers per Year

NT = (7.48 * ANT) / ((PI / 4.0) * D * H)

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
H: Tank Height (ft)

Working Loss Turnover (Saturation) Factor per Year

WLSF = (18 + NT) / (6 * NT)

WLSF: Working Loss Turnover (Saturation) Factor per Year
18: Constant
NT: Number of Turnovers per Year
6: Constant

Working Loss per Year

WL_{VOC} = 0.0010 * VMW * VP * ANT * WLSF / 2000

0.0010: Constant
VMW: Vapor Molecular Weight (lb/lb-mole)
VP: Vapor Pressure (psia)
ANT: Annual Net Throughput

WLSF: Working Loss Turnover (Saturation) Factor
2000: Conversion Factor pounds to tons

Emergency Generator

Emergency Generators Emission Factor (lb/hp-hr)

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

Type of Fuel used in Emergency Generator: Diesel
Number of Emergency Generators: 1
Emergency Generator's Horsepower: 135
Average Operating Hours Per Year (hours): 30

Emergency Generator Formula(s)

Emergency Generator Emissions per Year

AE_{POL}= (NGEN * HP * OT * EF_{POL}) / 2000

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)

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APPENDIX D

LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

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THREATENED AND ENDANGERED SPECIES/CRITICAL HABITAT

A list of species that could potentially be found in the action area was obtained from the United States Fish and Wildlife Service (USFWS) Southwest Region website and from Texas Parks and Wildlife Department (TPWD) and is provided in **Table D-1**. Additionally, several endemic listed species are present in the habitat related to Comal and San Marcos Springs in Comal and Hays Counties. These habitats are directly related to the water use in the Edwards Aquifer and its potential impact on the Comal and San Marcos Springs and related endemic species. Because JBSA obtains water from the Edwards Aquifer and has a Biological Opinion issued for its water use, the listed species are covered in this section; however, no known federally listed threatened or endangered species have been documented at JBSA-Lackland, including Kelly Field Annex (JBSA, 2014). Further, the 45 contracted maintainers and 9 contracted pilots would not cause a substantial increase in use in potable water in support of the contract ADAIR action and would have no effect on the Edwards Aquifer; therefore, the endemic listed species related to the Comal and San Marcos Springs are not discussed further.

There is potentially suitable habitat for five state listed species at JBSA-Lackland and Kelly Field Annex; these are the state threatened white-faced ibis (*Plegadis chihi*), Texas horned lizard (*Phrynosoma cornutum*), Texas indigo snake (*Drymarchon melanurus erebennus*), Texas tortoise (*Gopherus berlandieri*), and the Timber rattlesnake (*Crotalus horridus*); however, as there would be no ground activities at JBSA-Lackland and Kelly Field Annex, there would be no adverse effects on the four sensitive reptile species; therefore, they will not be discussed further.

Because there would be no ground activities in the Crystal, Crystal North, Laughlin 2 and 3, Kingsville 3, and Brady Low/High MOAs, and activities would be limited to aircraft overflights in the airspace where noise and visual cues could cause behavioral changes in birds and mammals, there would be no impacts on listed plants, aquatic species (i.e., fish), reptiles, amphibians, invertebrates, or crustaceans; therefore, of the listed species potentially occurring in the project area, 6 federally and 13 state listed birds (for a total of 14 unique species); four federally listed mammals and six state listed mammals (for a total of six unique species) could be impacted by the proposed action in the airspace. The federally and state endangered whooping crane (*Grus americana*), federally threatened rufa red knot (*Calidris canutus rufa*), and federally and state threatened wood stork (*Mycteria americana*), however, are costal species and would be unlikely to occur anywhere within the Crystal, Crystal North, Laughlin 2 and 3, Kingsville 3, and Brady Low/High MOAs except at limited times during migration. Further, although historically present within the area, there are no known recent occurrences of the federally and state endangered red wolf (*Canis rufus*) or the federally and state endangered gray wolf (*Canis lupus*) in the area or nearby environs, with the nearest known populations of the gray wolf in the Gila Mountains of New Mexico and Arizona and in the northern United States and Canada.

No designated critical habitat for any listed species occurs in the action area.

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Birds			
Whooping Crane (*Grus americana*)	Endangered	Endangered	Low
Piping Plover (*Charadrius melodus*)	Threatened	Threatened	Low
Black-Capped Vireo (*Vireo atricapilla*)	Recovery	Endangered	Yes
Golden-Cheeked Warbler (*Setophaga chrysoparia*)	Endangered	Endangered	Yes
Rufa Red Knot (*Calidris canutus rufa*)	Threatened	-	Low

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
White-Faced Ibis (*Plegadis chihi*)	-	Threatened	Yes
Wood Stork (*Mycteria americana*)	-	Threatened	Low
Zone-Tailed Hawk (*Buteo albonotatus*)	-	Threatened	Yes
Peregrine Falcon (*Falco peregrinus*)	-	Threatened	Yes
White-Tailed Hawk (*Buteo albicaudatus*)	-	Threatened	Low
Common Black-Hawk (*Buteogallus anthracinus*)	-	Threatened	Low
Texas Botteri's Sparrow (*Peucaea botterii texana*)	-	Threatened	Yes
Bald Eagle (*Haliaeetus leucocephalus*)	Recovery	Threatened	Yes
Interior Least Tern (*Sterna antillarum athalassos*)*	Endangered	Endangered	Yes
Mammals			
Red Wolf (*Canis rufus*)*	Endangered	Endangered	None
Grey Wolf (*Canis lupus*)*	Endangered	Endangered	None
Black Bear (*Ursus americanus*)	-	Threatened	Low
Ocelot (*Leopardus pardalis*)	Endangered	Endangered	Yes
White-Nosed Coati (*Nasua narica*)	-	Threatened	Yes
Gulf Coast Jaguarundi (*Herpailurus yagouaroundi cacomitli*)	Endangered	Endangered	None[2]
Reptiles			
Texas Tortoise (*Gopherus berlandieri*)	-	Threatened	Yes
Texas Horned Lizard (*Phrynosoma cornutum*)	-	Threatened	Yes
Texas Indigo Snake (*Drymarchon melanurus erebennus*)	-	Threatened	Yes
Texas Scarlet Snake (*Cemophora coccinea lineri*)			Yes
Reticulate Collared Lizard (*Crotaphytus reticulatus*)	-	Threatened	Yes
Concho Water Snake (*Nerodia paucimaculata*)	Recovery	-	Low
Timber Rattlesnake (*Crotalus horridus*)	-	Threatened	Yes
Amphibians			
Cascade Caverns Salamander (*Eurycea latitans* complex)	-	Threatened	None
South Texas Siren (*Siren sp.*)	-	Threatened	None
Black-Spotted Newt (*Notophthalmus meridionalis*)	-	Threatened	Yes

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Sheep Frog (*Hypopachus variolosus*)	-	Threatened	Yes
Comal Blind Salamander (*Eurycea tridentifera*)	-	Threatened	None
Mollusks			
Texas Pimpleback (*Quadrula petrina*)	Candidate	-	Yes
Texas Fatmucket (*Lampsilis bracteata*)	Candidate	Threatened	Yes
Texas Hornshell (*Popenaias popeii*)	Candidate	Threatened	Yes
Mexican Fawnsfoot Mussel (*Truncilla cognata*)	-	Threatened	Yes
Salina Mucket (*Potamilus metnecktayi*)	-	Threatened	Yes
False Spike Mussel (*Fusconaia mitchelli*)	-	Threatened	Yes
Texas Fawnsfoot (*Truncilla macrodon*)	Candidate	Threatened	Yes
Smooth Pimpleback (*Cyclonaias houstonensis*)	Candidate	Threatened	Yes
Golden Orb (*Quadrula aurea*)	Candidate	Threatened	Yes
Crustaceans			
Peck's Cave Amphipod (*Stygobromus* (=*Stygonectes*) *pecki*)	Endangered	-	None
Arachnids			
Cokendolpher Cave Harvestman (*Texella cokendolpheri*)	Endangered	-	Low
Government Canyon Bat Cave Spider (*Neoleptoneta microps*)	Endangered	-	Low
Madla's Cave Meshweaver (*Cicurina madla*)	Endangered	-	Low
Robber Baron Cave Meshweaver (*Cicurina baronia*)	Endangered	-	Low
Braken Bat Cave Meshweaver (*Cicurina venii*)	Endangered	-	Low
Insects			
Comal Springs Riffle Beetle (*Heterelmis comalensis*)	Endangered	-	None
Comal Springs Dryopid Beetle (*Stygoparnus comalensis*)	Endangered	-	None
[no common name] Beetle (*Rhadine infernalis*)	Endangered	-	None
Helotes Mold Beetle (*Batrisodes venyivi*)	Endangered	-	Low
[no common name] Beetle (*Rhadine exilis*)	Endangered	-	None
Fish			
Fountain Darter (*Etheostoma fonticola*)	Endangered	Endangered	None
Widemouth Blindcat (*Satan eurystomus*)	-	Threatened	Yes
Rio Grande Silvery Minnow (*Hybognathus amarus*)	Endangered*	Endangered	Low

Table D-1
Federal and State Listed Species Potentially Occurring in the Action Area†

Species	Federal Status[1]	State Status[2]	Potential to be Present in Action Area
Devils River Minnow (*Dionda diaboli*)	Threatened	Threatened	Low
Proserpine Shiner (*Cyprinella proserpina*)	-	Threatened	Yes
Blue Sucker (*Cycleptus elongatus*)	-	Threatened	Yes
Rio Grande Darter (*Etheostoma grahami*)	-	Threatened	Yes
Toothless Blindcat (*Trogloglanis pattersoni*)	-	Threatened	None
Plants			
Bracted Twistflower (*Streptanthus bracteatus*)	Candidate	-	Yes
Tobusch Fishhook Cactus (*Sclerocactus brevihamatus* ssp. *tobuschii*)	Threatened	Endangered	Yes
Texas Snowbells (*Styrax texanus*)	Endangered	Endangered	Yes
Johnston's Frankenia (*Frankenia johnstonii*)	Recovery	-	Yes
Ashy Dogweed (*Thymophylla tephroleuca*)	Endangered	Endangered	Yes
South Texas Ambrosia (*Ambrosia cheiranthifolia*)	Endangered	Endangered	Yes
Black lace Cactus (*Echinocereus reichenbachii* var. *albertii*)	Endangered	Endangered	Yes
Walker's Manioc (*Manihot walkerae*)	Endangered	Endangered	Yes
Texas Wild-Rice (*Zizania texana*)	Endangered	Endangered	None

Source: [1]USFWS, 2018; [2]TPWDc, 2018

Notes:

* Listed by TPWD as potentially occurring in the action area but not listed by USFWS as potentially occurring in the action area.
[1] Action Area includes Kelly Field Annex and the Crystal, Crystal North, Laughlin 2, Laughlin 3, Kingsville 3, Brady Low, and Brady High Military Operations Areas
[2] While believed to be extirpated from Texas, this species range is still listed in counties within the proposed action area.

TPWD = Texas Parks and Wildlife Department; USFWS = United States Fish and Wildlife Service

REFERENCE

JBSA. 2014. *Integrated Natural Resources Management Plan Update, Joint Base San Antonio*. Prepared for JBSA and Air Education and Training Command by Weston Solutions, Austin, Texas. September.